Quantitative Computational Imaging LAB

CALL FOR POSTDOCTORAL RESEARCHER

Starting Grants

ERC StG project:
[NaNoLens] Lensless label-free nanoscopy

Project Principal Investigator:
PhD DSc Maciej Trusiak, WUT professor, Head of the Quantitative Computational Imaging QCI LAB at Institute of Micromechanics and Photonics
https://qcilab.mchtr.pw.edu.pl/

Position in the Project: Postdoc in ERC project in Warsaw University of Technology WUT
Institution: Photonics Engineering Division, Institute of Micromechanics and Photonics, Faculty of Mechatronics WUT
Number of positions: 1

Warsaw University of Technology

About the QCI LAB: Quantitative Computational Imaging Lab is a part of the Institute of Micromechanics and Photonics (Photonics Engineering Division) and operates in the Faculty of Mechatronics at Warsaw University of Technology. Our goal in the QCI lab is to create new computational imaging frameworks merging developments in numerical reconstruction algorithms and experimental optical setups. Our main research line concerns optical microscopy advancements – we strive to provide technological means for deeper, faster, and more robust label-free imaging with extremely high signal-to-noise ratio and space-time-bandwidth product. We focus on coherent (interferometry, holography) and incoherent (Fourier ptychography, differential phase contrast, phase from intensity) imaging techniques and pay special attention to quantitative nature of optical measurements providing efficient new tools for non-invasive bioimaging and precise diagnosis. We are proud to cooperate with world-class research groups in University of Valencia (prof. Vicente Micó lab), The Arctic University of Norway, Tromsø (prof. Balpreet Ahluwalia lab) and Nanjing University of Science and Technology (prof. Chao Zuo lab).

What we offer:

1. Work in dynamic and competent scientific group (QCI LAB https://qcilab.mchtr.pw.edu.pl/) with excellent research environment and international cooperation promoting publications in high impact journals.
2. Contract for 12-24-32 months with base salary of 3000 Euro gross per month.
3. Financial support of abroad scientific visits and attending conferences.
4. Budget for laboratory and office purchases.
5. Encouragement and support in preparing grant applications and engaging in personal development.
6. Work life balance in terms of, e.g., flexible working hours, friendly atmosphere, WUT benefits (social bonuses for holidays and sport/cultural activities etc.).

Key tasks and responsibilities:

1. Conduct excellent research at the intersection of computational methods, imaging techniques and the life sciences.
2. Engage in collaborations with partners at WUT, in Warsaw/Poland and internationally.
3. Publish scientific results in top-notch optics, photonics and bioimaging journals.
4. Present excellent work at international conferences and events.
5. Work with QCI team in WUT (+ Warsaw based collaborators) environment of photonics/optical researchers and engineers and biomedical experts, and make impact on the path to increase visibility and quality of scientific outcomes.

Requirements:

1. PhD degree in, e.g., Optics, Physics, Biology, Computer Sciences, Engineering or other related and relevant fields.
2. Experience in devising new imaging methods, implementing new optical setups and applying them to study biomedical samples, and publishing results as a lead author.
3. Experience with Matlab (and/or Python), LabVIEW and other scientific programming environments.
4. Algorithmic background in image processing. Experience in signal/image analysis methods.
5. Fluent spoken and written English.
6. 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.
7. Very good social skills.

General description of the NaNoLens project:

Optical nanoscopy has changed the “seeing is believing” paradigm. This was achieved within a limited field of view (FOV~100μm2) and required fluorescent markers. Large-FOV high-throughput live unimpaired cell imaging is crucial for biology and biomedicine. Hence, improving the space bandwidth product (SBP) using time-consuming scanning stitching is not a good solution. Lensless holographic microscopy (LHM) inherently bypasses FOV limitations by using full sensor-size hologram reconstruction for label-free object information retrieval. Its major limitation, not yet addressed, is its low lateral (~1μm) and axial (~3μm) resolution. We will overcome this fundamental problem by pioneering deep UV (DUV) lensless holotomographic nanoscopy (LHN) as a simple and compact device easily operated inside the cell chamber or outside the laboratory (in contrast to lens-based systems). Owing to DNA damage, DUV is used to sterilize and never image bio-samples. This paradigm will be shifted to provide a breakthrough 10 giga pixel SBP via a low-dose DUV optical elements-free (no cost, no radiation loss) lensless setup with a worlds-first full-angle tomographic scenario, numerical aperture > 1, and a new class of reconstruction algorithms to decrease the effective pixel (to 100 nm) and remove background noise. We will use LHN to enable the discovery of a new mechanistic understanding of extracellular vesicles expression and intake within large live cell cultures with single-vesicle resolution. EVs, nanosized lipid spheres released by virtually every cell type, are currently emerging as novel disease biomarkers and drug nanovehicles. LHN is a new research field that inherently makes this a high-risk project, but the potential gains are also high as a new era of simple ultrahigh SBP nanoimaging might be opened. This multidisciplinary project calls for near-unique expertise in computational microscopy and digital holography and cooperation with international leaders.

The NaNoLens project team members include three PhDs and two postdocs. They will collaborate closely in special holographic lab, and team up with institutional (WUT), national, and international experts. Postdoc, we are looking for, (working with and co-supervising two PhD students) will closely collaborate with current Quantitative Computational Imaging (QCI) group at WUT skilled in numerical and experimental aspects of holographic microscopy. Cooperation with international network of experts (including prof. Vicente Micó from University of Valencia and prof. Balpreet Ahluwalia from University of Tromsø) will be crucial for postdoc to master coherent and incoherent resolution enhancement strategies. Postdoc will have an exciting goal - making the novel 2D lensless nanoscope work.

Please submit the following documents (and any questions) to: maciej.trusiak@pw.edu.pl

Conditions of employment:
Total income from the project offered to the PhD candidate: 3000 Euro gross work contract.
Position starting time: open to negotiations

Additional information required:
Motivation letter (in English).
CV (in English).
PhD thesis.
Contact details of the scientific supervisor and other referees (if available).

To apply, please send your application to the following e-mail address: maciej.trusiak@pw.edu.pl.

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).

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