PhD Positions with Full Scholarships

The University of Sydney is one of the top universities in the world and ranked in the 19th place globally according to the QS World University Rankings 2024. Application procedures can be found at https://www.sydney.edu.au/engineering/study/postgraduate-research.html. We have now several PhD positions with **full scholarships** available for the EUV Nanometrology Lab in School of Electrical & Computer Engineering. Master students or visiting scholars who are interested in our projects are also welcome to join our lab!

Project 1: Scan control for EUV Nanometrology systems

Supervisor: Assoc. Prof. F. Shu (Steve), feng.shu@sydney.edu.au

Research area:
Metrology, Coherent Diffraction Imaging, Ptychography, Nanophotonics, Precision Engineering

Project description:
The last few years has witnessed the successful commercialization of the extreme ultra-violet (EUV) photolithography technology, enabling mass-production of smaller and more powerful microchips with intricate structures and features. Meanwhile, EUV-based metrology has recently emerged as one of the most promising technologies to tackle the metrology challenges imposed by the next generation nano- and quantum devices, as well as the ever-increasing characterization needs in areas of material science, biological analysis, medicine and so on. Recent progresses have shown that EUV nanometrology exhibits unique advantages and can fill many current nanometrology gaps. This project aims to set up a table-top EUV nanometrology research system using a femtosecond laser and a high harmonic generator (HHG) - based EUV source module and an imaging chamber with increased scan efficiency and throughput.

Requirements:

- Major in optoelectronics, applied physics, photonics, electrical and electronic engineering, mechatronics, computer engineering and related disciplines;
- Excellent hands-on skills in optoelectronic experiments
- Excellent programming skills e.g., MATLAB, Python, or C++
- Good English communication skills;
- Good at teamwork and collaboration.

Contact:
If you are interested, please email feng.shu@sydney.edu.au with your resume attached, to discuss your suitability for this project.

Project 2: Efficient algorithm design for phase retrieval in ptychographic nanometrology

Supervisor:
Assoc. Prof. F. Shu (Steve), feng.shu@sydney.edu.au

Research area:
Phase Retrieval Algorithms, Coherent Diffraction Imaging, Machine Learning

Project description:
Phase retrieval is the process of algorithmically finding solutions to the phase problem, and is a key component of an extreme ultra-violet (EUV) ptychographic system which is an important type of coherent diffraction imaging (CDI). In such systems, the intensity of the diffraction pattern scattered from a target is measured. The phase of the diffraction pattern is then obtained using phase retrieval algorithms and an image of the sample is constructed. This project aims to boost the efficiency of existing phase retrieval algorithms by using various techniques including machine learning, to pave the way for EUV ptychography to become a mainstream nanometrology approach.

Requirements:
- Major in applied physics or mathematics, computer engineering, electrical and electronic engineering, optoelectronics and related disciplines;
- Excellent at mathematical and analytical skills
- Excellent programming skills e.g., C++/CUDA, Verilog or Python
- Good English communication skills;
- Good at teamwork and collaboration.

Contact:
If you are interested, please email feng.shu@sydney.edu.au with your resume attached, to discuss your suitability for this project.