

## **PhD vacancy at CWI, Amsterdam**

### **Dissertation topic: RARE EVENTS IN STOCHASTIC NETWORKS WITH INTERACTING LAYERS**

The **NWO-VICI project** *Rare Events: asymptotics, algorithms, applications* which is active since September 2015 aims to analyze rare events in man-made systems. While being mathematical in nature, the research program is inspired by (and aspires to make impact on) current and future needs in applications, and therefore also has a strong algorithmic component. The project is to be carried out within the CWI Stochastics group. Within the VICI project, two PhD students and two postdocs are currently active.

### **One additional PhD student will be hired at the end of the summer or early fall 2016.**

The successful candidate will focus on cutting edge research under outstanding working conditions. There are no teaching requirements, though teaching opportunities can be created. There are extensive opportunities for travel and collaboration (both nationally and internationally). The PI (Bert Zwart) will be the daily supervisor; the project will be carried out in collaboration with colleagues (Onno Boxma and Maria Vlasidou) from Eindhoven University of Technology – that university will award the PhD degree.

PhD students in the Netherlands are considered regular employees, receive a salary, and build pension rights. Salaries are competitive as foreign candidates may qualify for special tax benefits.

A suitable candidate is talented, ambitious, highly motivated, and proficient in reading and writing mathematical papers in English.

### **PROJECT DESCRIPTION**

Our modern society depends critically on the proper functioning of a variety of infrastructures which transport traffic, energy or information. These networks do not operate in isolation, but are closely coupled. Therefore, being able to ensure their resilience is of utmost importance. However, currently the interdependencies between various critical infrastructures are not well-known nor fully understood, which considerably complicates analysis of the vulnerabilities and their risk management.

Inspired by this, we examine stochastic networks and queues that consist of multiple layers. The goal is to develop probabilistic techniques to gain an understanding in the way rare events in a given layer of the network occur: is this due to an event in the same layer, or are other layers involved as well? Developing an understanding of these phenomena can lead to more robust network design and management.

The above examples require the development of new models, but existing problems also exist. For example, machines that serve jobs may not only break down, but their repair time may also grow large by a disruption in the maintenance supply chain. The question is then which cause of delay is most significant to the end user.

## **FORMAL REQUIREMENTS**

A Master's degree in Mathematics or Econometrics/Operations Research. Candidates with a master in Computer Science or Electrical Engineering or other related fields with outstanding mathematical skills are also encouraged to apply. A strong background in probabilistic modeling and analysis is crucial.

## **APPLICATION PROCEDURE**

The position will be open until April 1 2016, and thereafter until filled. Applications and inquiries for information should be directed to the PI of this project, prof. dr. Bert Zwart (bertz "at" cwi.nl).

## **ABOUT CWI**

Centrum Wiskunde & Informatica (CWI) is the Dutch national research institute for mathematics and computer science and linked to the Netherlands Organization for Scientific Research (NWO). The mission of CWI is to conduct pioneering research in mathematics and computer science, generating new knowledge in these fields and conveying it to trade, industry, and society at large.

CWI is an internationally oriented institute, with 160 scientists from more than 25 countries. The facilities are first-rate and include excellent IT support, career planning, training, and courses. CWI is located at Science Park Amsterdam that is presently developing into a major location of research in the sciences in The Netherlands, housing the sciences of the University of Amsterdam and of the Vrije Universiteit as well as several other national research institutes next to CWI.

For more information, visit: [www.cwi.nl](http://www.cwi.nl)