

DATA ON A MISSION

PRIVACY, CITIES
AND FINANCE
IN A DIGITAL AGE

*A Symposium with Leading Experts
from Industry, Government
and Academia*

April 1, 2015

LOW MEMORIAL LIBRARY, ROTUNDA
COLUMBIA UNIVERSITY



COLUMBIA UNIVERSITY
Data Science Institute

SYMPOSIUM AGENDA



#DataOnAMission
@DSI_Columbia



COLUMBIA UNIVERSITY

Data Science Institute

On behalf of Columbia University and the Data Science Institute, we have the honor of welcoming you today to our 2015 Symposium, Privacy, Cities and Finance in the Digital Age.

The Data Science Institute is led by the Engineering School and involves teaching and research faculty in every school on campus. The gathering and analysis of large sets of data are transforming every facet of society, and Columbia is well positioned to lead this change. Established in the fall of 2012 with support from the New York City Economic Development Council, the Institute has hired 15 faculty whose research lies in foundational areas of data science and in fields such as medicine, cryptography, finance, and experimental design of scientific experiments, where the analysis of big data has led to revolutionary insights. The Institute has also launched two new academic programs, a certification and master's in data science.

Our 2015 Symposium will explore the transformative nature of data science, for the individual as well as at the scale of cities and financial markets. Our opening keynote speaker will discuss privacy issues raised in this new era; our closing keynote speaker will discuss the use of data science in algorithmic trading. A panel on smart cities will debate the question of how data can improve our cities.

We welcome you to stay after the program to continue the conversation with our faculty and students who will be presenting posters summarizing recent research results.



Kathleen R. McKeown
Director



Patricia J. Culligan
Associate Director

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Registration and Breakfast	8:00AM – 9:15AM
Opening Remarks and Welcome	9:15AM – 9:30AM
<i>John H. Coatsworth, Provost of the University</i>	
<i>Mary C. Boyce, Dean of Columbia Engineering</i>	
Data Science Institute Updates	9:30AM – 9:40AM
<i>Kathleen R. McKeown, Director of the Data Science Institute and</i>	
<i>Henry and Gertrude Rothschild Professor of Computer Science</i>	
Introduction of Opening Keynote Address	9:40AM – 9:50AM
<i>Steven M. Bellovin, Professor of Computer Science</i>	
Opening Keynote Address	9:45AM – 10:30AM
<i>Julie Brill Commissioner, Federal Trade Commission</i>	
Break	10:30AM – 10:55AM
Introduction of Panel Session	10:55AM – 11:00AM
<i>Patricia J. Culligan, Associate Director of the Data Science Institute and</i>	
<i>Professor of Civil Engineering and Engineering Mechanics</i>	
Panel Session: Smart Cities	11:00AM – 12:00PM
MODERATOR:	
<i>Amen Ra Mashariki Chief Analytics Officer, The Mayor’s Office of Data</i>	
<i>Analytics</i>	
PANELISTS:	
<i>Ester Fuchs, Professor of International and Public Affairs and Political Science</i>	
<i>Michael Jansen Chief Executive Officer, Cityzenith</i>	
<i>Marcus Quigley Chief Executive Officer, OptiRTC</i>	
<i>Andrew Whittle Edmund K. Turner Professor in Civil Engineering, MIT</i>	
Introduction of Closing Keynote Address	12:00PM – 12:05PM
<i>Garud N. Iyengar, Professor and Department Chair of Industrial Engineering</i>	
<i>and Operations Research</i>	
Closing Keynote Address	12:05PM – 12:50PM
<i>Michael Kearns Founding Director of the Warren Center for Network and</i>	
<i>Data Sciences, University of Pennsylvania</i>	
Closing Remarks and Overview of Posters	12:50PM – 12:55PM
<i>David B. Madigan, Executive Vice President of Arts and Sciences and Dean of</i>	
<i>the Faculty and Professor of Statistics</i>	
Lunch and Poster Session	12:55PM – 2:00PM



JULIE BRILL

COMMISSIONER, FEDERAL TRADE COMMISSION

*“NAVIGATING THE TRACKLESS OCEAN:
PRIVACY AND FAIRNESS IN BIG DATA
RESEARCH AND DECISION MAKING”*

THE TROVES OF PERSONAL DATA AVAILABLE FROM CONNECTED DEVICES, APPS, SMARTPHONES, AND COMPUTERS CAN SHED LIGHT ON SOME OF THE GREATEST ECONOMIC AND SOCIAL CHALLENGES THAT WE FACE. BUT THE SAME DATA OFTEN RAISES VEXING QUESTIONS ABOUT PRIVACY AND OVERALL FAIRNESS. FOR EXAMPLE, WHAT KINDS OF DATA ARE SENSITIVE AND DESERVING OF HEIGHTENED PROTECTIONS? DOES INNOCUOUS DATA BECOME SENSITIVE WHEN ASSEMBLED INTO LARGE DATA SETS? OR ONLY IF IT IS USED IN CERTAIN WAYS? THESE QUESTIONS AND OTHERS ARE IMPORTANT FOR DATA SCIENTISTS AND DECISION MAKERS IN ACADEMIA, GOVERNMENT, AND INDUSTRY TO ASK AND ADDRESS. FUNDAMENTAL PRIVACY AND CONSUMER PROTECTION PRINCIPLES PROVIDE WAYS TO NAVIGATE THROUGH THEM. IN HER TALK, COMMISSIONER BRILL WILL DISCUSS PRINCIPLES THAT DATA SCIENTISTS SHOULD KNOW AND OUTLINE WAYS THAT DATA SCIENTISTS AND POLICYMAKERS COULD WORK TOGETHER TO ENSURE THAT RESEARCH THAT USES BIG DATA ALSO RESPECTS INDIVIDUAL PRIVACY AND MAINTAINS OVERALL FAIRNESS.

Julie Brill was sworn in as a Commissioner of the Federal Trade Commission April 6, 2010. Since joining the Commission, Ms. Brill has been working actively on issues of critical importance to today’s consumers, including protecting consumers’ privacy, encouraging appropriate advertising substantiation, guarding consumers from financial fraud, and maintaining competition in industries involving health care and high-tech.

Commissioner Brill has been named “the Commission’s most important voice on Internet privacy and data security issues” a “key player in U.S. and global regulations”, “one of the top minds in online privacy”, one of the top four U.S. government players “leading the data privacy debate”, “one of the top 50 influencers on big data”, and a “game-changer”. In 2014 she received the Privacy Leader of the Year Award from the International Association of Privacy Professionals.

Commissioner Brill is an advocate of protecting consumers’ privacy, especially with new online and mobile technologies, and supports the creation and implementation of mechanisms to give consumers better information and control over the collection and use of their personal online information. In her speeches, publications and meetings with a wide variety of stakeholders, Commissioner Brill calls on industry and policymakers to improve privacy by developing practical solutions rooted in both consumer protection and

competition principles.

Commissioner Brill has been named “one of the 50 most powerful people in health care”. She advocates for effective antitrust enforcement in the health care and high-tech sectors. She wrote the Commission’s unanimous decision in ProMedica, dissolving the merger of two hospitals in Toledo, Ohio. Commissioner Brill’s ProMedica decision was recently upheld on appeal by the Sixth Circuit of the United States Circuit Court.

Commissioner Brill focuses on the need to improve consumer protection in the financial services arena. She advocates improving regulations and enforcement involving credit reporting, debt collection and in other financial areas. She is particularly interested in combatting frauds targeting consumers caught up in the economic downturn. She strongly supports increased cooperation among the FTC, the CFPB, and the States as they implement the provisions of the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act.

Commissioner Brill has received numerous national awards for her work. In addition to the 2014 Privacy Professionals Privacy Leader of the Year Award, she also received the New York University School of Law Alumna of the Year Award, and was recently elected to the American Law Institute.

Prior to becoming a Commissioner, Ms. Brill was the Senior Deputy Attorney General and Chief of Consumer Protection and Antitrust for the North Carolina Department of Justice. Commissioner Brill has also been a Lecturer-in-Law at Columbia University’s School of Law. Before serving as Chief of Consumer Protection and Antitrust in North Carolina, Commissioner Brill served as an Assistant Attorney General for Consumer Protection and Antitrust for the State of Vermont for over 20 years. Prior to coming to the Vermont Attorney General’s office, Commissioner Brill was an associate at Paul, Weiss, Rifkind, Wharton & Garrison in New York. She clerked for Vermont Federal District Court Judge Franklin S. Billings, Jr. Commissioner Brill graduated, magna cum laude, from Princeton University, and from New York University School of Law, where she had a Root-Tilden Scholarship for her commitment to public service.



MODERATOR: AMEN RA MASHARIKI
CHIEF ANALYTICS OFFICER, THE MAYOR'S OFFICE
OF DATA ANALYTICS

Dr. Amen Ra Mashariki is the City's Chief Analytics Officer and leads the Mayor's Office of Data Analytics (MODA). Dr. Mashariki is an accomplished leader within government, private sector and academia with experience in bringing Big Data processing and analytics for large and complex data management efforts. He started his professional careers as a software engineer at Motorola working on over-the-air data transmission projects and led a team of user-interface developers to build components of security features for handheld devices. Most recently, Dr. Mashariki served as Chief Technology Officer at the U.S. Office of Personnel Management.

Dr. Mashariki previously worked at the Johns Hopkins Applied Physics Lab as a computer scientist and research scientist where he led a team working on data mining and data fusion projects in the bioinformatics domain. Prior to that, he served as Assistant Director of Informatics at the University of Chicago Comprehensive Cancer Research Center and taught computer science courses at Hong Kong University of Science and Technology, and robotics at Northwestern University.

Dr. Mashariki holds a Doctor of Engineering from Morgan State University, a Master of Science in Computer Science from Howard University, and a Bachelor of Science in Computer Science from Lincoln University. Amen is a Brooklyn native and attended Brooklyn Tech High School.



PANELIST: ESTER FUCHS
PROFESSOR OF INTERNATIONAL AND PUBLIC
AFFAIRS AND POLITICAL SCIENCE

Ester R. Fuchs is Professor of International and Public Affairs and Political Science, Director of the Global Mayors Forum, and Director of the Urban and Social Policy Program at Columbia University's School of International and Public Affairs. She is a board member of Columbia's Institute for Data Sciences and Engineering Smart Cities Center, a Senior Fellow of the Global Cities Institute at the University of Toronto and the Director of Whosontheballot.org, an online voter engagement initiative. She received the NASPAA Public Service Matters Spotlight Award, for WhosOntheBallot.org (2014), the Champion Award from the Sports and Arts in Schools Foundation (2012), an Award for Outstanding Teaching at SIPA (2007), and the City of New York Excellence in Technology Award for Best IT Collaboration among Agencies, for Access NYC (2006).

Prof. Fuchs served as Special Advisor to the Mayor for Governance and Strategic Planning under New York City Mayor Michael R. Bloomberg from 2001 to 2005. While at City Hall, she coordinated the restructuring of the City’s Out-of-School Time programs, streamlined social services through the Integrated Human Services Project (Access New York) across 13 agencies; and merged the Department of Employment with the Department of Small Business Services to align the City’s workforce development programs with the growing sectors of the economy. Prof. Fuchs was the first woman to serve as chair of the NYC Charter Revision Commission in 2005.

Prof. Fuchs is the author of *Mayor’s and Money: Fiscal Policy in New York and Chicago* (University of Chicago Press); “Governing the Twenty-First Century City,” *Journal of International Affairs* (Summer 2012); “Expanding Opportunity for Middle Class Jobs in New York City: Minority Youth Employment in the Building and Construction Trades,” prepared for New York Community Trust Workforce Development Fund (February 2014); and “Innovations in City Government: The Case of New York City’s Workforce Development System,” prepared for the NYC Department of Small Business Services (November 2008).

She currently serves on the NYC Mayor’s Sustainability Advisory Board, the NYC Workforce Investment Board, and the NYC Commission on Women’s Issues. She is appointed to the Committee on Economic Inclusion of the U.S. Federal Deposit Insurance Corporation (FDIC) and is a member of the boards of the Fund for the City of New York, Citizens Union and the Museum at Eldridge Street.

Prof. Fuchs is a frequent political commentator in print, broadcast and new media and lectures internationally. Prof. Fuchs received a BA from Queens College, CUNY; an MA from Brown University; and a PhD in Political Science from the University of Chicago.

PANELIST: MICHAEL JANSEN
CHIEF EXECUTIVE OFFICER, CITYZENITH



Michael Jansen is a sought-after Smart City industry leader and public speaker with numerous awards and accolades to his credit, and has been featured on CNN, CNBC, and myriads of business, technology, and AEC publications worldwide, including *Cities Today*, *Architectural Record*, *ENR*, *Business Week*, *Domus*, *Contract Magazine*, et. al. In 2007, Michael was awarded *Building Design + Construction Magazine’s* prestigious “40 Under 40” award honoring top

CEO’s in the architecture, engineering, and construction industry under the age of 40. As Chief Executive of Cityzenith, he earned the praise of Realcomm in

2011, which honored 5D SMART City™ as the “Top New Technology of 2011 in the Real Estate Industry”. More recently in November, 2013, Michael accepted an award on behalf of Cityzenith at the World Smart Cities Awards in Barcelona, where 5D SMART City™ was nominated as a finalist in the “Innovative Initiative” category.

An impassioned architect, urbanist, and entrepreneur, Michael founded his first AEC tech services company, Satellier, in 2004, a CAD and BIM production services company backed by Sequoia Capital. Under his leadership, in just four years Satellier experienced explosive growth from a team size of 10 to over 450, fundamentally changing the way the AEC firms use technology to deliver services globally. In 2010, Michael assumed the helm of Cityzenith to pursue his dream of transforming life in cities all over the world.

Michael was educated as an architect at Yale and Cambridge; earned a Fulbright scholarship; studied art and architecture in China and India; speak four languages and has traveled to more than 80 countries; designs high-end, exotic furniture www.urbantribedesign.com; and is an avid guitar player.



PANELIST: MARCUS QUIGLEY
CHIEF EXECUTIVE OFFICER, OPTIRTC

Marcus Quigley is recognized as a national technical leader in passive and active stormwater design, research and development, modeling, data analysis, and field data acquisition and has extensive experience in the execution and management of major compliance auditing and litigation support project.

Starting in December 2014 following on a 20 year career in water resources consulting, Mr. Quigley became Founder and Chief Executive Officer of OptiRTC, Inc. (“Opti”).

Opti is the leading provider of software-as-a-service products for intelligent, real-time monitoring and control of water and civil infrastructure. Opti provides its products and services to large physical asset owners, including cities, building and property owners, developers, asset managers, and government agencies.

Opti’s products reduce operating and capital costs, enable environmental compliance, and reduce risk from volatile environmental conditions through the integration of leading-edge information technologies, sensor and controller hardware, and software solutions. Opti’s core solutions optimize the performance of infrastructure systems by acquiring real-time data from project sites and third parties, autonomously controlling such infrastructure, and providing data and manual control options to managers and operators through a web-based user interfaces.

Mr. Quigley has co-authored a number of national guidance manuals for monitoring of stormwater runoff and evaluating and designing stormwater best management practices (BMPs) for clients such as the USEPA, the National Cooperative Highway Research Program, the Water Environment Research Foundation, and the Federal Highway Administration.

In addition to his technical and managerial leadership, Mr. Quigley has given many invited talks, regularly speaks at technical conferences, and has authored numerous journal articles.



PANELIST: ANDREW WHITTLE
EDMUND K. TURNER PROFESSOR OF CIVIL AND
ENVIRONMENTAL ENGINEERING, MIT

Andrew Whittle earned the B.Sc. (Eng.) (1st Class) from Imperial College in 1981 and was awarded the Skempton Prize in Soil Mechanics. He worked as a senior engineering management trainee for Western Region of British Railways before moving to the US to pursue graduate studies at MIT supported by a John F. Kennedy Scholarship (1982-1984). He joined the MIT faculty in 1988, was tenured in 1995, and promoted to full Professor in 2000. From 2009 – 2013 he served as Head of the Department of Civil and Environmental Engineering.

Much of Whittle's research deals with modeling soil behavior and predicting the performance of foundations and underground construction projects. His research has been widely used in the design of foundation systems for deepwater oil production facilities in the Gulf of Mexico. He has worked extensively on problems of soil-structure interaction for urban excavation and tunneling projects, including Boston's Central Artery-Third Harbor Tunnel and MBTA South Piers transit projects, as well as Tren Urbano, a subway system which began service in San Juan, Puerto Rico, in 2004. In 2008 Whittle established the Center for Environmental Sensing and Modeling (CENSAM), an interdisciplinary research program through the Singapore MIT Alliance for Research and Technology (SMART). Through this program he has led research efforts to develop wireless sensor networks for monitoring water distribution systems and is currently the Chief Scientific Advisor for an associated start-up company, Visenti Pte. Ltd.

Whittle is Co-Editor of the International Journal of Numerical and Analytical Methods in Geomechanics (since 1999) and previously served on the editorial boards for the ASCE Journal of Geotechnical and Geoenvironmental Engineering (1993-2009) and the Canadian Geotechnical Journal (2000-2009). He is an active consultant who has worked on more than 40 major onshore and offshore construction projects. He has served on several major expert panels;

for the National Research Council and National Academy of Engineering (NRC/NAE) investigating the performance of hurricane protection systems in New Orleans; for the Governor of Massachusetts on a 'stem-to-stern' safety review of the Big Dig tunnels in Boston; for the Consorzio Venezia Nuova on the MOSE project in Venice. He currently serves on an Independent Expert Panel for the Chief Executive of Hong Kong examining the delay in the works of the Hong Kong section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL). Since 2009 he has served as a member of the Board of Directors for the Massachusetts Department of Transportation.

Dr Whittle has published more than 170 papers in refereed journals and conferences, and received several awards for his work from the American Society of Civil Engineers, including the Casagrande Award (1994), the Croes Medal (1994), Middlebrooks Prize (1997, 2002, and 2005) and Huber Research Award (1998). He is a licensed professional engineer in New York State. In 2010 he was elected to the US National Academy of Engineering.



MICHAEL KEARNS

**FOUNDING DIRECTOR OF THE WARREN CENTER
FOR NETWORK AND DATA SCIENCES, UNIVERSITY
OF PENNSYLVANIA**

***“MACHINE LEARNING FOR ALGORITHMIC
TRADING”***

**TRADITIONAL FINANCIAL MARKETS HAVE UNDERGONE
RAPID TECHNOLOGICAL CHANGE DUE TO INCREASED
AUTOMATION AND THE INTRODUCTION OF NEW EXCHANGES AND
MECHANISMS. SUCH CHANGES HAVE BROUGHT WITH THEM CHALLENGING
NEW PROBLEMS IN ALGORITHMIC TRADING, MANY OF WHICH INVITE A
MACHINE LEARNING APPROACH. IN THIS TALK I WILL EXAMINE SEVERAL
ALGORITHMIC TRADING PROBLEMS, FOCUSING ON THEIR NOVEL ML ASPECTS,
INCLUDING LIMITING MARKET IMPACT, DEALING WITH CENSORED DATA, AND
INCORPORATING RISK CONSIDERATIONS.**

Michael Kearns is a professor in the Computer and Information Science department at the University of Pennsylvania, where he holds the National Center Chair and has joint appointments in the Wharton School. He is founder of Penn’s Networked and Social Systems Engineering (NETS) program (www.nets.upenn.edu), and director of Penn’s Warren Center for Network and Data Sciences (www.warrencenter.upenn.edu). His research interests include topics in machine learning, algorithmic game theory, social networks, and computational finance. He has worked and consulted extensively in the technology and finance industries. He is a fellow of the American Academy of Arts and Sciences, the Association for Computing Machinery, and the Association for the Advancement of Artificial Intelligence.

CENTER FOR FINANCIAL AND BUSINESS ANALYTICS

Financial System Risk

Agostino Capponi, Paul Glasserman, David Da-Weio Yao

Graphical Models for Basketball Match Simulation

Min-hwan Oh, Suraj Keshri, Garud Iyengar

Positive Psychology and the Consumption of Movies

Olivier Toubia, Garud Iyengar, Alain Lemaire, Renée Bunnell

Risk Analytics for Resilient Interdependent Critical Infrastructures

Masahiko Haraguchi, Upmanu Lall, David Da-Wei Yao

CENTER FOR FOUNDATIONS OF DATA SCIENCE

Augmenting Pharmacovigilance Using Chemical Systems Biology

Tal Lorberbaum, Mavra Nasir, Michael J. Keiser, Santiago Vilar,
George Hripcsak, Nicholas P. Tatonetti

A Bayesian Network Model of Financial, Social and News Streams Under Stress Conditions

Kui Tang, Henrique Gubert, Rashmi Tonge, Anyi Wang, Liang Wu,
Dwayne Campbell, Chris Kedzie, Liao Wang, Andelyn Russell,
Anthony Kimball, Anju Kambadur, Stefano Pacifico, James Hodson,
David Da-Wei Yao, Kathleen McKeown, Tony Jebara

Multi-Objective Design Optimization with Supervised Design-Space Exploration

Hung-Yi Liu, Luca P. Carloni

Uncovering Disease-Birth Month Dependencies Using Electronic Health Records

Mary Regina Boland, Zachary Shahn, David Madigan, George Hripcsak,
Nicholas P Tatonetti

CENTER FOR HEALTH ANALYTICS

Learning Probabilistic Phenotypes from Heterogeneous Patient Record Data

Rimma Pivovarov, Adler J. Perotte, Edouard Grave, John Angiolillo,
Chris H. Wiggins, Noémie Elhadad

Sequencing Ashkenazi Jewish Whole-Genomes for Medical and Population Genetics

Shai Carmi, Itsik Pe'er, and The Ashkenazi Genome Consortium

CENTER FOR NEW MEDIA

Modeling Reportable Events in Narrative

Jessica Ouyang, Kathleen McKeown

Predicting Salient Updates for Disaster Summarization

Chris Kedzie, Kathleen McKeown, Fernando Diaz

CENTER FOR SMART CITIES

Adaptive Stochastic Controller for Smart Buildings Total Property Optimization

Roger Anderson, Albert Boulanger, Promiti Dutta, Ashish Gagneja, Hooshmand Shokri Razaghi, Leon Wu

Optimal Control of Cascading Power Grid Failures with Imperfect Observations and Cyber Attacks

Guy Grebla, Saleh Soltan, Daniel Bienstock, Gil Zussman

Road Surface Monitoring via Multiple Sensor-Equipped Vehicles

Jinwoo Jang, Yong Yang, Andrew W. Smyth, Dave Cavalcanti

The Soil Water Apportioning Method (SWAM)

Raha Hakimdavar, Aida Guido, Patricia J. Culligan, Wade R. McGillis

MATERIALS DISCOVER ANALYSIS WORKING GROUP

Machine Learning for Many-Body Physics

Louis-François Arsenault, A. J. Millis

Rational Design of Molecular Products

Miguel Francisco M. Remolona, Akansha Singh, Venkat Venkatasubramanian

Robust Prediction of Real Materials: Realizing the Dream of Materials Genomics

Simon J. L. Billinge, Pavol Juhas, Kevin Knox, Qiang Du, Dan Hsu, Jon Owen

SENSE, COLLECT, AND MOVE DATA WORKING GROUP

Internet of Things: Project-Focused Course

Zoran Kostic

NATURAL SCIENCES AND DATA SCIENCES INTERFACE GRANT

High Dimensional Analysis of Microscopy Images via Convolutional Dictionary Learning

Sky Cheung, Yenson Lau, Abhay Pasupathy, Ju Sun, John Wright,
Yuqian Zhang

ROADS (RESEARCH OPPORTUNITY AND APPROACHES TO DATA SCIENCE) GRANT

Mining a Written Educational Intervention to Identify the Unique Linguistic Features of Stigmatized Groups

Travis Riddle, Sowmya Sree Bhagavatula, Weiwei Guo,
Smaranda Muresan, Valerie Purdie-Vaughns

Weak Lensing Non-Gaussian Statistics Using N-Body Simulations

Jia Liu, Andrea Petri, Zoltan Haiman, Lam Hui, Morgan May, Jan Kratochvil



JOHN H. COATSWORTH
PROVOST OF THE UNIVERSITY

John H. Coatsworth is the Provost of Columbia University, as well as Professor of International and Public Affairs and of History.

Provost Coatsworth is a leading scholar of Latin American economic and international history. Previously, he was Dean of the School of International and Public Affairs. Prior to his appointment as Dean in 2008, he served as a visiting professor at Columbia University (2006 – 2007) and Interim Dean of SIPA (2007 – 2008).

Before joining Columbia, Coatsworth served as the Monroe Gutman Professor of Latin American Affairs at Harvard University (1992–2007). He was the founding director of Harvard’s David Rockefeller Center for Latin American Studies and the chair of the Harvard University Committee on Human Rights Studies. Prior to his work at Harvard, Coatsworth was a member of the faculty at the University of Chicago (1969–1992). Other academic posts have included visiting professorships at El Colegio de México, the National Autonomous University of Mexico, the National University of Buenos Aires, the Instituto Torcuato di Tella in Buenos Aires, and the Instituto Ortega y Gasset in Madrid.

Coatsworth is a member of the American Academy of Arts and Sciences, the Council on Foreign Relations, the Board of Directors of the Tinker Foundation and numerous professional associations. He is the former president of the American Historical Association and Latin American Studies Association. Coatsworth has served on the editorial boards of scholarly journals including the American Historical Review, the Journal of Economic History, the Hispanic American Historical Review and other social science journals published in Britain, Chile, Germany, Mexico, Peru, and Spain.

In 1986, Coatsworth was awarded the John Simon Guggenheim Foundation Fellowship. He has served as Senior Fulbright Lecturer three times, with appointments in Argentina and Mexico, and has received numerous research and institutional grants from public agencies and private foundations. He has acted as a consultant for program design or review to numerous U.S. universities and foundations.

Coatsworth received his BA in History from Wesleyan University, and his MA and PhD in Economic History from the University of Wisconsin-Madison.



MARCY C. BOYCE
DEAN OF ENGINEERING AND
MORRIS A. AND ALMA SCHAPIRO PROFESSOR

Marcy C. Boyce is Dean of Engineering and Morris A. and Alma Schapiro Professor at Columbia University's Fu Foundation School of Engineering and Applied Science. Prior to joining Columbia, Dean Boyce served on the faculty of Massachusetts Institute of Technology (MIT) for over 25 years, leading the Mechanical Engineering Department from 2008 to 2013. Her research focuses on materials and mechanics, particularly in the areas of molecular and nanomechanics of polymers and soft composites, both those that are man-made and those formed naturally. Her leadership in the field of the mechanics of materials has expanded understanding of the interplay between micro-geometry and the inherent physical behavior of a material, which has led to innovative hybrid material designs with novel properties. Models and results from her group have the potential to influence a range of industrial and academic fields from polymer processing to composite material design, tire mechanics, protective armor designs, and transformative meta-material design. She is well known for her collaborative work and leadership in overseeing research teams that bring together faculty from different departments and universities and is the author of more than 150 archival journal publications with her group.

Dean Boyce has been widely recognized for her scholarly achievements, including election as a fellow of the American Society of Mechanical Engineers, the American Academy of Arts and Sciences, and the National Academy of Engineering. She also has been honored for her teaching at MIT, where she was named a MacVicar Faculty Fellow and received the Joseph Henry Keenan Innovation in Undergraduate Education Award. Dean Boyce earned her BS degree in engineering science and mechanics from Virginia Tech, and her MS and PhD degrees in mechanical engineering from MIT.



KATHLEEN R. MCKEOWN
DIRECTOR, DATA SCIENCE INSTITUTE AND
HENRY AND GERTRUDE ROTHSCHILD PROFESSOR
OF COMPUTER SCIENCE

Kathleen R. McKeown is the Henry and Gertrude Rothschild Professor of Computer Science at Columbia University and she also serves as the Director of the Institute for Data Sciences and Engineering. She served as Department Chair from 1998-2003 and as Vice Dean for Research for the School of Engineering and Applied Science for two years. McKeown received a Ph.D. in Computer Science from the University of Pennsylvania in 1982 and has been at Columbia since then. Her research interests include text summarization, natural

language generation, multi-media explanation, question-answering and multi-lingual applications.

In 1985 she received a National Science Foundation Presidential Young Investigator Award, in 1991 she received a National Science Foundation Faculty Award for Women, in 1994 she was selected as a AAAI Fellow, in 2003 she was elected as an ACM Fellow, and in 2012 she was selected as one of the Founding Fellows of the Association for Computational Linguistics. In 2010, she received the Anita Borg Women of Vision Award in Innovation for her work on text summarization. McKeown is also quite active nationally. She has served as President, Vice President, and Secretary-Treasurer of the Association of Computational Linguistics. She has also served as a board member of the Computing Research Association and as secretary of the board.

STEVEN M. BELLOVIN
PROFESSOR OF COMPUTER SCIENCE



Steven M. Bellovin is the Percy K. and Vidal L. W. Hudson Professor of Computer Science at Columbia University, where he does research on networks, security, and especially why the two don't get along, as well as related public policy issues. In his spare professional time, he does some work on the history of cryptography. He joined the faculty in 2005 after many years at Bell Labs and AT&T Labs Research, where he was an AT&T Fellow. He received a BA degree from Columbia University, and an MS and PhD in Computer Science from the University of North Carolina at Chapel Hill. While a graduate student, he helped create Netnews; for this, he and the other perpetrators were given the 1995 Usenix Lifetime Achievement Award (The Flame). Bellovin has served as Chief Technologist of the Federal Trade Commission. He is a member of the National Academy of Engineering and is serving on the Computer Science and Telecommunications Board of the National Academies, the Department of Homeland Security's Science and Technology Advisory Committee, and the Technical Guidelines Development Committee of the Election Assistance Commission; he has also received the 2007 NIST/NSA National Computer Systems Security Award and has been elected to the Cybersecurity Hall of Fame.

Bellovin is the co-author of *Firewalls and Internet Security: Repelling the Wily Hacker*, and holds a number of patents on cryptographic and network protocols. He has served on many National Research Council study committees, including those on information systems trustworthiness, the privacy implications of authentication technologies, and cybersecurity research needs; he was also a member of the information technology subcommittee of an NRC study group on science versus terrorism. He was a member of the Internet Architecture Board from 1996-2002; he was co-director of the Security Area of the IETF from 2002 through 2004.



PATRICIA J. CULLIGAN

**ASSOCIATE DIRECTOR, DATA SCIENCE INSTITUTE
AND PROFESSOR OF CIVIL ENGINEERING AND
ENGINEERING MECHANICS**

A leader in the field of water resources and urban sustainability, Culligan has worked extensively with The Earth Institute's Urban Design Lab at Columbia University to explore novel, interdisciplinary solutions to the modern day challenges of urbanization, with a particular emphasis on the City of New York. Culligan is the director of a joint interdisciplinary Ph.D. program between Columbia Engineering and the Graduate School of Architecture Planning and Preservation that focuses on designs for future cities, including digital city scenarios. Her research group is active in investigating the opportunities for green infrastructure, social networks and advanced measurement and sensing technologies to improve urban water, energy, and environmental management.

Culligan received her M.Phil. and Ph.D. from the University of Cambridge, and was on the faculty at M.I.T before joining Columbia in 2003. She has received numerous awards for her contributions in engineering research and education, including the National Science Foundation's CAREER Award, the Egerton Career Development Chair, M.I.T's Arthur C. Smith Award for contributions to undergraduate life, Columbia Engineering School Alumni Association's Distinguished Faculty Award, and Columbia's Presidential Teaching Award.

Culligan serves on the National Academies Nuclear and Radiation Studies Board and the Board of Earth Sciences and Resources Committee on Geological and Geotechnical Engineering. In 2011, she was elected to the Board of Governors of the American Society of Civil Engineer's Geo-Institute. She is the author or co-author of six books, two book chapters, and over 70 referred scientific publications and 110 technical articles.



GARUD N. IYENGAR

**PROFESSOR AND DEPARTMENT CHAIR OF
INDUSTRIAL ENGINEERING AND OPERATIONS
RESEARCH**

Professor Garud Iyengar joined Columbia University's Industrial Engineering and Operations Research Department in 1998. Professor Iyengar teaches courses in simulation and optimization.

Professor Iyengar's research interests include convex optimization, robust optimization, mathematical and computational finance, machine learning and computational biology.



DAVID B. MADIGAN
EXECUTIVE VICE PRESIDENT FOR THE ARTS AND
SCIENCES AND DEAN OF THE FACULTY AND
PROFESSOR OF STATISTICS

David Madigan serves as the ninth Executive Vice President for the Arts and Sciences and Dean of the Faculty, a position he assumed on September 3, 2013. Since March 2013, he had served as the Interim Executive Vice President. He is a Professor of Statistics at Columbia University, and served as the Department Chair since 2007. Before coming to Columbia in 2007, Professor Madigan was Dean of Physical and Mathematical Sciences at Rutgers University. He is a Fellow of the American Statistical Association, the Institute of Mathematical Statistics, and the American Association for the Advancement of Science. He received a bachelor's degree in Mathematical Sciences and a Ph.D. in Statistics, both from Trinity College Dublin. He has previously worked for AT&T Inc., Soliloquy Inc., the University of Washington, Rutgers University, and SkillSoft, Inc. He has over 150 publications in such areas as Bayesian statistics, text mining, Monte Carlo methods, pharmacovigilance and probabilistic graphical models. He recently completed a term as Editor-in-Chief of Statistical Science and is the current editor of Statistical Analysis and Data Mining.

PARTNERING WITH THE CAT

CENTER for ADVANCED
INFORMATION MANAGEMENT
a New York State Center for Advanced Technology at Columbia University

What is the Center for Advanced Information Management?

- The Center for Advanced Technology (CAT) at Columbia University is known as CAIM. The CAT program is funded by New York State (NYS) to promote collaboration between universities and NYS companies. Our goal is to create a direct tangible economic impact/benefit, for these companies through a partnership with Columbia University.
- The CAT program is funded by NYSTAR, a division of NYS Empire State Development.

What are the benefits of partnering with the CAT for faculty?

- Matching grants for company sponsored projects at Columbia
- Support for locating corporate sponsors for research and development projects
- Entrepreneurship activities and events (ie. HealthTech Assembly, AWS Grant Program)
- Joint preparation of proposals to third party sources (Examples: SBIR/STTR)
- Consulting arrangements with companies
- Education/training programs and events

CAT funds are available to help support and augment budgets provided by the company. The requirements for a CAT grant are (1) a joint project with a focus on science/technology; (2) a reasonable project time frame and budget estimate; (3) the promise of a successful commercial product; and (4) the cooperation of company senior management to provide documentation of benefits to the company for semi-annual reports

Matching Grant Application Process

- The application for a company co-supported grant is straightforward (2 page form + budget) and reviewed internally at Columbia University.
- Decisions on CAT grant applications are made quickly (usually 1-2 weeks)
- Funds are made available for the faculty member in a project account in their department.
- Grant awards typical are for \$25-50k/year but may be higher depending on the projected economic impact to the company.
- CAT grants are charged a special low 15% (on salary + fringe benefits) indirect cost rate, about ¼ of the standard federal rate.
- Company matching funds may also be eligible for the special low 15% IDC rate.

For more information on our various programs, please see:

www.cat.columbia.edu

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