Valeria Cherepanova

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Research Interests

I am interested in studying robustness and interpretability of deep neural networks. Another area of interest to me is fairness in deep learning.

Education

Aug 2018-Present	PhD in Applied Mathematics **University of Maryland**, College Park Advisor: Prof. Tom Goldstein • *Dean's Fellowship*
Sept 2017-Sept 2018	MRes in Computational Biology (CoMPLEX) **University College London**, London Advisor: Prof. Alexei Zaikin • *Distinction*
Sept 2013-Jun 2017	BSc in Mathematics **National Research University Higher School of Economics**, Moscow Advisor: Prof. Vladimir Poberezhny

Work Experience

May 2020-Aug 2020	**University of Maryland, Graduate Research Assistant** Advisors: Profs. Tom Goldstein Projects in Machine Learning
May 2019-Aug 2019	**University of Maryland, Graduate Research Assistant** Advisor: Prof. Lise-Marie Imbert-Gerard Project in Numerical Analysis and PDEs
Jul 2016-Oct 2016	**Teradata (Moscow), Internship at the Data Analysis Department** Advisor: Dr. Sergei Gromov Educational project in Machine Learning

Publications

Micah Goldblum, Steven Reich, Liam Fowl, Renkun Ni, Valeriia Cherepanova, Tom Goldstein, *Unraveling Meta-Learning: Understanding Feature Representations for Few-Shot Tasks*, ICML, 2020
arXiv:2002.06753

Oleg Blyuss, Alexey Zaikin, Valeriia Cherepanova et al., *Development of PancRISK, a urine biomarker-based risk score for stratified screening of pancreatic cancer patients*, British Journal of Cancer, 2019
doi:10.1038/s41416-019-0694-0

V. Cherepanova, *On Properties of solutions for the Riemann-Hilbert Problem on an Elliptic Curve*, IX Priokskaya Conference on Differential Equations and Related Problems of Mathematics, 2017
Conference Proceedings p. 42-52 (in Russian)

Relevant Coursework

Machine Learning: Deep Learning (HSE), Computer Vision (UMD, CMSC426), Computational Linguistics (UMD, CMSC723), Algorithms in Machine Learning: Guarantees and Convergence (UMD, CMSC828U), Foundations of Deep Learning (UMD, CMSC828W).

Optimization and Numerical Methods: Optimization Methods (HSE), Numerical Methods (HSE), Scientific Computing (UMD, AMSC660, AMSC661), Scientific Computing (UMD, CMSC764),

Research Projects

Aug 2020 - Present	**Can we trust fairness?** University of Maryland, College Park We investigate the problem of fairness gerrymandering in facial recognition systems and robustness of fairness constraints to domain shifts. The goal of the project is to develop new robust algorithms mitigating unfairness in deep learning which would not suffer from gerrymandering.
Apr 2020 - Present	**Hiding from facial recognition systems** University of Maryland, College Park In this project we develop efficient adversarial attacks against facial recognition systems to protect photos shared online from being used by third-party algorithms to recognize users. The goal is to design an attack that could fool systems deployed in industry.
Dec 2019 - Feb 2020	**Unraveling Meta-Learning: Understanding Feature Representations for Few-Shot Tasks** University of Maryland, College Park In this work we develop and test the hypothesis that meta-learned models perform better than classically-trained ones because of the smaller intra-class to inter-class variance ratio. Based on this assumption we designed a regularizer which improved performance of standard-learning for few-shot classification.
May 2019 - Aug 2019	**Investigating the interpolation properties of Generalized Plane Waves in the high frequency regime** University of Maryland, College Park In this work we investigate the behaviour of approximate solutions to PDEs of order two and higher built as a linear combination of Generalized Plane Waves in the high frequency regime..
Apr 2018 - May 2018	**m-Africa: smartphone connected test for HIV** University College London, London We applied CNN to the problem of interpretation the results of HIV lateral-flow tests. Model achieved 98% accuracy on classification problem.
Feb 2018 - Mar 2018	**Analyzing signals from Neuropixel recordings of neural circuit activity** University College London, London We performed analysis of the spatiotemporal characteristics of the extracellular signals recorded in a head-fixed mouse using the novel silicon probe Neuropixels. In this project we measured backpropagation of somatic action potentials into the apical dendrite in L5 pyramidal neurons in vivo.
Jan 2018 - Feb 2018	**Development of neural network architecture for the early diagnosis analysis of on-comarker data in women's cancer** University College London, London We applied RNN for detection and early diagnosis of ovarian cancer. In 26% patients the model was able to detect ovarian cancer one year earlier than the doctor (with 95% specificity).

Teaching Experience

Teaching Assistant: MATH140 (UMD), STAT100 (UMD), Calculus (Independent University of Moscow)

Instructor: STAT100 (UMD)