

# GOERGEN INSTITUTE FOR DATA SCIENCE

FUELING 21ST-CENTURY RESEARCH AND DISCOVERY



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► Data science is the centerpiece of the University of Rochester's 2013–18 strategic plan. To greatly expand its work in this burgeoning field, the University has recently committed \$50 million, in addition to more than \$50 million it has invested in recent years.

At the core of this commitment is the creation of the new Goergen Institute for Data Science, named in recognition of support from Trustee Robert B. Goergen '60 and his wife, Pamela. The investment also includes the construction of a state-of-the-art 50,000-square-foot building to house the Goergen Institute as well as the Department of Computer

Science and other academic areas. In recognition of support for the institute from the Wegman Family Foundation, the new building will be named Wegmans Hall. It is slated for full occupancy by winter 2017.

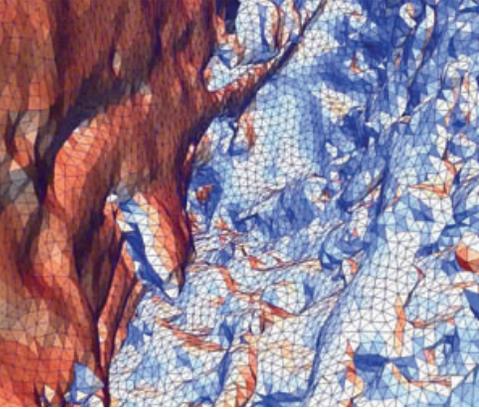
As part of its data science initiative, the University is committed to hiring new faculty in areas in which data science plays a critical role, including bioinformatics, biomedical engineering, brain and cognitive science, business and economics, computer science, physics, mathematics and statistics, and political science. The University has added 14 new faculty members to date.

## What Is Data Science?

Data science is the defining discipline of the 21st century and is transforming nearly every human endeavor. Business, science, arts, government, and family life are all being changed by computational tools that reveal meaningful patterns in data of all kinds. It is not just the scale of data or the available computer power either—it is the development of new ways to analyze information that is at the root of these new discoveries.

## New Campus Landmark

Wegmans Hall will provide much-needed space for collaborative research, conferences and workshops, and special events. It will be the catalyst for the reconfiguration and renovation of research and lab spaces across campus. It will also become the anchor for a new Science and Engineering Quadrangle on the River Campus, which will form a distinctive, collegiate space. From here, people can walk in any direction and, within minutes, interact with students, staff, and faculty members whose work involves medicine, the humanities, the social sciences, education, and business.



Model of the human heart used to evaluate drug effects



fMRI (functional magnetic resonance imaging)



Inside the IBM Blue Gene/Q

## Areas of Focus

The Goergen Institute builds on the University's strengths and brings together research groups, centers, and programs that have already been collaborating on work but have been dispersed across various departments and divisions. The institute serves as an umbrella under which those who build the technology as well as those who use it can advance discovery across fields. It encourages dialogue with people who have different perspectives, thus fueling new ways of thinking.

Initial domains of data science research focus on developing health care breakthroughs, improving our knowledge of how the brain works, and creating tools and systems to use data efficiently. The University is targeting the following areas.

### Health Analytics

Using data to predict individual health outcomes based on treatments, genomics, and lifestyle and behavioral factors may lead to some of the biggest advances in health care. For example, UR Medicine neurologist Ray Dorsey, the David M. Levy Professor in Neurology and a White House "Champion of Change," uses data to improve access to specialized care for people with Parkinson's

disease. He recently worked with Sage Bionetworks to develop a new iPhone app to help researchers better understand how Parkinson's affects people's daily lives.

The University also will build on programs at the Medical Center to use data science and biomedical informatics to improve health and health care delivery. For example, the Clinical and Translational Science Institute's Bioinformatics Group provides systems and support to enhance research and data acquisition from the Medical Center's health records system.

### Cognitive Science and Artificial Intelligence

Home of internationally recognized research in cognitive science and artificial intelligence, the University is uniquely positioned to advance our understanding of how the brain makes sense of the world. Modeling and replicating human perception is one of the most ambitious and exciting domains in data science.

Rajeev Raizada, an assistant professor of brain and cognitive sciences, uses pattern-based fMRI analysis in order to understand the way the brain encodes and processes information. He integrates machine-learning methods

from data science with questions about mental representations from cognitive neuroscience. His work focuses especially on decoding the brain's representations of linguistic meaning. In the future, this research could help neuroscientists diagnose underlying causes of learning disabilities such as dyslexia.

### Methods, Tools, and Infrastructure

Some of the institute's faculty members will take on the challenge of addressing the methods, tools, and infrastructure required to analyze large-scale data. The ultimate goal is to relieve the end user from the need to understand details of a platform in order to have the computer system determine the optimal use of resources.

Sandhya Dwarkadas, a professor and chair of computer science and professor of electrical and computer engineering, is just one Rochester researcher making strides in this area. She works at the interface of hardware and software and develops scalable support for parallelism; that is, communication and coordination mechanisms that allow computational tasks to be executed simultaneously, easily, and in a portable manner. Her research helps build the

basic infrastructure needed to help end users—including physicists, linguists, chemical engineers, medical practitioners, and others—advance knowledge in their fields.

## High-Performance Computing

The University's aggregate computational capacity equals 420 teraflops or 420 trillion calculations per second—the equivalent computing power of more than 20,000 laptops. The Goergen Institute is committed to having the right people, computational infrastructure, and technology in place to serve our researchers and partner organizations and help them apply computation and data analytics to their work.

The University has already made major investments in developing an outstanding computing infrastructure:

- **The Center for Integrated Research Computing (CIRC)** provides computational technology and support services to more than 900 faculty members across the University;

- **The Health Sciences Center for Computational Innovation (HSCCI)**, home of the health sciences research program that brought the University the IBM Blue Gene/Q, one of the world's fastest supercomputers; and
- **The VISTA Collaboratory** (featured below), a 1,000-square-foot visualization lab that renders massive data sets, helping researchers visualize and analyze complex data instantly and collaboratively.

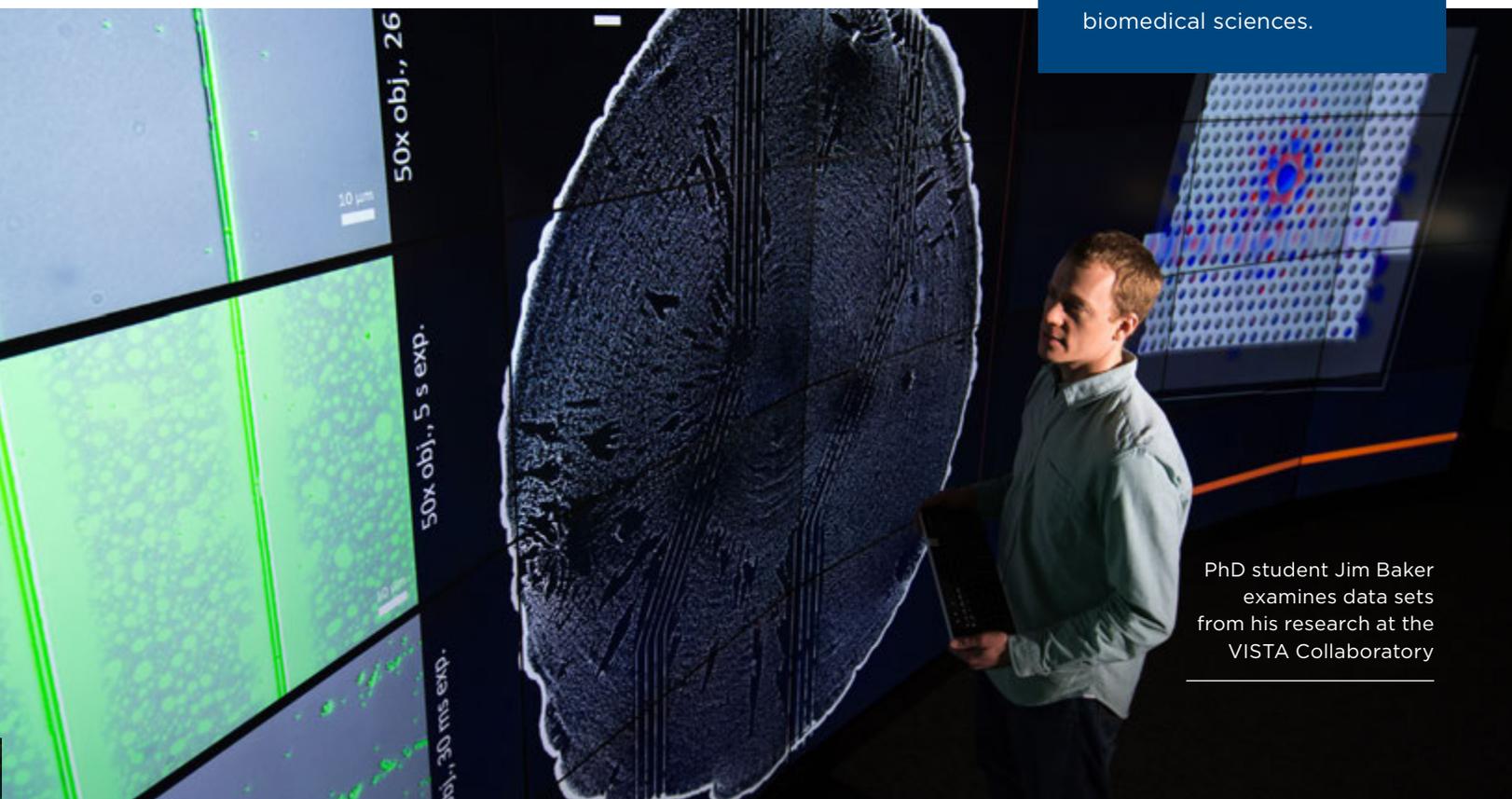
## New York State Supports University of Rochester Efforts

In 2014, New York State provided \$872,000 for the New York State Center of Excellence in Data Science, which operates in conjunction with the Goergen Institute for Data Science. New York State has authorized \$1 million of support for 2015 as part of the annual funding of its Centers of Excellence program. These centers have been established at leading universities across the state to support high-technology ventures and encourage the rapid commercialization of scientific breakthroughs.

## Data Science Degrees

National demand for data scientists and managers is growing rapidly. To help meet that demand, the University offers the following programs to prepare students to harness technology in ways that will inform a variety of fields:

- **A BA/BS in data science**, which prepares students for a variety of careers in data analytics and for graduate study in the physical, life, social, and computational sciences;
- **An MS in data science**, which provides a strong foundation in computing and statistics and opportunities to concentrate on an application area such as business or health; and
- **A variety of MS and PhD programs** in related fields such as computer science, medical statistics, and the biomedical sciences.



PhD student Jim Baker examines data sets from his research at the VISTA Collaboratory

# INSIDE THE NEW WEGMANS HALL

## How You Can Help

The University has raised \$28 million toward its \$50 million data science fundraising goal thanks to leadership support from the Goergens; the Wegman Family Foundation; Trustee Tim Wentworth and his wife, Robin; and Trustee Nomi Bergman '85 and her husband, Neal; along with commitments from many others. Myriad opportunities exist to join us at the forefront of this emerging field through philanthropic support or corporate and academic collaboration.

For more information, contact

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## Naming Opportunities

**Naming opportunities are available for these areas inside Wegmans Hall:**

- Main Concourse
- Auditorium
- Overlook/Commons Area
- Bridge Commons
- Collaboration Areas
- Lounges
- Robotics Lab
- Goergen Institute Offices and Conference Room
- Computer Science Offices and Labs
- Chemical Engineering Offices, Labs, and Conference Room

**The University also seeks endowed funding for the following:**

- Professorships
- Visiting Professorships
- Graduate Fellowships
- Undergraduate Scholarships
- Research Funds



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Inside Wegmans Hall, the new building that will house the Goergen Institute for Data Science and other academic areas

Learn, Discover, Heal, Create—And Make the World Ever Better  
[www.rochester.edu/data-science](http://www.rochester.edu/data-science)