Mikhail Petrov

Email : mikhail.petrov@tufts.edu

chillqq.github.io
LinkedIn
GoogleScholar
Github

Education

- **Tufts University** — Medford, MA, USA
  PhD in Mechanical Engineering — *Jan. 2022 – present*
- **University of Antwerp** — Antwerpen, Belgium
  M.Sc. with Honors in Nanophysics — *Sep. 2016 – July. 2018*
- **Peter the Great St. Petersburg Polytechnic University** — St. Petersburg, Russia
  B.Sc. in Physics — *Sep. 2012 – June. 2016*

Technical Skills

- **Programming languages:** Python, MATLAB, C++, Fortran.
- **Machine Learning Frameworks:** PyTorch, TensorFlow, JAX, scikit-learn.
- **Data Analysis Tools:** NumPy, Pandas, SciPy, Matplotlib, Seaborn, SQL.
- **Materials simulation packages:** Qauntum Espresso, ABINIT, EPW, Wannier90, WannierTools.
- **Microsopy hardware:** Atomic Force, Confocal and Raman microscopes.
- **High performance computing.**

AWARDS AND ACHIEVEMENTS

- School of Engineering Outstanding Academic Scholarship Award, Tufts University, 2024
- Personal PhD scholarship from Flemish government (FWO), University of Antwerp, Belgium, 2019.
- Scholarship for the master program in the university of Antwerp as a result of well working performance during the summer internship, University of Antwerp, Belgium, 2016.
- Scholarship of distinction and summer internship as a result of high distinction in the academic results, St. Petersburg polytechnic university, Russia, 2013-2015.

Research Experience

- **Tufts University** — Medford, MA
  Research assistant — *Jan. 2022 – present*
  - **Mechanical spectroscopy of materials using atomic force microscopy (AFM-MS).**: Developed an algorithm for high-resolution classification of different polymer materials within a polymer blend based on their AFM images. 1 paper published.
  - **Data compression engineering and Machine learning for cancer detection.**: Working with atomic force microscope (AFM) images of human cells. Transforming AFM images into a set of numerical features with minimal information loss. Using the compressed dataset to build classification models capable of detecting cancer with high accuracy. Actively working on methods of interpretability of ML based cancer detection algorithms. 2 papers published.
  - **Transfer learning**: Developing better transfer learning algorithms for image recognition. Two papers published.
  - **Bayesian deep learning**: Using generative models (VAE) to simulate atomic force microscope (AFM) images of human cell surfaces.
- **University of Antwerp** — Antwerpen, Belgium
  Master student — *Sep. 2016 – July. 2018*
  - **Computational physics: Superconductivity in low-dimensional materials.**: Numerical simulations of low-dimensional materials including their electronic, vibrational and superconducting properties. 3 papers published.

Publications

Density Functional Theory

- Comment on "Coexistence of superconductivity and topological aspects in beryllenes", Materials Today Physics 38, 101257 (2023).
  Mikhail Petrov and Milorad V. Milošević. arXiv:2407.18254 – July 2022
- High-temperature multigap superconductivity in two-dimensional metal borides.
  Cem Sevik, Jonas Bekaert, **Mikhail Petrov** and Milorad V. Milošević. *Phys. Rev. Materials* 6, 024803 – February 2022
- Superconductivity in gallenene.
  Mikhail Petrov, Jonas Bekaert and Milorad V. Milošević. *2D Mater.* 8, 035056 - June 2021.
- Hydrogen-Induced High-Temperature Superconductivity in Two-Dimensional Materials: The Example of Hydrogenated Monolayer MgB_2.
  Jonas Bekaert*, **Mikhail Petrov*** and Milorad V. Milošević. *Phys. Rev. Lett.* 123, 077001 – August 2019.

Machine learning

- Learning the Regularization Strength for Deep Fine-Tuning via a Data-Emphasized Variational Objective.
  Ethan Harvey*, **Mikhail Petrov*** and Michael C Hughes. *accepted at NeurIPS FITML*, October 2024.
- Mechanical spectroscopy of materials using atomic force microscopy (AFM-MS).
  M. Petrov, D. Canena , N. Kulachenkov, N. Kumar, Pierre Nickmilder, Philippe Leclère, Igor Sokolov *Materials today*, September 2024.
- Transfer Learning with Informative Priors: Simple Baselines Better than Previously Reported.
  Ethan Harvey*, **Mikhail Petrov*** and Michael C Hughes. *Transactions on Machine Learning Research*, 2835-8856 - May 2024.
- Machine Learning Allows for Distinguishing Precancerous and Cancerous Human Epithelial Cervical Cells Using High-Resolution AFM Imaging of Adhesion Maps.
  Mikhail Petrov and Igor Sokolov. *Cells* 2023, 12(21), 2536 - October 2023.
- Identification of Geometrical Features of Cell Surface Responsible for Cancer Aggressiveness: Machine Learning Analysis of Atomic Force Microscopy Images of Human Colorectal Epithelial Cells.
  Mikhail Petrov and Igor Sokolov. *Biomedicines* 2023, 11(1) - January 2023.

Experimental physics

- Visible to near IR luminescence spectrum of Radachlorin under excitation at 405nm.
  V.P. Belik, I.M. Gadzhiev, M.V. Petrenko, **M.A. Petrov**, I.V. Semenova and O.S. Vasyutinskii. *Chemical Physics Letters* - November 2016
- Crystallisation of hydrogenated amorphous Si films (a-Si:H) under irradiation of femtosecond laser pulse.
  V. Belik, O. Vasytinski, A. Kuznetsov, **M. Petrov**, R. Popov, E. Terukov. *Technical Physics Letters*, 15(36) - November 2016.

Academic Services

Served as a referee for papers in peer-reviewed journals like *Nature Scientific Reports* and *Superconductor Science and Technology* as well as for *FITML* workshop at *NeurIPS* machine learning conference.