


Hosting offers

for

Marie Skłodowska-Curie Actions Postdocotral Fellowships
at the Institute of Fundamental Technological Reseach,
Polish Academy of Sciences (IPPT PAN)

Call: 2025

evaluation panels

ENG, PHY

Michał Byra

keywords:

biomedical image analysis

deep learning

implicit neural representations

computational medical imaging

quantitative ultrasound

Potential project topics

Our research focuses on advancing neural networks and computational techniques for biomedical image analysis. We work mostly with ultrasound, microscopy, and magnetic resonance images. In addition, we explore interdisciplinary approaches that bridge applied mathematics, computational modeling and AI-driven approaches.

We welcome proposals in line with the following topics:

- deep learning for biomedical image analysis,
- physics-guided implicit neural networks in medical imaging,
- computational methods for ultrasound imaging (e.g., image reconstruction),
- explainable AI and robust machine learning.

evaluation panels

ENG, PHY

Piotr Chudziński

keywords:

strongly correlated systems

low dimensional materials

topological materials

Potential project topics

I am working in the field of low dimensional materials, studying their potential exotic orderings and electronic properties such as transport coefficients (both in and out-of-equilibrium). Specific materials of my interest are charge/spin density waves materials (including those that host superconductivity), topological insulators, columnar tri-halcogenides, stepped surfaces and nanotubes, but I am not limited to those and can consider working also on e.g. cold atoms' settings. Potential applications of these systems are in nano-electronics, nano-optics and novel platforms for quantum computing. I encourage applications from researchers who would like to develop their knowledge in some of the above-mentioned fields. Naturally, specific research programme can be tailored in order to fit best particular interests of the applicant.

evaluation panels

ENG

keywords:

molecular dynamics

MEMS and NEMS

composite materials

mechanical modeling

analytical analysis

structures

Hossein Darban

Potential project topics

The proposed project welcomes topics suggested by the applicant, provided they are aligned with my expertise. I have experience in the mechanical modeling of materials and structures, encompassing composites, MEMS, and NEMS, across a range of scales from macro to micro, and down to nano levels. My methodology includes the use of numerical methods such as Molecular Dynamics and Finite Element Analysis, as well as analytical modeling like nonlocal models and advanced structural theories, complemented by experimental techniques.

evaluation panels

ENG, LIF, PHY

keywords:

therapeutic ultrasound

microbubbles

blood-brain barier

passive acoustic mapping

cavitation

Łukasz Fura

Potential project topics

We encourage applicants to propose a research project that is consistent with their scientific interests and the core expertise of our research group, which focuses on the use of therapeutic ultrasound for biomedical applications. Our team specialises in exploring ultrasound-based techniques for targeted drug delivery, particularly in the context of opening the blood-brain barrier, as well as developing advanced monitoring and control strategies to enhance the precision and safety of treatment.

evaluation panels

ENG, MAT, PHY

keywords:

fatigue

modelling

additive manufacturing

yield surface

Mateusz Kopeć

Potential project topics

Potential project will focus on modelling the fatigue behavior and yield surface evolution of additively manufactured (AM) materials using experimental and computational approaches. The fatigue modelling aims to predict life expectancy by incorporating microstructural features, defects, anisotropy, and residual stresses through physics-based or machine-learning models. The yield surface evolution modelling investigates the impact of cyclic loading, plastic deformation, and process-induced heterogeneities on material strength and deformation behavior, employing crystal plasticity, finite element analysis (FEA), and constitutive modelling. Supervisor has enough experimental data to share therefore someone with modelling experience and good knowledge in experiment is expected to join.

evaluation panels

CHE, ENG, LIF, PHY

keywords:

microfluidics

experimental fluid mechanics

droplets

chemical and biological applications of microfluidic systems

Piotr Korczyk

Potential project topics

Our laboratory aims to develop microfluidic techniques to increase their precision and applicability.
Our group's primary expertise is experimental fluid mechanics, focusing on microfluidics. The other important area of interest is developing microfluidic devices that can be customized to particular biological or chemical research requirements.

We welcome proposals in line with these topics:

- microfluidics,
- experimental fluid mechanics,
- applications of microfluidics in biological or chemical research.

evaluation panels

ENG

Katarzyna Kowalczyk-Gajewska

keywords:

mechanics of materials

micromechanics

multiscale modelling

crystal plasticity and fracture

anisotropy

Potential project topics

The applicant is free to propose a project that fits both her/his scientific interest as well as the research area, however within the general scope of Mechanics of Materials. Previous projects conducted within our group were dealing with micromechanical modelling of metals and alloys with high specific strength, optimization of heterogeneous material microstructure concerning composites and metals, description of the void growth in the anisotropic metallic materials, all combined with the experimental validation.

evaluation panels

CHE, ENG

keywords:

composite materials

electrochemistry

nanotechnology

materials for energy storage

oxides

Marcin Krajewski

Potential project topics

All topics related to the application of electrochemical methods in energy storage devices (lithium-ion batteries, supercapacitors), sensors or corrosion protection films are welcome. Moreover, the candidate can work on the synthesis of electroactive materials as well as the polymeric membranes suitable for energy storage applications, desalination of water and infrared or electromagnetic shielding.

evaluation panels

CHE, ENV, MAT

Njemuwa Nwaji Njoku

keywords:

hydrogen generation

advance electrode materials

fuel cells

metasurfaces

water splitting

Potential project topics

The applicant can propose his/her own topic provided it align well with the research expertise of Nwaji's research group.
The main research focus of the group are in synthesis of nano catalysts as advanced electrode materials for energy storage and conversion applications with special interest in energy-saving and self-powered hydrogen generation, supercapacitor powered implanted device, magnetoplasmonic photoelectrochemical water splitting, Plasmonic metasurface biosensor and dye-sensitized photocatalysis.

evaluation panels

CHE, ENV, MAT

Magdalena Osial

keywords:

nanomaterials

nanoparticles

magnetic hyperthermia

drug delivery

Potential project topics

Our laboratory aims to develop nanomaterials and nanocomposites to be used in biomedicine and environmental including the design and optimization of the formulations and physicochemical properties of the obtained novel nanostructures. The scope of studies is focused on the chemical synthesis of nanostructured platforms for drug immobilization, magnetic hyperthermia, and imaging as well as the preparation of materials with well-developed surfaces of occurring photoactivity to be used as adsorbents and/or photocatalysts, and deposition of novel electroactive nanomaterials to be used in electrochemical sensing. We welcome researchers specializing in materials engineering, chemistry, physics, or related fields who are highly oriented on interdisciplinarity to propose projects in the related fields.

evaluation panels

ENG, LIF

keywords:

host pathogen interactions

innate immunity

bacterial pathogens

signalling pathways

single-cell heterogeneity

stochastic regulation

live-cell microscopy

mathematical modelling

systems biology

Paweł Paszek

Potential project topics

The work in our group focuses on understanding infection biology at the single-cell level with particular focus on innate immune signalling networks and responses to bacterial pathogens. We use interdisciplinary systems biology approaches combining live-cell imaging with single-cell genomics to develop novel insight into the infection process. This involves applications of mathematical and statistical modelling to understand and predict outcomes of single-cell host-pathogen interactions. Current projects focus on innate immune macrophages and the food-borne bacteria L. monocytogenes, an important pathogen of man. We use live-cell imaging approaches to understand how robust immune responses emerge from the noisy single-cell NF-B/STAT/IRF and cytokine signalling. We also monitor fate and virulence of individual bacteria to understand pathogen invasion strategies.
We welcome candidates with different experimental and theoretical skills to propose projects in related area. Training in novel and topical imaging and single-cell biology approaches as well as mathematical modelling will be provided to fit candidate's interests and complement their existing skills.

evaluation panels

CHE, ENG

keywords:

hydrogel

electrospun nanofibers

3D printing

smart materials

conductive polymers

biomaterials

Filippo Pierini

Potential project topics

The applicant is free to propose a project that fits both her/his scientific interest as well as the research area in which the Pierini Research Group is playing, keeping in mind that we are experts in the field of biomaterial development using hydrogels, electrospun nanofibers, 3d-printing, conductive polymers, and smart materials.

evaluation panels

ENG, LIF, PHY

keywords:

biomedical Engineering,
ultrasonography
oncology diagnostics
quantitative ultrasound (QUS)
image analysis and processing
signal analysis and processing
multiparametric ultrasound
computer-aided diagnosis

Hanna Piotrzkowska-Wróblewska

Potential project topics

Our research focuses on modern methods of ultrasound diagnostics. We pay particular attention to their application in oncological diagnostics of the breast and thyroid. Key areas of activity include quantitative and multiparametric ultrasonography. We are working on the development of technologies and methods for analyzing ultrasound images and signals. The aim of our research is the precise assessment of pathological changes, both in the context of differentiating between benign and malignant lesions, as well as monitoring the response to treatment.
We also focus on integrating artificial intelligence into medical imaging, particularly in the use of machine learning and deep learning techniques for automating the analysis of medical images and their applications in oncological diagnostics.
Our projects are carried out in collaboration with major medical centers, with the active involvement of physicians and patients, enabling the conduct of preclinical studies with high application value. As a result, our research has a direct impact on clinical practice, supporting the development of innovative diagnostic technologies that address the real needs of medicine.
We accept project proposals submitted by candidates that align with the above research areas. We are also open to innovative ideas that go beyond our current interests, as long as they fall within our area of expertise. We offer candidates the opportunity to pursue their own research interests using our experience and resources.

evaluation panels

CHE, LIF, PHY

Adolfo Poma Bernaola

keywords:

IDP

MD

coarse-grained simulation

GōMartini 3

α-synuclein

Parkinson Disease

Potential project topics

The applicant is free to propose a project that fits both her/his scientific interest as well as the research area in which the Poma Research Lab is mostly focused on, keeping in mind that his team is the main developer of the GōMartini approach for the sampling of large conformational changes in protein complexes with active interest in disease related applications and the role of mechanical forces in virus-cell interactions.

evaluation panels

ENG, LIF, MAT, PHY

Eligiusz Postek

keywords:

ceramics

failure

molecular dynamics

numerical methods

cell models

tensegrity

Potential project topics

1. Brittle materials dynamic failure taking into account the interphase zones.
Multiphase composites, and especially ceramics, are used in all industries that are crucial for the functioning of the world economy. The aim of the study is to determine how the brittle materials are fragmenting under impact loads, sudden pressure, and temperature increase, considering the interfaces between the various phases of the composite. Numerical methods such as the finite element method, meshless and molecular dynamics methods will be used. High performance computers (HPC) will be used in the calculations. The reason for this approach is the desire to initially define the phenomena that may occur, and whose experimental analysis is still impossible. Hypotheses are created that enable the design of experimental research.

2. Stress development in growing tissue.
The physical environment of living cells and tissues, and more particularly their mechanical interaction with it, plays a crucial regulatory role in their biological behaviour such as cell differentiation, apoptosis, proliferation, tissue growth, remodelling, etc. However, the way that mechanical forces at the cellular level (i) influence the cell functions and (ii) govern the behaviour of cell assemblies, as well as their development, remains unclear. An agent-based methodology will be used.
There are still questions (i) how to evaluate mechanical stress in growing tissue, (ii) how the mechanical stress influences the tissue growth.

evaluation panels

ENG, MAT

Mohsen Rezaee Hajidehi

keywords:

materials modeling

multi-scale analysis

microstructure evolution

phase transforming materials

plasticity

fatigue

Potential project topics

Applicants are invited to propose research projects that align with their scientific interests and our expertise in materials modeling. Our research theme is inherently interdisciplinary, integrating mechanics, materials science, and computational modeling within a dynamic and collaborative environment where diverse methodologies converge to tackle complex material phenomena. Potential projects may span from atomic- to macro-scale analyses, from phase transformation to plasticity mechanisms, from monotonic to cyclic behaviors, and from conventional to smart/exotic materials. Interested candidate will have the opportunity to develop computational approaches of continuum/discrete nature to explore material behavior across scales. Training in relevant theoretical and numerical techniques will be provided to complement the applicant’s expertise and broaden the scope of their proposed research.

evaluation panels

ENG, MAT

Tomasz Steifer

keywords:

machine learning
artificial intelligence
theoretical computer science
computational learning theory
mathematical logic
mechanistic interpretability
computational social choice

Potential project topics

I am open to projects related to my present and past research. Some of the topics I am interested in these days: computational power of standard transformer architecture, generalized attention mechanisms for graph data, mechanistic interpretability, perpetual voting, online learning and computational complexity etc. Potential project could be concerned with other topics in artificial intelligence and machine learning theory, especially those making use of mathematics and theoretical computer science.

evaluation panels

ENG

Stanisław Stupkiewicz

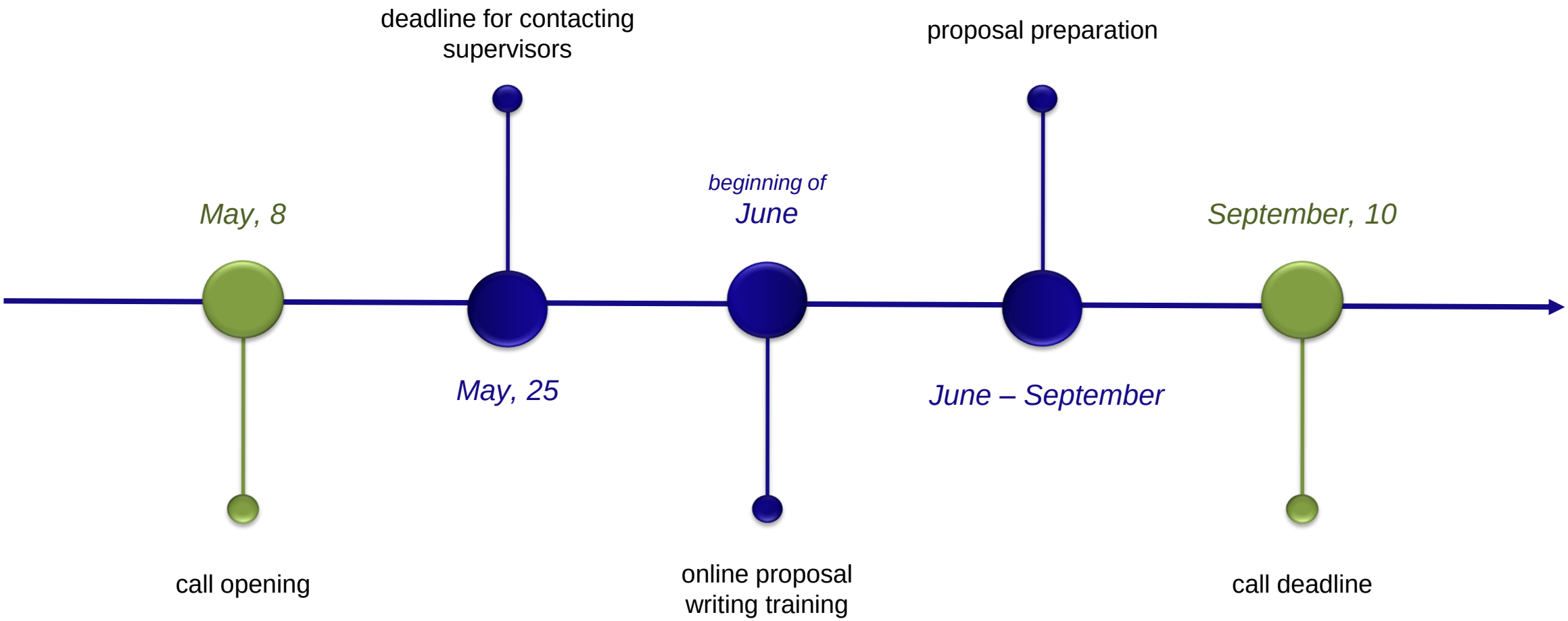
keywords:

mechanics of materials
micromechanics
interfaces
phase-field method
shape memory alloys
computational mechanics

Potential project topics

The applicant is free to propose a project that fits both his/her scientific interests and the general area of scientific interests and expertise of the host. Our special interest is in microstructure evolution problems and inelasticity in solids. Both constitutive modelling and computational aspects are of interest. We have considerable experience in development of efficient computational schemes for complex problems involving coupling between various deformation mechanisms. Sample application areas include shape memory alloys, deformation twinning in magnesium, and plastic deformation at small scales with size effects. Contact mechanics and soft contacts (dry or lubricated) is also an area for possible collaboration.

time frame


deadline for contacting supervisors
proposal preparation
beginning of June
May, 8
September, 10
May, 25
June – September
call opening
online proposal writing training
call deadline