FACULTY OF ENGINEERING AND ARCHITECTURE

DEPARTMENT OF INFORMATION TECHNOLOGY
PHOTONICS RESEARCH GROUP
SURROGATE MODELING GROUP

Two PhD Positions as part of the research project: "Machine Learning and Design Techniques for Tolerant Photonic Circuits"

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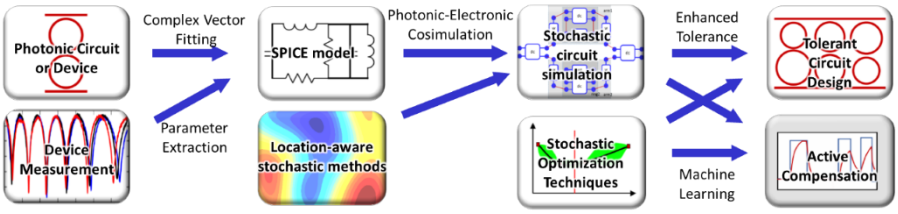
Opening new horizons

We are looking for two PhD candidates to develop a new class of circuit simulation models for large and complex photonic circuits, that will enable first-time-right design and high yield of circuits that are tolerant to fabrication variations.

Context

Photonic integrated circuits (and especially silicon photonics) are becoming increasingly complex, as fabrication technology is steadily becoming more mature. However, current state-of-the-art design tools are not matching this. In particular, it is very difficult to simulate the photonic circuits in an accurate way, especially when using signals on many optical wavelengths. This is complicated by the effect of fabrication variations, which must be taken into account at the time of design, so it becomes possible to estimate the yield and create a tolerant circuit.

In the new project MALEPHICENT, fully funded by the Flemish Research Foundation (FWO-Vlaanderen), we combine the expertise of the *Photonics Research Group* (PRG) and the *Surrogate Modeling Group* (SUMO) to build a new class of photonic models that are efficient and at the same time respect the physical constraints of photonic circuits. We will use advanced machine learning techniques to build such models from simulations and experimental data. These models can be extended to incorporate variability. We will test these models by designing more tolerant photonic circuits and fabricate them in a silicon photonics platform for experimental verification.



Job description

As a PhD student, you will be engaged in the process flow from theoretical derivation of the core modelling principles, over simulation, circuit design to experimental verification through measurements. You will be part of the two research groups (one position with a primary supervisor in the PRG and one in the SUMO).

Over the course of 4 years, you will develop your research methodologies in line with the objectives of the MALEPHICENT project. You will also be interacting with colleagues in both research groups, which could lead to contributions to other research projects. As part of Ghent University, you will also support the research group with limited education tasks.

Profile

We are looking for candidates with a M.Sc. degree in electrical engineering, with a strong interest in mathematical and numerical methods. Good programming skills are definitely a strong point (the core language used is Python).

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A basic background in photonics is definitely useful, but there will be ample opportunity to acquire this on the job in the first year of the PhD. During the PhD, the students will have the opportunity to familiarize themselves with the overall technologies behind silicon photonics (note that this research will not involve much hands-on processing or clean-room work), photonics design and advanced modelling and machine learning techniques.

Requirements

- M.Sc. degree in Engineering, preferably Electrical Engineering.
- Strong analytical skills for designing and implementing abstract models and algorithms.
- Strong interest in Photonics.
- Good programming skills.
- You can work independently, have a strong feeling of responsibility and are able to commit to timing and milestones set forward by the research project.
- You are a team player and have strong communication skills.
- A good knowledge of English (oral and written) is a must. Any knowledge of Dutch (oral) is a plus.
- This PhD position is available immediately and is open until the vacancy is filled. The position is not open for post-docs.

About the Photonics Research Group (PRG)

The Photonics Research Group at Ghent University develops optical chips for a diverse range of applications, from telecom/datacom over sensing to medical devices. The group with 9 professors and >70 researchers is also an associated lab of the IMEC nanotechnology center in Belgium. The group is considered a leader in the field of silicon photonics, demonstrated by its high-impact publications and multiple spin-off companies.
Within the PRG, the Team of prof. Wim Bogaerts focuses on the challenges to realise next-generation large-scale photonic circuits, and especially new type of programmable photonic circuits. This research is in part supported by the consolidator grant PhotonicSWARM of the European Research Council.

About the Surrogate Modeling Group (SUMO)

The Surrogate Modeling Group is part of the Department of Information Technology of Ghent University, and is also associated with the Interuniversity Microelectronics Center (IMEC) in Belgium. It is an internationally recognized group in the field of data-efficient modeling and machine learning for complex engineering applications. Academic and business partners worldwide have successfully used the software tools developed by the SUMO.
Within the group, dr. Domenico Spina focuses on developing innovative technique for the design and analysis of high-frequency (including microwave and photonic) circuits and systems based on a combination of statistical modeling and machine learning.

Application

Use the online form: http://photonics.intec.ugent.be/contact/vacancies/Application.htm

More information

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