

Project: *[TRUE_QPI] High spatio-temporal throughput truly 2D/3D quantitative phase imaging at single-cell level*

Principal Investigator: prof. Małgorzata Kujawińska

Position in the Project: PhD student

Institution: Institute of Micromechanics and Photonics, Faculty of Mechatronics, Warsaw University of Technology

Requirements:

1. Master's degree in Physics, Engineering, Optics, Computer Science or Biomedicine. Enrollment to the Doctoral School of WUT.
2. Very good knowledge of Matlab and/or Python environments. Algorithmic background in optical information processing.
3. Experience in AI based algorithms applied to optical metrology
4. Fluent spoken and written English.
5. Strong motivation and passion for scientific work (theoretical, numerical and experimental) both independently and as part of a team in an interdisciplinary environment, with the ability to creatively propose solutions to problems at hand, pay close attention to detail and to meet deadlines.
6. Very good social skills.
7. Experience in dissemination of research results to the scientific community and establishing/participating in international cooperation are welcome.

General description of the project:

TRUE_QPI has the main objective to take the quantitative phase imaging QPI (label-free microscopy) development beyond the state of the art by adding multiscale and correlative functionalities combined with fully metrological validation of the results in biomedical applications at cellular level. TRUE_QPI focuses on establishing new fundamental theories, optoelectronic systems, and reconstruction algorithms for realizing label-free, high-throughput, high-resolution, interferometric, and non-interferometric QPI in 2D and 3D (tomography). Through altering the coherence of the multiplexed illumination and devising novel computational imaging algorithms we will gain experimentally and numerically driven phase signal-to-noise-ratio improvement and break the space-time bandwidth product limit of microscopic systems.

In TRUE_QPI we plan: (1) developing high-precision 2D QPI methods for high-contrast phase imaging of transparent unlabelled live cells based on low-coherence common-path holographic microscopy (CPHM) and non-interferometric Fourier ptychographic microscopy (FPM); (2) improving the throughput of 2D QPI methods for label-free, high-resolution, large field-of-view CPHM/FPM imaging; (3) studying 3D QPI realized in interferometric (holographic) and non-interferometric (3D FPM) coding, understanding fundamental links between ptychographic and tomographic 3D reconstructions, advancing them through novel algorithmic solutions and proposing completely new optical microscope for correlative phase tomography and ptychography – the ShengScope; (4) performing 2D/3D biomedical imaging and measurements conducted with bio-partners which will provide a new insight into neurobiology and cancer research. PhD student to be recruited is expected to assist in all 4 tasks. The research backgrounds of WUT and NJUST are highly complementary, which inspires us to combine the strengths of both interferometric (WUT) and non-interferometric (NJUST) based optical diffraction tomography techniques to propose an innovative 3D label-free microscopy method with novel metrological figure of merit. Hence, the main impact of the research is expected to ensure the theoretical foundation and technical support for the next generation of metrologically-valid non-invasive high-contrast 2D/3D single-cell analysis enabling life scientists to efficiently study large unimpaired populations with subcellular details and easy sample preparation.

A successful dissemination of results to the scientific community is expected. Moreover, PhD students will co-supervise Master students.

What we offer:

1. Scholarship contract and competitive remuneration package.
2. Work in dynamic and competent scientific group with excellent research environment and international cooperation promoting publications in high impact journals.
3. Financial support for abroad scientific visits and attending conferences.
4. Encouragement and support in preparing grant applications and general career development.

Type of NCN Project: SHENG – ST.

Application deadline: 20.01.2025, 23:59. Results available on 24.01.2025.

Please submit the following documents to: malgorzata.kujawska@pw.edu.pl

Conditions of employment:

PhD scholarship: 3500 PLN/month, stipend contract for 12 months.

Preferred time of starting position: 1st February 2025.

Additional information required:

To apply, please send your application, including motivation letter, CV with the list of your publications and achievements, Master degree thesis alongside with contact information to the scientific supervisor and other referees (if available) to the following e-mail address: malgorzata.kujawska@pw.edu.pl (deadline 20.01.2025). Incomplete applications will not be considered.

We thank all applicants for their interest; however, only selected candidates may be invited for an interview. Applications will be accepted until the position is filled. If the winner of the competition resigns from signing the contract, we reserve the right to choose the next best person from the ranking list.

Due to the entry into force of Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016, all candidates are requested to provide consent to the processing of his or her personal data by the institution which carries out the recruitment process.

Thus, please include in your application the following statement: "I hereby agree to the processing of my data included in the application documents by Warsaw University of Technology, Warsaw, Poland, to carry out the recruitment process."

Your personal data is processed on the basis of the Article 6 Part 1 Points (c) and (f) of the Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (GDPR; Official Journal of the European Union L 119/1).