Data Science Faculty

Rochester has unique advantages in data science. We have developers who can build computer infrastructures. We have an environment where collaboration happens easily and seamlessly. And we have myriad researchers using data science to help them ask, analyze, and answer the big questions in nearly every field.

Basic scientists, clinicians, and computational modeling experts are among those harnessing the power of data at the University of Rochester—to improve our health, our daily lives, and our planet and to make the world ever better.

The following represents just some of the University of Rochester faculty members who are using data science to advance their research. Work in this field continues to grow as the top priority area across all of the University's schools and academic units.

Jean Philippe Couderc

associate professor of medicine at the Heart Research Follow-up Program (Cardiology) and research associate professor of electrical and computer engineering

Couderc is the driving force behind several corporate partnerships that are using big data to improve heart health. With Xerox, he is developing the next generation of technologies to monitor individuals who may be at risk for heart issues, including video technology that records the face of a patient and can detect atrial fibrillation, a serious cardiac condition affecting more than 2.3 million people in the United States. Couderc is also collaborating with basic scientists here and with computational modeling experts at IBM to develop supercomputer models of the human heart for testing effectiveness and safety of new drugs, eventually making patient testing obsolete.

Rajiv Dewan

professor of computers and information systems, the Simon School

Throughout his career, Dewan has applied computer science concepts to the world of business and economics. His current research focuses on marketing of digital goods and services, economics of open source programming, and the strategic use of analytics in organizations. Dewan is particularly interested in how to use data to help businesses extract more value for themselves and serve their customers better. For instance, he is working on a project that is using data analysis to help a health care organization improve its urgent care processes.

Sandhya Dwarkadas

professor and chair of computer science, professor of electrical and computer engineering

Dwarkadas's current research addresses the challenge of leveraging the computational power of today's processors by developing novel techniques for efficient data sharing. Her work has led to more than 100 refereed publications. She also continues to stay involved in parallel applications development, particularly in the biomedical domain. In addition, she is a coinventor on 10 granted U.S. patents, a board member for the Computer Research Association's Committee on the Status of Women in Computing Research, and an associate editor of the *Journal of Parallel and Distributed Computing* and *IEEE Micro*.

Timothy Dye

professor of obstetrics and gynecology and director of biomedical informatics at the Clinical and Translational Science Institute

Dye is an anthropologist-epidemiologist specializing in applied public health. His work focuses on improving our understanding of complex maternal and child health problems through the creation and analysis of large integrated datasets. He is also interested in how technological innovation can improve health locally and around the world. Dye has received project funding from national and international organizations, and his work spans more than 20 countries. It also helped establish birth and immunization registries in New York State, which provided a foundation for his interest in integrating genetic, molecular, electronic, and public health information.

Cindy Ebinger
professor of earth and environmental sciences

Ebinger studies the movement of global tectonic plates. Her research is being used to mitigate hazards associated with earthquakes and volcanoes, help develop new energy systems, and even preserve historical structures. Through sophisticated equipment that she has placed around the world, Ebinger marries her knowledge of the Earth with data science to collect information, sift through it, and find patterns that lead to discoveries in her field.

Gourab Ghoshal
assistant professor of physics and astronomy

Ghoshal joined Rochester in 2014 from Harvard University. As a statistical physicist who works in the field of complex systems, his research interests include the theory and applications of complex networks as well as nonequilibrium statistical physics, game theory, econophysics, dynamical systems, and the origins of life. Ghoshal is also the editor of a book on complex networks and his work has been published in *Nature*, *Science*, and *Physical Review Letters*.

Daniel Gildea
associate professor of computer science

Gildea works in machine translation, an area of natural language processing. Computer scientists like him and linguists have created automated translation programs that can roughly translate back and forth in many of the world's languages and even pick up on idioms and double entendres. Gildea and his team generate algorithms that can translate from one language to another. Although these can be applied to any language, they have concentrated on translating Chinese into English.

Henry Kautz
director, Institute for Data Science, and professor of computer science

Kautz is data mining social media such as Twitter to identify global disease outbreaks in their earliest stages and track their spread. The approach has the potential to dwarf previous methods for health monitoring in scalability and immediacy and is changing how we predict, monitor, and address health issues. Kautz is also collaborating with researchers in computational linguistics, machine vision, and biology in the construction of a system to monitor activities in a biology lab, creating an automated lab notebook, and alerting users to deviations from the intended experimental protocols.

Coeli Lopes
*associate professor, Aab Cardiovascular Research Institute*

Lopes uses data science to translate cellular studies to the whole human heart. She collaborates with clinicians and computational modeling experts across the University and at IBM to explore how the heart responds to the mutations and/or various drug treatments and to understand which type of mutations or drugs are most likely to cause life-threatening arrhythmias in patients. Ultimately, her research will contribute to the development of better and more tailored anti-arrhythmic treatments.

Jiebo Luo
associate professor of computer science

Luo works on image understanding and develops systems that automatically label images, videos, and other forms of multimedia. Dedicated to the idea that "every picture tells a story," he mines images from the Internet and then teaches the computer to understand what the image means. By looking at trends associated with these images, researchers can come up with predictions of how various products will sell and even the outcome of political elections.
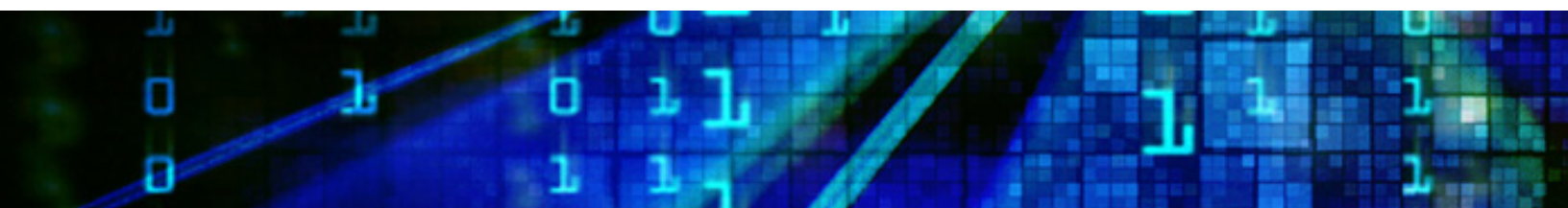
Gonzalo Mateos
assistant professor of electrical and computer engineering

Mateos's research interests span statistical learning, network science, wireless communications, and signal processing. His current research focuses on developing algorithms, conducting analyses, and applying statistical signal processing tools to dynamic network health monitoring, social networks, the power grid, and big data analytics. Before joining the University in 2014, Mateos was a visiting scholar with the computer science department at Carnegie Mellon University. Prior to that, he was a systems engineer at ABB in Uruguay.

Steve Piantadosi
assistant professor of brain and cognitive sciences

Piantadosi studies language processing and acquisition. Before joining the University in 2014, he was a postdoctoral researcher here. He draws on information theory, tera-scale language databases, and statistical models to explore how people acquire number words (such as "one," "two," and "three"), quantifiers (such as "every," "most," and "both"), and syntactic knowledge. He conducts experiments with infants, preschoolers, and adults aimed at pinpointing the concepts learners might use to support linguistic meaning and conceptual development.

Rajeev Raizada
assistant professor of brain and cognitive sciences

Raizada uses pattern-based fMRI (functional magnetic resonance imaging) analysis in order to understand the way the brain encodes and processes information. Functional magnetic resonance imaging is nonintrusive and provides a risk-free way to study our brains. His work is laying a foundation for the day when neuroscientists will use a brain scan to diagnose the underlying causes of learning disabilities such as dyslexia and to detect impairments long before children experience difficulty or, potentially, failure in school.

Huaxia Rui
assistant professor of computers and information systems, the Simon School

Rui focuses on how businesses can make use of data from social media sites such as Twitter and Facebook to improve decision making. Rui and fellow researchers analyzed the impact of four million tweets on box office sales for more than 60 movies. The results show that online chatter really does affect sales. Business managers could glean important clues about the popularity of their products and even forecast future sales through careful analysis of Twitter traffic.

Vincent Silenzio
associate professor of psychiatry, family medicine, and public health sciences

Silenzio works on suicide prevention among at-risk youth and explores the use of online social networks to gather data from people who are otherwise difficult to identify or reach. Understanding exactly how social networks can be used is the key to expanding the reach of positive interventions and blocking the transmission of negative influences. Silenzio is also developing social-enabled mobile applications that could be put in the hands of teachers, community members, and others to help young people in need.

Robert Strawderman
professor and chair of biostatistics and computational biology

Strawderman's expertise in statistical analysis plays an essential role in medical research. He and those in his department are involved in all stages of data collection and analysis, including designing clinical trials of new neurological therapies, predicting suicide risk in military veterans, examining how genomic influences can affect human health, and more. He and his colleagues develop state-of-the-art methods and computational tools to query and analyze the increasingly complex data generated by medical researchers here.
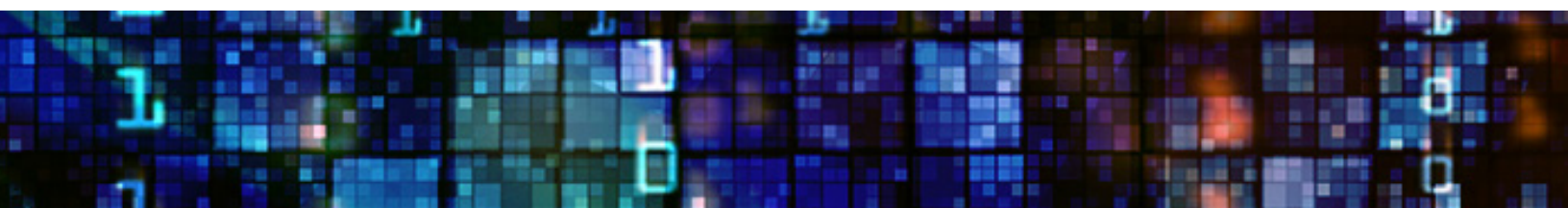
David Topham

vice provost and executive director of the Health Sciences Center for Computational Innovation, director of the NIAID Respiratory Pathogens Research Center, codirector of the New York Influenza Center of Excellence, and professor of microbiology and immunology

Topham concentrates his work on immune responses to viral infections and vaccines, with an emphasis on respiratory infections and influenza. He leads efforts to apply computational and data-driven approaches to study human diseases, developing highly sophisticated imaging and mathematical simulations that use data visualization technologies and supercomputers, such as IBM's BlueGene/Q, to study the human body's adaptive response to influenza. His research is making strides against some of the world's biggest health concerns.

Andrew White

assistant professor of chemical engineering

White is interested in energy and biomedical research and will join Rochester this January. His research explores the development of high-density batteries that will last in a car and biomedical devices that will be compatible with the human body. High-performance computing, computer-aided simulation, and interdisciplinary collaboration are important to his work. He will work with researchers at the Hajim School, the Laboratory for Laser Energetics, the Center for Integrated Research Computing, and the Medical Center.

Axel Wismüller

associate professor of radiology, biomedical engineering, and electrical and computer engineering

Wismüller's research addresses the question of how computers can help to analyze huge volumes of medical image data. His goal is to expedite image-based diagnosis and treatment of challenging diseases, such as breast cancer, Alzheimer's disease and other dementia, and osteoporosis. According to Wismüller, computational radiology will transform the field, aid the analysis of highly complex data, and help bridge the gap between fundamental engineering research and clinical practice. His lab develops advanced pattern recognition and novel machine learning technology for visually guided knowledge discovery in biomedical big data.

Martin Zand

professor of medicine and medical humanities, director of the Rochester Center for Health Informatics, medical director of the Kidney and Pancreas Transplant Programs, and codirector of the Center for Biodefense Immune Modeling

Zand's background is in biomedical engineering, human immunology, internal medicine, and transplant nephrology. His research is focused on computational modeling of immune responses to vaccines and transplanted organs, network modeling of gene and protein regulatory networks, visualization of high dimensional data, and population health.

Learn, Discover, Heal, Create—And Make the World Ever Better
www.rochester.edu/data-science

UNIVERSITY *of* ROCHESTER