Aleksandar Makelov

Work Experience

May 2023 – Present **Independent Researcher**, *SERI MATS*, Research in mechanistic interpretability, mentored by Neel Nanda.

Education

Sep 2016–Sep 2022 **PhD**, *MIT EECS*, Mądry lab.
Robust machine learning, spectral graph theory, mathematical optimization

Oct 2015–June 2016 **Part III Mathematical Tripos**, *Emmanuel College*, University of Cambridge, with distinction.
Coursework in combinatorics and algebra. Part III Essay: ‘The graph isomorphism problem’, supervised by Prof. Timothy Gowers

Sep 2011–May 2015 **BA in Honors Mathematics and Computer Science**, *Harvard University*, summa cum laude.
Undergraduate thesis: ‘Expansion in lifts of graphs’, supervised by Prof. Salil Vadhan

Awards and Honors

2015 **Akamai fellowship for first-year graduate students**, *MIT*, (declined).

2015 **Thomas Temple Hoopes Prize**, *Harvard University*.
For undergraduate thesis ‘Expansion in lifts of graphs’

2015 **Herchel Smith fellowship**, *Harvard University*.
To support graduate studies at the University of Cambridge

2015 **Certificate of Teaching Excellence**, *Harvard University*.
For ‘Algorithms and complexity’, Fall 2014

2014 **Phi Beta Kappa Junior 24**, *Harvard University*.

2012 **Honorable mention**, *William Lowell Putnam Mathematical Competition*.

2010 **AMC Medal**, *Australian Mathematics Competition*.

2010 **Silver medal**, *International Mathematical Olympiad*, Kazakhstan.
Representing Bulgaria

2010 **Gold Medal**, *Balkan Mathematical Olympiad*, Moldova.
Representing Bulgaria

2009, 2010 **Bronze & Silver medal**, *International Physics Olympiad*, Mexico & Croatia.
Representing Bulgaria

Teaching and Service

Fall 2019 **6.854: Advanced Algorithms**, *MIT*, Teaching Assistant.

Spring 2019 **6.046: Design and Analysis of Algorithms**, *MIT*, Teaching Assistant.

July 2017 **International Mathematical Olympiad**, *Brazil*, Observer A for Bulgaria, With support from 'American Foundation for Bulgaria'.

July 2016 **International Mathematical Olympiad**, *Hong Kong*, Observer A for Bulgaria, With support from 'American Foundation for Bulgaria'.

Fall 2014 **CS 125: Algorithms and Complexity**, *Harvard University*, Teaching Fellow.

Fall 2013 **Math 131: Topology**, *Harvard University*, Teaching Fellow.

2010-2017 **International Mathematics Olympiad Preparation**, *With Bulgarian national team*, Delivered lectures on topics in olympiad mathematics.

Publications

2024 **Is This the Subspace You Are Looking for? An Interpretability Illusion for Subspace Activation Patching**, *A. Makelov, G. Lange, N. Nanda*, International Conference on Learning Representations.

2023 **Backdoor or Feature? A New Perspective On Data Poisoning**, *A. Khaddaj, G. Leclerc, A. Makelov, K. Georgiev, A. Ilyas, H. Salman, A. Mądry*, International Conference on Machine Learning.

2018 **Towards Deep Learning Models Resistant to Adversarial Attacks**, *A. Madry, A. Makelov, L. Schmidt, D. Tsipras, A. Vladu.*, International Conference on Learning Representations (poster).

2015 **Expansion in Lifts of Graphs**, *A. Makelov*, Undergraduate thesis.

Open source software projects

2023 **mandala**.
A Python framework for data management of computational experiments.

Open source software contributions

2017 **CIFAR10 Adversarial Examples Challenge**.
A benchmark for training neural networks on the CIFAR10 dataset robust to adversarial examples

2012 **sympy**, *Google summer of code*.
Contributed algorithms for computational group theory, advised by Prof. David Joyner, United States Naval Academy

Coursework

Advanced Algorithms, *MIT*.

Math 231a&b: Algebraic Topology, *Harvard University*.

Graduate courses in CS Theory, *Harvard University*.
CS221 (Complexity), CS225 (Pseudorandomness), CS228 (Learning Theory), 2xCS229r (Topics in the Theory of Computation)

Physics 16, *Harvard University*.

Math 55a&b, *Harvard University, with Prof. Yum-Tong Siu*.

Technical skills

Programming Languages.
Proficient in Python. Extensive experience with the PyData stack (numpy, pandas, scikit-learn, dask, matplotlib), Pytorch

Databases.
SQL (Postgres, sqlite) and ORMs (SQLAlchemy)

OS.
Linux/Unix

Personal

In my free time I enjoy cycling, playing guitar/singing, hiking, and reading sci-fi.