Embedding and Perspectives of the open Professorship "Data Engineering" in the Department of Computer Science at RPTU Kaiserslautern-Landau

Research

Data engineering forms the foundation for data-driven applications and research fields – from classical data analysis to modern AI methods. Its goal is to collect, transform, and provide data from a wide variety of sources in a structured, reliable, and accessible form. Key aspects include data quality, data integrity, scalability, and data protection. Particularly in the context of big data, specific challenges arise: enormous data volumes, high velocity of data generation, potentially incorrect or faulty information, as well as diverse and often unstructured formats. Data engineering develops methods and systems to make this complexity manageable - through powerful data pipelines, efficient storage and processing architectures, and optimized algorithms. As an independent and wide-ranging discipline, data engineering operates between fundamental research and practical implementation: on the one hand, it deals with basic questions of efficiency, robustness, and quality assurance; on the other hand, with the concrete realization of scalable systems. Without this foundational work, modern data science and artificial intelligence would hardly be possible.

At the department of computer science at RPTU Kaiserslautern-Landau, several research groups contribute to core research around data science or would benefit from foundational research results as the basis of their own research and applications.

- AG Data Science und ihre Anwendungen (Prof. Vollmer)
- AG Datenbanken und Informationssysteme (Prof. Michel)
- AG Digital Farming (Prof. Dörr)
- AG Maschinelles Lernen (Prof. Kloft and J.-Prof. Fellenz)
- AG Robotersysteme (Prof. Berns und J.-Prof. Wolf)
- AG Scientific Computing (Prof. Gauger)
- AG Sichere Dezentrale Systeme (Prof. Roos)
- AG Software Engineering (Prof. Liggesmeyer)
- AG Softwaretechnik: Programmierung verteilter Systeme (Prof. Bieniusa)
- AG Visuelle Informationsanalyse (Prof. Leitte)
- AG Automated Reasoning (Prof. Lin)

A professorship in data engineering is further expected to foster and substantially contribute to interdisciplinary research projects across RPTU, where data-centric research questions from other fields are supported through expertise in systematic data acquisition and reliable and efficient processing methods. Currently, there are two major research directions – spanning across various research groups, departments, and institutes in and around RPTU – that are expected to grow further in the near future. The professorship in Data Engineering is expected to complement aspects of both.

The **AI, Computing & Society (AICS) initiative** at the Max-Planck-Institute for Software-Systems (MPI-SWS) and RPTU is committed to exploring how artificial intelligence and computing technologies reshape our world - technologically, socially and ethically. It focuses

on questions such as how AI can be developed responsibly and in ways that align with human well-being, fairness and autonomy; how its deployment impacts domains like education, governance and economic equality; and how industry, academia and policy makers can collaborate to steer innovation in a way that is inclusive. A professorship in data engineering is expected to complement this initiative. Given that the success of AI methods vastly depend on large data sets that first need to be collected, processed, curated and analysed, research in data engineering is expected to ensure that the underlying infrastructure and data pipelines are robust, transparent, and ethically designed. In this way, the professorship can be seen as a bridge between raw data infrastructure and the societal/ethical questions the initiative seeks to address.

Autonomics is an interdisciplinary research initiative focused on understanding, developing, and integrating autonomous systems across technical, social, economic, and legal dimensions. It aims to create self-managing, adaptive technologies – such as autonomous production, mobility, and energy systems – while ensuring their safe, trustworthy, and responsible use. By combining expertise from engineering, data science, and system theory with societal perspectives, Autonomics seeks to build a holistic foundation for the autonomous systems of the future. A professorship in data engineering is expected to complement the Autonomics research agenda as autonomous systems depend on high-quality, well-structured, and continuously available data. Data engineering provides the methods and infrastructures needed to collect, process, and manage the complex data flows that power autonomous decision making. Real-time data analytics is embedded into autonomous systems and data engineering is integrated with software and systems engineering to deliver trustworthy and safe functionality. Within Autonomics, this expertise enables reliable data pipelines, scalable architectures, and trustworthy data management and thus contributes to the engineering of safe autonomous systems.

Teaching

The professorship in Data Engineering is expected to enrich teaching in the fields of information systems and software engineering for data management systems by bridging theoretical foundations with practical, data-driven methodologies. Willingness to participate in teaching related core courses of the curriculum of the Bachelor program is assumed. Through expertise in data modeling, pipeline design, and scalable processing architectures, such a professorship equips students with advanced skills to build robust data infrastructures that underpin modern information systems.