

Data-Driven Discovery at the U.S.-Mexico Border

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February 6, 2020



UC San Diego



Funded by:



UC San Diego, University of Arizona, New Mexico State University, University of Texas at El Paso, and University of Texas at San Antonio held a series of NSF-sponsored workshops during the summer of 2019 with hundreds of participants from research universities, NGOs, the private sector, and local governments. During the workshops, participants identified critical use-inspired research questions grounded in the challenges faced by practitioners, service providers, and policymakers in border communities.

During this convocation we will highlight opportunities for innovation in data-driven research in science and engineering at the intersection of technology and society that emerged during the workshops. We will also highlight ongoing efforts to connect research universities to community stakeholders around fundamental science questions and complex societal issues that require deep integration across disciplines around data science challenges.

Thursday, February 6

8:15 AM – 8:45 AM: Opening Remarks

- **Erwin Gianchandani**, Deputy Assistant Director for Computer and Information Science and Engineering, National Science Foundation
- **Sandra Brown**, Vice Chancellor for Research, UC San Diego
- **Raul B. Rodriguez**, Associate Vice President for International Affairs, Tec de Monterrey

8:45 AM – 9:35 AM: Fireside Chats on the Transformation of Production

Moderated by **Albert Pisano**, Dean, Jacobs School of Engineering, UC San Diego

8:55 AM: Advanced Manufacturing Supply Chains

- **Olivia Graeve**, Director, CaliBaja Center for Resilient Materials and Systems, UC San Diego
- **Delia Valles-Rosales**, Associate Professor, New Mexico State University

9:15 AM: Intelligent Mobility Systems

- **Heidi Taboada**, Associate Dean for Research and Graduate Studies, College of Engineering, University of Texas at El Paso
- **Marisa Walker**, Senior Vice-President, Strategic Planning/Infrastructure, Arizona Commerce Authority

9:35 AM – 9:50 AM: Coffee Break

9:50 AM – 10:35 AM: Fireside Chats on Health and Well-Being

Moderated by **Adolfo Matamoros**, Professor, University of Texas at San Antonio

9:55 AM: Healthcare Delivery

- **Thenral Mangadu**, Director, Minority AIDS Research Center, University of Texas at El Paso
- **Lucila Ohno-Machado**, Chair, Biomedical Informatics, UC San Diego

10:15 AM: Emergency and Disaster Management

- **Ilkay Altintas**, Chief Data Science Officer, San Diego Supercomputer Center
- **Carlos Calvillo**, Chief, Los Angeles Fire Department

10:35 AM – 11:25 AM: Fireside Chats on Regional Sustainability

Moderated by **Adriana Zuniga**, Assistant Research Scientist, Udall Center for Studies in Public Policy, University of Arizona

10:40 AM: Urban and Rural Resilience

- **Michael Kleeman**, Senior Fellow, School of Global Policy & Strategy, UC San Diego
- **Keith Pezzoli**, Director, Bioregional Center for Sustainability Science, UC San Diego

11:05 AM: Transboundary Watershed and Aquifer Resources

- **Carlos de la Parra**, Professor, Colegio de la Frontera Norte
- **Alexander Fernald**, Director, Water Resources Research Institute, New Mexico State University
- **Christine Kirkpatrick**, Deputy Director, West Big Data Innovation Hub

11:25 AM – 12:00 PM: The Future of Work at the U.S.-Mexico Border

11:25 AM: Introductory Remarks

- **Catherine Cramer**, Program Lead, DS4All, Northeast Big Data Innovation Hub and Director, Woods Hole Institute

11:35 AM: Keynote

- **William Eggers**, Executive Director, Center for Government Insights, Deloitte

12:00 PM – 12:30 PM: Luncheon in the West Court

12:30 PM – 12:45 PM: Afternoon Remarks

- **David Corman**, Program Director, CISE/CNS, National Science Foundation

12:45 PM – 1:30 PM: Government Partners Panel

Moderated by **Rene Zenteno**, Professor, University of Texas at San Antonio

- **Jodi Black**, Deputy Director, Office of Extramural Research, National Institutes of Health
- **Matthew Clark**, Senior Advisor, Science and Technology Directorate, Department of Homeland Security
- **Douglas Maughan**, Office Head, Convergence Accelerator, National Science Foundation

1:30 PM – 2:00 PM: Next Steps Roundtable

- **Miroslav Krstic**, Senior Associate Vice Chancellor for Research, UC San Diego
- **Rod McSherry**, Associate Vice President for Innovation and Economic Development, University of Texas at San Antonio
- **John O'Neil**, Chief of Staff to the Senior Vice President for Research and Innovation, University of Arizona
- **Roberto Osegueda**, Vice President of Research, University of Texas at El Paso
- **Patricia Sullivan**, Director for Office of Strategic Initiatives, New Mexico State University

Speakers

Ilkay Altintas, *Chief Data Science Officer, San Diego Supercomputer Center*

Dr. Altintas leads collaborative multi-disciplinary teams with a research objective to deliver impactful results through making computational data science work more reusable, programmable, scalable and reproducible. She is the Founder and Director for the Workflows for Data Science Center of Excellence and a Fellow of the Halicioglu Data Science Institute (HDSI). Her work has been applied to many scientific and societal domains including bioinformatics, geoinformatics, high-energy physics, multi-scale biomedical science, smart cities, and smart manufacturing. She is a co-initiator of the popular open-source Kepler Scientific Workflow System, and the co-author of publications related to computational data science at the intersection of workflows, provenance, distributed computing, big data, reproducibility, and software modeling in many different application areas.

Jodi Black, *Deputy Director, Office of Extramural Research, National Institutes of Health*

Dr. Black has held a variety of leadership positions at NIH as well as in the private sector. Early in her NIH career she was a program officer and director of the Office of the AIDS Malignancy Program at the National Cancer Institute. From 2005 through 2009 she served as director of research administration and vice president of research administration at the Translational Genomics Research Institute. Prior to her leadership roles in research administration, Dr. Black was a research microbiologist at the Center for Disease Control (CDC), where she served as the head for the CDC Cellular Virology Lab in the Herpes Virus section.

Sandra Brown, *Vice Chancellor for Research, UC San Diego*

Dr. Brown is a Distinguished Professor of Psychology and Psychiatry at UC San Diego. She is internationally recognized for her developmentally focused alcohol and drug research, which yielded pioneering information on adolescent addiction, relapse among youth, and long-term outcomes of youth who have experienced alcohol and drug problems. She is the past President of Division 50 (Addictions) of the American Psychological Association, is on the executive board of numerous scientific organizations, and has over 35 grants and 350 publications. She is involved in addiction prevention and intervention at the regional, state, and national levels and helped lead NIAAA's effort to establish national screening and early intervention guidelines for youth. She currently directs the National Consortium on Alcohol and Neurodevelopment in Adolescence (NCANDA) and investigates the effectiveness of novel approaches to intervention with youth.

Carlos Calvillo, *Chief, Los Angeles Fire Department*

Calvillo is an Assistant Chief with the Los Angeles Fire Department. A 30-year veteran of the Department, he has been assigned to both administrative and operational commands in the LAFD. He is currently the Commander of the Metro Fire Dispatch and has a background in hazardous materials and communications.

Matthew Clark, *Senior Advisor, Science and Technology Directorate, Department of Homeland Security*

Dr. Clark is responsible for developing, managing, integrating, and delivering the results from a \$50-million annual research and education program, which includes the DHS Centers of Excellence, the Scholars and Fellows program, and the Minority Serving Institutions program. Prior to joining DHS, Dr. Clark spent 11 years as an economist with the U.S. Environmental Protection Agency (EPA). Prior to his time at EPA, Dr. Clark was an energy and environmental economics consultant for public and private clients, an economist and budget planner for the Washington State Department of Ecology, and a land use and environmental planner for the two largest counties in Washington State. He is the author of over 50 papers, reports, and regulatory and policy analyses. Dr. Clark was also a Peace Corps volunteer in Guatemala in the mid-1970s.

David Corman, *Program Director, CISE/CNS, National Science Foundation*

Dr. Corman leads Cyber Physical Systems (CPS) and Smart and Connected Communities (S&CC) Programs for the National Science Foundation. He joined NSF 2013 and previously worked for McDonnell Douglas/Boeing in a variety of research positions. Dr. Corman was chief scientist in the Network Systems Technology for Boeing Research and Technology during the period from 2007 – 2013. His responsibilities also included development and leadership of research projects in cybersecurity for airplane and avionics systems.

Catherine Cramer, *Program Lead, DS4All, Northeast Big Data Innovation Hub*

Cramer's work centers on identifying, creating, sustaining, growing and studying productive and innovative collaborations and partnerships among research, industry and academia, and applying her years of experience in bringing complex data and network sciences to underserved communities and workforce development in underrepresented populations. She directs the Woods Hole Institute, where she leads the development of tools and programs at the intersection of complex data-driven science, learning, and equity. Her background includes a decade working on ocean literacy with the NSF-funded Centers for Ocean Science Education Excellence (COSEE), and on network literacy through co-founding the international Network Science in Education initiative. Catherine also serves on the Board of Directors for the Network Science Society and co-leads the Data Science for All data literacy effort with the Northeast Big Data Innovation Hub at Columbia University's Data Science Institute.

William Eggers, *Executive Director, Center for Government Insights, Deloitte*

Eggers has worked in government reform for more than two decades and is responsible for the firm's public sector thought leadership. His new book is *Delivering on Digital: The Innovators and Technologies that are Transforming Government*. He is a former appointee to the U.S. Office of Management and Budget's Performance Measurement Advisory Commission and the former Project Director for the Texas Performance Review/e-Texas initiative. He also served as a Commissioner for the Texas Incentive and Productivity Commission and a designee on the Texas Council on Competitive Government. He is a former senior fellow at the Manhattan Institute for Policy Research and the former director of Government Reform at the Reason Foundation.

Alexander Fernald, *Director, Water Resources Research Institute, New Mexico State University*

Dr. Fernald is a faculty member in the Department of Animal and Range Sciences at New Mexico State University. He leads the Federally and State supported NM WRRI, working to develop and disseminate knowledge that will assist the state, region, and nation in solving water resources problems. The NM WRRI, one of 54 water institutes in the nation, encourages university faculty statewide to pursue critical areas of water resources research while providing training opportunities for students, and provides an outlet for transferring research findings to the academic community, water managers and the general public.

Erwin Gianchandani, *Deputy Assistant Director for CISE, National Science Foundation*

Dr. Gianchandani contributes to all aspects of the management of the CISE directorate, including strategic and human capital planning, formulation and implementation of the directorates more than \$900 million annual budget, and oversight of day-to-day operations. In the last several years, he has led the development, launch, and implementation of several new NSF investment areas, including Smart & Connected Communities and Platforms for Advanced Wireless Research. Previously, Dr. Gianchandani served as the Deputy Division Director for the CISE Division of Computer and Network Systems (CNS). Before joining NSF in 2012, he was the inaugural Director of the Computing Community Consortium (CCC).

Olivia Graeve, *Director, CaliBaja Center for Resilient Materials and Systems, UC San Diego*

Dr. Graeve is a professor in the Department of Mechanical and Aerospace Engineering at UC San Diego and faculty director of the IDEA Engineering Student Center. Previously, she was an associate professor at Alfred University and an assistant professor at the University of Nevada, Reno. Dr. Graeve has gained international recognition in the area of nanomaterials manufacturing. Her area of research focuses on the design and processing of new materials for extreme environments, including extremes of temperature, pressure and radiation. Her expertise connects fundamental principles of materials processing with specific engineering needs, with special emphasis on electromagnetic multifunctional materials for sensors and energy applications. She has four patents, has been published in more than 80 journals and co-authored four books and book chapters.

Thenral Mangadu, *Director, Minority AIDS Research Center, University of Texas at El Paso*

Dr. Mangadu is an Associate Professor at the Public Health Sciences and Interdisciplinary Health Sciences Department at the University of Texas at El Paso. Her research interests are in the areas of HIV prevention for minority women, violence prevention, and public health program evaluation. She and her graduate students conduct community-based research that encompasses service learning, program evaluation, and research service to the community. She also engages in interdisciplinary research collaborations with local, national and international experts.

Adolfo Matamoros, *Professor, University of Texas at San Antonio*

Dr. Matamoros is the Peter T. Flawn Professor in the Department of Civil and Environmental Engineering at the University of Texas at San Antonio. He is a fellow of the American Concrete Institute and the Structural Engineering Institute of the American Society of Civil Engineer. He is a Licensed Professional Engineer in the state of Texas and serves a member of national code standard committees ACI 318-H, ACI 369, and ASCE 41, on seismic design and evaluation of reinforced concrete structures.

Lucila Ohno-Machado, *Chair, Biomedical Informatics, UC San Diego*

Dr. Ohno-Machado is Associate Dean for Informatics and Technology, and the founding chair of the Health Department of Biomedical Informatics at UC San Diego, where she leads a group of faculty with diverse backgrounds in medicine, nursing, informatics, and computer science. She is the principal investigator for the California Precision Medicine Consortium for the National Institutes of Health (NIH) All of Us Research Program. Dr. Ohno-Machado is an elected member of the American College of Medical Informatics, the American Institute for Medical and Biological Engineering, the American Society for Clinical Investigation and the National Academy of Medicine. Her research focuses on privacy-preserving distributed analytics for healthcare and biomedical sciences. She has received numerous awards for innovations in biomedical informatics.

Carlos de la Parra, *Professor, Colegio de la Frontera Norte*

Dr. de la Parra is a professor and researcher in the department of Urban Studies and Environment, where he has worked since 1986. He played a role in the negotiation of the recent bilateral agreement on the management of the Colorado River, serving as advisor to the International Boundary and Water Commission. He was the Federal Delegate to Baja California for the Mexican Ministry of Environment and Natural Resources from 2002 to 2004, and served as environmental minister at the Mexican Embassy in Washington, DC from 2004 to 2006. He has published extensively on issues of sustainability and development in the Mexico-U.S. border region.

Keith Pezzoli, *Director, Bioregional Center for Sustainability Science, UC San Diego*

Dr. Pezzoli directs UC San Diego's Bioregional Center for Sustainability Science, Planning and Design and the MetroLab Network's Green Infrastructure and Planning Project. Since 2000, he has been leading the Community Engagement Core and Research Translation Core of UCSD's Superfund Research Center (SRC) funded by the National Institute of Environmental Health Sciences (NIEHS). Dr. Pezzoli currently serves as an appointed member of the Good Neighbor Environmental Board, an independent federal advisory board that advises the US President and Congress on US-Mexico border environmental issues. And he is actively engaged in UC Office of the President Initiatives focused on Global Food, Climate and Mexico.

Albert Pisano, *Dean, Jacobs School of Engineering, UC San Diego*

Dr. Pisano, in his role as Dean, is responsible for strategic planning and programmatic development, including school-wide research initiatives, space plans, academic affairs, planning and operations, and university-wide cooperative initiatives. He is an active researcher who serves on the faculty of the departments of mechanical and aerospace engineering and electrical and computer engineering. In 2001, Pisano was elected to the National Academy of Engineering for contributions to the design, fabrication, commercialization, and educational aspects of micro-electro-mechanical systems. Dr. Pisano is a Fellow of the American Society of Mechanical Engineers, a co-inventor listed on more than 20 patents in MEMS and has co-authored more than 300 archival publications.

Christine Kirkpatrick, *Deputy Director, West Big Data Innovation Hub*

Kirkpatrick is Division Director for IT Systems & Services at the San Diego Supercomputer Center. She is also Chair of the Technical Advisory Committee for the National Data Service. She specializes in enterprise architectures, integrations and implementation of large-scale storage, cloud and computational resources. A pioneer in web-based instruction, she has extensive online teaching experience coupled with expertise in developing the associated technologies needed for effective online teaching. She joined UC San Diego in 1996 and has been with SDSC since 2012.

Michael Kleeman, *Senior Fellow, School of Global Policy & Strategy, UC San Diego*

Kleeman has worked globally as a business and non-profit leader, focusing on the intersection between technology and business, and for the last 20 years in academic research. He has held a variety of management roles, as a partner at the Boston Consulting Group, founder at Sprint and over a dozen communications firm on three continents, and at Business for Social Responsibility (BSR). As a Senior Fellow at UC San Diego, he has worked at the San Diego Super Computer Center, and Schools of Global Policy and Engineering. He serves on advisory boards at Harvard, the University of Michigan, the American Geophysical Union and on the boards of the Marine Mammal Center, Red Cross and Institute for the Future.

Miroslav Krstic, *Senior Associate Vice Chancellor for Research, UC San Diego*

Dr. Krstic is Distinguished Professor of Mechanical and Aerospace Engineering, holds the Alspach endowed chair, and is the founding director of the Cymer Center for Control Systems and Dynamics at UC San Diego. He also serves as Associate Vice Chancellor for Research at UCSD. Dr. Krstic works on nonlinear, adaptive, and infinite dimensional control theory and the applications of his work have enabled technology development in photolithography for chip manufacturing and in landing jet aircraft on the newest class of aircraft carriers. He has been elected Fellow of seven scientific societies. He has received the ASME Oldenburger Medal, Nyquist Lecture Prize, Paynter Outstanding Investigator Award, Ragazzini Education Award, Chestnut textbook prize, the PECASE, NSF Career, and ONR Young Investigator awards, the Axelby and Schuck paper prizes, and the first UCSD Research Award given to an engineer.

Douglas Maughan, *Office Head, Convergence Accelerator, National Science Foundation*

Dr. Maughan leads the NSF Convergence Accelerator. Previously, he was the division director of the Cyber Security Division in the Homeland Security Advanced Research Projects Agency (HSARPA) within the Science and Technology Directorate (S&T) of the Department of Homeland Security (DHS). As an expert on how evolving threats and advanced technologies are changing our security landscape and operations, Dr. Maughan was responsible for helping bring to market more than 40 commercial and open-source information security products at DHS. Previously, Dr. Maughan served as a program manager at the Defense Advanced Research Projects Agency (DARPA) and as a senior computer scientist at the National Security Agency (NSA).

Rod McSherry, *Associate Vice President for Innovation and Economic Development, University of Texas at San Antonio*

McSherry leads the activities of nine economic development centers and programs. His directives include expanding the reach of current programs, building new relationships with stakeholders, and developing new funding sources, both from the public and the private sectors. He comes from New Mexico State University (NMSU) where he served as Associate Provost, and previously as Global Initiative Director where he focused on agriculture and agro-technology projects and grant development in the U.S. and Mexico. He also lectured on foreign affairs and U.S. international economic development. In a prior career, he served as a Senior Foreign Service Officer and worked in many countries including Afghanistan, where he coordinated a \$1 billion portfolio of economic development projects funded by USAID.

John O'Neil, *Chief of Staff to the Senior Vice President for Research and Innovation, University of Arizona*
Dr. O'Neil supports research and innovation at the University of Arizona. Prior to joining the university, he held various leadership roles in the National Security Directorate at Oak Ridge National Laboratory and more than a decade in the intelligence community. He also worked in research administration at Virginia Tech, leading federal agency relations and research development.

Roberto Osegueda, *Vice President of Research, University of Texas at El Paso*
Dr. Osegueda is a Professor of Civil Engineering at the University of Texas at El Paso. He has more than thirty years of professional experience in the academic arena. His research interests have focused on several multidisciplinary fields: nondestructive damage evaluation of structures, experimental and analytical modal analysis, semi-active control structures, finite element applications, laser methods for inspecting structures, among others. Dr. Osegueda has written proposals and paper reviews for the Journal of Structural Engineering ASCE, and consulted at the FBI, Harper Row Publishers, National Science Foundation, Pan American Institute of Highways, IRWIN Publishers, Battelle Group, Inc., Federal Highway Administration, Texas Engineering Extension Service, and the Texas Transportation Institute.

Raul B. Rodriguez, *Associate Vice President for International Affairs, Tec de Monterrey*
Rodriguez has participated in leadership roles in academic, business, civic, and government affairs, based in the U.S., Canada and Mexico. He has served as CEO of the North American Development Bank; Chairman of the Board of the U.S.-Mexico Foundation in New York; Executive Director at the Mexican Foreign Trade Bank; Mexico's Trade Commissioner in Canada; Secretary of Economic Development for the border State of Tamaulipas; Founding Chairman of the North American Center at Arizona State University; Engineering Professor at Monterrey Tech; Honorary Consul of Spain and Chairman of the World Affairs Council and the Free Trade Alliance in San Antonio; and business consultant. He has published business essays in the U.S., Mexico, Canada, the U.K. and the Netherlands and has participated as a speaker in over 30 countries.

Patricia Sullivan, *Director for Office of Strategic Initiatives, New Mexico State University*
Dr. Sullivan serves as Associate Dean for Outreach in the College of Engineering where she leads statewide programs in STEM outreach, technical business assistance, and professional development through extensive short courses and workshops for industry professionals. She has extensive ties with industry organizations across New Mexico and the Western states, including her current role as chair of the Western Interstate Commission on Higher Education. Her academic background is in energy policy and renewable energy integration.

Heidi Taboada,
Associate Dean for Research and Graduate Studies, College of Engineering, University of Texas at El Paso
Dr. Taboada is an associate professor in the Department of Industrial, Manufacturing and Systems Engineering. Her research interests intersect broad areas such as applied operations research, systems analysis and optimization, resiliency and sustainability, and metaheuristic and biologically inspired optimization. Her international work includes the development of and participation in different faculty-led study abroad programs in Latin America through funding received by the U.S. Department of State and the 100K Strong in the Americas Initiative. She has published over 50 refereed manuscripts in technical journals, book chapters and conference proceedings.

Delia Valles-Rosales, *Associate Professor, New Mexico State University*
Dr. Valles-Rosales has developed research projects that involve the optimization of manufacturing processes to protect the environment; reducing manufacturing costs and scrap, designing and planning the best facilities; reducing process cycle time; selecting the appropriate raw material; facilitating collaboration among companies and academia; reducing fatigue among employees; and increasing the pool of women and minorities in engineering careers. She has given several conference presentations on sustainable products, and publications on the Journal of Applied Research and Technology.

Marisa Walker, *Senior Vice-President, Strategic Planning/Infrastructure, Arizona Commerce Authority*

Walker began her professional career at the University of Arizona, where for more than a decade she held positions that advised the University's Associate Vice President for Economic Development on Arizona-Mexico and NAFTA issues; analysed border economic development opportunities and competitive advantages; and organized forums and symposiums on trilateral collaborations among academic institutions in Canada and Mexico in the areas of university research parks, agricultural biosciences and optical sciences-photonics. She also served as the Executive Director for the Arizona Governor's CANAMEX Task Force where she was responsible for managing projects and priorities regarding transportation and telecommunication infrastructure; technology and process enhancements for cross border shipments; and international trade policy.

Rene Zenteno, *Professor, University of Texas at San Antonio*

Dr. Zenteno is currently professor of Demography in the College of Public Policy at the University of Texas at San Antonio. He was the founding executive director of ConTex, a joint initiative of the University of Texas System and Mexico's National Council of Science and Technology (CONACYT). In this role, he spearheaded the launch of a \$16 million five-year investment committed to fostering collaboration between the United States and Mexico through graduate training, research and discovery. Dr. Zenteno has also served as the first vice provost for international initiatives at UTSA and the Under Secretary in the Ministry of the Interior in Mexico. He has authored more than 50 publications in the areas of social and demographic change, international migration, and social inequality. Dr. Zenteno has received several professional honors, including President of the Mexican Society of Demography (SOMEDE) and membership in the National Academy of Science of Mexico.

Adriana Zuniga, *Assistant Research Scientist, Udall Center for Studies in Public Policy, University of Arizona*

Dr. Zuniga's work at the School of Landscape Architecture and Planning and at the Udall Center for Studies in Public Policy has focused mainly at the neighborhood and city scales and examines neighborhood design patterns that affect physical activity, wellbeing, and the use of greenspace. She explores questions related to green infrastructure and urban resilience, environmental justice, water security in cities of Latin America, groundwater governance, and other environmental issues in arid lands. She teaches courses related to sustainability and history of the built environment for the Sustainable Built Environments degree program. Zuniga has published about 50 peer-reviewed articles, non-peer reviewed book chapters and reports, and blogs for the general public.

**To learn more about this initiative, visit:
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