PhD Design and Implement Security Protocols for Blockchains, Delft University of Technology, Netherlands.

Department/faculty: Faculty Electrical Engineering, Mathematics and Computer Science

Level: University Graduate

Working hours: 38-40 hours weekly

Contract: 4 years

Salary: 2325 - 2972 euros monthly (full-time basis)

Faculty Electrical Engineering, Mathematics and Computer Science

The Faculty of Electrical Engineering, Mathematics and Computer Science (EEMCS) is known worldwide for its high academic quality and the social relevance of its research programmes. The faculty’s excellent facilities accentuate its international position in teaching and research. Within this interdisciplinary and international setting the faculty employs more than 1100 employees, including about 400 graduate students and about 2100 students. Together they work on a broad range of technical innovations in the fields of sustainable energy, telecommunications, microelectronics, embedded systems, computer and software engineering, interactive multimedia and applied mathematics.

The Software Engineering Research Group (SERG) is part of the department of Software Technology, faculty of Electrical Engineering, Mathematics, and Computer Science, and a member of the research school IPA. The group employs approximately 30 people, comprising full, associate, and assistant professors, lecturers, postdocs, and PhD students. The main research areas for the group include but are not limited to software analytics, software testing, software quality and maintenance, software evolution and search-based software engineering. The involved researchers have developed numerous techniques to make it easier for software developers to (1) understand, (2) maintain and (3) test existing software systems.

The Distributed Systems (DS) group is one of the sections of the Department of Software Technology (ST) of the Faculty Electrical Engineering, Mathematics, and Computer Science (EEMCS) of Delft University of Technology. The mission of the DS group is to model, design, implement, and analyze distributed systems and algorithms. Its research is fundamental, aimed at the development and evaluation of new generic concepts in systems software, and application-driven, motivated by important application areas, such as e-science, online games, graph processing, and online social networks. Much of it is experimental, validating the proposed new concepts by means of implementation and deployment in prototypes that are used in the real world. The three research areas of the DS group are scheduling in distributed computing systems, big data processing, and cooperative systems (with a strong focus on blockchain technology). The DS group leads the Delft Blockchain Lab, TU Delft’s multi-disciplinary initiative for research, education, and training in blockchain technology and trust in the internet.
Located in a charming college town, TU Delft is the largest and oldest public technological university in the Netherlands. The university is regularly ranked among the most highly-rated worldwide for engineering and technology. Information about academic careers in the Netherlands and working at TU Delft can be found at factcards.nl and tudelft.nl/en/about-tu-delft/working-at-tu-delft/coming-to-the-netherlands-tu-delft.

**Job description**

Delft University of Technology participates in the University Blockchain Research Initiative, a new program founded by Ripple to support academic research, technical development, and innovation in blockchains, cryptocurrency, and digital payments. More information about the initiative is available at the following link: ubri.ripple.com.

Goals of this collaboration are to design and implement security protocols for blockchains as well as developing effective and efficient solutions for testing and verification. In the first phase of the collaboration, we are hiring two Ph.D. students, who will be daily supervised by experts in both Software Engineering and Distributed Systems.

The two PhD positions will focus on the following research areas:

1. **AI-based Software Testing.**

   The development, maintenance, and testing of blockchains involve many activities that are complex, expensive and error-prone. In this project, we aim to automate testing activities by leveraging artificial intelligence algorithms (e.g., by using search-based and machine learning algorithms). The goal is, for example, to assess the implementation of the consensus algorithms or testing blockchain applications against security attacks (e.g., double-spending attacks).

   **Background:** Software Testing, Optimization Search Algorithms, Blockchain (optional)

   **Supervisors:** Annibale Panichella, Arie van Deursen

   **More information:** apanichella.github.io, se.ewi.tudelft.nl/sbse.html

2. **Real-World Blockchain Scalability and Security.**

   Theoretical models and actual networks differ in a number of points. In this project, we aim to measure Ripple how is used in the wild. Based on these results, we want to develop more suitable algorithms. Potential examples include improved consensus algorithms, improved scalability, and designing privacy-preserving protocols.

   **Background:** Distributed Systems, Network Security, Blockchain
Supervisors: Stefanie Roos, Dick Epema

More information: tudelft.nl/delft-blockchain-lab, ds..ewi.tudelft.nl

While the two PhD positions focus on two different areas, the candidates will collaborate closely. Besides, we expect the candidates to spend some time working at Ripple offices for deploying the developed solutions.

Requirements

- An excellent master's degree (or equivalent) in computer science, with a strong interest in at least one of the following areas: Software Testing, Distributed Systems, Network Security, Optimization and Artificial Intelligence. Experience with Blockchain is not mandatory but it is highly beneficial

- Strong programming skills are required, preferably in C and/or C++

- Good communication and presentation skills in English

- Ability to work in a team and a strong commitment to research.

Conditions of employment

TU Delft offers a customisable compensation package, a discount for health insurance and sport memberships, and a monthly work costs contribution. Flexible work schedules can be arranged. An International Children’s Centre offers childcare and an international primary school. Dual Career Services offers support to accompanying partners. Salary and benefits are in accordance with the Collective Labour Agreement for Dutch Universities.

As a PhD candidate you will be enrolled in the TU Delft Graduate School. TU Delft Graduate School provides an inspiring research environment; an excellent team of supervisors, academic staff and a mentor; and a Doctoral Education Programme aimed at developing your transferable, discipline-related and research skills. Please visit tudelft.nl/phd for more information.

Information and application

For information about this vacancy, you can contact:

Annibale Panichella, assistant professor in Software Engineering, a.panichella@tudelft.nl
Stefanie Roos, assistant professor in Distributed Systems, s.roos@tudelft.nl
To apply, please e-mail a detailed CV (with contact information of two referees) along with a letter of motivation, a detailed transcript of university grades, and proof of English proficiency. If applicable, please also attach a (draft) version of your Master thesis.

Please send your application material before February 28th to: hr-eemcs@tudelft.nl. When applying for this position, please refer to vacancy number EWI2019-03.

Dr.ir. C.A. Reijenga

Hr-Adviser

email: hr-eemcs@tudelft.nl