

Centrum Wiskunde & Informatica (CWI) has a vacancy in the Stochastics and Intelligent and Autonomous Systems research groups for a talented

PhD student,

on the subject of **Planning and Optimization of Production Systems.**

Job/project description

This PhD research project is part of a public-private partnership between Centrum Wiskunde & Informatica (CWI) and Engie, a large technology company. With smart innovative technical solutions, integrated sustainable area development, energy-efficient smart building solutions, and reliable generation and supply of green energy, Engie responds in a responsible manner to social developments and current themes in work and living environment.

Research topic

The topic of interest concerns a modern industrial plant producing a large variety of composite biomaterials which are manufactured by combining and processing a substantial number of ingredients. Incoming orders are processed in real time and slotted into a production schedule in order to meet the required delivery deadline. The scheduling problem is complicated because of numerous constraints, chief among them the availability of production lines and the limited storage capacity for intermediate or finished products. Additional scheduling restrictions are imposed by the need to avoid contamination between product runs. Solving this complicated scheduling problem currently requires comprehensive manual intervention by experienced planning experts. As a consequence, it is labor-intensive and lacks flexibility.

The above-described operational reality is increasingly perceived as unsatisfactory. For one thing, since working out a (near-optimal) schedule is such a laborious and time-consuming process, planners tend to be weary of adapting the schedule on-the-fly to address changing circumstances or take advantage of new opportunities.

The **goal of this project** is to develop new algorithms to tackle the dynamic scheduling problem outlined above. Of particular interest is the robustness of the proposed scheduling strategies under unplanned disturbances such as machine-downtime or the arrival of urgent new orders that need to be processed without delay.

Although this scheduling problem is linked to a concrete industrial installation, it can be seen as prototypical of a new class of challenges gaining prominence in the context of "Smart Industry". These problems are characterized by the availability of large amounts of real-time data quantifying nearly all aspects of the production and logistics process, the need to incorporate numerous, and often heterogeneous, constraints, and the requirement to enable on-the-fly flexibility.

The successful applicant is expected to address the concrete problems as specified by Engie while striving to make the results sufficiently generic and extensible to facilitate their applicability to other situations.

Job requirements

PhD students are required to have a Master of Science (M.Sc.) degree in areas like Operations Research, mathematics or engineering. The candidate has a solid background in optimization or planning, and is interested in working on challenging real-life applications. Candidates are expected to have an excellent command of English, and experience in academic writing and presentation.

Terms and conditions PhD Student

The terms of employment are in accordance with the Dutch Collective Labour Agreement for Research Centres ("CAO-onderzoeksinstellingen"). The initial labour agreement will be for a period of 18 months. After a positive evaluation, the agreement will be extended by 30 months. The gross monthly salary, for a PhD student on a full time basis, is €2,346 during the first year and increases to €3,007 over the four year period.

Employees are also entitled to a holiday allowance of 8% of the gross annual salary and a year-end bonus of 8.33%. CWI offers attractive working conditions, including flexible scheduling and help with housing for expat employees.

The candidate's main affiliation will be CWI in Amsterdam, but the candidate will also spend 1 or 2 days per week at the Engie premises in Zaandam (close to Amsterdam), in order to facilitate the collaboration with Engie. The PhD-project will have a duration of four. Please visit our website for more information about our terms of employment: www.cwi.nl/terms-of-employment.

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Application

Applications can be sent before 15 March 2019 to apply@cwi.nl. All applications should include a detailed resume, motivation letter, list of your MSc courses and grades, copy of your Master's thesis and preferably a list of publications.

For more information about the project, please contact Prof.dr. Rob van der Mei, E-mail "mei@cwi.nl".

For more information about CWI, please visit www.cwi.nl or [watch our video about working at CWI](#).

About Centrum Wiskunde & Informatica

Centrum Wiskunde & Informatica (CWI) is the Dutch national research institute for mathematics and computer science and is part of the [Institutes Organisation](#) of [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 approximately 27 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 natural 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.

Research group

Within CWI, both the Stochastics research group and the Intelligent and Autonomous Systems research group are involved. The PhD student will be formally embedded in the Stochastics group. Please check out our website for more information about our Stochastics

<https://www.cwi.nl/research/groups/stochastics>) and Intelligent and Autonomous Systems

<https://www.cwi.nl/research/groups/intelligent-and-autonomous-systems>) research groups