

Artem Pulkin

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🏠 Amsterdam NL 🇳🇱

Expertise

Machine learning, computational science, research code development

Education 🎓

Docteur ès Sciences EPFL in physics Lausanne CH 🇨🇭 Specialized on: numerical electronic structure, quantum simulations. Thesis: Electronic Transport in 2D Materials with Strong Spin-orbit Coupling (03/2017); supervisor: Oleg Yazyev 2012-2017

Master of Science Chalmers in applied physics Göteborg SE 🇸🇪 Thesis: Spintromechanical Aspects of Charge Transport in Nanostructures (06/2012); supervisor: Robert Shekhter 2010-2012

B.Sc. in Physics cum laude V.N. Karazin's State University Kharkiv UA 🇺🇦 2006-2010

Training

Coursera: Machine Learning from Stanford University

Experience 📄

Postdoc @ QuTech Delft university of technology NL 🇳🇱 Apr '19-Apr '22

I researched a stack of machine learning tools: deep neural networks DNN, generative models (reverse Monte-Carlo, RMC), adversarial attack approaches in the context of electronic structure/nanoscale atomic dynamics. I developed a DNN/atomic descriptor code for nanoscale dynamics miniff. I discovered novel electronic materials as a part of a multi-disciplinary team of quantum researchers.

Postdoc @ Caltech US 🇺🇸 Jul '17-Mar '19

I developed and implemented a computational many-body quantum chemistry framework to model two-dimensional crystalline materials. I investigated low-energy spectral properties of two-dimensional molybdenum disulphide with numerical modeling.

Doctoral assistant @ EPFL CH 🇨🇭 Oct '12-Apr '17

I carried out a scientific project in the quantum materials modelling domain. I discovered a new class of electronic band structure effects in two-dimensional semiconductors. I collaborated with world-leading experimental groups to prove my findings experimentally.

Research assistant @ Seoul National University, KR 🇰🇷 Jun '12-Aug '12

Research assistant @ Chalmers, SE 🇸🇪 Aug '10-Jun '12

In numbers

15 publications >500 citations 14 talks

>10 countries

>30 collaborators

Projects

More on [github/pulkin](https://github.com/pulkin)

miniff <https://gitlab.kwant-project.org/qt/miniff>

A **machine learning** project in **python** to simulate molecular dynamics with classical force fields. Uses **deep learning** to train multiple **neural networks** at once from a hybrid dataset including both dependent variable values and their gradients. Combines the power of **cython**, **numpy** and **torch** to deliver maximal performance in a high-quality python code. Demonstrates my experience of full-stack machine learning research including dataset generation and performance-aware inference.



Adversarial ML playground colab

An **adversarial machine learning** project where I investigate the robustness of **deep learning computer vision** setups to various flavors of **gradient-based adversarial attacks**. I decided to publish (parts of) the project to make an easy **hands-on introduction** for those interested in the topic.

- Awards** 🏆
- 💰 Personal **Swiss NSF grant** to study abroad 80k CHF, 18 months, postdoctoral level (Early Postdoc.Mobility) grant P2ELP2_175281 postgraduate
 - 💰 Personal computing time at **national supercomputing facilities (SURF NL)** Approximate equivalent of 26k EUR, 24 months project 45873
 - 🏆 Olympiad in Physics for University Students (national in Ukraine) – **first prize** graduate
 - 🏆 **Youth Physicists Tournament** (national in Ukraine, team) – multiple prizes
 - 🏆 Open Olympiad in Applied Physics (MIPT Moscow) – **first prize**
 - 💰 Kharkiv City Mayor and Kharkiv State Governor scholarships for gifted youth
 - 🏆 Dozens of prizes in physics and informatics (olympiads, student projects; **top-10 and top-1 in national competitions**) high school
 - 💰 Multiple scholarships

Skills 🔧

Software development in 🐍 Python (7 years): scientific stack: numpy, torch, matplotlib; notebooks; HPC and parallel/distributed/concurrent computing (MPI, OpenMP, multiprocessing, async); performance-driven development with C and cython; styling, testing, documenting, packaging; other: FastAPI, django, OpenCV, OpenCL, bytecode.

C/C++: HPC and parallel environments (MPI, OpenMP); Lapack; embedded platforms; interfacing other languages; decompiling and reverse-engineering.

Other: ☕ Java, Fortran, Julia, Javascript, Matlab.

Infrastructure: git, CI/CD (Travis, Gitlab-CI, Azure pipelines), docker, HPC, AWS (EC2, S3).

IDEs: Pycharm, vim.

Machine learning: supervised learning (DNN, linear fits, logistic fits, SVM); unsupervised learning (PCA/SVD, K-means, anomaly detection); dataset generation, feature extraction, adversarial models.

Soft skills: critical analysis, problem solving, communicating (organizing discussions, presenting, paper/grant/documentation writing), full-cycle project management (idea - funding - implementation - reporting), supervision.

Languages English (prof), Ukrainian (mother), Russian, French (basic), Dutch (basic).

Hobbies Sports, ✈️ travels, cross-stitching, soldering, 🗝️ lock picking, 🎮 board and video games, open-source projects.