SERGEY SHUVAEV

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PhD in applied mathematics and physics with focus on computer science and computational neuroscience
Research focus on combining machine learning and cognitive priors to develop models of decision-making

Experience

Postdoctoral Researcher 3/25-now, *Dyer & Pesaran Labs*, University of Pennsylvania, Philadelphia, PA

- Curate data and develop neuro-AI foundation models of neural and behavioral dynamics for brain-machine interfaces toward improved clinical outcomes in behavioral disorders

Postdoctoral Researcher 11/22-2/25**, Student in Residence** 7/16-10/22,
Koulakov Lab, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY

- Developed data-driven models of decision-making for stay-or-leave decisions (RL) (NeurIPS '20), motivation (RL) (Front Sys Neurosci '21), and conflict (Bayesian/game-theoretic) (NeurIPS '23)
- Worked on a deep learning framework to predict the smell of odorants (ICML '19) and analyzed olfactory connectivity data to investigate how smell is processed in the brain (PLOS Comp Bio '24)
- Co-developed methods for neural network compression (PNAS '24) and unfolding (PNAS '19)

Research Associate 7/16-12/18**, Research Assistant** 1/12-6/16**,**
Enikolopov Lab, Moscow Institute of Physics and Technology, Moscow, Russia

- Developed automatic procedures to analyze cell populations in whole-brain samples: microscopy (MethodsX '19), 3D data alignment (Sci Reports '22), and object detection (Front Neuroanat '17)
- Performed microscopy and analyzed data to evaluate common impacts on adult neurogenesis: irradiation (NeuroReport '19); antidepressants, brain development, and cell migration

Research Assistant 8/13-7/15**,** *Superconductivity Department*, Kurchatov Institute, Moscow, Russia

- Developed numerical models and worked towards experimental measurements of electro- and thermodynamics in high-current superconductive cables to pursue requirement-based design

Education

PhD ('22)**, MSc** ('15)**, BSc** ('13)**, Physics and Mathematics,** Moscow Institute of Physics and Technology

Publications

- **Author:** 15+ papers (9 first-authored incl. 2 NeurIPS & 2 PNAS), 150+ citations; **see next page**
- **Reviewer:** NeurIPS, ICLR, ICML, COSYNE, RLC, AAAI, AISTATS; 3x Top Reviewer

Skills and qualifications

- Python, PyTorch, LaTeX, git, shell; prior work: Matlab, Wolfram Mathematica, C, C++
- Foundation models, reinforcement learning, Bayesian inference, game theory, POMDP, sequence modeling, computer vision, computational neuroscience, theory of mind

Awards

- Highlighted Reviewer: ICLR, 2022; NeurIPS, 2022 & 2024. *Awarded to top-5%/top-10% reviewers*
- Travel awards: CSHL; Gatsby Charitable, Burroughs Wellcome, Google DeepMind, Simons, 2020
- Swartz Fellow in Computational Neuroscience, 2016-2017. *$100k+/2yrs toward salary and travel*
- Alexandrov Scholar, 2012-2015. *Awarded to students with recent conference records & top-tier GPA*
- Abramov and Frolov Scholar, 2010-2012. *Awarded to undergraduate students with the 4.0 GPA*
- Kurchatov Award for Outstanding Research, 2013

Selected publications

Encoding innate ability through a genomic bottleneck (PNAS '24)
Shuvaev, S., *Lachi, D., Koulakov, A., and Zador, A.*

The primacy model and the structure of olfactory space (PLOS Comp Bio '24)
Giaffar, H., ***Shuvaev, S.,*** *Rinberg, D., and Koulakov, A.*

A normative theory of social conflict (NeurIPS '23)
Shuvaev, S., *Amelchenko, E., Smagin, D., Kudryavtseva, N., Enikolopov, G., and Koulakov, A.*

Spatiotemporal 3D image registration for mesoscale studies of brain development (Sci Reports '22)
Shuvaev, S., *Lazutkin, A., Kiryanov, R., Anokhin, K., Enikolopov, G., and Koulakov, A.*

Neural networks with motivation (Front Sys Neurosci '21)
Shuvaev, S., *Tran, N., Stephenson-Jones, M., Li, B., and Koulakov, A.*

R-learning in actor-critic model offers a biologically relevant mechanism for sequential decision-making (NeurIPS '20)
Shuvaev, S.*, *Starosta, S.*, Kvitsiani, D., Kepecs, A., and Koulakov, A.*

DeepNose: Using artificial neural networks to represent the space of odorants (ICML '19)
Tran, N., Kepple, D., ***Shuvaev, S.,*** *and Koulakov, A.*

Network cloning using DNA barcodes (PNAS '19)
Shuvaev, S., *Başerdem, B., Zador, A., and Koulakov, A.*

Click histochemistry for whole-mount staining of brain structures (MethodsX '19)
Lazutkin, A., ***Shuvaev, S.,*** *and Barykina, N.*

Suppressed neurogenesis without cognitive deficits: effects of fast neutron irradiation in mice (NeuroReport '19)
Mineyeva, O., Barykina, N., Bezriadnov, D., ..., ***Shuvaev, S.,*** *Usova, S., and Lazutkin, A.*

DALMATIAN: an algorithm for automatic cell detection and counting in 3D (Front Neuroanat '17)
Shuvaev, S., *Lazutkin, A., Kedrov, A., Anokhin, K., Enikolopov, G., and Koulakov, A.*

Representations of sound in deep learning of audio features from music (arXiv '17)
Shuvaev, S., *Giaffar, H., and Koulakov, A.*

Details: scholar.google.com/citations?user=2u5O9OwAAAAJ