UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

Professorship in Verification of Complex Systems

(W3 salary band as defined in the North Rhine-Westphalian regulations for the W salary range)

at the Faculty of Computer Science

Overview

1. The University of Duisburg Essen: Open-Minded

We are a young, innovative university located in the heart of the Ruhr metropolis. We pride ourselves on outstanding research and teaching, think in terms of opportunities rather than limitations and develop ideas with a view to the future. Diversity is an integral part of our culture as we promote potential and are committed to upholding genuine equity in education.

A view of the Duisburg campus. Please find further images at:
https://www.uni-due.de/de/universitaet/impressionen-duisburg.php

Located in the heart of the Ruhr metropolis, the University of Duisburg-Essen (UDE) is one of the youngest and largest universities in Germany. The courses range from the humanities and social sciences via economics and business studies all the way to the engineering sciences and natural sciences (including medicine). The University has also established itself firmly in the international scientific community since being founded in 2003.

This is reflected by the top positions UDE has recently achieved in international rankings. In a comparison of the best universities founded after the turn of the millennium, UDE ranks sixth worldwide. In the Times Higher Education (THE) Young University Ranking, UDE is 18th among the top 200 international universities that are under 50 years old. UDE is also well ahead when it comes to citations of scientific publications: it ranks 15th nationwide and in the top 300 internationally in the THE World University Ranking.

The research carried out at UDE covers a broad spectrum including five interdisciplinary strategic research areas: Nanosciences, Biomedical Sciences, Urban Systems, Transformation of Contemporary Societies and Water Research. Lifelong learning and socialisation processes are another central field of research.

Thanks to innovative and digitally supported teaching and learning concepts, UDE is an attractive location for research-based teaching. Around 40,000 students from over 130 countries are enrolled at UDE in a total of over 250 courses of study, 127 of which include the option to teach in schools.

UDE is considered a paradigm throughout Germany of how equity in education can be implemented at a university with a strong track record in research. Numerous measures and projects are in place to support talented young people and offer them prospects. UDE considers itself a vibrant environment of diversity and openness where students, researchers and staff can realise their potential and willingness to perform. At the same time, we make every effort to ensure our development covers a wide range of areas and is resource-friendly.

In a strategic partnership, UDE is affiliated with Ruhr University Bochum (RUB) and TU Dortmund University. Together, they form the University Alliance Ruhr (UA Ruhr) and collaborate closely in research and teaching. They also have joint liaison offices on two continents. In addition, UDE maintains partnerships with more than 100 universities around the world.

Please find further information at:

- https://www.uni-due.de/en/university/

What we offer as an employer:

Seal of quality from the German Association of University Professors and Lecturers

In August 2014, the University of Duisburg-Essen received the German Association of University Professors and Lecturers' (DHV) seal of quality for the fair and transparent nature of its appointment proceedings.

In August 2017, UDE also successfully underwent the re-audit procedure that takes place after three years and was again awarded the seal of quality for the fair and transparent nature of its appointment proceedings.

Family-friendliness

At UDE, there is a wide variety of services aimed at helping to reconcile work and family. The Family Service Office provides advice regarding very practical matters of childcare and care for relatives. Furthermore, there are various care services on offer including daycare facilities, holiday care and short-term care.

Since 2010, UDE has also successfully taken part in the family-friendly university audit (*audit familiengerechte hochschule*) run by berufundfamilie GmbH. Even after having attained certification as a family-friendly university, UDE continues to consider improving family-friendliness a shared goal of all University members and consistently pursues the self-commitments that result from the audit.

Onboarding and Dual Career Service

The Onboarding team within the Appointment Management Department provide advice for getting started at UDE and can connect you with UDE's consultation services. They also offer the Dual Career Service.

Coaching and further training

The personal further development of its staff members with management responsibilities is of particular importance to UDE. At UDE, it goes without saying that we offer coaching and seminars on leadership development, which are provided both internally and externally. The Personnel Development Department can help identify other suitable tools for enhancing leadership skills.

Promoting good health

As part of UDE's efforts to promote good health, there are numerous opportunities that enable staff to do something for their health and well-being in an active way at or near to the workplace.

Company ticket

The company transport ticket enables inexpensive and environmentally friendly mobility.

2. The Faculty of Computer Science

The newly established Faculty of Computer Science comprises the following departments:

- Core Informatics
- Human-Centered Computing and Cognitive Science
- Software Engineering
- Business Informatics

It has nearly 40 professors. The Faculty of Computer Science places its strategic focus on foundational and topical questions in technology and software-based digitalisation. Its departments bring the following key disciplines together:

a) **Core Informatics:** Solid computer science foundations are the basic prerequisite for software-based innovations, and thus also for digitalisation. In addition to traditional key competencies (such as formal methods, AI basics, networks and distributed systems), core informatics also includes forward-looking topics (e.g., quantum computing and data analytics/science).
b) **Human-Centered Computing and Cognitive Science:** For innovations to be successful, sufficient account must be taken of the interactions between software-based solutions and individuals. This calls for systematically analysing and understanding these interactions and building the resulting insights into the system design process. This involves core capabilities in areas including the foundations of psychology, the design of interactive systems and media as well as the evidence-based user experience analysis.
c) **Software Engineering:** Software-based innovations must be developed and operated systematically. In addition to the traditional core competencies (such as requirements analysis, architecture design, specifications, development and quality assurance), this also requires in particular key aspects associated with digital transformation (e.g. explainability of system behaviour, embedding AI processes, privacy/trust, security, resilience).
d) **Business Informatics:** Software-based innovations result in significant changes in companies, markets and value chains. The interaction between software-based innovations, companies and organisations must be factored in, which requires core competencies in areas including digital business models, digital transformation, the development and implementation of enterprise systems, application management and IT management.

The combination of these four disciplines and their core competencies gives the Faculty of Computer Science at the University of Duisburg-Essen a profile that is unique in Germany.

Research focus areas at the Faculty of Computer Science:

In addition to the fundamentals of computer science, the faculty's general approach to its research focus is to examine the environment – i.e. the context – in which the systems are to be developed. This notably includes interactions with people and other systems as well as their integration into the economic and social framework. The faculty's interdisciplinary

makeup enables it to examine these key aspects as part of its research. To that end, the faculty's research has been grouped into three focus areas:

- Human-Centered Digital Technology
- Software Technology
- Rhine Ruhr Institute of Information Systems

Human-Centered Digital Technology

Considering the widespread nature of digital technologies today, it is clear that they will grow even more ubiquitous in future, becoming people's constant companions in their environment, in the workplace and at home, and even on their bodies. Against this backdrop, the question arises as to how the constant accessibility and impact of digital technologies is reshaping individuals' lives on multiple levels (experience, behaviour, opinions, knowledge, and biological and brain functions) and in many facets.

Today's online technologies in particular are being impacted and expanded by intelligent algorithms in such a way that they can be considered interactions with artificial intelligence. As a general rule, cyber-physical systems are intertwined, increasingly blurring the boundaries between web technologies, interactive intelligent systems and devices. Users are faced with systems that are acting with growing autonomy, evidencing their own agency and controlling users' actions by suggesting certain actions or performing them outright. Research must address these new varieties of human-AI interactions to be able to take people's needs better into account and ensure that control is not transferred entirely to the technological systems. Furthermore, it is already clear today that while technology influences people, people also influence technology. The way Internet technologies such as social media are used defines their further development, and the same applies to the provision (or withholding) of data to be fed into software applications and AI systems. Technology development is thus an emergent effect of a large group of people (consisting of users and developers). In future, even more reciprocity and dynamic interactivity can be expected here. In addition, learning algorithms will also incorporate human behaviour and align themselves with it.

This research focus area brings together researchers from various institutes who bring their psychological and IT expertise to the table. Interdisciplinary synergies are generated by a) joining forces to focus on understanding human behaviours in the online environments described earlier, and b) developing measures and technological solutions that enable people to use the intelligent systems to their advantage. On this basis, the research focus area aims to improve intelligent digital technologies in such a way that they are truly human-centred.

Software Technology

Today, software systems are omnipresent and have permeated virtually all aspects of our lives. In addition, advances in information technology, such as the Internet of Things (IoT) and cloud/edge computing, produce innovative, software-based systems that are being adopted at an unprecedented pace and will influence our daily routines more significantly than ever before.

As the main driver of digitalisation, these technologies are changing the world – the way people work, learn, do business, produce, communicate and travel. These software-based technologies trigger leaps in the evolution of all industries and unlock new ways to use technology that are impacting business models in established industries ever more rapidly and

more intensively, creating new markets and affecting all facets of our lives. They are making software systems possible that were not conceivable or feasible previously (i.e. without the technological innovations available today). These innovative software systems offer immense potential for disruptive, innovative possibilities in automation, new business models and new software-based services. The software systems based on these innovations are the driving force behind the digital transformation.

Engineering such systems (i.e. their scoping, development and operation) poses enormous new challenges for computer science in general and software engineering in particular. That is why research in software technology focuses on the challenges raised by digital transformation itself, including restructuring in industries that have already digitalised most of their operations as well as those that are still in the process of doing so. In these contexts, it is particularly challenging to find the right balance between complexity, security and usability. In addition, software-intensive systems, traditional information systems and embedded systems are merging and continuously adapting their behaviour through the Internet of Things, Data and Services. Such systems are increasingly becoming self-adaptive and using data-based approaches to recognise the need to adapt and choose suitable options for doing so.

The Faculty of Computer Science's Software Technology research focus area is pooled and coordinated at the research organisation paluno – The Ruhr Institute for Software Technology. paluno ranks among Germany's largest software technology research institutes. Twelve professors and more than 100 academic staff members pursue excellent applied and fundamental research here in innovative software systems, digital key technologies, information and system security, human-computer interaction, development methods and tools, and digital education. The institute has a high level of third-party funding. This encompasses fundamental research (German Research Foundation/DFG, EU), application-oriented research (including Federal Ministry of Education and Research/BMBF, EU) and technology transfer projects.

Please find further information about paluno at https://paluno.uni-due.de/en/

Rhine Ruhr Institute of Information Systems

All types of data and media are now stored, transferred and processed in entirely digital form, and all varieties of devices are connected globally. With this transformation completed, information and communication technology has laid the foundations for new technological concepts and applications that have altered every aspect of our lives and will continue to do so. The miniaturisation and enhanced performance of devices together with the unlimited mobility enabled by wireless technologies and economic scaling have enabled entirely new, ubiquitous and multimedia systems and applications.

Particularly the combination of the basic technologies and infrastructures for digitalisation – such as the traditional Internet, which is evolving into an Internet of Things (IoT) – with the substantial advances in areas such as artificial intelligence and big data analytics has led to disruptive technology approaches that are altering the behaviour of companies and other organisations on a long-term basis. While efficiency goals were previously the main factor in process automation and decision-making support, the new technologies are making innovations in processes, products, services and business models feasible. This is resulting in significant changes in companies, markets (with new markets emerging and existing market structures transforming) and value chains. All of this is playing a role in companies' continuous

expansion of the services t hey offer; commercial enterprises in particular are increasingly turning into service providers and platform operators. This research focus area pools research endeavours that explore digitalisation in the service domain. This also includes smart city research projects, which are strongly linked to trade and services. On the one hand, numerous challenges arise in trade and services that are rooted in an urban context (e.g. the last mile problem). On the other, many solutions to urban challenges are service-like in nature (e.g., mobility solutions).

In the search for solutions, it is essential in research to sufficiently consider the inherent software-related artifacts, their integration in a social and organisational context as well as the economic questions that are also a factor. Basically, the research focuses on three key questions: firstly, it explores ways in which selected disruptive technology approaches can be developed and used to generate innovations in service companies. Secondly, it examines how companies can be sure that these innovations contribute to their overall success. The third question deals with understanding their impact on the organisation (internally: acceptance and adoption of the artifacts by the organisation's social actors and structural changes within the organisation as a whole; externally: evolution of the competition structures and value chains). The element linking these research questions is the matter of how technologies – and which ones – can be developed that can make a (positive) impact on organisations. The resulting insights can be used to determine targeted ways to implement these technologies. In this context, organisations may be commercial companies, public sector institutions or NGOs, although in order to tie in with the research focus, the nature of the business activity should be services.

The faculty's current strategic research areas are also related to the study programmes it offers. With our wide range of elective and development options and teaching that offers real-world relevance, our graduates leave us with a solid education and very good perspectives on the job market. In addition, the electives offered as part of our study plan give students a wide range of courses to choose from as a result of the large variety of teaching units.
The Faculty of Computer Science offers an attractive and diverse range of courses that is unique in the region. It comprises a multifaceted full computer science programme with various master's options, first cycle bachelor's and master's programmes in Software Engineering, and the interdisciplinary, consecutive degree programmes Business Information Systems and Applied Cognitive and Media Studies. In addition to the necessary knowledge in core informatics, the scope always also extends to the environment in which the information systems exist and the surroundings – such as technical systems, humans and (business) organisations – with which they interact. We also offer teacher training courses for secondary schools.

3. The Department of Core Informatics

The focus areas of the Department of Core Informatics are the fundamentals of computer science as a prerequisite for software-based innovations and the continuous progress of digitalisation. These include traditional core competencies (such as formal methods, distributed and embedded systems, and artificial intelligence) as well as new ranges of topics for forward-looking developments (e.g. quantum computing and data analytics/science).

Key research fields in the Department of Core Informatics are:

- theoretical computer science and formal methods
- distributed and networked systems
- embedded systems
- artificial intelligence
- computer graphics and visualization
- information systems and data science
- didactics of informatics

The Department of Core Informatics offers the following degree programmes:

- bachelor's and master's in Applied Computer Science
- bachelor's and master's in Computer Science with a teaching option
- master's in Cyber Physical Systems
- master's in Computer Engineering (International Studies in Engineering)

4. Information about the position

University Professor for Verification of Complex Systems (W3 salary level as defined in the North Rhine-Westphalian regulations for the W salary range (*Landesbesoldungsordnung* W))

a) Research

This position is aimed at researchers in the field of Verification of Complex Systems who are distinguished by academic excellence and enjoy visibility both in Germany and internationally. It offers a long-term perspective in an attractive environment that is strong in research. Therefore, for this position, we are seeking a person whose academic track record indicates high scientific potential and innovative capability.

The position is integrated into an outstanding research environment within the Department of Core Informatics at the newly established Faculty of Computer Science, which takes part in numerous research initiatives on the national and international levels. Applicants should document their research excellence and note potential links to existing working groups in the Department of Core Informatics and the Faculty of Computer Science.

We expect the successful candidate to have published papers in leading peer-reviewed venues and have experience in conducting projects for which they have acquired external funding from competitive schemes themself, including fundamental research projects, as appropriate to the advertised position.

Applicants should represent a cutting-edge area in research and teaching. The successful candidate will be distinguished by research excellence and national and international visibility, and will represent a research profile that strengthens the Department of Core Informatics.

b) Teaching

One focus of teaching is in the current bachelor's degree programme in Applied Computer Science, although participation in the faculty's other programmes is expected, particularly the master's in Applied Computer Science and the bachelor's and master's in Software Engineering. The bachelor's and master's degrees in Applied Computer Science are intended to be expanded into wider-ranging computer science degrees in the newly established faculty. A willingness to contribute to the expansion of the degree programmes is expected.

The Faculty of Computer Science places particular emphasis on teaching quality. Therefore, candidates should outline their didactic concepts and, if possible, provide documentation of their teaching skills (results of teacher evaluations, teaching awards or similar).

c) Additional requirements

Acquiring external funding is of particular importance. This includes both public funding (DFG, Federal Ministry of Education and Research/BMBF, EU) and funding from cooperation partners in the private sector. Candidates should have experience in successfully acquiring external funding, preferably from the DFG or equivalent, as appropriate to the position.

The formal requirements are stipulated in Section 36 of the North Rhine-Westphalian Higher Education Act (*Hochschulgesetz NRW*). This act requires candidates to have a university degree and a particular aptitude for research work, as is generally demonstrated by outstanding results in doctoral studies in a relevant field. The successful candidate is also expected to have demonstrated further academic achievements as part of a junior professorship, a habilitation or a role as a research fellow at a higher education institution or at a non-university research institution or through research work in industry, administration or another public sector field in Germany or abroad.

d) Scope and time commitment of the activities associated with this position

The advertised professorship is a full-time position. As stipulated in the legal regulations, it includes nine hours of teaching per week. These are to be conducted mainly in the bachelor's and master's programmes in Applied Computer Science as well as in the faculty's other degree programmes.

In addition, appropriate involvement in academic self-governance at the department and faculty levels is expected.

e) Information about resources to be offered

The advertised professorship includes resources appropriate to the salary band. Details regarding these resources will be determined during the appointment negotiations.

5. Legal framework

Universities are state-funded bodies under public law with legal capacity. State funding is based on the university's tasks, the obligations agreed upon in university contracts and the university's performance. They have a global budget and are not subject to individual instructions from the Ministry for Culture and Science of the state of North Rhine-Westphalia.

If the legal requirements are met, professors are appointed as permanent civil servants as a rule. Professors can also be appointed on the basis of an employment contract under private law.

When awarding a junior professorship, it is to be noted that individuals who already meet the hiring requirements for a university professorship due to having completed a habilitation or another reason cannot be considered.

Further information (in German):

- Contacts
  www.uni-due.de/verwaltung/organisation/peo_professoren.php
- Regulations on the appointment proceedings
  www.uni-due.de/imperia/md/content/zentralverwaltung/formulare/berufungsordnung.pdf
- Information on the appointment and hiring process
  www.uni-due.de/verwaltung/berufungsmanagement/

6. Salary

The salary of university teaching staff is stipulated by the North Rhine-Westphalian system for the remuneration of civil servants. These staff members fall under the W salary range, which contains the bands W1, W2 and W3.

Basic salaries can be supplemented with (performance) bonuses in bands W2 and W3. These performance-based salary components can be awarded

- as a result of appointment and retention negotiations (appointment and retention bonuses),
- for special achievements in research, teaching, art, further education and supporting early career researchers (special achievement bonuses), and
- for assuming functional or special responsibilities as part of the University's self-governance or University management (functional bonuses).

In certain circumstances, so-called teaching and research bonuses may be paid from private third-party funds.

During appointment and retention negotiations, performance bonuses can also be agreed for a fixed period of time if they are linked to target and performance agreements.

Appointment bonuses are to be negotiated on an individual basis with the Rector of the University of Duisburg-Essen as part of appointment negotiations.

Please find a table showing the current remuneration (in North Rhine-Westphalia) for the salary bands W1, W2 and W3 at:

- www.finanzverwaltung.nrw.de/dienststellen/landesamt-fur-besoldung-und-versorgung-nrw/besoldungstabellen-fuer-beamtinnen-und-beamte

You can find information on the W salary range (in North Rhine-Westphalia) and the legal foundations for it on the following webpages (in German):

- www.uni-due.de/verwaltung/organisation/peo_links.php
- www.hochschulverband.de/leistungen/wiss-nachwuchs/faq-karriere/besoldung

Further information (in German) can be found in the regulations on awarding performance-related bonuses:

- www.uni-due.de/imperia/md/content/zentralverwaltung/bereinigte_sammlung/3-60_jan22.pdf