

Information Systems PhD Position, University of Cologne

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Title	Data-driven analytics, modeling and decision support to address wicked problems in sustainable energy markets
Abstract	With the exponential growth of data available from different market channels, firms have the opportunity to exploit data for their competitive advantage. The volume and variety of data have far outstripped the capacity of manual analysis. Meanwhile, computers have become far more powerful, networking is ubiquitous, and algorithms have been developed that can connect datasets to enable broader and deeper analyses than previously possible. This project aims to understand decision-making in complex market environments and develop policy implications to promote sustainability. The main application area of this PhD project is in the energy sector, such as smart energy cooperatives and markets, and mobility domain, such as electric and autonomous vehicles.
Keywords	Big data, Business and Data Analytics, Decision-making, Dynamic Pricing, Smart Energy Markets, Wicked Problems, Competitive Simulation, Modeling
Topic	Business Analytics and Information Systems
Approach	The PhD will have a primary workspace at the Information Systems Chair of Prof. Wolf Ketter within the Information Systems Institute, as well as a shared space at the Energy Economics Institute of the University of Cologne. The research will span the fields of artificial intelligence, behavioral science, business management, energy economics, energy systems and markets, information systems, machine learning, operations research, and software engineering. The primary objective is to research,

develop, and apply (semi-) autonomous intelligent agents using big data to support human decision making capabilities in the area of smart electricity markets and smart electric mobility.

- Literature references
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Cooperation

This PhD project will cooperate with researchers in the Worldwide Information Systems Community

(<http://www.isworld.org>) and with research groups in the USA, for example, the Carlson School of Management (Department of Information and Decision Sciences) at University of Minnesota, the Haas School of Management at UC Berkeley, the Berkeley Institute for Data Science at UC Berkeley, and the Rotterdam School of Management at Erasmus University. Research visits at our international collaborators are highly encouraged. Further, we have also established close cooperation with leading companies, such as BMW, Google, Innogy, Uber, and Port of Rotterdam, in many B2B markets which helps to pave the way to collect data, conduct experiments, and to evaluate the results and findings in real-world economic settings.

Expected output	The research will be published in high quality journals in the fields of Information Systems, such as Management Science, MIS Quarterly, Decision Support Systems, Information Systems Research, and Decision Sciences. Because of the intense interest in the field of this research project, ample possibilities will occur to communicate and publish in international conferences. The target will be three A publications, and presenting the results in at least three international conferences.
Scientific relevance	The research will result in deeper understanding of decision problems that support sustainability in complex energy markets. The results will provide the know-how to build data-driven decision automation systems, which have the potential to be the next generation of decision support systems.
Societal relevance	Many important challenges of our time are “wicked problems” that transcend individuals, organizations, and markets, which have been the traditional focus areas of IS research. Problems such as sustainable energy, climate change, and financial market stability

can only be fully understood through discovery and analysis of a wide variety of data at many levels of detail. Such problems require interrelated advances in data discovery and analysis, theory development, and design that are best provided by interdisciplinary research communities. IS innovations have tackled these challenges through their enabling role in globalization, and they should play a similarly important part in their resolution.

Required profile

The successful candidate should have solid quantitative background as well as profound knowledge in the field of data analytics and simulation-based modeling and should be able to collaborate with researchers from a diverse background such as computer science, economics, management, and mathematics/statistics. In addition, the candidate should have a keen interest in contributing to the intersection of the aforementioned fields.

The ideal candidate will meet the following requirements

- A master's degree in Computer Science (e.g., Data Mining, Machine Learning), Economics/Management (e.g., Applied Econometrics, Decision Theory, Operations Management, Quantitative Marketing), Mathematics/Statistics
- Good academic record
- Creative and rigorous analytical thinking
- Strong statistical and optimization skills
- Good programming skills (Java, Python and/or similar programming languages)
- Commitment and drive to execute excellent interdisciplinary PhD research
- Excellent Communication Skills
- International orientation and the capacity to speak and write in English fluently

