Columbia Business
The Magazine of Columbia Business School
Summer/Fall 2023

# Embracing the Digital Future

## CBS launches four cutting-edge labs

ALSO

ChatGPT: Connect the Dots or Be Replaced

CBS Tech Innovators Transforming Industries

How AI Created This Magazine's Cover


#CBSREUNION2023

# Unlocking the Digital Future

The effect of technology in all sectors of the economy, in all aspects of our lives, is profound. Over the past few months, we all witnessed the exponential improvement in artificial intelligence—this time in the context of language models. Change is poised to only accelerate.

At Columbia Business School, we have continually retooled how we educate students to meet contemporary business needs, and we have fundamentally advanced business practices with our scholarship.

Ten years ago, we began expanding our curriculum with classes tackling areas such as algorithmic decision-making, machine learning, and the coding platform Python. And, over the past five years, we've vastly expanded our elective offerings in response to the rapidly changing business landscape, how it impacts strategy, marketing, and crucially, how it affects team dynamics, management, and leadership.

Our curriculum now offers a comprehensive range of courses that delves deeply into fields such as tech fundamentals, applied AI, digital product management, blockchain, crypto, and climate tech. We offer experiential courses in cross-functional teams, which are ubiquitous in modern organizations, and opportunities to explore the impact of tech and data on valuation and investing.

In a new class, Technology Breakthroughs, which I now teach with Professor Shih-Fu Chang, dean of Columbia University's Fu Foundation School of Engineering and Applied Science, we bring in an array of faculty experts from the Business School and Columbia Engineering to discuss current developments in areas ranging from deep learning to computational imaging and computer vision to robotics.

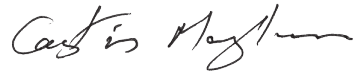
And interest in Python is only growing, with nearly 300 of the entering MBA students in 2021 having taken, or currently taking, a course in the programming language. Our Intro to Python class is by far the most popular online course, underscoring how much our alumni appreciate the usefulness of exposure to programming and algorithmic thinking in their own professional journeys today. The class is available to all alumni through Alumni Edge.

The book *Python for MBAs* was written by CBS faculty Mattan Griffel and Daniel Guetta, just two of our researchers who are contributing directly to many of the advances we teach. Scholars such as Stijn Van Nieuwerburgh, who uses big data to improve real estate analytics, and Carri Chan, whose work is improving healthcare delivery, are advancing the smart adoption of technology. Other faculty, such as Stephan Meier, who studies the impact of automation on the workforce, and Sandra Matz and her research on psychological targeting, document and share vital perspectives on the impact of technology on business practices.

Other faculty members are leading the way in cutting-edge research that shapes our daily online interactions. For instance, Assaf Zeevi's work on machine learning and its integration in the healthcare industry is highly innovative. Dan Russo's research on AI, particularly in the area of reinforcement learning, has far-reaching applications in developing large-scale recommendation systems. Bo Cowgill's research on labor markets offers valuable insights into the impact of automation in the workforce. And in his recent book, Oded Netzer demonstrates how data and intuition can be combined to make informed business decisions, providing practical recommendations for business leaders.

Building on all of this activity, late last year we established the Digital Future Initiative, an ambitious effort to focus on the global transformation to a digital economy. In January, we launched four new research labs to bring together students, business practitioners, and leading faculty from across Columbia University to promote research and curriculum development in the areas of the algorithmic economy, digital finance, humans in the digital economy, and media and technology. The goal is to interface more closely with businesses, organizations, governments, and communities in an effort to optimize and accelerate technological advances.

It is an exciting time to be at CBS, and I look forward to all we will do, together, to shape the digital future.



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## In this issue Summer/Fall 2023



In keeping with our commitment to the environment, this magazine was created in an ISO 14001 facility certified for environmental management using 100 percent alternative energy. The paper is sustainably manufactured using recycled water and renewable energy, and it is certified recycled by the Forest Stewardship Council®. The inks used are soy based or 99.5 percent VOC-free.

PEOPLE

# The 100/50 Celebration Kickoff Embraces a Legacy of Black Excellence

From left: Martavius Leonard '23, Dale Dobson, Keisha Phipps '06, Reneé Sewell '23, Kia Lowe '11, Arthur Polk '75

One hundred years ago, a young determined Black woman from Louisiana applied to Columbia Business School. When Theodora Fonteneau Rutherford was admitted and became the first Black graduate of CBS, she changed the course of history and paved the way for many to follow.

Students, alumni, faculty, and friends who followed her path gathered February 7 for the kickoff of 100/50: Embracing Our Legacy, a yearlong celebration marking the 100th anniversary of Rutherford's matriculation and the 50th anniversary of the Black Business Students Association (BBSA). The event was designed to honor the trailblazers of the past, educate others about their experiences, and celebrate the impact of Black excellence at CBS over the past century. Stories collected for the event were shared in a video reflecting on the early days of the BBSA and the safe space it created for Black students.

Opening the livestreamed kickoff event, Hayley Mason '24 encouraged the crowd to "pay homages for the sacrifices that allow us to be in this space, striving for better for ourselves and our community."

In conjunction with the 100/50 celebration, a digital history archive to collect more alumni stories and continue to commemorate the Black experience at CBS is underway.

Following the 100/50: Embracing Our Legacy kickoff event, the BBSA Elevate conference was held March 31–April 1 (see "Honoring Black Business Leaders"), and on May 12, a DEI Research Roundtable convened preeminent diversity, equity, and inclusion academics and industry practitioners to discuss bridging theory and practice to enhance current DEI leadership strategies.

## Honoring Black Business Leaders and Their Legacies

On March 31 and April 1, Elevate, the oldest student-led conference at Columbia Business School, took part in the 100/50 celebration in honor of the 100th anniversary of the first matriculated Black student, Theodora Rutherford, and the 50th anniversary of the BBSA.

Held in David Geffen Hall, the event explored the theme "Epic Ascents: Breaking Barriers & Reaching New Heights," honoring the legacies of Black business leaders who carved their own paths and showcasing the ways current Black business leaders continue to carve paths in innovative ways today.

Several CBS board members delivered powerful keynotes during the conference, including Robert F. Smith '94, who is the founder, chairman, and CEO of Vista Equity Partners; Tracey T. Travis '86, executive vice president and CFO at The Estée Lauder Companies Inc.; and Erika Irish Brown '98, who is the chief diversity, equity, and inclusion officer and global head of talent at Citi.

Robert F. Smith '94, right, speaks at Elevate.

The event provides an annual opportunity for Black business leaders and their allies to share their career journeys and personal perspectives, discuss challenges, reflect on opportunities, and honor the achievements of industry giants.

ENTREPRENEURSHIP

## Four Alumni Awarded Lang Entrepreneurship Investment Funding

Invest. Launch. Scale. Repeat.

The venture cycle continues as Columbia Business School's Eugene M. Lang Entrepreneurial Initiative Fund announced its spring round of investments in four new companies founded by alumni entrepreneurs. A separate competition for students has been ongoing since 1996.

Through the fund, the Eugene M. Lang Entrepreneurship Center supports innovative startups tackling big problems and leading change. For example, in the last round of alumni funding in fall 2022, recipients focused on tackling issues such as ethical supply chain management, shrinking the racial wealth gap, and reducing trauma-related mortality rates.

Established in 1996 with a $1 million gift from Eugene M. Lang, MS '40, the Lang Fund helps foster an entrepreneurial environment at CBS. To date, companies incubated and launched by students and alumni include Away, Betterment, Beyond Meat, Compass, Daily Harvest, Flexport, Mack Weldon, Workrise, Zocdoc, and many more.

This spring, after a highly competitive selection process, the fund awarded investments to these new ventures:

- **Genius Sheets**
  **Trevor Lee '20 and Zheng Li '20**
  Lets users connect to any internal API or database to ask questions, generate reports, and query data using text interfaces powered by AI.
- **Health In Her HUE**
  **Eddwina Bright '18**
  Leverages the power of tech, media, and community to improve Black women's health and well-being.
- **Sool**
  **Carol Pak '16**
  Operates as a global wholesaler of premium Korean alcoholic beverage brands.
- **Truewind**
  **Alex Lee '19**
  Provides AI-powered accounting and financial planning for startups.

All applicants were screened by students in the two-year Columbia Venture Fellows program. The program provides firsthand venture investing experience to CBS students who are serious about pursuing a career in venture capital.

Learn more about the Lang Entrepreneurship Center at business.columbia.edu/lang.

TECH & STARTUPS

## Student-Run Alleycon Features AI, DeFi, and Climate Tech


Venture capital panel at Alleycon

Alleycon, Columbia Business School's annual student-run technology conference, returned to an in-person format February 17 with a day-long series of panels, speeches, and keynotes covering such topics as generative AI, digital health, climate, venture capital, and decentralized finance.

The Eugene M. Lang Entrepreneurship Center at Columbia Business School, the Sanford C. Bernstein & Co. Center for Leadership and Ethics, the CBS Venture Capital Club, and the CBS Fintech and Blockchain Club each sponsored panels at the event, which was held at Convene in Lower Manhattan.

The day's sessions kicked off with opening remarks from CBS Dean Costis Maglaras,

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IN MEMORIAM

## Professor Charles M. Jones

Charles Mark Jones, the Robert W. Lear Professor of Finance and Economics at Columbia Business School, passed away at the age of 56 last December, surrounded by his family. He had been living with a malignant brain tumor for four years.

Jones was a product of public education and a lifelong music lover. Growing up, he sang with the Orlando Deanery Boychoir and at his church, where he also played the trombone. He loved to perform and played the lead role in *Oliver* in grade school and in *Pippin* in college.

Jones earned his SB in mathematics from the Massachusetts Institute of Technology, where he met Daphne, his wife of 33 years. He spent a semester at the London School of Economics and after college worked as an analyst for Merrill Lynch in investment banking. He then earned his PhD in finance at the University of Michigan School of Business Administration.

Before joining the faculty of Columbia Business School in 1997, Jones was appointed assistant professor of economics at Princeton University. At CBS, he was named the Robert W. Lear Professor of Finance and Economics in 2008.

Over his career, Jones built a legacy of work on short sales, algorithmic and high-frequency trading, market liquidity, and individual investor trading. His empirical research has helped answer some of the biggest questions in finance, including how stock markets incorporate information and why investors trade. Using his deep knowledge of market structure and financial history, Jones had an uncanny ability to design statistical tests that shed light on these fundamental issues.

In addition to his notable research contributions, which bridge academic theory and business practice, Jones was an exceptional teacher, skilled administrator, and contributor to the finance field at large. He continuously held significant leadership positions at Columbia Business School for more than a decade.

Always a prolific scholar, Jones co-authored and published "Tracking Retail Investor Activity" in the *Journal of Finance* in 2021. He continued working with co-authors on five active papers into the fall of 2022.

A devoted husband, father, colleague, and friend, Jones had an infectious love of life and an even stronger love of the people around him. He is survived by his wife, Daphne; children, Elizabeth, CC '24, Andrew, SEAS '20, and Caroline (and her partner, Fergus); mother, Alice; brothers, Chris (Elaine) and David (Edurne); parents-in-law, David and Anabel; brother-in-law, Anthony (Laura); and a niece and three nephews. He was predeceased by his father, Lawrence.

For information on the Jones Doctoral Fellowship Fund in memory of Professor Charles M. Jones, visit the CBS website.

*continued from page 4*

followed by a keynote from Jaleh Bisharat, co-founder and CEO of NakedPoppy, a beauty company that curates clean, safe, and effective beauty brands.

The day's events included a climate technology roundtable as well as sessions such as "Generative AI: Current State, Future Applications, and Impacts on Business and Society," "NYC Tech Startup Ecosystem: Current State and Future Opportunities," and "Crypto: The Rise, the Fall, and What's Next."

The closing keynote was delivered by Marc Randolph, co-founder of Netflix, who recounted how tossing around product ideas with a colleague led him to develop the concept of Netflix.

"Success is proportional to how many ideas you try," Randolph said.

WOMEN IN LEADERSHIP

## Inspiration from Tech Trailblazers

**From left: Alison Lindland '08, Alexandra Tibbetts '99, Dana Weeks '03, and Andrea Zaretsky '01**

C-suite executives, leading industry experts, and Columbia Business School alumni shared perspectives on the advancement of women in the technology sector at the sixth annual Women's Business Leadership in Tech Conference, held in February on the Manhattanville campus.

Produced in partnership with Vista Equity Partners, the event included panels and discussions around innovation, challenges and solutions within the industry, and the need to continue advocating for inclusivity in business.

CBS Dean Costis Maglaras welcomed attendees, which included Vista Equity Partners Chairman and CEO Robert F. Smith '94 and Rachel Arnold, senior managing director at Vista. That morning, Smith also met with the Robert Smith Scholars over breakfast in the dining hall named in his honor. He launched the Robert F. Smith '94 Scholarship Fund to support MBA students through partial or full scholarships. The awards are designated for enrolled CBS students who have graduated from HBCUs, overcome systemic hardships or challenges in their academic pursuits, or demonstrated a strong commitment to engaging diversity.

The daylong conference offered panel discussions such as "Adopting a Diverse Workforce During Uncertain Times," "Investing In Uncertain and Volatile Times," and "How Every Industry Is Utilizing and Adapting to New Technology."

Panelists included leadership from companies such as Integral Ad Science, LogicMonitor, Amplifyher Ventures, PhotoBall, Menai Financial Group, Movable Ink, YouTube Learning, MedTrans Go, and Morgan Stanley Wealth Management.

"What I'm most impressed by at this conference is how it brings together leaders from all sectors to talk about the nature of technology and women in business," said Vista's Arnold. "Columbia Business School has a reach many organizations don't have, and providing that platform is special."

The conference also featured a fireside chat with Agnes Chu, president of Condé Nast Entertainment. "I'm all for more global citizens," she said. "Unification is a very good thing ultimately for how we see the world."

BOTWINICK PRIZE

## Business Ethics Prize Goes to KIND Snacks Founder Daniel Lubetzky

The 2023 Columbia Business School Botwinick Prize in Business Ethics and Ethical Practice was awarded to founder and CEO of KIND Snacks Daniel Lubetzky, who was honored at a ceremony in David Geffen Hall last April. As part of the event, Lubetzky discussed values-based leadership with CBS Professor Rebecca Ponce de Leon.

Lubetzky founded the KIND company in 2004 as a not-only-for-profit corporation, a business model he has followed since 1994, when he


Daniel Lubetzky

launched the Peaceworks Foundation to bring together neighbors from Middle Eastern countries in business ventures. Today, Peaceworks, a 501(c)(3), and its signature initiative, the OneVoice movement, continues Lubetzky's work to amplify the voices of moderate Israelis and Palestinians.

In 2020, KIND was acquired by candymaker Mars and has since remained committed to civic engagement. Within the organization, Lubetzky spearheaded the KIND Movement, which aims to promote "everyday acts of KINDness." The initiative involves collaborating with under-resourced communities to bolster local nonprofit organizations, establish school programs to cultivate diversity and mutual understanding, and sponsor events that promote entrepreneurship.

Recently, Lubetzky unveiled a new venture, Camino Partners, a startup incubator and investment platform dedicated to supporting entrepreneurs who are creating "enduring value with values as their compass."

Established by the late Benjamin Botwinick '26 and his wife, Bessie, the Botwinick Prize goes to businesses or business individuals who exemplify the highest standard of professional and ethical conduct. The award ceremony was co-sponsored by the Student Leadership and Ethics Board as part of Leadership and Ethics Week.

HIRING

## A Business Case for Second-Chance Employment

The inaugural "Charting a Path Forward with Business Schools and Corporations," a new annual conference exploring labor market trends and the benefits of second-chance employment, was held April 3 in David Geffen Hall.

The event convened business and government leaders, faculty, administrators, scholars from other business schools, and individuals impacted by incarceration for a discussion about the business case for second-chance hiring.

Co-organized by the Tamer Center for Social Enterprise at CBS and Justice Through Code, the Business Roundtable, and the Second Chance Business Coalition, and co-chaired by JPMorgan Chase and Eaton Corporation, the conference highlighted examples of the work of government and business leaders in providing individuals with criminal records with pathways to sustainable employment.

Panelists—including Oklahoma Governor J. Kevin Stitt; Verizon CEO Hans Vestberg; and human resource heads at JPMorgan Chase & Co., NBCUniversal, and Schnitzer Steel—explained the benefits and best practices of second-chance hiring. Conference attendees also heard from individuals with criminal records who've graduated from Columbia's Justice Through Code program and now work as software engineers at companies including The Walt Disney Company and Amazon Web Services.

In future years, the conference location will rotate among partnering business schools.

Panelists at the conference on second-chance employment

SUSTAINABILITY

## Democratizing Sustainability Through Technology

Donnel Baird '13, CEO and founder of BlocPower, a company striving to make buildings healthier, smarter, greener, and more valuable, said he recently introduced his family to one of his heroes: the 32nd president of the United States, Franklin Delano Roosevelt.

"FDR, as part of the New Deal, brought electricity to America," Baird explained in a conversation


Donnel Baird '13

with Columbia Business School Professor Bruce Kogut as part of the Business, AI, and Democracy initiative's BAID @TheHub speaker series. "FDR came up with a rural electric co-op model," and that fundamentally democratized parts of the country that otherwise may have been left behind.

Baird was referring to the Rural Electrification Act passed in 1936, which allowed the federal government to extend low-cost loans to nonprofit farming cooperatives to bring electricity to rural communities.

FDR's influence extends to how Baird thinks about addressing today's climate crisis and the racial wealth gap. "I can't help but wonder: Could you have cooperatively owned green energy utilities that are owned and operated by people in Harlem or the Bronx?" Baird posited. "I think if we gave more citizens an opportunity to own equity in local entities that are providing green infrastructure, facilitated by the federal government, then citizens would have a different kind of relationship to their energy providers, to energy generally, and to their local communities and government."

Since 2014, BlocPower has been using proprietary technology to analyze, finance, and upgrade homes and buildings with the latest in energy-efficient electric technology and appliances. The technology has cut costs, shortened project timelines, and—crucially—made the benefits of these upgrades accessible to all.

Baird supports Congress' passage of the Bipartisan Infrastructure Deal and said the onus is now on the private sector to do its work finding solutions to address the climate crisis.

BlocPower has so far raised cash through venture capitalists, but Baird is now thinking on a different scale.

"VC just isn't going to get us there on climate change. It's too big. We need to find other forms of early-stage capital," he said. Without giving too much away, he mentioned that he had dined recently with Jeff Bezos, who's already pledged billions of dollars to fighting climate change.

"I'm asking myself, is there a path here to solve some of these problems using new technology strategies, with sound corporate governance," Baird said. "Yes, I truly think there is a path through."

BUSINESS & SOCIETY

## Do Economists Need a Hippocratic Oath?


Professor Joseph Stiglitz

In his 2013 book, *The Price of Inequality*, Joseph Stiglitz, a Nobel Prize-winning author, economist, and CBS professor, laid bare the actual and potential consequences of a dramatically imbalanced distribution of wealth across America.

In a new book, *The Great Polarization* (Columbia University Press, 2022), Stiglitz and co-editor Rudiger L. von Arnim of the University of Utah pick up that thread, discussing growing inequality in stark terms and outlining potential ways forward.

Stiglitz discussed the topic of inequality and the future of capitalism with Glenn Hubbard, dean emeritus and the Russell L. Carson Professor of Finance and Economics at CBS, during the first installment of a new speaker series on the future of capitalism from The Hub, a new CBS think tank.

Since *The Price of Inequality* was released, much has changed in America: The Donald Trump presidency redefined the US's role on the world stage; an opioid epidemic ravaged the country; the effects of climate change became more evident; and the global pandemic claimed millions

of lives and livelihoods, making many of the great divides that Stiglitz once wrote about even harder to ignore.

At the heart of Stiglitz's argument: Too many economists and business leaders still blindly subscribe to the free market ideas of economists Milton Friedman, Adam Smith, and Friedrich Hayek. Stiglitz said many leaders with influence have "propagated the idea that markets solve all problems. There is a core idea that we should just let the market rip, and that is simply not true."

To make capitalism more equal, Stiglitz suggested that, like physicians, economists should take a Hippocratic Oath.

"Similarly, the first point of the economics profession should be to do no harm," he said. That could mean understanding that while raising wages and investing in the workforce might be less advantageous to shareholders in the short term, the long-term benefits will certainly materialize, he said.

"I am optimistic for the next 30 years, if we get our policies right," Stiglitz added. But we need stronger regulation and a better education system, he said, and we need to steer technological change in the right direction.

"There's a real reconstruction of the economy that is needed. [But] if we get it right over the next 30 years, then we should be good for the next 30 years after that."

AI-GENERATED ART

## AI Created the Illustrations in this Magazine: Here's How


While new technologies are often considered to be disruptive forces that can shake up entire industries and sectors, graphic designers may not need to fear for their jobs just yet.

In recent months, there has been a rapid expansion of AI-powered tools, the most well-known of which is ChatGPT, a widely used language-generation program created by OpenAI. Using machine learning, it can comprehend the nuances and patterns of natural language, enabling it to provide responses that closely resemble human, written communication.

Can AI tools do the same for art? Several programs, including Stable Diffusion, Midjourney, and DALL·E, attempt to produce high-quality images based on a text prompt from a user. We felt compelled to use this groundbreaking new technique for the cover image and story illustrations inside this issue of *Columbia Business* magazine.

Our traditional approach to creating illustrations involves working with human designers. We first decide on the articles and pages we want to enhance with an illustration and review the work of several designers to decide on a short list. Working with our AI designer—in this case Shutterstock's AI image generator, Shutterstock.AI, which is powered by Open AI and LG technology—is a very different process.

The briefing with the AI designer consisted of little more than typing a desired phrase into a browser. But getting our AI designer to come up with some usable art was a hit-or-miss affair, mostly consisting of misses. For example, when we opted to input the phrase "***the Digital Future Initiative at Columbia Business School***," this is the sort of image we received:

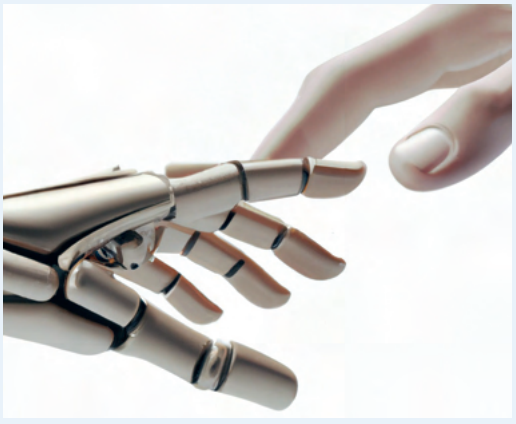
We next tried using longer text (the full 77-word description of the new Algorithmic Economy Lab, for example), but adding more words did not yield more focused or usable images. Instead, we saw bizarre images with colored squares and indecipherable text—a message from the future, perhaps?

We soon realized we needed to be more prescriptive in our image descriptions, conceptualizing the image first and then giving the AI designer very clear instructions on the look, tone, and contents of the image. After inputting scores of phrases, using trial and error to find the most interesting ones, and honing the prompts that generated them, here's what the phrase "***a person looking into the digital future with zeros and ones raining down***" yielded for us:

While the image was closer to the one we were looking for—a conceptual image of the digital future—we felt we could do better.

Our next step was to borrow an idea from one of the most creative and influential artists in the history of Western art: Michelangelo. We sought to emulate his image of Adam reaching out to God in the *Creation of Adam* fresco on the ceiling of the Sistine Chapel. As with the famous image, where God's gesture represents the creation of humanity, the new cover image we generated would suggest a new creation—of artificial intelligence by humans.

The new command "***3D photorealistic rendering of a robot hand reaching out to a human hand in the style of Michelangelo Sistine Chapel***" generated these images (closer to our intended concept, but with a clear bias towards lighter skin tones):



Finally, after some reworking of our prompt, "***an ai-generated photo of a human hand with mid-tone skin color reaching down to touch a robot hand, suitable for use on a magazine cover; the image should be visually striking and evoke a sense of connection or contrast,***" we came up with an image that we were happy with:

What can we learn from our experience using AI to generate art?

Despite its ability to rapidly produce images, the AI art generator often failed to effectively convey the themes we sought to illustrate. We had to input a very specific set of text commands that we discovered through trial and error. And we had to find a way to circumvent the bias we found in the results.

The bottom line is that the human factor remains crucial, and the ingenuity that comes with it cannot be wholly substituted by machines. In creative fields such as design, illustration, or music composition, it's likely that, for now, the human-AI partnership will power the workplaces of the future. AI will aid artists in generating novel forms of art rather than rendering their jobs obsolete.

# Scene@CBS


Benís Reffkin '12 and Robert Reffkin '03 join CBS students, alumni, faculty, and friends for the launch of the 100/50: Embracing Our Legacy campaign.

The Bank of Japan Deputy Governor Masazumi Wakatabe speaks at a lunchtime seminar hosted by the Center on Japanese Economy and Business.


Shake Shack CEO Randy Garutti addresses students at an event hosted by the Eugene M. Lang Entrepreneurship Center.

Professor Abby Joseph Cohen discusses trends that will shape global financial markets in 2023. The event was hosted by the Jerome A. Chazen Institute for Global Business.


Alleycon, CBS's annual student-run technology conference, returned to an in-person format in February with a daylong series of panels, speeches, and keynotes covering such topics as generative AI, digital health, climate, venture capital, and decentralized finance.

Marc Randolph, co-founder of Netflix, delivers the closing keynote speech at Alleycon, sharing his experiences as a serial tech entrepreneur.

Gary Stewart, partner at Polaris Partners, speaks about maximizing your career potential during the Alleycon conference.


CBS Assistant Dean Michael Robinson '01, who leads strategic efforts centered around diversity, equity, and inclusion, at the launch of 100/50: Embracing Our Legacy campaign.

Donnel Baird '13, right, CEO of BlocPower, and CBS Professor Bruce Kogut discuss the use of alternative energy to power cities at an event hosted by The Hub.

Students from the United States Military Academy at West Point, NY, visit CBS for a full-day event to exchange ideas on leadership, ethics, and decision-making. The February event was organized by the Student Leadership and Ethics Board with help from the Bernstein Center and the Military in Business Association.


Tracey Brown, Walgreen's executive vice president, president of Walgreens retail, and chief customer officer, gives a keynote address at the 19th annual Healthcare Industry Association (HCIA) conference.

Diego Sacristan, Pfizer's Oncology US lead, in conversation at the 19th annual HCIA Conference.

Professor Mark A. Cohen, left, with Anushka Salinas '10, president and COO of Rent the Runway, at the 17th Annual Retail & Luxury Goods Conference.

Nobel Prize-winning economist Professor Joseph Stiglitz, right, discusses the future of capitalism with CBS Dean Emeritus Glenn Hubbard for the first installment of a new speaker series from The Hub.

# Expanding Entrepreneurship Ecosystems

CBS's Inclusive Entrepreneurship Initiative seeks to build venture ecosystems in the communities around the School. **By Katie Gilbert**

When Columbia Business School opened the doors of its Manhattanville campus for a Neighborhood Open House last fall, it was extending an invitation to members of the neighboring Harlem community for more than just a get-together. The open house served as the public introduction of the new Inclusive Entrepreneurship Initiative, an effort housed within the Tamer Center for Social Enterprise to bring entrepreneurial activities, opportunities, and training to the local Upper Manhattan community.

Lacie Pierre '23, a dual-degree MBA and international public affairs student, notes that attendees of the open house included a diverse mix of local entrepreneurs, investors, students, representatives of nonprofits, and others.

"It was an opportunity for us to open up the space and accept feedback from people in the community: What would you like to see? What would be helpful? When we talk about inclusive entrepreneurship, we need to design that in a participatory way," Pierre says. Stations manned by students dotted the gathering space, and attendees were invited to converse with the students or anonymously share their thoughts and ideas via index cards. In some cases, Pierre says, CBS students were able to offer attendees guidance or make connections in real time.

"I would describe the evening as affirming that it really is possible to do entrepreneurship in an inclusive way," notes Pierre, "and that our School is at the leading edge of that intersection of business and society."

The Inclusive Entrepreneurship Initiative is headed by Professor Dan Wang, co-director of the Tamer Center for Social Enterprise, who says the initiative's origins stretch back nearly two decades—to his own tenure as a Columbia undergraduate and his work on the news team of the University's student radio station, WKCR 89.9 FM. One of the first stories Wang worked on for the station, around 2004, was about neighborhood tensions surrounding Columbia's proposed expansion into West Harlem. In 2022, when he found himself moving his office to Columbia's newest expansion, in Manhattanville, the stories he heard as a student reporter were still lodged in the back of his mind.

**"I would describe the evening as affirming that it really is possible to do entrepreneurship in an inclusive way."**

**Lacie Pierre '23**, a dual-degree MBA and International Public Affairs student

"I may not have the power to completely remediate these tense relationships," he says. "But one thing we can do at Columbia Business School is create opportunities."

Working closely with Kaaryn Nailor, assistant dean of community partnerships at Columbia Business School and managing director of the Columbia-Harlem Small Business Development Center, Wang sketched out a blueprint for how the Inclusive Entrepreneurship Initiative might work and what it could offer. The initiative's overarching goal is to expand and develop venture ecosystems in the communities around CBS—connecting students, faculty, alumni, and resources to the people and organizations who'd like to work with them in doing so.

Nailor says in these early conversations about the initiative, she felt particularly excited about the educational opportunities that opened up for CBS students when its campus moved to Manhattanville.

"I was passionate about ensuring that students understand that when they're at Columbia Business School—and after they leave—the community around them should be considered a real benefit," Nailor says. "I think there can be the idea that, 'I'm coming into this historically marginalized community, and I'm here to help.' Our community doesn't view itself that way; most New Yorkers don't view Harlem that way. If anything, Columbia gets the benefit of having these incredibly rich, diverse communities filled with people who are providing incredible experiences for our students, faculty, and staff—and who do a lot of teaching for the academy."

Wang says the collaborations facilitated by the initiative could take many shapes, including internship programs for CBS students within existing local business-accelerator organizations or free "venture clinics" (modeled on the concept of law clinics) where students can offer business advisory services. Wang says, eventually, he hopes the Inclusive Entrepreneurship Initiative will include a curricular offering for students, "so that students who are interested in this can receive formal training in what it means to create economic value by bridging digital, economic, and social divides."

During the spring '23 semester, student working groups began developing preliminary feasibility studies and strategic plans for their own inclusive entrepreneurship project ideas. Nailor says she's been heartened by how patient community members have been with students as they plot out their projects—and she has also heard from community partners about how excited they are to see what may come of those projects.

Wang says it's important to think broadly about what "inclusion" can and should mean—especially when the initiative and the student projects are in their nascent stages.

"When you have a broad interpretation of inclusion, you can include populations such as individuals who are either permanently or temporarily disabled," he says. "You can include folks who are elderly who want to access the labor market but face cultural discrimination. You can include undocumented immigrants. When we think of inclusive entrepreneurship, we're thinking about all of these non-market barriers that people face in accessing the formal economy through entrepreneurship."

Working hard to include a greater diversity of these underrepresented groups in entrepreneurial ecosystems is just good business, he notes. Entrepreneurship is the engine of the US economy because of its ability to generate novel solutions for the people who want and need them—but it could be doing an even better job of that.

"When every startup looks the same and comes from founders who have the same demographic and economic background, you lose that diversity of ideas," Wang says. "One way to supercharge entrepreneurship, and make it useful for everybody, is to make it more inclusive." ■

# Lessons from Lucidian and Beyond

## How a 'space-mining' game pushes MBA students to test how they function in teams

By Laurie B. Davis

Shoki Oyabu '23, left, and Kali Ridley '23 mapping strategy in *Lucidian*

Racing the clock between solar storms and seismic events, a team of space miners hunts for "alloc-ite" on a deep-space asteroid in a do-or-die attempt to save their colony. The team's leader scrambles to guide their crew through the chaos. Their engineer toils to repair a badly damaged drill head. The navigator looks for input from the team's analyst on mining strategy. Unable to find him, she makes a tough call on her own, sending a mining rig careening across the asteroid, and into potential harm, in search of the lifesaving materials they need.

As the action reaches a fever pitch, a gong sounds, abruptly signaling the end of the mining sprint. A half-dozen teams return to base camp—a Columbia Business School classroom in Manhattanville. There, the lead choreographer of the simulation, Daniel Ames, the Ting Tsung and Wei Fong Chao Professor of Business, points out QR codes that link to feedback surveys. The room falls silent as students pull out their phones and tablets to reflect on their own experiences and evaluate how their fellow team members are performing in *Lucidian*, the "space mining" game Ames created for his Immersive Teamwork course.

"*Lucidian* presents students with an intense, multi-hour hands-on teamwork stress test," says Ames. "We hit the pause button mid-mission for people to capture their thoughts in digital diaries. Then, after a few minutes, we flip the switch and they're back in space for another hour and a half of mayhem."

Todd Carlson ’22, left, and Seltadino Abadi ’22 working together in an impromptu team

Before launching the course, Ames worked on *Lucidian* for four years, collaborating with immersive theater expert Dalton Gray and game designer Caroline Porter, refining the activity through tests with dozens of teams. “No other business school has a teamwork course like this, mixing deep-dive operational simulations, creative design projects, and tech-enabled peer feedback,” says Ames. The outer space activity pushes students to test their abilities as cross-functional team members or leaders. Without enough time to fully explain their roles to each other, players operate with incomplete information—and leaders juggle to keep everyone synchronized. Ames also bakes in some surprises, giving teams opportunities to support or betray one another, leading to cries of joy and groans of pain.

## Not All Fun and Games

Typically, games are fun, but like *Mario Kart*, the No. 1 stress-inducing video game according to *Forbes*, *Lucidian* activates a level of tension. “It’s not meant to be fun,” says Ames of *Lucidian*. “The whole experience is designed to propel personal development. We ask students to push themselves out of their comfort zones. Then we hold up a mirror for them to reflect on themselves and their teams.”

Self-reflection can be revealing. “I learned that pressure makes it hard for me to think, and I like to be prepared,” says MBA second-year student Cole Ahnell ’23. “I learned that in chaos, taking too much time to think can paralyze a team.”

The reflections and critiques students give one another throughout the two-and-a-half-day course help them glean important lessons to apply to future teamwork situations. Ames wants his students to closely observe how they express themselves and communicate in teams, how they react to stress, and how they generate ideas, in whatever role each may play.

To that end, Ames urges students to choose the space-mining role that is least comfortable for them. If someone naturally gravitates toward leadership roles, he councils them to be an analyst or engineer. In many cases, extroverts take the supporting roles while introverts step into leadership positions, says Ames. What can be learned by going against type? A lot.

MBA second-year student John Scalamandre ’23, chose to be a navigator. “I generally prefer to have a thorough analysis prior to making a decision and would rather not be forced to make quick decisions with little information,” says Scalamandre, who didn’t have that luxury in *Lucidian*. As navigator, he learned that he needed improvement in a critical teamwork capability: communicating. While the game helped him see strengths in his adaptability and leadership readiness, he says it “also gave me some points to work on, mainly communication within my team in situations where I would rather push forward and get it done.”

## At the Core of Team Functions

The course revolves around Ames’s “Team Functions” framework, which stresses the importance of two core processes: communication

> **"The most impactful lesson learned for me is trust the process. I had to quickly adapt to relying on the journey and my teammates. I had to learn to place faith in our ideas and believe in our product, even though I couldn't see the end result."**
>
> **Tami Thompson '23 ,** MBA student and US Navy officer

(how team members express themselves and understand each other) and conflict (how team members address differences), built on a foundation of climate (how members view one another and the team).

During the course's second day, groups are reshuffled to tackle a creative challenge: design a game revolving around team dynamics such as coordination. It's a different kind of pressure but one the students feel acutely, knowing their classmates will play their game the next morning.

**Alena Shurtakova '23, left, and Grace Zimmerman '24 playing a new game**

While communication was an issue in Scalamandre's *Lucidian* experience, trust was the main focus in the game design exercise for second-year MBA student and US Navy officer Tami Thompson '23.

"The design challenge was a bit of a whirlwind for me because I couldn't see the forest through the trees," says Thompson. "Usually, I know where I want to end up but have to figure out how to get there. In creating the team game, we were given a general direction but had no clue where we were going, and that was a bit scary."

She adds, "The most impactful lesson learned for me is *trust the process*. I had to quickly adapt to relying on the journey and my teammates. I had to learn to place faith in our ideas and believe in our product, even though I couldn't see the end result."

Insights and lessons were plentiful during the course.

Ahnell, who says he learned from the self-reflections, also found Immersive Teamwork challenging and relatable to work situations.

"In business, you're not only tackling the problems you deal with for your company, but you are also managing emotions, expectations, and desires of other human beings," he says, referring to team dynamics. "Honestly, it was one of the best and most-exhausting courses I have taken during my time at CBS." ■

# A NEW VISION OF THE DIGITAL FUTURE

**Columbia Business School does more than prepare students for what's next—it helps define that future, starting with four new labs.**

Breakthrough technologies will continue to transform our world at an ever-increasing pace, and we need to do more than simply keep up. We need to continue building skills that will be transferable as technology continues to rapidly evolve.

That's precisely the ongoing philosophy behind Columbia Business School's Digital Future Initiative (DFI), which recently introduced four specialized labs that will draw on faculty expertise to tackle the most significant topics in the digital future: the algorithmic economy, the emerging world of decentralized finance, how technology is affecting people in organizations, and technology's impact on media and entertainment.

"As the digital economy continues to expand—with new products, business practices, and careers in big data, digital finance, and algorithmic decision-making—our labs will guide the way with research on technology, ethics, and management," explains Dean Costis Maglaras.

On the pages that follow, you'll gain insights into the focus of each lab, as communicated by its faculty leader, as well as a summary of the current state of digital transformation in the areas each lab covers.

The DFI's labs will place significant emphasis on research activities that explore new and challenging questions about the digital economy. These insights will offer a deeper understanding of the digital transformation of business, while connecting the insights of the business community and academia in a two-way exchange.

Collaboration among the labs will be important, too, and open up even more productive areas of inquiry, while continuing to sharpen the School's curriculum for students and alumni, and acknowledging the wide-ranging effects of digital disruption on our economy and society.

It's the kind of revolutionary approach that has always defined the School: a bold embrace of change combined with disciplined analysis.

# 01 Shaping the Future of Digital Finance

**The Briger Family Digital Finance Lab advances the latest research and developments in the field.**

When Ciamac C. Moallemi hears people conflating emerging blockchain technologies with crypto currencies and the collapse of FTX, he suspects they are missing the bigger picture—and likely also missing out on opportunities.

That's because when Moallemi, the William von Mueffling Professor of Business in the Decision, Risk, and Operations Division of Columbia Business School, considers the latest developments in blockchain technologies, he can't help but contrast the spirit of experimentation he sees in the field with the comparative stasis of traditional financial markets.

"There are a lot of ideas that people have tried in crypto because it's unregulated—and because you *can* try them. Some of them have been bad, but some of them have worked quite well," says Moallemi. "Fundamentally, blockchain might enable new things that are simply not possible in the traditional environment."

It's this promise of new innovations, and the potential to solve financial problems more efficiently, that is at the core of the new Briger Family Digital Finance Lab, one of a collection of labs being launched as part of the School's Digital Future Initiative.

Overseen by Moallemi, the lab focuses on decentralized finance and its role in transforming how financial markets function within new structures like automated collateralized lending pools and automated market makers. Included in the lab's purview will be the underlying economics of blockchains, decentralized market microstructure, and mechanisms for decentralized organization and governance.

In addition to supporting research in the area of digital finance, the lab will seek to bridge the gap between industry practitioners and academics, and bring together academics from a variety of areas (operations, economics, computer science) to expose students to these new technologies and their applications.

IN DEPTH

## Defining Where Digital Finance Will Go Next

As blockchain and cryptocurrencies evolve, their potential to reshape the future of finance is becoming clearer.

**FROM THE EARLY** emergence of Bitcoin to the rise of stablecoins such as Tether, we've seen years of dramatic expansion in digital finance. Statista forecasts that the use of blockchain in finance will explode from $280 million in 2018 to $22.5 billion in 2026. Of course, that prediction came out shortly before FTX unraveled and Bitcoin floundered, throwing continued growth into question.

In late 2022, professionals and academics gathered at Columbia University for the

The lab's team will investigate questions ranging from "How do we match people when they want to trade or lend?" to "What are the types of products we can offer investors?" For instance, Moallemi sees the development of perpetual futures in crypto (futures contracts that have no expiry date, unlike traditional futures contracts) as a good example of how blockchain technology permits the development of new products.

"The goal of this Digital Finance Lab is first and foremost to explore some of those ideas," Moallemi said. "But then also, by doing our own research and by interacting with practitioners, we bring those ideas back into the curriculum."

Fostering an ongoing dialogue between researchers, practitioners, and students is a key part of the Digital Finance Lab—and one Moallemi sees as essential to both teaching and informing new research. Joint projects between academics and practitioners can identify the capabilities blockchain offers as well as the challenges. Moaellemi also sees an opportunity to address further research to make systems work more efficiently. The overarching question is: How can blockchain help process more transactions to help reduce costs and increase efficiency?

Conferences are one way the lab will facilitate collaboration and bring the newest ideas to campus. The inaugural Columbia CryptoEconomics Workshop, co-sponsored by the Ethereum Foundation, was held this past fall. At the event, professors, alumni, and practitioners in the field explored issues related to economics, incentives, and blockchain technology. And the new Digital Finance Seminar Series brings in top researchers from academia and industry across disciplines to discuss the latest developments in the field.

The ability of both the lab and the planned events to move the conversation forward in the field will be a benefit to all involved, says Moallemi.

"As academics, we're really good at building models and understanding things if we know the problems," he says. "But the industry practitioners, they're the ones who know the problems. So a big role of the center is to connect these two sides." ■

inaugural CryptoEconomics Workshop. Despite the turmoil facing the industry, many in the field still offered strongly positive projections. The overall sentiment was optimism that recent issues would lead to useful recentering, moving us away from the runaway valuations and the unmanaged risk that led to crashes, fraud, and hacks. Some workshop attendees called the FTX debacle an opportunity to move toward appropriate regulation and rigorous analysis, even suggesting that this is precisely the right time to develop creative applications of technology focused on decentralizing finance.

It's an exciting vision, looking ahead to improved technology transforming how we execute every type of transaction by replacing intermediaries with distributed ledgers in the form of unbreakable blockchains. The envisioned advances could create the confidence consumers get today from having monies held by trusted intermediaries, a scenario familiar to anyone who has used escrow accounts or online markets such as Airbnb.

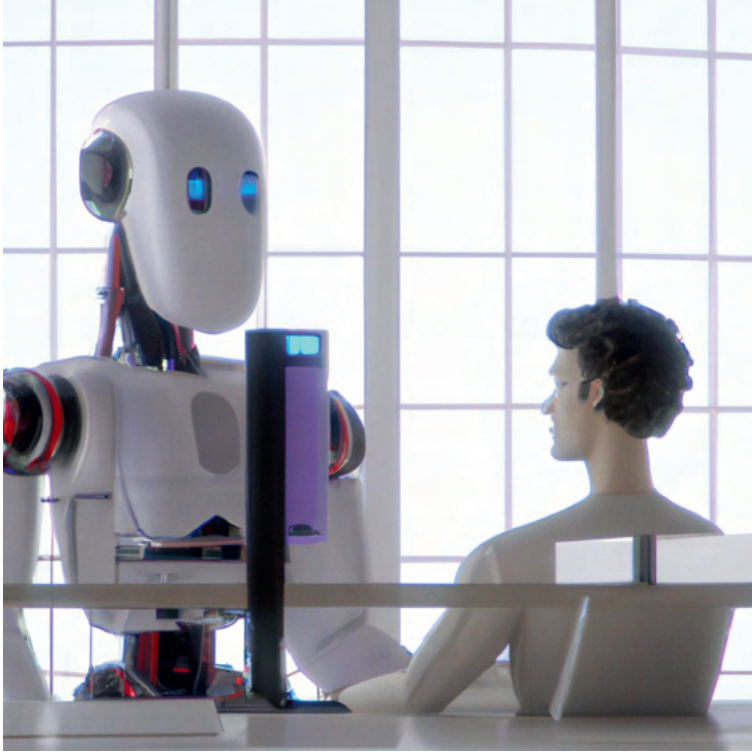
If decentralized models replace these middlemen, transactions would leverage tokens and be governed by protocols, going through a digital system that's automated, secure, and independent. Transfers would clear almost instantaneously with almost no opportunity for fraud. Better yet, the systems could operate without the fees and commissions that are integral to today's transactions because decentralized data could streamline, reduce, or eliminate the need for costly steps such as reconciliations and audits.

It's a vision worth striving for. Regulation needs to be ironed out and other concerns still exist, but it's clear that digital technologies will be shaping the future of finance. Perhaps that growth prediction of $22.5 billion in 2026 may even turn out to be low. ■

Cover Story

# 02 How Technology Is Shaping Our Relationship to Work

**The Humans in the Digital Economy Lab delves into how technology is changing the way we work.**



When the pandemic turned millions of employees into remote workers overnight, it accelerated acceptance of a technology-enabled distributed workforce that had been gaining speed for years.

The lasting effects of this technological change—and the next digital disruptors in the workplace—are among the topics on tap for the newly created Humans in the Digital Economy Lab. Part of Columbia Business School's Digital Future Initiative, the lab is led by Stephan Meier, the James P. Gorman Professor of Business.

Bringing together experts from interdisciplinary fields, the lab will investigate how technology and digitalization affect and interact with people in organizations. Projects will focus on elements of work including automation across industries, the composition of the workforce, and how the workplace could be reimagined.

For Meier, the rapid adoption of technology presents ample new research topics. Some of the questions he intends to explore include:

- To what extent are machines capable of replicating work currently done by humans?
- What is the current nature of the interaction between humans and machines, and what should it be?
- Under what circumstances do they work better together, in partnership, rather than having a machine displace a person?

As one example, Meier's class, Future of Work: Strategy & Leadership, takes an in-depth look at the interactions and partnerships between computers and humans in Morgan Stanley's wealth management division. The case study examines how the role of financial advisor has changed over time.

In the past, an advisor would evaluate a client's risk appetite and develop personalized investing recommendations. Now, Meier says, robo-advisors can generate investment strategies aligned

IN DEPTH

## Understanding the Challenge of Workforce Disruption

Increasingly rapid change coupled with emerging technologies is having a profound effect on our work lives, cities, and society.

**FROM SUPPORT STAFF** to senior managers, we've all learned that change is the norm—often coming hand in hand with new technologies.

The increased adoption of remote work following the pandemic, for example, has accelerated the use of tools that allow workers to collaborate and communicate within a geographically dispersed workplace. And it has led organizations to devise new workforce habits. Many companies that brought staff back to the office over the past year have done so for just a handful of

to people's preferences, giving them the confidence to take control of their own finances. In response, the advisor's role has shifted from relying on computers that create custom plans for clients to relationship building and providing service.

"In the human-machine interaction, the humans are very important, but they're doing different jobs than they did before," Meier says. "Whatever needs trust or empathy, a machine is not as good at that, at least not yet. Those conversations, those human interactions, remain very important."

How to prepare for these changing roles will be another important focus for the lab, as will the new skills that people will need to work effectively alongside algorithms, artificial intelligence, and the new technologies still to emerge.

Even if a job remains untouched by automation, doing that job remotely has enormous implications for workers, employers, and basic societal structures.

Millions of square feet of office space still sit empty three years after the start of the pandemic. Meier and others at the lab will explore how this simple geographic shift will continue to transform the economic landscape. In February, the lab hosted a panel discussion looking at changes in the workplace and their effects on the real estate market. Experts from academia, industry, and government discussed declining commercial real estate values and how cities can cope with the resulting tax revenue shortfalls.

For employees, remote work offers numerous advantages: time and money saved by not commuting, better flexibility with childcare, and fewer disability-related employment obstacles. And members of groups impacted by negative bias and discrimination in the workplace may prefer to work remotely. But Meier points out there are many questions still to be answered in this distributed workforce model.

"How do you make a career when you're not in the office? How do you network? How do you negotiate wages over Zoom?" Meier says. "For our students, there's hopefully some very practical career advice that will come from all the people involved with the lab."

Overall, Meier remains optimistic about the future of work life and says he's excited by the opportunity the lab presents to help navigate the very real human challenges ahead.

"With our Digital Future Initiative, we're talking about new technology," he says. "My lab focuses on how that interacts with a very, very old technology: the human brain." ■

days. Many are asking if the future of work will be permanently hybrid.

It certainly seems likely. Flexible schedules and time management policies afford workers a far better work-life balance and provide hiring managers with incentives that help them woo the best employees. And while working at the office means you're more likely to forge closer bonds with your colleagues and managers, it presents disadvantages for those who can't. Given such shifts, managers may need training to effectively manage remote workforces.

To provide some perspective, change was the norm long before the digital era. While it was jarring when the global pandemic sent workers home in droves to collaborate on Zoom and Google Docs, working in offices is the relative newcomer. Throughout history, manual laborers toiled in nearby fields and forests and around the hearth and homestead while relatively few ventured forth to fight wars, trade, or explore. It wasn't until the Industrial Revolution that multitudes left home, commuting or moving closer to factory jobs. The diaspora accelerated as service industries grew and knowledge workers flocked to cities, spurring the formation of bedroom communities along with a market for real estate relocations and business-class travel.

As emerging technologies deliver advances that were once the realm of science fiction, it's clear that educators, researchers, policymakers, and entrepreneurs must unearth and fully understand the potential these technologies offer us in order to drive and guide innovation and prepare the workforce of the future. As each wave appears on the horizon, the race is on to avoid being plowed under when the inevitable changes come—or better yet, to take a place at the helm of creating the disruptors that will come out on top. ■

# 03 | Refining and Rethinking Digital Decision-Making

**The study of data-driven algorithmic decision-making is at the heart of the new Algorithmic Economy Lab.**

When a classic action movie appears on your Netflix home screen or a new mystery series rises to the top of your Amazon account as something you might like, you know it's an algorithm at work. But those are just the transparent ones.

Increasingly, algorithms are everywhere, for they are the digital DNA of modern life. They aren't just making media suggestions. They're also enabling every online search, screening job candidates, powering customer service chatbots, and deciding who qualifies for a bank loan.

"Algorithms and data-driven decision-making are being used more frequently to power all kinds of decisions within organizations," says Omar Besbes, the Vikram S. Pandit Professor of Business. The study of data-driven algorithmic decision-making is at the heart of a new CBS think tank helmed by Besbes, the Algorithmic Economy Lab, which is part of the School's Digital Future Initiative.

Given the widespread adoption of algorithms across all types of industries, it's imperative that we research and refine this still-evolving field, Besbes says.

"There are a variety of questions that arise about the technology that supports real-time decision-making with data-driven algorithms," he adds. "But there are also questions about the value that can be captured through more sophisticated algorithms—and the sometimes unintended consequences that can emerge as a result."

The new lab will delve into these and other unanswered questions by focusing on research, teaching, and engagement with the business community. One key area of investigation will be the issues that may arise from the proliferation of algorithms, and why it's important for us to understand how they interact.

For instance, if two competing firms use similar but different algorithms, what are the implications? Will the outcomes be more accurate? Or might the results influence each other and lead

IN DEPTH

## Minding the Machines that Make Decisions

As algorithms increasingly shape our lives and economies, we must balance how we maximize their potential with the need to wield their power responsibly.

**INVISIBLE BUT POWERFUL** algorithms underpin much of modern life—from powering vast online marketplaces to facilitating airport check-ins without requiring you to show your passport. By cutting through the online clutter to bring tailored information and propose decisions based on data, algorithms can personalize recommendations and actions to match our tastes and personal attributes. They are designed to improve outcomes for all of us, save us time, and along the way, improve the efficiency and profitability of the service providers.

Earlier on, algorithms would be curated collections of rules or instructions that govern how a task is to be conducted, step-by-step, to reach a rule-based decision to achieve a desired result.

to less accurate outcomes? If one firm's algorithmic trading orders are triggered by a specific set of circumstances, such as having a preset buy order for a target price-earnings ratio, how might the market be influenced by another firm's preset order? With the potential for complementary or competing algorithms triggering trades, what are the unintended consequences and potential risk exposure for the firms? Promoting a mindset of algorithms as a system helps unearth these essential questions, says Besbes.

Another critical area to explore is trust in the way algorithms are used. Besbes notes that customers are more willing to use services where trust and transparency are central. The lab will therefore explore how to avoid biases, ensure privacy and transparency, and increase trust in an algorithmic economy.

Preparing students to successfully parse data—and manage teams and companies that rely heavily on algorithms—requires a parallel shift in the classroom. Even a decade ago, companies appreciated that data analytics was critical, but the focus was on hiring data scientists, Besbes says. Over time, there has been a growing understanding that data scientists may lack the institutional knowledge to ask the right questions, while those who ask the right questions may not always have the technical abilities to answer them.

The CBS curriculum teaches students to understand data science and have the business acumen to help a company solve the problem at hand, Besbes says.

"There's a sweet spot where individuals are digitally and technically literate but not necessarily specialists—and they can challenge data scientists," Besbes says. "Columbia Business School's graduates are uniquely positioned to play that role because with their business acumen, they're able to ask the right questions. They also have the sufficient technical and digital literacy to be able to challenge and guide the analysis." ■

Today, with a boom in artificial intelligence underway, algorithms are doing much more than following preset instructions. Thanks to the development of machine learning, algorithms can now process troves of data and learn on their own without being explicitly programmed, gradually improving their accuracy as they gather and process more data.

Data is an asset, and it is doubling globally every year. Companies all over the world are capturing and storing as much data as they can, understanding not only that data plays a crucial role in leveraging the AI algorithms of today, but also that data is an essential ingredient to achieving innovation and growth. A case in point is a retailer using location sensors to improve the efficiency of shipments, or processing data from wearables to help workers avoid workplace injuries.

But with great power comes great responsibility. Algorithms are raising questions about data use and data privacy, and their structure—from how they are estimated to how they are used—can absorb the biases found in larger society and then reinforce it, deepening inequalities. And with the recent explosion of AI, it will be increasingly important for us to consider the potential ramifications of super-intelligent machines and determine how best to use them. The potential for unintended consequences shouldn't preclude us from wielding this powerful technology. But it does require that we identify and responsibly manage how algorithms are deployed to ensure outcomes are fair, perhaps leaning on a bit of human intervention and adding some reasonable guardrails.

Fortunately, while algorithms may be hidden from public view, practitioners, regulators, academics—including Columbia Business School faculty—and others are addressing these questions, with the aim to improve outcomes, mitigate risk, and increase transparency.

With many ethical questions still unanswered, much work remains to be done. The next generation of business leaders will need the skills and judgment to realize the full potential of these technologies and wisely manage their influence and impact.

While algorithms can help save lives and quickly solve complex problems, it's our collective responsibility to keep an eye on the way they are programmed and trained to make suggestions and drive decisions. ■

# 04 | Time-Tested Methods Meet Cutting-Edge Advances

**The new Media and Technology Lab will examine how today's rapidly evolving technology is leading to a new era in media.**

In January, when lush stills from the 1982 futuristic movie *Tron* surfaced online, they were purported to be from an unreleased version filmed by Alejandro Jodorowksy in 1976, six years before the Disney blockbuster hit screens. But in a surprising twist, it turns out the filmmaker never made such a movie. Instead, the images were generated as a test of an artificial intelligence platform called Midjourney, which brings photo-realistic visuals to life from descriptive commands.

Breakthroughs such as Midjourney's *Tron* visuals are just one example of how today's rapidly evolving technology is leading to a new era in media. Such breakthroughs are among the topics Miklos Sarvary, the Carson Family Professor of Business in the Marketing Division at Columbia Business School, and Jonathan Knee, the Michael T. Fries Professor of Professional Practice, will explore in heading the new Media and Technology Lab.

Building on the School's 15-year-old Media and Technology Program, the lab will focus on the overlap between the evolution of media and entertainment and the technological breakthroughs that continue to shape it. Through expanded resources and cross-disciplinary collaboration, it will fund and disseminate advanced research on how technology has transformed the media sector and how to address new challenges that emerge. It will also support regular seminars that include the presentation and discussion of papers by notable researchers from across the United States and the world.

Given the proliferation of technology, this is a moment to be analytical and thoughtful about separating the excitement about new technology from the prospects of what such advances might mean to business, Sarvary says. As such, CBS is uniquely positioned to bring its rich history of fundamental analysis to technology companies, he notes.

One key task for the new program is to consider signs of viability and watch what happens, Sarvary says. The goal is to learn or predict which of these emerging technologies will become the next big things or dominant platforms of the future and which will fail to gain traction.

The lab's analytical approach will hold new

**IN DEPTH**

## Tech-Driven Transformation: The Evolving Landscape of Media and Entertainment

The media and entertainment industry is shifting quickly as consumers, creators, and companies adopt and explore the possibilities of new technologies.

**IF THE FACT** that it's increasingly difficult to pry our eyes away from our screens is any indication, media and entertainment is an unstoppable sector. Whether people are listening, watching, or interacting, the category is now global, digital, and growing at an impressive pace. Within the next few years, it is likely to be transformed by innovations rapidly displacing our current likes and trends—and prompting complex questions about content ownership and responsibility.

Perhaps the upswing in broadband adoption, as a means of facilitating video calls and remote classes for homebound consumers, has enabled the next surge: soaring demand for over-the-top (OTT) media, including connected TV and video

technologies to the same standards that apply in reviewing all aspects of a business. Assessing whether there are benefits from economies of scale, or network effects resulting from bringing a new technology to market, can help separate passing fads from developments with lasting promise. The lab will bring the results of its research into the classroom, offering new perspectives on evaluating the business impact of new technologies. And as always at CBS, investment fundamentals will remain at the heart of any analysis.

"There is a set of technologies to assess, and Columbia Business School has a tradition of understanding what makes businesses profitable for the long term," Sarvary says. He notes this approach builds on the school's reputation for being the birthplace of value investing, which established "the foundation that allows you to assess whether a business is going to be profitable in the long term or not."

One course that illustrates this is Media Platforms and Content, in which students analyze both established and new companies representing different types of media firms, ranging from TV to video games to social networks. This year, visiting speakers included Strauss Zelnick, founder and managing partner at ZMC and CEO of Take-Two Interactive Software, and Bob Cohn, president of *The Economist*. Over the years, CBS has hosted group fireside chats that have included executives such as Charlie Collier, who was CEO of Fox Entertainment at the time, and Reed Hastings, then-CEO of Netflix.

It's those rich connections between New York City's business community and the School that add unparalleled value to the CBS experience. Frequent events, from large-scale debates to intimate lunch gatherings, have led to student internships with Amazon, The Walt Disney Company, Google, Spotify, TikTok, and others.

"Executives at the forefront of this field come to campus to meet students and be a part of the discussion," Sarvary says. "The idea is to really create connections and for people to learn in ways that go beyond the cases and the lectures." ■

on demand, either ad supported or subscription based. The latter surpassed cable and broadcast TV in 2022, and today, Disney+, Netflix, Peacock, Paramount+, and Amazon Prime Video are powerhouses at creating original content. But they are competing for eyeballs with lower cost content from independent creators whose TV-like experiences are algorithm driven on social media networks with minimal payouts—or now can be delivered via a direct connection with users, giving content owners control over their own revenue streams.

In other media, innovators are turning to newer technologies to create the next can't-miss experiences. In just two years, augmented reality (AR) is expected to be frequently used by nearly 75 percent of the global population and almost all smartphone users. Livestream shopping is big in China and catching on globally, with many shoppers already seeing its value for visualizing potential purchases. Gaming is an established career option with billions of dollars at stake in international prizes and sponsorships. And music fans are buying non-fungible tokens (NFTs) to invest in artists, while those artists may be using AI and machine learning to create songs and are holding concerts in the metaverse.

However, with technological advances come inevitable questions for business, government, and society—perhaps most pressing in the field of artificial intelligence (AI), which among its myriad uses can drive AR experiences and generate content.

Creating the next ChatGPT may pay off, whether it comes from a global leader or startup, but with human-machine collaboration come questions like who owns the content, and can it be copyrighted and sold? How is such co-created content used in training models, and how will new technologies disrupt or evolve existing platforms? How can marketers and advertisers predict which platform or marketing strategy to adopt, or even keep up? And, more important, how can protections be created quickly enough to avoid scams and other forms of harm?

As technologies evolve, the digital media and technology industries are ripe for innovation. Keeping up with the latest trends and understanding the various technologies available will be crucial for businesses looking to capitalize on these opportunities. ■

Professor Ciamac C. Moallemi

# A New Era Beyond Crypto

## Unleashing the power of blockchain in the world of traditional finance

By Josie Cox

**MANY OF US** might remember the past six months as a time of nail-biting drama and chaos in the world of finance. In late 2022, the spectacular collapse of cryptocurrency exchange FTX served as something of a precursor to some of the tumultuous developments that defined the start of 2023: In March, Silicon Valley Bank's failure sent shockwaves through the global tech sector and beyond. Just days later, Credit Suisse's downfall roiled markets before UBS acquired it, saving it from the brink.

But while all these events have underscored the fact that the world of money is not for the faint of heart, they've also shed light on a more important and less obvious truth: Traditional models of finance may well be functional, but they're not optimal. In many cases, a makeover is overdue.

There are, of course, many ways in which that can be done, including changes to organizational culture and operational strategy, or better regulation. But at an event held at Columbia Business School's David Geffen Hall in mid-March, a panel of experts suggested that integrating blockchain technology into legacy structures might be one of the most efficient and exciting ways to future-proof finance.

As part of the discussion, hosted by the School's Digital Future Initiative and moderated by Todd H. Baker, a senior fellow at the Richard Paul Richman Center for Business, Law, and Public Policy at Columbia University, experts from industry and academia explored blockchain's potential in traditional finance.

"All is certainly not roses in crypto," acknowledged panelist Ciamac C. Moallemi, the William von Mueffling Professor of Business at CBS, at the outset of the conversation. But he agreed with fellow speakers that blockchain's potential —particularly in the traditional finance space— is varied and underappreciated.

Here are three takeaways from the event:

### 1 | Settlements can be simpler

Considering the clout of the global finance sector, it might be surprising that some of the most integral parts of the services it supports are, in some ways, still so primitive, argued Moallemi.

"Think of settlements," he said. "The time it takes to settle a trade in the traditional finance world is generally still about two days. This is primitive compared to the blockchain world, where settlement can essentially happen in real time and can be visible to all."

And these advantages are not just for institutions, he explained. Every consumer can benefit from the composability that blockchain allows, enabling a frictionless experience for individuals who want to manage their assets and investments

without worrying about different accounts, with different interfaces and passwords. For example, if a saver wants to obtain a margin loan from a brokerage but not from the brokerage that manages their assets, blockchain technology could be the answer.

Morgan Krupetsky, director of business development for institutions and capital markets at Ava Labs, also highlighted this advantage. By implementing blockchain technology, "trade confirmations and reconciliation can effectively occur in real time," she said, which provides the additional benefit of reducing counterparty and other types of risk.

## 2 | Open and transparent doesn't have to mean risky

Our world today runs on the most powerful commodity imaginable: data. Data sets are everywhere. Because of the technology available to us, they drive how we live, love, learn, work, travel, socialize, and more. Data are our lifeblood, whether we know it or not.

But in traditional finance, data remain tightly held, said Moallemi: "It's still a fundamentally opaque system. If you're trading US equities, for example, you still have to literally buy relevant data from the stock exchange in order to know what's going on. In the blockchain world, by contrast, things to a large extent are open and free."

He added, "A great thing about the blockchain world is that you can look at the source code to understand how it works. You can audit it. It creates accountability. If you want to know how Nasdaq works, well, good luck!"

Krupetsky ventured one step further. "This is fundamentally about democratizing finance and opening up capital markets," she said. "It's about consolidated databases and a single source of truth."

## 3 | Crypto can be a valuable resource for the here and now

Underpinning perhaps all the advantages of integrating blockchain into legacy financial systems is that today's world—and the interconnected nature of it—simply demands it.

Indeed, Aaron Brown, a crypto entrepreneur who formerly served as managing director and head of financial markets research at AQR Capital Management, noted that while we rely on versions of exchange for most things in life, many of us don't realize that large and important parts of the economy—"like intellectual property or music or art"—don't actually fit efficiently and neatly around the concept of money. "There are, of course, regulations and intense legal structures in place, but again, these tend to be wedded to the physical, to physical assets," Brown said.

"There's tremendous value out there if we had more sophisticated ways of making metered exchanges that aren't based on money," he added. And that is where blockchain technology might well be the solution.

Tom Brown, a partner and general counsel at venture capital firm Nyca Partners, applied the same argument to something perhaps even harder to navigate in the context of a world in which the pace is set by the speed of innovation, the sophistication of technology, and the interconnectivity of it all: our own identity.

"As we interact and live in a digital space, it becomes very important to identify yourself to digital counterparties," Brown explained, adding that it's a matter of safety and security. "Blockchain technology can provide a solution."

For Krupetsky, the most compelling case traditional financial players should consider when deciding whether to leverage the power of blockchain or continue doing things as they always have is that in the long run, everyone will be integrating the technology.

"More and more financial institutions will move on chain, to the point that we'll eventually stop differentiating between 'trad-fi' and 'de-fi,' 'on chain' and 'off chain.' It will all just be 'finance,'" she said.

And as someone who considered the concept of a cryptocurrency way back in the 1970s, Brown said he's seen for himself how "sometimes these visionary, clever, mathematical ideas really do come to fruition."

From the vantage point of now, he noted, it's impossible to know what the next decades hold. Who would've thought 25 years ago that social media would be such a dominant part of our lives? As such, Brown said, it's up to us to appreciate that technologies like blockchain truly do have the potential to be the foundation of an entirely new industry, one that none of us have even thought of. ■

Advertising
Artificial Intelligence
Consumer Behavior
Corporate Strategy
Data Analysis
Finance
Healthcare
Real Estate
Workplace

# Digital Influencers at CBS

The research showcased below sheds light on the ongoing projects and noteworthy achievements of our faculty.

By Carmen Marti

Algorithms, machine learning, and blockchain are among the many technology breakthroughs roiling the business world these days as connectivity, artificial intelligence, and automation fuel one of the biggest upheavals in business practices in the history of industry.

From AI in the workplace and climate technology to big data market analysis and algorithms to improve dating app insights, the work of our faculty is everywhere because technology has forced every business to become digitally literate.

CBS researchers not only study and delineate this phenomenon, they also drive it in many sectors. Within the digital space, our professors write code and build and study huge data sets. They coach businesses striving to leverage the huge amounts of data now available.

For example, real estate firms are benefitting from the research of CBS Professor Stijn Van Nieuwerburgh, the Earle W. Kazis and Benjamin Schore Professor of Real Estate, who demonstrates the value of data analysis with his studies using big data to find new perspectives on real estate market trends.

Vice Dean for Research Oded Netzer, the Arthur J. Samberg Professor of Business and an Amazon Scholar, explores the use of unstructured data (text, image, video, and audio) to help companies make better data-driven decisions.

In the field of finance, Ciamac C. Moallemi, the William Von Mueffling Professor of Business, uses large-scale stochastic systems with applications in financial engineering to understand decision-making under uncertainty.

And Daniel Russo, the Philip H. Geier Jr. Associate Professor of Business, uses machine learning to develop algorithms that help Spotify tailor music recommendations to individual listeners.

These are just a few examples of the ways CBS researchers are contributing to the digital revolution.

The following selections of research highlight some of the ways our faculty are developing the models and tools to facilitate data collection, as well as applying those tools to make discoveries.

## Advertising

**Santiago Balseiro**

**Informing Online Advertising**

Professor Santiago Balseiro's research on auction design is offering new tools to big tech. He's developing innovative methods of research-based online advertising that have gained the interest of Google, Meta, Microsoft, and Yahoo.

**Hortense Fong**

**Machine Learning Emotions in Advertising**

Professor Hortense Fong has developed a neural network to predict emotional response to music. In application, her work offers advertisers a method for testing the effectiveness of emotion-based ad placements in videos. She has shown that emotion-based ads can produce higher brand recall rates if they are placed near content expressing similar emotions.

**Oded Netzer**

**Driving E-Commerce**

Professor Oded Netzer is an Amazon Scholar whose work helps fuel the platform's Advertising Analytics and Insights initiative.

**Olivier Toubia and Shawndra Hill**

**Improving Search Engine Performance**

Professors Olivier Toubia and Shawndra Hill are shaping search engine performance with new models that could help search engines and advertisers better match their results with customers' preferences.

## Artificial Intelligence

**Hongseok Namkoong**

### Prioritizing Fairness in the Workplace

Professor Hong Namkoong is using machine learning to design office workflows organized around considerations of fairness. He and his team have developed a framework for evaluating and contextualizing fairness within complex organizations.

## Consumer Behavior

**Gita Johar** and **Yu Ding**

### Finding the Truth in News

Professor Gita Johar and Yu Ding, PhD '22, have devised an innovative approach to combat misinformation by leveraging crowdsourcing to verify the truthfulness of news. Their proposal involves third-party fact checkers, such as Gigafact contributors or PolitiFact, and news platforms like Twitter and Facebook, enabling users to rate the similarity of news in articles that cover the same topic. According to the researchers, similarity ratings can be an effective tool for reducing bias in veracity testing by revealing shared facts among similar articles.

**Daniel Russo**

### Using Machine Learning to Affect Decision-Making

Professor Daniel Russo is working with Spotify to enhance personalized recommendations. He's building machine learning algorithms that optimize for the long term and are capable of learning by trial and error.

**Fanyin Zheng**

### Improving Dating Apps

Professor Fanyin Zheng is helping increase match rates on dating apps. Her algorithms leveraging user behavior have improved match rates by 40 percent.

**Sandra Matz**

### Using Data to Understand Psychology

Professor Sandra Matz's research shows that the data used to create psychological profiles of consumers can be employed in positive ways. Specifically, her work has helped to reduce college dropout rates and identify early signs of depression, which can lead to timely intervention and support.

## Corporate Strategy

**Tania Babina**

### Showing the Benefits of Sharing

Professor Tania Babina is informing bank regulation with her work on consumer data collection. She finds that policies making it easier for banks to share customer data lead to an increase in fintech investment because companies with more data can improve customer screening processes and product design.

## Data Analysis

**Laura Veldkamp**

### Updating Finance Tools for the Data Economy

Professor Laura Veldkamp is developing new finance tools to price data collection. She's measuring the potential value added to companies that use digitized information to reduce uncertainty and minimize risks.

**Omar Besbes**

### Proving Data Makes a Difference

Professor Omar Besbes is providing evidence to support the use of data analytics in the workplace. Through his research, he has demonstrated that companies can achieve better solutions in areas such as capacity management and pricing, even when using small data sets.

## Finance

**Tomasz Piskorski**

**Exposing Shadow Banking**

Professor Tomasz Piskorski has found that when traditional banks contract under regulatory constraints in the mortgage market, fintech and shadow-bank lending rise. His mortgage lending models suggest regulation accounts for roughly 60 percent of shadow-bank growth, while technology accounts for roughly 30 percent.

**Sehwa Kim**

**Outing Insider Trading**

Professor Sehwa Kim is exposing the vulnerabilities in fragmented securities regulation. His data sets suggest that higher levels of insider trading can result when bank regulators, rather than the Securities and Exchange Commission, oversee disclosure regulation.

## Healthcare

**Carri Chan**

**Using Data to Save Lives**

Professor Carri Chan is improving hospital care with data analytics and mathematical models that help hospitals better manage healthcare delivery in resource-constrained environments, including during the COVID-19 pandemic. Her recommendations on nurse staffing were piloted in the Weill-Cornell emergency department in New York City.

**Assaf Zeevi**

**Using AI to Target Healthcare Interventions**

Professor Assaf Zeevi is developing a machine learning tool to aid healthcare providers in identifying malnourished patients who would benefit from nutrition support while hospitalized. His tool aims to improve patient outcomes, as a diagnosis of malnutrition is commonly linked with unfavorable hospital outcomes.

## Real Estate

**Stijn Van Nieuwerburgh**

**Using Big Data to Understand Real Estate**

Professor Stijn Van Nieuwerburgh is studying the impact of the pandemic on real estate markets. His research using large data sets, which enable him to predict behavior, suggests the dramatic increase in remote work during the pandemic will continue, with long-lasting implications for residential and commercial real estate.

## Workplace

**Bo Cowgill**

**Forecasting the Future of AI**

Professor Bo Cowgill's work is showcasing the potential of AI in the workplace, particularly in hiring decisions. His research demonstrates how AI algorithms can outperform humans in such tasks, highlighting the benefits of incorporating these tools into traditional office settings.

**Bruce Kogut**

**Determining Value in AI**

Professor Bruce Kogut's research sheds light on the circumstances where AI may not be as useful in the workplace. Specifically, his findings indicate that replacing a human team member with an AI counterpart can lead to a decrease in team performance, an increase in coordination failures, and a reduction in both team trust and individual effort. Kogut argues that human-machine interaction is critical for realizing the positive impact that AI can have on teams, organizations, and work practices in general.

**Wei Cai**

**Having Fun at Work**

Professor Wei Cai is improving the workplace experience with research that finds, on average, gamified training platforms can have a highly positive effect on workplace performance.

# Becoming Data Fluent

CBS builds a model curriculum for students who seek leading business roles in data-rich environments.

By Laurie B. Davis

In business environments today, vast amounts of data determine how companies operate and invest in resources. Successful firms base hiring on talent with a deep understanding of data analytics and knowledge of the newest technologies. "All of our students need to be not just literate, but I would say, data fluent," says Jonah Rockoff, senior vice dean for curriculum and programs at CBS.

The School offers courses that help students not only achieve that fluency, but also gain understanding of the fundamental tools businesses use today, and exposure to the cutting-edge breakthroughs that will change business in the future.

Courses prepare students to successfully lead engineers and data experts in creating new products, moving into emerging markets, and improving business functionality. "You can't lead tech experts if you don't understand the essentials of how technology works," says Rockoff, who also is the Paul Garrett Professor of Public Policy and Business Responsibility.

Rockoff and other curriculum developers, including faculty, determine which courses fulfill the school's curricular priorities. They watch the business landscape, monitor emerging tech, and address any gaps with opportunities for both traditional and experiential learning. Students have embraced these opportunities, flocking to courses such as Technology Breakthroughs, taught by CBS Dean Costis Maglaras and Columbia Engineering Dean Shih-Fu Chang. In it, guest lecturers discuss current trends in digital tech, including AI, robotics, photonics, deep learning and neural networks, blockchain, and digital cities.

Technical in a different sense, CBS Professor Chris LaSala's hands-on learning opportunity in digital product management requires students to work with companies to apply the best practices and frameworks they've learned in the classroom to various real-world issues related to new digital products.

At this point, CBS supports a full digital curriculum, with new courses and opportunities added in response to the business landscape and the CBS community. Highlights of this year's program include courses in crypto, Python, and real estate.

## Using big data in the real estate industry takes risk assessment to micro-levels

As large data sets become available within the real estate industry, leaders are starting to leverage those for better predictive power when assessing investment risks and potential valuations.

Big data analysis in the real estate industry allows for micro-level risk assessments, according to the Bright Data blog post "How Big Data Is Transforming Real Estate."

"Previously, real estate companies would profile entire neighborhoods homogeneously," the writer notes. "Big data has exposed the key differentiators between city blocks, for example, crime rates to price appreciation, zoning codes, and future infrastructure projects."

At CBS, Stijn Van Nieuwerburgh, the Earle W. Kazis and Benjamin Schore Professor of Real Estate, uses Python to teach students how more variables offer stronger foundations for property investments. The course, Real Estate Analytics, was designed for both students with strong programming credentials who want to learn about real estate and students of real estate who want to augment their data analytics skills. It requires Python fluency, so students can successfully manipulate new, large real estate data sets to explore important questions in residential and commercial real estate.

## Python remains top programming language to learn

CBS Professor Daniel Guetta and Adjunct Professor Mattan Griffel literally wrote the book for the course they teach, *Python for MBAs*. In the course, students learn the rewards of understanding Python, which business and technology publications such as *The Wall Street Journal, Forbes*, and *Technology Insights* have ranked in the top three programming languages for 2023.

Python's many business use cases include machine learning and AI; blockchain smart contracts; entertainment applications such as Spotify and Netflix, which use algorithms to suggest music and movies to consumers; and fintech platforms such as Stripe and Affirm, which were partially developed using Python.

The course teaches students how Python code is written and how it automates repetitive tasks, parses and analyzes large data sets, interacts with APIs, and scrapes websites. While engaged in the business uses of Python, students sharpen their analytical skills and become more competitive for leadership positions.

## In Climate Tech, students evaluate potential for tech solutions with financial backing

Columbia MBA and Columbia Engineering students are joining forces on the climate-change front in the new course, Climate Tech. The course aligns with CBS's goal to lead in teaching about the threat of climate change in a business context and preparing students to address it.

In the course, CBS and Columbia Engineering students are grouped in small, interdisciplinary teams to assess climate technologies that venture capitalists have committed to financing. They determine the technologies' viability, commercial opportunity, and impact on mitigating or adapting to climate change.

Climate Tech is co-taught by Bruce Usher, CBS professor of professional practice; David Kirkpatrick, adjunct associate professor of business at CBS; and Alan West, the Samuel Rube-Peter G. Viele Professor of Electrochemistry and professor of earth and environmental engineering at Columbia Engineering. Together they demonstrate how to combine business and engineering expertise in the search of tech solutions that address climate change.

## Exploring the structure of blockchain markets and how they interact

*"Predictions are tough to make, especially about the future."—Yogi Berra*

Adjunct Professor Jesse Austin Campbell, a veteran crypto industry leader and former head of portfolio management at Paxos, quotes the beloved baseball icon when referring to potential shake-ups in the crypto markets. "Crypto moves fast—a year ago, most people would not

have predicted the collapse of FTX," he says. "One of the beautiful things about being in a rapidly evolving space is you are confronted with novel situations." Campbell says he chooses not to predict but rather just say that he expects something will occur.

Campbell and Professor Gur Huberman, the Robert G. Kirby Professor of Behavioral Finance, start each class in their advanced B Term course, Blockchain Markets Infrastructure and Uses, with a review of the day's headlines to stay on top of current events in the blockchain and crypto ecosystem. The two will adapt the material for whatever events may occur in real time.

> **"You can't lead tech experts if you don't understand the essentials of how technology works."**
>
> **Jonah Rockoff**, senior vice dean for curriculum and programs

Guest speakers and live demos also are part of the course, which builds upon the Introduction to Blockchain and Cryptocurrencies class, taught in the A Term by Huberman and Omid Malekan, associate professor in business in CBS's Finance Division. In that course, students see how to "use a decentralized exchange to buy Ether for USD, then use a different decentralized finance exchange to deposit that ETH as collateral and take out a loan against it," says Malekan, an eight-year veteran of the crypto industry and author of two books on the subject.

## As the cryptocurrency ecosystem grows, questions abound on legalities, regulations

The fast and loose nature of crypto has been likened to the Wild West of finance, where answers to legal questions regarding bankruptcy, regulation, and norms are up for grabs.

That's why CBS is offering Regulatory and Legal Matters on Blockchain, Cryptocurrencies, and Digital Assets, a new course taught by Donna Redel '78, JD, an adjunct professor, a former managing director of the World Economic Forum, and an angel investor.

Redel teaches with a frontline perspective, blending her background in law, business, and finance to inform discussions on issues such as the ICO craze of 2015-2018. Initial coin offerings, or ICOs, were once used to raise funds for cryptocurrency startups, securing billions for projects. In 2017, the SEC warned that if ICOs shared the characteristics of securities, then these digital assets had to abide by securities laws. Today, a group of US regulatory bodies, including the Commodity Futures Trading Commission, the US Securities and Exchange Commission, and the US Treasury's Financial Crimes Enforcement Network, are scrutinizing crypto activity as new legal cases emerge.

Students in Redel's class explore these cases, confront broad questions, and inquire into the complexities and rapid developments surrounding the blockchain and crypto ecosystem. They examine multiple cryptocurrencies, digital tokens, stablecoins, and Central Bank Digital Coins, from legal, regulatory, policy, business, economic, and privacy perspectives.

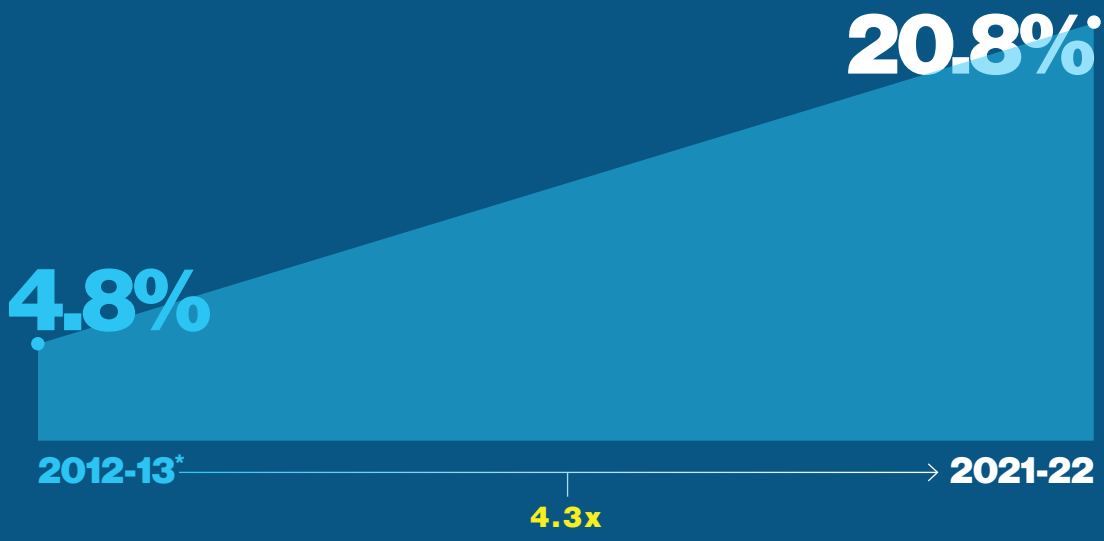
"We have a nice-sized blockchain crypto curriculum, which includes two different versions of an intro class and two different advanced classes," says Rockoff. In the program, students choose between two introductions to blockchain and then move on to the second-level courses. "Our faculty recognized the need to provide real-time instruction in the fast-paced fintech world, so we responded by creating a new curriculum."

Rockoff makes it a point to respond to the needs of faculty and students. In the digital space, this means constantly adding, reinventing, and expanding foundational courses that tackle some of the most popular digital- and data-focused ideas and applications in the business world. Taught by faculty at the forefront of their fields, these courses position CBS graduates to, in turn, lead in their fields. ■

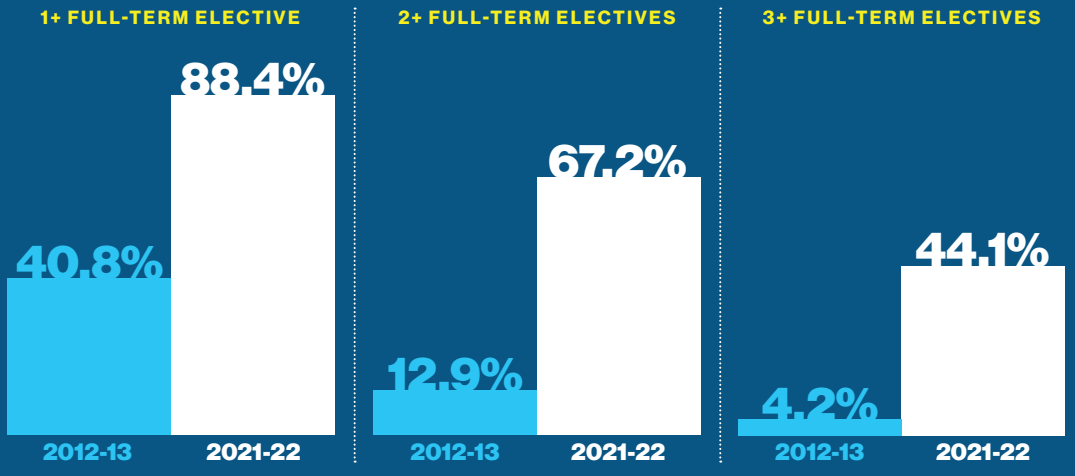
**Columbia Business School** was among the first business schools to introduce business analytics as a core course in the MBA program. Since then, we have continued to add analytics and data-focused classes to the curriculum, including the introduction of a Python programming course in 2015. Of the 845 entering MBA students in 2021, nearly 300 have taken, or are currently taking, a course in Python. As shown below, the number of data and digital-related classes offered at CBS continues to grow.

## INCREASE IN ELECTIVES TAKEN

% of MBA students' elective course load focused on product, tech, digital, analytics, or programming




## STUDENT COURSE SELECTIONS




% of MBA graduates who took at least one, two, or three full-term electives focused on product, tech, digital, analytics, or programming

*Last major core curriculum revamp

## TOPICS COVERED IN THE DIGITAL CURRICULUM

# Psychological Targeting

## Professor Sandra Matz reveals how to find the pros among the cons. By Sandra Matz

**Named one of *Poets & Quants*'s "40 Best Business Professors Under 40" in 2021, Sandra Matz, the David W. Zalaznick Associate Professor of Business at Columbia Business School, is a leader in the field of computational social sciences. She coined the term *psychological targeting* to describe the way digital traces can reveal human psychology.**

**In her forthcoming book, *Mind Masters: How to Turn Nosy Algorithms into Powerful Allies*, Matz shows how data enable external influencers to sway the choices we make individually and collectively. Yet, from her perspective, this can be positive. She suggests ways individuals can unite through common interests to leverage their data ethically, to understand themselves personally, and to find resources they intentionally seek.**

**In the following essay, Matz explains these concepts.**

**IN THE BOOK** *One Boy's Day* by Barker and Wright (Harper Bros., 1951), two psychologists set out to study actual behavior. They hired eight research assistants to observe a 7-year-old boy for 14 consecutive hours recording his natural "psychological habitat" at one-minute intervals. With the goal of producing an objective report of the boy's behavior, they noted how he woke in the morning, played with his dog, rode his bike, and interacted with his parents, teachers, children of various ages, and adults in the community.

Fast-forward 70-plus years and now each of us has millions of observers based on all our devices, tracking us by the second, gathering data and recording it. This data-crawling digital equivalent to Barker and Wright's research assistants reads my Facebook messages, collects my credit card purchases, and records my facial expressions and casual encounters using some 50 million public cameras across the United States.

In addition, not only can we collect more data today than ever before, computers can interpret it. They can translate this seemingly mundane, innocuous information about *what we do* into highly intimate insights about *who we are* and ultimately prescriptions of *what we should do*. I call this process *psychological targeting* and I've been studying it for over a decade now.

> **"I argue that we can't fight this fight alone. No one has the knowledge, time, and energy to make protecting their data and policing third parties that use it a full-time job."**
>
> **Sandra Matz**, the David W. Zalaznick Associate Professor of Business

My path began in 2011, when I met two postgrads at Cambridge, Michal Kosinski and David Stillwell, who developed the Facebook app myPersonality in 2007. It went viral. In less than five years, more than 7 million people had taken a personality test. Then the researchers invited users to share information from their Facebook profiles with the app for research purposes. From that, they were able to generate an enormous data set combining people's digital traces with insights into their psychology.

What Michal and David had stumbled upon suggested a real pivot in how we could study the human psyche. Instead of having to rely on observers, survey responses, and highly stylized lab experiments, psychology finally stood a chance to live up to its promise of being concerned with people's everyday experiences and behaviors.

By the time I joined Michal and David in Cambridge to do my PhD, they had just published their first scientific article showing that computers could accurately predict people's intimate psychological traits—like personality, political ideology, sexual orientation, and IQ—from the pages they followed on Facebook.

Since then, my colleagues and I have published numerous articles showing how computers can get to know you intimately.

But so what? What does it mean that computers can peek into our psychology and understand what lies below the surface of the behaviors they can observe? What does it mean for you and me? And for society at large?

It's a question of power—understanding your psychological needs, preferences, and motivations gives others power over you. Power to influence your opinions, emotions, and ultimately behavior.

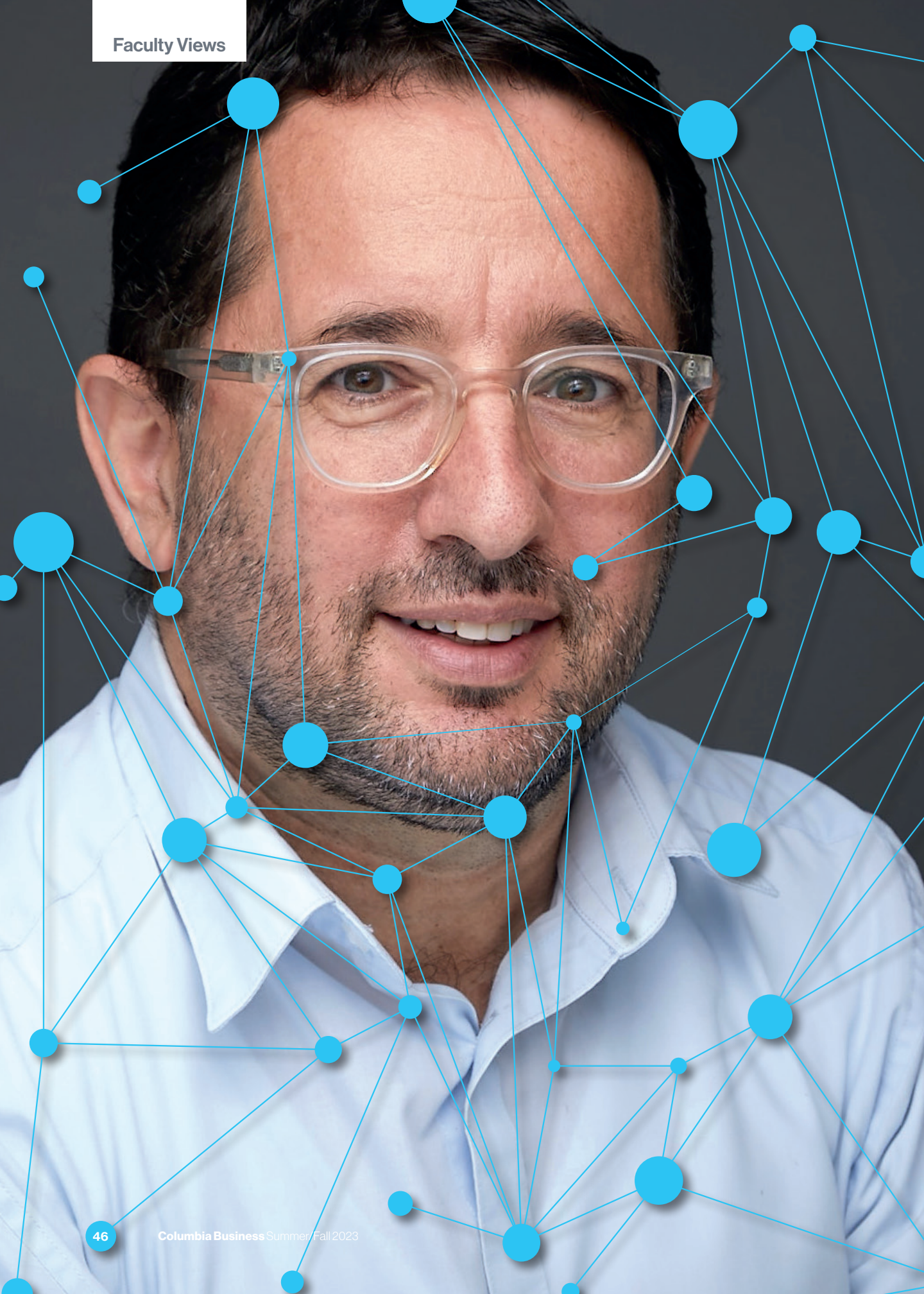
It doesn't take much imagination to understand that psychological targeting, in the wrong hands, could become a weapon. Cambridge Analytica made that abundantly clear in 2018 when it allegedly created psychological profiles of millions of Facebook users without their knowledge and then hit them with fear-mongering political ads tailored to their psychological vulnerabilities.

But let's look at it from a different angle. This window into the psychology of millions of people that can change behavior provides a remarkable opportunity. My research, for example, has been used to predict and prevent college dropout, guide low-income individuals toward better financial decisions, and detect early signs of depression. It's not only a chance to detect depressive symptoms early (before they develop into a full, clinical depression) but also to offer personalized advice or resources.

How do we amplify the positive sides of psychological targeting to make it work *for* us instead of *against* us? I argue that we can't fight this fight alone. No one has the knowledge, time, and energy to make protecting their data and policing third parties that use it a full-time job. But we can design a system that helps us do just that.

I'm talking about establishing small communities designed to help you manage your personal data. These entities, data trusts or data coops, would be legally obliged (e.g., through fiduciary responsibilities) to act in the best interest of their members.

We need allies. Like-minded people who have similar interests and share the same goals. With about 8 billion people around the world, you can find someone with the same problems and ideas as you. Then you have the advantages of sharing data without the costs of losing your privacy and self-determination. ■



# Connect the Dots or Be Replaced

Oded Netzer, the Arthur J. Samberg Professor of Business, shares his thoughts on ChatGPT, how to use data most effectively, and the essential qualities that future business leaders must possess.

**By Katie Gilbert**

**MUCH HAS BEEN MADE** of ChatGPT's ability to pass multiple graduate-level assessments—including MBA-level exams and the legal profession's bar exam—but is the new AI-powered chatbot so impressive it will soon put swathes of human white-collar managers out of work?

It's a question Professor Oded Netzer determined to find out when he opened up ChatGPT recently and plugged in some straightforward facts about a company across two years of business: Sales had fallen from $10 million in 2019 to $8 million in 2020; call center complaints had increased from 100,000 to 150,000 during that time; and so on. "Explain what is going on with this company," Netzer's prompt instructed.

ChatGPT's answer began, "Based on the information provided, it appears that the company experienced a decrease in sales between 2019 and 2020," and continued in that vein, summarizing the information it had been given.

The response wouldn't have earned a pass from Netzer. Why? Because the chatbot had merely summarized the prompt rather than offering any higher level insights. Netzer expects more from his CBS students because more will be expected of them as business leaders. He predicts the AI tool won't be replacing business decision-makers anytime soon—as long as those decision-makers understand that the value they bring to their roles is changing.

"At the heart of management and leadership roles is the ability to see what everybody else is seeing and think what nobody else is thinking—to look at different pieces of information, apply critical thinking, and pour on some judgment to arrive at a synthesis and eventually a decision," Netzer explains. "Synthesizing information means going beyond the 'what' in the data to 'So what?'—what does it mean—and 'Now what?'—what should we do about it?"

Not long before the launch of ChatGPT, Netzer co-authored a book, *Decisions Over Decimals: Striking the Balance Between Intuition and Information*, with CBS adjunct professors Christopher J. Frank and Paul F. Magnone. The book zeroes in on the importance of business leaders focusing on synthesis rather than merely summarizing information, and explains where big data can fit in. When ChatGPT burst on the scene, the book's themes took on a new urgency.

Netzer has devoted much of his academic career to exploring how unstructured data (that is, data not formatted for structured database storage, whether it's audio, video, text, internet of things sensor data, and so on) can be used to support sound decision-making. In the following Q&A, he applies his expertise to some of the most pressing concerns for business leaders raised by ChatGPT: Is AI poised to encroach on the jobs of human decision-makers? What technological

developments could lead us there? And how can MBA programs ensure their graduates maintain their relevance?

**CBS: In your book, *Decisions over Decimals*, you offer a framework to help decision-makers use data without becoming overreliant on it. Can these ideas also apply to decision-makers wondering about how to use ChatGPT and other fast-improving AI tools?**

**Oded Netzer:** The book is very much related to the way I'm thinking about ChatGPT. Part of what we are arguing in the book is that in decision-making today, the value comes from combining data (or analytics) with intuition, something we call Quantitative Intuition, or in short, QI.

When I say intuition, I truly mean human judgment. Human judgment could be in how I search for data, or it could be in how I evaluate the data. For example, if I find surprises in the data, that is, by definition, combining judgment and information because surprise is what happens when data clashes with an expectation.

Now, I think all of this very much relates to the discussion that came a few months after the book was published, when ChatGPT came out.

People are asking, "Is this going to replace human decision-makers? Are machines going to take away not only the analytics or quantitative part of management but also the intuition or judgment parts?"

I looked into this. In a few tests, I've tried to push ChatGPT to go beyond the data and the "What?" to the "So what?" It has done quite well in the "what" aspect, mainly summarizing information. It's a very good tool for summarizing large amounts of information in a comprehensive manner (with a few pitfalls there, too).

However, what ChatGPT rarely does well is synthesize information, by which I mean apply judgment to say, "This is what the data implies we should do." While it is possible that future generations of generative AI tools will learn to do that as well, at least for now, humans are still much better than machines at doing that.

**CBS: What does the recent history of hype around big data reveal about the current excitement about ChatGPT?**

**Netzer**: When big data came about, many people said, "Forget about human judgment. We are going to have data that makes decisions for us." Then as a decision-maker, you realize, no, data doesn't make decisions; that is still our domain. We can't rely solely on data. We need some combination of data and judgment to use it well, and we may have shifted the pendulum too far in this whole big data revolution, believing that data and analytics will make decisions for us.

I think ChatGPT further highlights the point that what is left for humans is that we need to focus on the judgment aspect of data-driven decision-making. But at the end of the day, this is often the fun part of our jobs. We don't want to get bogged down with creating tables; we want to spend our time interpreting them.

This could be true for people in many industries—take journalism as an example. Yesterday, I was talking to a journalist from a major media outlet about ChatGPT. At one point he said, "Wait, is this going to be writing articles for me soon?"

I believe the answer to that is no, but I do believe tools like ChatGPT can make journalists better. In other words, perhaps what that journalist should fear is not being replaced by AI but being replaced by a journalist who knows how to take advantage of AI.

Why not ask ChatGPT to create a first draft of a summary of the information and then apply your judgment—your writing acumen—to it? If, as a journalist, you feel very comfortable going to Google and searching for information, why wouldn't you feel comfortable with Google creating a coherent summary of what's in Google? Of course, what is currently missing from ChatGPT for that purpose is appropriate and validated sources for fact checking, but this is likely to be resolved in the near future.

**CBS: Is the impressiveness of ChatGPT a sign that we're getting closer to machines being able to make decisions, though? We're not there yet, but is it likely that AI will begin to close in on that all-important differentiator—human judgment?**

**Netzer**: Machines are starting to get better at doing things a little more complex than, "If X passes a certain threshold, then do Y." An example might be helping us with the next word that

we want to write in an email. One day, it may be able to get to a human-level judgment in certain domains.

What tools like ChatGPT will need to continue to improve are a lot of observations. Another way to put it: They'll need much more data. When it comes to machine learning, most major technological innovations didn't come from a fancier machine learning model; they came from much more data being available to train the model.

Now, we are very good, as humans, at putting information in the right context, whereas machines are not that good at it yet. When I talk to you, I have a lot of context, even though we don't know each other. If I use the word *model*, you know that from a nerd like me, it's got to be a mathematical model and not someone who walks on a runway.

Technology-wise, one of the reasons why ChatGPT is one of these true innovation breakthroughs is context. What the newest version of ChatGPT specifically did was create a context of about 4,000 to 8,000 tokens around every word—think of a token as a word and the context as the adjacent thousands of words used to understand the meaning of each word. That is way more than what previous language models had. The previous GPT version had a context window of only 2,000 tokens.

Part of why humans are good at judgment is because of this concept of context: We are able to connect information to all kinds of other things we observe. Now, to be honest, we don't fully understand our own brains. Otherwise, we would've trained machines to be as good as humans, but we don't know how we learn context. Before a child can even speak, you can show them an illustration of a cat in a book and tell them that it meows, and then show them a drawing of a dog and tell them that it barks. And after you show them three or four of these images, they're going to meow or bark when they see a real cat or dog in the street. Machines need to train on millions of observations to show a similar level of recognition.

**"As MBAs, where does your value come from? You are not getting paid to tell me what I can see in the data myself. You are getting paid to tell me, 'So what? What does it mean? And now what? What should we do about it?'"**

**Oded Netzer**, the Arthur J. Samberg Professor of Business

**CBS: How will the maturation of AI tools like ChatGPT impact MBA classrooms—and job prospects for MBA graduates?**

**Netzer**: As MBAs, where does your value come from? You are not getting paid to tell me what I can see in the data myself. You are getting paid to tell me, "So what? What does it mean? And now what? What should we do about it?" Generative AI tools like ChatGPT are becoming better and better at summarizing the "what" at a super-human level. Answering the "so what" and "now what" questions requires judgment, and it requires taking a risk—bringing in information from somewhere else, not from what you just showed me here.

For those of us who teach, this emphasizes the need to go beyond "just tell me what's in the case" and "here's how to make magic with Excel." We must push students to interpret things, to make recommendations.

MBAs are in demand because they act as translators between the data team and the C-suite. They're able to translate what has been done within data analytics into the business problem because they have the context of the business, which often, data analysts don't have. And these skills will not easily be replaced by something like ChatGPT any time soon.

If anything, we are in a good situation in business schools because of the role of judgment in our education. The first question in every case study is, "What is the business problem that they're trying to solve?" There is now higher value than ever on pouring the judgment into information, and not just learning information and technical skills. This has been, and will continue to be, our focus in training future leaders. ■

CBS alumni are helping fuel the digital revolution.

By Toni L. Shears

# Data Driven Disruptors

Today, as technology increasingly impacts business practice, even traditional sectors from real estate to retail have been revolutionized and reimagined through the use of big data and advanced analytics. Startling innovations driven by machine learning and generative artificial intelligence have the capacity to ever improve themselves, opening the gates for constant growth. With technological advances such as these steamrolling ahead, many say what we're seeing today is only a fraction of what will be possible tomorrow.

"If you look across the last several decades, we've seen exponential growth in available computing power, in data generated, and in the power of software tools to manage and analyze this data. The use of data and AI to make decisions and drive efficiencies will be ubiquitous across all enterprises very quickly," says Jake Reynolds '97, general partner at TCV, who recently made a transformative gift to help establish the School's Digital Future Initiative.

Reynolds has been investing in tech ventures for three decades, and calls the digital revolution "an unstoppable wave that's going to continue to grow and be more powerful with time."

To leverage this digital wave, leaders and managers across all spheres need critical thinking skills and a well-honed ability to understand statistics and synthesize data. "Being able to understand operations, understand the data across the business, and manage inventory—many people don't have these skills," says Ryan Petersen '08, founder of Flexport. "It's a crucial part of what business schools teach."

It's certainly a part of what Columbia Business School teaches. Countless CBS alumni are leading companies that harness cutting-edge data analytics to measurably increase operational efficiency, uniquely personalize customer service, and, in some cases, disrupt industries entirely. According to Allon Bloch '97, the co-founder and CEO of K Health, "Running companies over the years, I've come to believe that half-measures and incremental solutions aren't going to work in healthcare. We have to use the power of data to rebuild a better system."

Sortile CEO Constanza Gomez '22 decided to help build one of the first systems for recycling textiles using AI-driven automation and data. Eighty thousand dollars in grants and a strong nudge from a fellow student who became her co-founding partner helped Gomez launch the venture. "I would have never started this if it wasn't for CBS," she says.

Lorena Puica '15, founder and CEO of syd, likewise formed a new company using AI power and big data. Her all-in-one life quality platform, syd, serves as a personalized resource for preventative healthcare practices. And while syd's success in improving quality of life and increasing productivity is measurable, Puica says tech-driven improvements in healthcare are still nascent, particularly when it comes to equal access and opportunity. If society doesn't "have a clear understanding of what equity truly is," Puica says, "the machines we build will have even less clarity."

The bar is high, but under Dean Costis Maglaras, CBS is leading the way toward balanced solutions. Last year, the School launched the Digital Future Initiative, which unites students, business leaders, policymakers, and hundreds of faculty across disciplines in the discussion of technology's disruptive impact on society.

Non-traditional, disruptive tech startups—these are the kinds of companies CBS alumni have been launching lately. In the following stories, we profile alumni introducing novel ideas and building entirely new disruptive businesses based on explosive data-driven technologies.

**Jake Reynolds '97, general partner, TCV**

## Tech Innovation Is 'Mind-Blowing' and 'Not Well Understood'

Jake Reynolds has been investing in tech startups for 30 years, specializing in the enterprise and software-as-a-service sector. Still, he says, "my

mind is blown every day" by the power of data and the boundary-breaking ideas for new products and services that aspiring entrepreneurs bring to the table seeking capital. "Every day I see how digitization and AI are exploding the potential of what we can imagine."

He sees unlimited potential for what generative AI will bring to enterprise software and all aspects of business. "ChatGPT and all the emerging generative AI tools and models are just the beginning," he says. Soon, "you won't even talk about AI being embedded; it will just be assumed."

While business is racing to capitalize on the power of data, Reynolds notes, society at large is scrambling to make sense of how this latest wave of technology will change our lives. "The impact of the digitalization of business is not very well understood in economics, in policy, or in traditional macroeconomic measurements and models," he adds. "And the pace of change is happening much, much faster than our ability to understand and adapt."

The challenge for higher education, and business schools specifically, is to merge the best thinking in sociology, psychology, and other fields to understand this massive change. It's "a big task and a difficult thing to do, but it's a vital thing for us as a society," Reynolds says. "And we don't have a lot of time to navel gaze or ponder. We need to act now."

**Ryan Petersen '08, founder, Flexport**

## A Window into Every Link of the Supply Chain

Ryan Petersen started his career 20 years ago importing and selling motorcycles and motor sports gear on the internet. He soon found the pain point: getting the products on a ship, through customs, and safely into the country.

Out of that pain grew Flexport, a company with the mission of "making global trade easy for everyone," Petersen says. "It's so hard to wrangle data out of your supply chain" to optimize inventory, understand costs, cut waste and reduce carbon emissions, and master the intricacies of customs. "Even the biggest companies in the world struggle with this."

Flexport's answer provides radical transparency with software that gives importers a "single pane of glass" to see the status of all of their orders placed in factories and shipments moving around the world, to book freight by any mode of transport, and know when it will be delivered. "It works because we have connected all the parties in the chain," he adds. The platform includes software for manufacturers; trucking, air, and ocean freight companies; warehouse managers; and government agencies controlling customs. The Flexport platform powers the company's global freight forwarding and customs brokerage business, which has propelled Flexport into the top 10 for global freight providers from Asia to the United States, one of the busiest trade lanes in the world.

An added benefit of Flexport's rich data on transport is that client companies get solid information on their carbon emissions that is otherwise hard to come by, helping them meet sustainability goals.

Building Flexport was a huge effort to integrate so much data and so many players. "Being very, very ambitious was kind of our secret," Petersen notes. But if they only tried to fix one part of the puzzle, "I'm not convinced you add enough value to really be a viable business."

Flexport, valued at around $8 billion, is more than viable, and the firm uses its good fortune to help those in need. Through its global impact arm, Flexport.org, the venture offers logistical expertise to international humanitarian relief and rescue organizations, matching corporate donations to needs and making sure critical supplies get to where they need to be with less waste. Flexport provides these services at cost, with companies that donate goods with transparency gaining a terrific return on their philanthropic investments.

For instance, since the start of the war in Ukraine, Flexport.org has shipped over 13 million pounds of aid to 8 million Ukrainians in need, including

hospital beds, medical and surgical equipment, ambulances and clinics, firefighter equipment, hygiene kits, blankets, and food supplies.

"I'm really proud of that. We're fortunate that our core capacity—moving cargo all over the world and using data to make sure it gets where it needs to go—benefits humanity," he says.

**Allon Bloch '97, co-founder and CEO, K Health**

## AI Enters the Chat . . . with Your Doctor

Allon Bloch believed that using artificial intelligence to harness the power of clinical data could dramatically improve healthcare. So he built K Health, a simple system that provides access to doctors and pharmacies in the palm of your hand.

K Health provides fast, affordable, on-demand text-based doctor visits and prescriptions available 24/7 from your phone. Driving the system is a vast database of detailed, anonymized medical records for millions of patients.

A team of mathematicians, doctors, and software engineers used machine learning to train an AI application to mimic the process of differential diagnosis that every doctor uses. Then they recruited highly qualified medical professionals to provide virtual visits while tapping into this powerful data source.

K Health improves on online symptom checkers and now-common telehealth visits by allowing both physicians and patients to tap into a vast pool of detailed symptoms and clinical outcomes for "people like me," matched on age, gender, and pre-existing conditions. During these virtual visits, K Health's AI-powered personal assistant "stays in the conversation," drawing on deep knowledge and clinical outcomes no doctor can access and synthesize in real time.

The system strips away the inconvenience of a trip to the doctor's office, the pricey premiums, confusing copays, the opaque rules of health insurance, and much of the massive bureaucracy of healthcare.

"Our claim is simple. We think that using data technology and building the right approach using AI, you can create a much better health system from a medical quality perspective at a lower cost," says Bloch, K Health's CEO and co-founder.

"Medicine is a deeply human profession; it's also deeply complex. But the system we built didn't learn from one doctor; it learned from thousands of doctors," Bloch says.

"Using data to find a new way of doing things to change medicine and healthcare is no small undertaking. I think this is something I wouldn't have done 10 years ago. But I'm a little older now; I've been a CEO for 16 years and was part of a team that built two public companies from scratch, and that gave me the confidence to tackle something that is near to my heart—and something that mattered."

**Constanza Gomez '22, co-founder and CEO, Sortile**

## Saving the Planet with Data Analytics

Constanza Gomez remembers with laser clarity the moment that sparked her passion for textile recycling. While working as a researcher in the financial industry analyzing the impact of a law governing how firms in Chile classified obsolete inventory, she stumbled across a stunning unintended consequence. To get unsold garments off their books, retailers would throw them out—"hundreds and thousands of pieces of clothing that had never been worn, in pristine condition, all going to a landfill, all due

to a small change in accounting rules. I couldn't believe it," she recalls, still sounding appalled.

At the time, there was no recycling infrastructure for textiles. "I kind of went down a rabbit hole and started reading up to find out why this problem existed. It became kind of an obsession."

Agustina Mir, MPA '21, whom Gomez met in Columbia Business School's multidisciplinary Think Bigger course, encouraged her to engineer a solution. Together, they founded Sortile, a company that makes textile recycling financially viable with AI-driven automation and data. They developed and marketed a small device that accurately analyzes the fiber content of clothing, reducing the need for label reading and hand sorting.

Sortile collects data on everything sorted and sells software that analyzes the data, allowing waste processors to track their output and productivity and predict the volume of fiber they can sell. Without this data, which helps supply a consistent stream of clean quality fibers, recyclers can't recover their costs.

"This is a space where data basically doesn't exist," says Gomez, "and because it doesn't, the possibilities of what we can do with data in this space are pretty much endless." For example, Sortile did a waste characterization study for a fashion brand and found out that at least 50 percent of clothing thrown out could have been recycled. "Just the monetary value of not putting that in a landfill—forget about potentially reselling—could be massive."

An accidental entrepreneur who never intended to start her own business, Gomez says the analytical skills and long hours of her experience in finance were useful. Still, there were daunting things she'd never done and some that she's still learning. "I'm so grateful to CBS. There are thousands of things I've learned, through classes, professors, summer programming, and access to mentors who had experience. There was just so much support and so many people to bounce ideas off. One of the things I learned was to just talk to people; ask for help. Don't be scared to put yourself out there. You'd be surprised by the number of people who genuinely want to help you."

**Lorena Puica '15, founder and CEO, syd**

## Improving the Quality of Life for a Billion People

Lorena Puica swore to herself that she would never start a business. In her late 20s, she had an almost literal change of heart when she was diagnosed with a combination of cardiac and thyroid problems.

Doctors told her she had three years to live if she did not strictly follow prescribed treatments. Puica wasn't buying it. A naturally analytical investment manager, she dove into medical research, built a spreadsheet, ran a sophisticated comparison of the findings, and found a way to manage her own condition—and proved the doctors wrong by becoming a world record-holding extreme athlete.

Along the way, she realized everyone around her had similar stories of struggling to get answers and effective treatment for their conditions. "That got me thinking of building something, if only so people didn't have to go through what I did," she recalls.

"I started to look more seriously into what was wrong with our healthcare system and learned that globally, we had an $8 trillion problem. That's what gets thrown away on treating preventable conditions with little gain in quality of life, all because we don't have the right information and support."

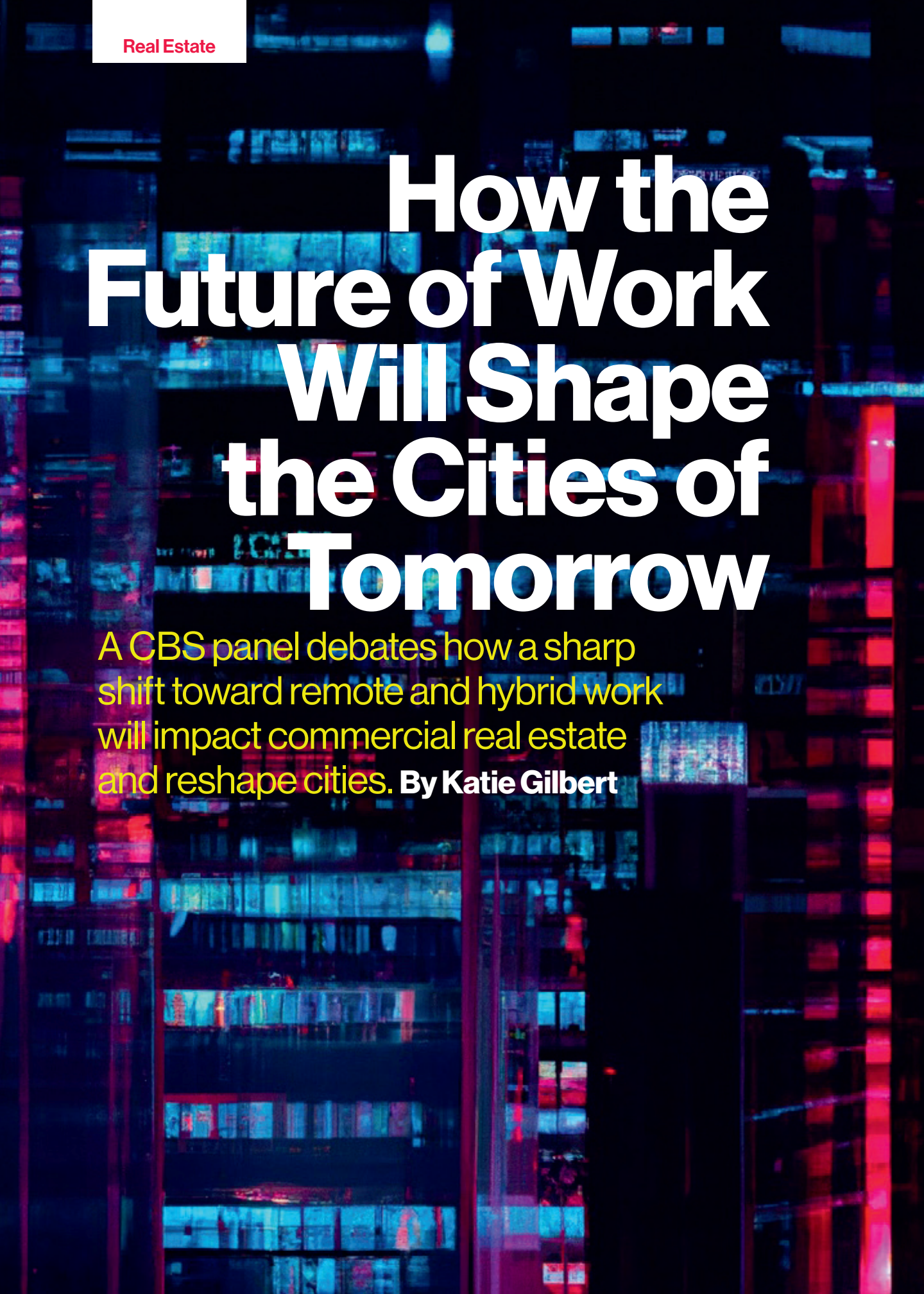
Her solution was syd, an AI-powered preventive precision health platform, built on rigorous analysis of more than a million academic studies on health, genetics, and wellness. Using a "virtual companion" called syd.life, people can tap into this data to understand their own biology and behavior and take control of their own life quality in a simple, effective, and measurable way.

Puica sells the system to employers who recognize that healthy, happy, productive employees are key to the health of the company. Employers get a dashboard with feedback human resource managers can use to assess the impact of their efforts to support their workforce and optimize performance. Privacy is strictly protected. The dashboard illuminates trends in measures like stress levels, retention, and productivity, with information on collective circumstances that are driving the trends.

Puica thinks big. Her goal is to improve the quality of life for a billion people around the planet. ("Investors tossed me out of the room when I told them that," she recalls with a laugh.) Because prevention is the goal, syd's approach is holistic, encompassing nine dimensions of life quality: physical, emotional, and financial health, brain power, purpose, self-awareness, career, social life, and environment. Even small changes in one of these realms impacts others, Puica maintains.

So far, the venture has members in 26 countries and its Life Quality Index—the metric the syd team built to measure impact—shows a 20 percent increase in individuals' life quality, a 23 percent increase in productivity, and a 15 percent increase in employee retention.

Puica says that technology driving improvements in healthcare—particularly in genetics and AI—has a long way to go before delivering on its promise. But her greatest lesson in her unplanned journey as a tech entrepreneur is that "it's all about people." Ultimately, her dream is that all this technology and automation will "bring us a better understanding of what it means to be human and how we can nurture human potential." ■



# How the Future of Work Will Shape the Cities of Tomorrow

A CBS panel debates how a sharp shift toward remote and hybrid work will impact commercial real estate and reshape cities. **By Katie Gilbert**

As distinct as our digital and our physical worlds may seem, their inextricable connectedness has become impossible to ignore. If this wasn't clear before the pandemic, it certainly is now: Technology and digitalization have transformed the way we work, live, and consume—and now, the cities where so many of us do these things must change, too.

At a recent panel discussion hosted by Columbia Business School's Digital Future Initiative and the Paul Milstein Center for Real Estate, experts from academia, industry, and government considered the ways in which the sharp shift toward remote and hybrid work is impacting commercial real estate and reshaping the future of cities.

Moderator Stephan Meier, the James P. Gorman Professor of Business at CBS, guided the panelists in a conversation that covered the unprecedented scope of the change we're currently witnessing; coming challenges to real estate, along with their broad relevance; and the actions city leaders are taking to try to wrest a potential crisis into an opportunity to evolve—especially in New York City.

Their discussion included four key takeaways:

## 1 We are living in the middle of a remarkable transformation.

Panelist Stijn Van Nieuwerburgh, the Earle W. Kazis and Benjamin Schore Professor of Real Estate and professor of finance at CBS, kicked off the discussion by establishing just how seminal the current moment is: "We are living in the middle of a remarkable transformation, really a revolution," he said. Divorcing our places of work from our places of residence is a brand-new concept—given that humans have always needed to live reasonably close to where they forage, farm, or clock in—and it'll likely take decades to grapple with all of the ways in which this separation will ripple through our society, he noted.

"This is a mind-blowing idea, and one that I think is going to have important repercussions for real estate and urban structure," Van Nieuwerburgh said.

His recent research helps quantify the scope of this disruption with striking numbers: For one thing, Manhattan has lost 200,000 households since March 2020, the most of any county in the United States.

He has also documented that, over a similar period, the office real estate market in New York has sustained a massive blow—likely with the worst yet to come. Leasing revenue from existing office buildings has already fallen by 20 percent, and only about one-third of the leases outstanding in December 2019, just before the pandemic descended, have come up for renewal since then. "What that means is that, as bad as the drop in leasing revenue has already been, the second shoe is yet to fall because there are all of these leases that are still outstanding," Van Nieuwerburgh said.

When new leases do roll around for renewal, demand will be down sharply: Van Nieuwerburgh estimates that new office leasing activity has dropped 50 to 80 percent in cities across the United States. (He puts the number at 54 percent in New York and close to 70 percent in San Francisco.)

Overall, what do these trends imply for the value of office real estate assets? Van Nieuwerburgh's research suggests that, in aggregate, the value of all offices in New York City has dropped by a whopping 40 percent.

## 2 Expect wide-ranging impacts.

Julie Stein, executive director of the governor- and mayor-convened "New" New York Panel, launched to plan for the future of New York's economy, emphasized that the consequences of the trends laid out by Van Nieuwerburgh will hardly be isolated to real estate owners and inhabitants. After all, if fewer companies and workers are reliant on office buildings, then the whole commercial ecosystems that have long existed to support them—the restaurants, retail, and other businesses that constitute cities' business districts—are also in peril.

Local governments have long been heavily reliant on the tax revenue generated by these business districts, Stein pointed out.

"Even if you don't work in Midtown, you need to care about what's happening there because your library, your senior center, your education, your roads—all that stuff—is funded by this center of global commerce that's happening in Midtown," Stein said.

Van Nieuwerburgh pointed to another constituency that could feel the pain of the shrinking value of commercial real estate: institutional investors and all the underlying investors who rely on them, including pension-holders. The average institution allocates about 10 percent of its portfolio to commercial real estate, he said, and a lot of that is in office holdings.

## 3 Cities have an opportunity: Evolve to meet the moment.

Though the panelists' conversation included plenty of gloomy forecasts, it also offered reason for optimism. Nicholas Bienstock '96, managing partner of real estate investment firm Savanna, said while he has experienced many ups and downs over his career in New York's real estate industry, "New York does have a remarkable capacity across multiple crises of different types to recover."

Ultimately, he said, even companies that lean into hybrid work setups will continue to want to have offices in places where they can draw on big talent pools, and New York and other major metropolitan areas in the United States can continue to offer those—as long as they remain places where people genuinely *want* to live.

One of the guiding aims of the "New" New York Panel, Stein said, is to recognize and act on a recent paradigm shift: In the world of remote work, people will no longer simply move to where the businesses are; businesses will need to move to where people want to be.

"In this world where people can vote with their feet, we really need to answer the question, 'Why should they work here?' which led us to the conclusion that we needed to make New York the best place to work, no matter what you do or where you work," Stein said. "And to do that, you really need to make New York the best place, period."

The "New" New York Panel was formed in mid-2022, when Governor Kathy Hochul and Mayor Eric Adams brought together 59 civic leaders and industry experts to develop a plan for boosting the economic resilience of the city and the wider region. Six months later, the mayor and governor adopted the panel's 40-point plan, which includes legislative, budgetary, and agency actions on the city, state, and federal levels.

Stein explained the plan's 40 points were organized under three central goals: 1) reimagining the city's business districts as vibrant, 24/7 districts where people want to live, work, and play; 2) acknowledging that the future of work is hybrid, making it easier for people to commute into Manhattan and developing employment hubs throughout the city so people can easily work from any of the five boroughs; and 3) generating inclusive, future-focused growth, which must address the city's affordable-housing crisis, among other issues.

In providing examples of how the city government can help facilitate the realization of these big goals, Stein highlighted the possibility of converting office spaces into residential spaces, a hot topic of late, she said.

"We want to make sure that when it makes sense—and *where* it makes sense—the rules are out of the way so we can convert outdated office space to residential use, to both soak up some of that excess vacancy but also bring more foot traffic into these business districts," Stein said.

Bienstock followed up on that point, agreeing that such conversions would be great for the city but cautioning that office-to-residential conversions are "among the riskiest things you can do in my business" because of the high costs, long time horizon, and considerable regulatory hurdles.

Van Nieuwerburgh doubled down on that, citing a statistic that over the past seven years, only 1 percent of New York's office inventory has been converted to residences, and a highly optimistic expectation for the next three to four years would be the conversion of just another 1 percent.

But Stein emphasized that what these perspectives don't account for are changes the city could make to zoning codes, for example, to allow denser residential development in areas where it's appropriate, which would swiftly change how such economic calculations are made.

"Fundamentally, this plan talks about how we need to not just recover, but we need to evolve," Stein said. "We need to make sure that the city is better positioned moving forward into this new world."

## 4 | Others, too, can be on the lookout for opportunities amid transformation.

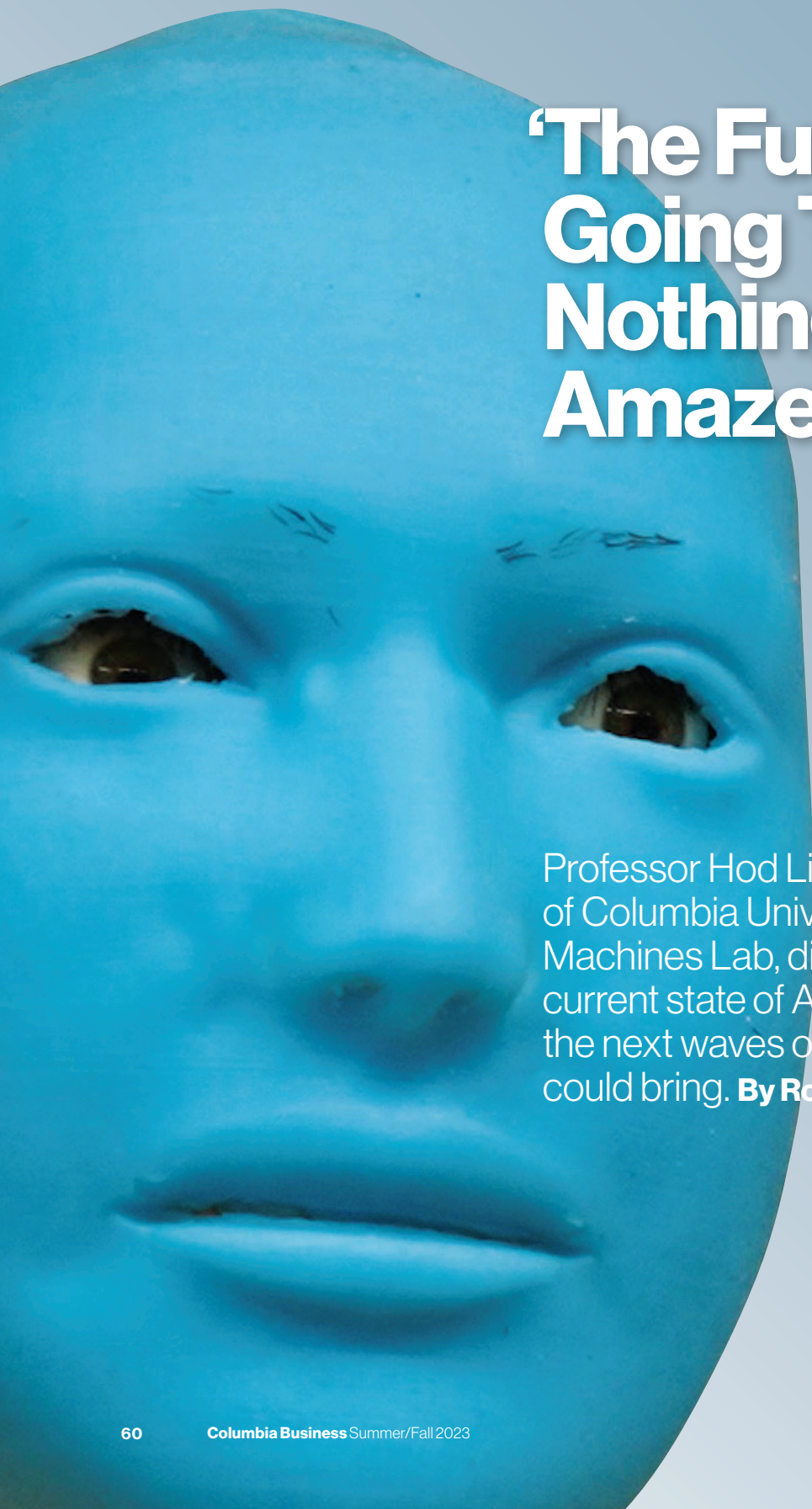
Plenty of people outside of city leadership will find opportunities to meet the new needs being formed by these tectonic shifts, the panelists agreed.

Van Nieuwerburgh noted that he believes a business model set to "get new life" is the shared-office-space offering—though he doesn't necessarily think the longtime dominators of the space, like WeWork, will be the biggest beneficiaries. After all, any resourceful landlord can develop an app to make it easy to sign up for flexible leasing structures—for example, a small startup may need office space only on Mondays and Fridays.

"I think that's good news for creative landlords who can use their buildings more efficiently," Van Nieuwerburgh said, "even if it's very bad news for aggregate demand for office space."

Bienstock added that as his firm designs, develops, and updates office spaces, it is shifting its thinking as well, keeping in mind new hybrid work needs. For example, when employees are called into the office for a partial week, it's with a focus on working closely and collaboratively with their colleagues, which has implications for how an office should be laid out.

"There are more open spaces, there are more conference rooms, more collaborative spaces, fewer individual office spaces," he said. "Everyone has incorporated a work-from-home component to work, so when they're back, they want people to be together and intermingling." ■



# ‘The Future Is Going To Be Nothing but Amazement’

Professor Hod Lipson, director of Columbia University’s Creative Machines Lab, discusses the current state of AI and what the next waves of innovation could bring. **By Roland Wyn Jones**

A robot prototype in the Creative Machines Lab

The introduction of ChatGPT late last year sent shock waves around the world, raising substantial public interest in the capabilities of the AI-powered chatbot.

Developed by research company OpenAI, ChatGPT represents a significant advancement in AI language modeling. Instead of having to input specific commands or keywords, users of the chatbot speak or type questions using natural language, making the technology more user-friendly and allowing for numerous practical uses, from content creation to search and more intuitive computer interfaces.

But while ChatGPT and other emerging AI tools have innovative capabilities that are poised to revolutionize workplaces and entire industries, we should brace ourselves for even greater disruptive changes in the fields of AI, robotics, and associated technologies, says Hod Lipson, professor of mechanical engineering and data science at Columbia Engineering.

A world-renowned roboticist and AI expert, Professor Lipson is the founder and director of the Creative Machines Lab, housed at Columbia's Engineering School, where he and his team push the boundaries of robotics and AI with groundbreaking research. He is also a guest lecturer in a new CBS class, Technology Breakthroughs, taught by CBS Dean Costis Maglaras and Columbia Engineering Dean Shih-Fu Chang. The class examines the impact new technologies have had on business and society.

The strong response to ChatGPT could be merely the beginning of a far larger trend, Lipson notes. While progress to date has been slow and steady, newer technologies driven by more data and processing power are accelerating the use of AI and robotics—at a pace that's surprising even those working in the field, he says.

"I think the future is going to be nothing but amazement," he adds.

Lipson recently spoke with us about the factors behind the latest developments in robotics and AI, the societal implications of technological advancement, and the role of business and industry in pushing the boundaries of innovation.

**Professor Hod Lipson, director of Columbia University's Creative Machines Lab**

### CBS: What are the most recent breakthroughs in the development of AI?

**Hod Lipson:** AI software used to focus on rules-based automation. For example, you could program software to detect fraudulent transactions by noticing if somebody spends in one day more money than they spent in the entire previous month. That's probably a fraudulent transaction, and the AI flags it for review. You can apply these rules automatically to millions of transactions a second, so it's efficient. But when you want to improve the system, you're stuck because you have to go back and create new rules. This is where we have been stuck for decades, until around 2012, when we figured out how to program computers not by telling them what to do but by showing them what to do. In other words, instead of telling the computer how to find fraudulent transactions, we instead give the computer examples of fraudulent transactions, and it can study them, find their statistical signatures, and then look for more. And when it finds more, it can study those and get even better at finding what it's looking for.

These kinds of data-driven systems are self-improving, and this is the key thing. It's why we are seeing exponential growth, because modern AI is based on machine learning and machine learning keeps improving. The more examples and data it collects, the better it gets.

It's difficult to predict where AI is going to go next because the improvements are accelerating. We are seeing these improvements touching many industries and sectors, from medicine to agriculture to security and retail. We're seeing the technology power driverless cars and factory automation. It's affecting every market segment that you can think of.

**CBS: You've talked about "compounding exponentials" that are driving change at an accelerating rate. Can you share more?**

**Lipson:** Lots of people have the misconception that the reason AI is moving forward at an exponential rate is simply because computing power is continually improving. Moore's Law states that the amount of computing power available for a given cost will increase by a factor of two every 18 months or so, allowing us to build computers that are faster, cheaper, and better at an exponential rate. And while it seems like AI is riding this curve, and is therefore accelerating, there's a lot more going on here than just Moore's Law.

The creation of data, which is the fuel of modern AI, is also accelerating. Some people say that the amount of data that we have is doubling every 12 months. That's an incredible rate of acceleration. And on top of that, we've seen the growth of AI systems themselves—how much data they can store, the size of the "brains" of AI systems, if you like—doubling even faster. And on top of these factors, you also have the fact that AI systems are now able to teach other AI systems, creating a compounding effect. All these factors are self-amplifying and creating an incredible rate of acceleration.

**CBS: Why is data so important to the development of AI?**

**Lipson:** When you think about the economics of AI, certain things are a commodity and others are assets. Programming code, for example, is open source now and it's mostly free. Computing power is a commodity, too—a penny a core hour. And talent is ubiquitous. You have high school kids these days who can put together a system that would have earned them a PhD just a few years ago. People all over the planet (and AI itself) are learning quickly to create these systems.

But two things are not a commodity, and they're important to understand. One is data. The other is understanding what problems need to be solved. And this is where I think people with business backgrounds have an advantage. If you are in a particular market segment, you understand what the challenges are, and you understand what data are available to you. And you understand how data can help you solve a problem. Everything else you need is a commodity. You can put together a solution and lead your industry. This is what will differentiate the leaders from the followers in this world of AI.

**CBS: How can generative AI help us achieve business goals or create new markets?**

**Lipson:** The current wave of creative AI, or generative AI, is really fascinating. It's a different kind of intelligence. Up until recently, most of AI focused on decision-making. AI would ingest a lot of data and then make a decision. Is it a cat or a dog? Should I buy or sell? Should I turn left or turn right? Now, we are seeing a different kind of intelligence, which is creativity. You start from a goal, a seed, a very small thing, and then generate a lot of new things. We used to think computers can only make decisions and that creativity is uniquely human, but it turns out, creativity is exactly what AI is good at. It's actually very good at generating new ideas.

You can see that with software like ChatGPT, Stable Diffusion, or DALL·E. They can create not only poems, but music, scientific reports, engineering designs, molecules, or art. In class, I see students struggling to generate a new design for a robot, but AI can sketch out eight different designs in 25 seconds. It's amazing to see how creative AI can be. And this is important because a lot of our ability to innovate has to do with creativity. It's particularly difficult in areas where we don't have a lot of intuition. We are very good at designing chairs or bridges—the things we understand—but we are not as good at designing proteins or antennas, or nano materials—things that we don't have a lot of intuition about.

AI can design all these things for us, and it expends the same amount of effort to design a bridge as to design a protein. So I think this is an incredibly powerful aspect of AI. We've been stuck in a corner for centuries because of our limited intuition about the world, and now AI can allow us to create amazing new things.

**CBS: Should we be concerned about the potential power of AI?**

**Lipson:** People think AI is competing with humans, but the right way to look at it is that finally we're going to collaborate with another creative species

that's going to think about problems in a different way. It's going to allow us to look at things differently and create new solutions. And it's not just going to be one AI that's going to be creative. We're going to have a whole ecosystem of AIs that are very good at finding creative solutions to a lot of challenges, such as designing spaceships or finding a solution for climate change, probably in ways we can't comprehend. When we put humans and AI together, who knows where we can go and what we can achieve.

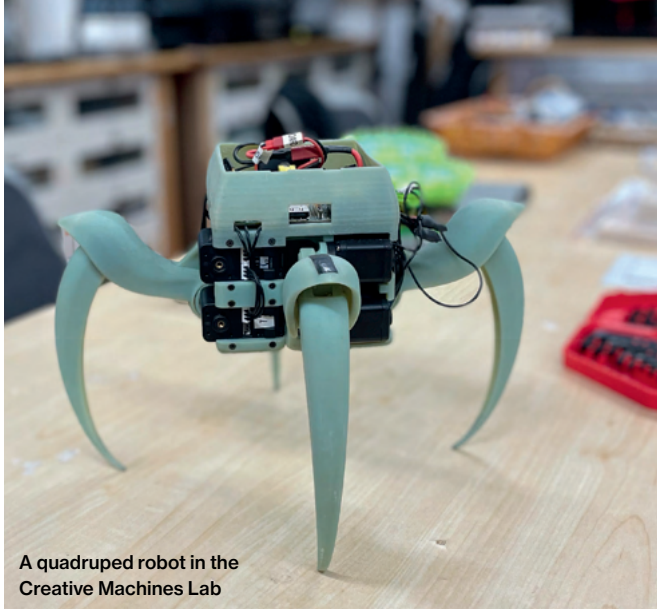
### CBS: Your specialization is robotics. How does that fit in with AI?

**Lipson:** Robotics is taking AI and giving it a physical body. By itself, AI is an abstraction that works on a computer, but it's detached from the physical world. When you take AI and put it in a body, it becomes a robot. And robotics turns out to be particularly difficult. It's one of these things that we humans take for granted, but it actually takes a lot of computing power to do trivial things like walk or manipulate things with our hands. It's a little bit like telling the difference between a cat and a dog. We take it for granted, we can do it easily—we don't even think about it—but until recently, it was a very difficult challenge for computers.

Right now, I would say physical AI robotics is way behind compared to virtual AI. There's a lot more to do there. But it also means that, for example, jobs and activities that have to do with unstructured physical action are not going to be automated as quickly as decision-making or operations that are much more abstract. For example, AI can drive your car tomorrow, but when your car breaks down, it's going to take a human to fix it. We are very far from having a robot that can fix a broken car. So jobs like plumbers, electricians, hairdressers, nurses, anybody who works with their hands are safe for now. And that's a reversal of how people have tended to view how automation is going to affect jobs.

### CBS: How can we deal with the ethical challenges presented by AI?

**Lipson:** Some of these challenges are immediate and some of them are long term. One of the immediate questions is, how do we train these



A quadruped robot in the Creative Machines Lab

AI systems? How do we make sure they are less biased than the data they're being trained on? How can they do a better job at managing the world than we humans do? These questions were not really at the forefront for many years because AI wasn't very good. It's only in the last couple of years that AI has become so good that it can do things that suddenly are life and death—everything from driving a car to security—so that the questions are very, very important.

So there's a lot of effort trying to both understand how to balance AI, or how to understand its weaknesses or understand how to manage multiple AIs working together. I can't say this problem is solved, but there's a lot of attention on it. For example, if you look at ChatGPT today versus a few months ago, you'll see a marked difference in the raw answers it used to give compared with its ability now to speak in a much more appropriate way.

But the long-term question that's still unanswered is not what AI will do to people, but what people will use AI to do to other people. Will it be used for warfare or hacking? That's something that of course we need to figure out how to handle. Personally, when it comes to AI, I think the benefits far outweigh the risks, but the risks are there and we need to be aware of them and then work to mitigate them.

**Scan to watch our full interview with Professor Hod Lipson.**

# Postcards from Heaven

**In his 7th-floor office in Henry R. Kravis Hall, economist Tano Santos curates a rotating exhibition of art postcards he's collected for 40 years.**

"I DID THE BULLETIN BOARD without much thinking, and it has turned out to be such a big success. I get an enormous kick out of looking at them and thinking about places and paintings I've seen with friends, things I've loved for 50 years, and new things I've discovered. By now I have hundreds of cards from around the world, everything from Michelangelo's *David* to Dürer's *Self-Portrait*. It's important to feel that side of yourself that brings, I don't know what to say, psychological relief? A spiritual well-being? These are the things that, to some extent, give meaning to everything else."

Tano Santos, the Robert Heilbrunn Professor of Asset Management and Finance, with his postcard of *Las Meninas* by Diego Velázquez

**Scan this QR code to test your art knowledge. How many works can you identify?**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