

First data science major in the region launched by CSU

Katie Courage

Our world now depends on big data – and the thoughtful analysis of it. From health care to finance to government to science, we rely every day on the study of truly massive troves of data. People trained in this skill are, however, in very short supply, which is one of the reasons data scientist has been the top-rated job in the U.S. for the past two years. To help the state and the world meet this ever-increasing need and to help shape the data-driven future, Colorado State University is launching a new major in data science, starting fall 2018.

The program is the first of its kind in the entire Rocky Mountain region. The major will offer 10 new dedicated data science courses – ranging from data wrangling to data graphics and visualization to a group capstone project. It will also give majors a broad foundation in computer science, mathematics, and statistics. “Data science has emerged from a combination of computer science, mathematics, and statistics,” said Simon Tavener, College of Natural Sciences executive associate dean for academics. “And it has now developed into a separate field in its own right, thanks in part to demands for data-driven knowledge across disciplines.”

Students in the new major will select a concentration in computer science, economics, mathematics, or statistics. The first, foundational year is similar for all concentrations. The concentrations then diverge as students pursue upper level courses alongside majors in these fields, while continuing to take specialized data science courses. In their final year, data science students from all

concentrations will come together in small groups to tackle real-world data problems in the capstone course. “This new degree program at CSU provides a powerful balance across fields,” Tavener said. “It will prepare students with the skills and understanding to be able to enter directly into the workforce – or continue their study in data-based disciplines.”

Data scientists have top earning potential, with an average salary of more than \$110,000. And experts estimate a shortage of more than 1 million data scientists, making people trained in this field in high demand. The new program is housed as an interdisciplinary major in the College of Natural Sciences and is currently enrolling incoming first-year students for the first cohort in fall 2018. Rising second-year students with relevant credits might also be able to transfer into the major. The program will have a dedicated Academic Success Coordinator as well as faculty mentors from the participating departments. There will be opportunities to get involved in research and activities outside of the classroom as well. For more information about the major, visit the [data science](#) homepage.

“We are incredibly excited to be able to offer this new and dynamic field of study to students at Colorado State University,” said Dean of the College of Natural Sciences Jan Neger. “Data science majors will be able to make a real difference in the world in whatever field they choose. We cannot wait to welcome the first cohort in the fall – and then to see the fascinating and important things they do after they graduate.”



MESSAGE FROM THE CHAIR



Dear Alumni and Friends,

There is a lot going on in the Department of Statistics!

We are in the midst of searches for six faculty positions. Two of the tenure-track positions are related to the newly approved data science major. Another tenure-

track position is focused in the area of epidemiology and environmental health in a partnership with the Department of Environmental & Radiological Health Sciences. We are searching for two non-tenure-track faculty to teach in the department and collaborate through the Graybill Statistical Laboratory as consultants for environmental health. Finally, we are ramping up a search for an open rank tenure track position specializing in clinical trials in partnership with the Translational Medicine Institute. With these hires, we will be growing the department's research portfolio significantly in the directions of biostatistics and data science.

Colorado State University is the first university in the state to offer a full undergraduate program in data science. We also received approval to create a data science concentration in the master's in applied statistics program, which is a joint effort with the Department of Computer Information Systems. Our proposal to create a master's in data science is still under review.

Professor Mary Meyer and the undergraduate statistics club Statistics Alliance organized the very first Probability Casino. The Probability Casino gave students from across campus the chance to measure their

understanding of probability in fun games designed by the Statistics Alliance students while department faculty and graduate students helped run the event. I am happy to report that three of our professors, Jay Breidt, Dan Cooley, and Haonan Wang, were outstanding in the Stump the Chump competition.

The department is undertaking a major reform of the introductory statistics courses called PUMAS (Pathways to Understanding and Mastery of Statistics). The idea is to tackle the challenge of providing avenues for every student at CSU, regardless of their background, to take as much statistics as they desire. The reform includes introducing a new STAT100 course in Statistical Literacy without any prerequisites, connecting the STAT201, 204, 301, 307, and 315 courses through a shared common "core," introducing multiple aids for student learning, and creating one-credit modules on specialized topics. As part of the reform, we have created the Statistics Success Center, which is an innovative approach to provide individualized education to students.

In conclusion, I mention that we reorganized the annual student awards ceremony to make it into an end-of-year party and a celebration of our students' achievements. We had a large turnout, and it was a fun night full of celebration and recognition for our students.

Don Estep, Ph.D.
University Distinguished Professor and Chair

DEPARTMENT HIGHLIGHTS

DEPARTMENT OF STATISTICS FUNDED AS NSF-REU SITE



The American Statistical Association (ASA) was funded for hosting National Science Foundation Research Experiences for Undergraduates (NSF-REU) sites between 2016 and 2018. Each year, the ASA funds three REU sites around the U.S., each with four students. The Department of Statistics at Colorado State University was funded as an ASA-NSF-REU site in 2018. The college and the department will fund two CSU students to participate as well. REU participants will collaborate with researchers within the College of Natural Sciences on the management of data, data analysis, data visualization, and summaries.

Specific domain science projects include the exploration of anticancer agent properties, classification of salmonella serotype proteins, and simulating and examining optical density versus time data from particles under varying experimental conditions.

GRADUATE STUDENT FRANK MARRS SELECTED AS VPR FELLOW



Frank Marrs was selected as one of approximately a dozen elite graduate students from across CSU to be part of the 2018-2019 Vice President for Research (VPR) Graduate Fellows Program. This program was created by the Office of the VPR to support excellence in graduate research and promote interdisciplinary work at the University by engaging the best and brightest students from graduate programs across the institution. Fellows are awarded funds for scholarship and travel, as well as opportunities to participate in collaborative engagement activities and professional development.

ALUMNI SPOTLIGHT: STACEY HANCOCK



Stacey Hancock (class of 2008) earned a Ph.D. in statistics under the direction of Professor Richard Davis; her dissertation research focused on detecting structural breaks in time series data. Stacey has fond memories of being a graduate student in statistics. She served as the chair of the CSU Statistics Department Student Advisory Committee from 2006-2008 and

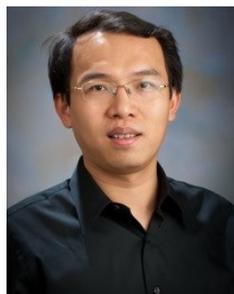
considers the purchase of the green couch on the third floor as her greatest success. Graduate students could be found napping on that couch at any time of day.

Since graduating from CSU, Hancock has found her passion in statistics education. She began her career at Reed College in Portland, Oregon as a visiting assistant professor. She has recently made her way back to her native Montana as faculty in the Department of Mathematical Sciences at Montana State University.

Her research in statistics education focuses on the teaching and learning of statistics in the college-level introductory statistics course, specifically in how students use language while learning sampling distributions. She is also heavily involved in the data science education community; she helped develop and implement a Bachelor of Science in Data Science while she was an assistant teaching professor at the University of California, Irvine, prior to her move to Montana. She makes substantial contributions to the statistics community and profession through her service in the Mathematical Association of American (MAA) and the American Statistical Association (ASA).

Most recently, she has served as chair of the MAA's Special Interest Group in Statistics Education and is currently Joint Statistical Meeting 2019 program chair for the ASA Statistics Education Section. Additionally, she serves on the rubric team for the AP Statistics Reading each June. In her free time, Stacey enjoys being outdoors, skiing and hiking, and spending time with her family and friends.

FACULTY SPOTLIGHT: HAONAN WANG



Graduate Director and Professor Haonan Wang became a faculty member in the Department of Statistics in 2003. He enjoys the friendly, family-like environment in the department. Wang recently became the director of graduate studies in the department. In his new role, he has enjoyed interacting with other departments and their graduate directors. He is eager to promote the

Department of Statistics and emphasize how important the faculty are to disciplines needing good quantitative methods for research. Wang's research in a variety of areas is driven by real applications.

He is currently developing methods for complex and inhomogeneous data objects like tree structures. New collection tools provide researchers with new data, often

in the form of images or a sequence of images. Those images could be of the neuron structure or arteries of the brain. While clearly multivariate, this data is not easily put into vector form, thus new inferential tools and even descriptive statistics must be developed.

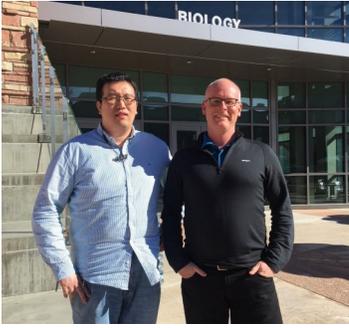
An overlapping research area is modeling the dynamic relationship of neuronal structure. The goal of this research is to understand brain activity, particularly information transformation between different brain regions. These methods have a large impact for doctors and researchers, providing them with tools to make better use of these new data sources. Ultimately, this will aid in disease diagnosis and treatment.

STATISTICS SUCCESS CENTER



The Department of Statistics opened the Statistics Success Center (SSC) in Fall 2017 as a resource for CSU students enrolled in introductory level statistics courses. The SSC is staffed with statistics instructors, graduate students, and undergraduate majors. The SSC offers graduate students and undergraduate majors the opportunity to learn by teaching, by answering questions from students in different courses in different ways. Additionally, undergraduate students are not limited to their instructors' office hours and are able to learn from other instructors. In the fall semester, the SSC served 1,258 students total with an average of 97 students visiting per week. Numbers for this spring semester are estimated to be even higher!

INTERDISCIPLINARY RESEARCH TEAM RECEIVES \$2 MILLION GRANT FROM DOE



An interdisciplinary research team, Graham Peers (Biology, PI) and Wen Zhou (Statistics, Co-PI), at Colorado State University is developing a collaborative planning tool for the study of fundamental mechanisms and potential applications of bio-energy. They received a \$2 million grant from the Department of Energy for their

converting enough sunlight and CO₂ to produce one quarter of the world's biomass. They also represent one of the most promising avenues to efficiently produce biofuels. To fulfil this potential, it is necessary to better understand how energy is transduced from sunlight to biofuel precursors. Researchers at CSU, Vanderbilt University, University of California, San Diego, and the J. Craig Venter Institute will then use this information to inform engineering strategies that aim to increase the carbon fixation efficiency of diatoms. The group of biologists, statisticians, and engineers is developing a genome-scale metabolic model and methods for genome engineering in the diatom *Phaeodactylum tricornutum*. They aim to construct and introduce artificial chromosomes designed for in vivo optimization of electron flow, photosynthesis, and overall cellular growth while directing key metabolic precursors into desired products.

five-year research project, "Design, Synthesis and Validation: Genome Scale Optimization of Energy Flux Through Compartmentalized Metabolic Networks in a Model Photosynthetic Eukaryotic Microbe" starting from 2017. Diatoms are algae that dominate the world's oceans,

ALUM ESTABLISHES FELLOWSHIPS



As Colorado State University alumni look back on their time as students, they find that there are many reasons to appreciate their experience. Thomas Jones found his professional footing at CSU, where he earned a B.S. in Mathematics in 1964 and an M.S. in Statistics in 1967. After completing an additional M.S. in Geology in 1968 and a Ph.D. in Mathematical Geology in 1969 from Northwestern University, he joined the Exxon Production Research Company in Houston. There, he developed innovative geological software and worked on projects addressing statistical uncertainty and analysis until his retirement in 2003. He went on to be an adjunct professor at Rice University until 2016.

It was his education from CSU, particularly in statistics, that Jones believes was most influential in preparing him for his future. This realization led to his decision to provide financial support for CSU in the form of a legacy gift for two fellowships – one for the College of Natural Sciences and the other for Warner College of Natural Resources. The fellowships are composed of annual gifts, which are matched by Exxon and will become fully endowed with an estate gift. This process has allowed Jones and his wife, Toby to become even more involved with CSU through meeting students and seeing the gift in action. It gives him the satisfaction of knowing that his legacy will support CSU students for generations to come. Read more [here](#).

FIRST COLLEGE OF NATURAL SCIENCES PROBABILITY CASINO NIGHT A GREAT SUCCESS



The College of Natural Sciences Probability Casino was a great success with over 150 participants. Contestants played games with cards, dice, random walks, and more; the successful players planned strategies based on probabilities and expected values. Statistics department faculty and graduate students ran the games, while undergraduate majors and minors kept score and helped keep things running smoothly. The planning committee consisted of four undergraduate students: Mikaela Elder, Alexis Suhr, Jackson Hill, and Justin Cowden (pictured), and Professor Mary Meyer. A big thanks goes to College Director of IT Jim Cox, who developed the software for the popular Stump the Chump game, as well as the score-keeping software. Undergraduate student Lindsey Young organized the venue at Laurel Village Pavilion, and prizes were provided by the statistics department and the College of Natural Sciences Dean's Office.

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For more information on giving, contact Simone Clasen, Executive Director of Development and Operations

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