Big Data Training for Cancer Research

Special Lecture Series

The future of AI-driven science

Dr. Rebecca Doerge
June 7, 2021, 1:00 – 2:30 PM (EDT)

Abstract: Since Marie Curie discovered radioactivity at the turn of the 20th century, the fundamentals of research have changed little. A scientist has an idea and designs an experiment. They go into their laboratory, close the door and conduct the experiment — typically involving manual tasks that are repeated over and over again with only slight variations. They record and analyze the data. Often, insights are gleaned only after dead ends are explored, failures are overcome and significant time and effort are invested. The process is time-intensive, prone to human error, requires tremendous resources, and often not reproducible.

At Carnegie Mellon University (CMU), we are throwing out this dated model and radically changing how science is conducted. Across much of science, automated instrumentation is beginning to replace repetitive tasks in the lab, and to allow new scientific questions to be asked through the collection of vastly larger data sets. The key lies in partnering computation, robotics and data analytics with innovative scientific research, which will make the discovery process more transparent, less prone to error and more reproducible — and it will accelerate innovation. By automating the process of experimentation and data analysis in a remote controlled laboratory driven by artificial intelligence (AI), robotics, and machine learning CMU scientists and researchers will be able to focus on asking tough questions and designing breakthrough experiments that lead to world-changing advancements. How AI-driven science changes the scientific landscape is the topic of this presentation. Specifically, we will think about how science is conceived, experiments designed and analyzed, data and protocols are shared, as well as the impact of this framework on open science.

Speaker Bio: Rebecca Doerge is the Glen de Vries Dean of the Mellon College of Science at Carnegie Mellon University. Prior to joining both the Department of Statistics and Data Science and the Department of Biology at Carnegie Mellon University Rebecca was the Trent and Judith Anderson Distinguished Professor of Statistics at Purdue University. Dean Doerge joined Purdue University in 1995 and held a joint appointment between the Colleges of Agriculture (Department of Agronomy) and Science (Department of Statistics) until her departure. Dean Doerge's research program focuses on Statistical Bioinformatics, a component of bioinformatics that brings together many scientific disciplines to ask, answer, and disseminate biologically interesting information in the quest to understand the ultimate function of DNA and epigenomic associations. Rebecca is the recipient the Teaching for Tomorrow Award, Purdue University, 1996; University Scholar Award, Purdue University, 2001-06; and the Provost's Award for Outstanding Graduate Faculty Mentor, Purdue University, 2010. She is an elected Fellow of the American Statistical Association (2007), an elected Fellow of the American Association for the Advancement of Science (2007), and a Fellow of the Committee on Institutional Cooperation (CIC; 2009). She is Chair of the American Association for the Advancement of Science (AAAS) Section U (Statistics). Dean Doerge has published over 140 scientific articles, published two books, and graduated 26 PhD students.

Rebecca was born and raised in upstate New York. As a first generation student from a tiny rural community, she studied theoretical Mathematics at the University of Utah; it was there that she gained interest and experience in both computing and Human Genetics. Rebecca obtained her PhD in Statistics from North Carolina State University under the direction of Bruce Weir, and was a postdoctoral fellow with Gary Churchill, Biometry and Plant Breeding at Cornell University.

Dean Doerge is a past member of the Board of Trustees for both the National Institute of Statistical Sciences, and the Mathematical Biosciences Institute. Rebecca is currently a member of the Engineering External Review Committee, Lawrence Livermore National Laboratory; a member of the Danforth Plant Science Center Scientific Advisory Board, St. Louis MO; and a member of the Board of Directors for Innovation Works, Pittsburgh PA.

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