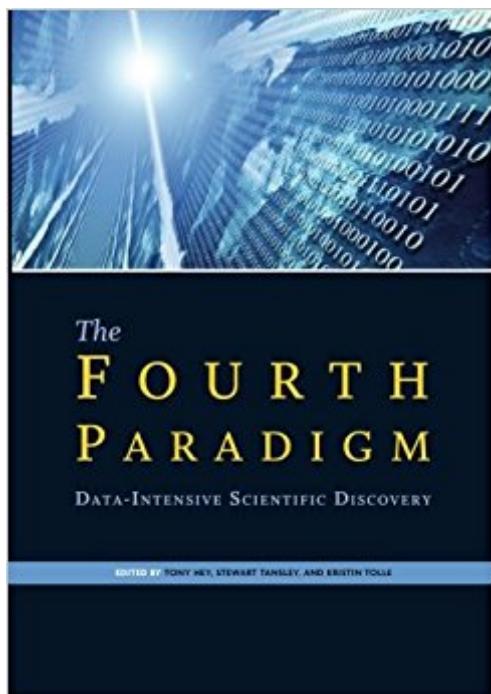


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The Fourth Paradigm: Data-Intensive Scientific Discovery



Synopsis

This book presents the first broad look at the rapidly emerging field of data-intensive science, with the goal of influencing the worldwide scientific and computing research communities and inspiring the next generation of scientists. Increasingly, scientific breakthroughs will be powered by advanced computing capabilities that help researchers manipulate and explore massive datasets. The speed at which any given scientific discipline advances will depend on how well its researchers collaborate with one another, and with technologists, in areas of eScience such as databases, workflow management, visualization, and cloud-computing technologies. This collection of essays expands on the vision of pioneering computer scientist Jim Gray for a new, fourth paradigm of discovery based on data-intensive science and offers insights into how it can be fully realized.

Book Information

Paperback: 284 pages

Publisher: Microsoft Research; 1 edition (October 16, 2009)

Language: English

ISBN-10: 0982544200

ISBN-13: 978-0982544204

Product Dimensions: 7 x 0.7 x 10 inches

Shipping Weight: 1.4 pounds (View shipping rates and policies)

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"We have to do better producing tools to support the whole research cycle - from data capture and data curation to data analysis and data visualization." - Jim Gray The Fourth Paradigm is a collection of papers talks on research areas that aim to improve the research cycle. The talks are a memorial to Microsoft Tech Fellow Jim Gray. Gray had the insight that science has gone through four paradigms so far. The first paradigm, which has lasted over the last few thousand years, was empirical science which describes natural phenomena. Over the last few hundred years, the second paradigm of theoretical science using models and generalizations has occurred. Within the last 50 to 70 years, the third paradigm of computational science has developed to simulate complex

phenomena. Finally, the fourth paradigm (also known as eScience) has developed to unify theory, experiment, and simulation. Jim Gray says: "... it is worth distinguishing data-intensive science from computational science as a new, fourth paradigm for scientific exploration." The book itself is divided into four major sections: Earth and Environment, Health and Wellbeing, Scientific Infrastructure, and Scholarly Communications with 6 to 8 papers per section. The emphasis here is on science; however, I'd assert that all these areas directly impact engineering as well. For example, the flight test of a new product involves an enormous amount of data, which produces much analysis, knowledge, and understanding. The principle idea of eScience (and eEngineering) is that the data and analysis interoperate with each other, such that information is at your fingertips for everyone, everywhere. The payoff is a large increase in information velocity and productivity.

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