# SERGEY SHUVAEV

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Building AI with neural and cognitive priors to model human actions, preferences, and their neural basis
PhD in applied math and physics with a focus on computer science and computational neuroscience

## Experience

**Postdoctoral Researcher** 3/25-now, *Dyer & Pesaran Labs*, University of Pennsylvania, Philadelphia, PA
- Develop neuro-AI models of neural and behavioral dynamics (NeurIPS' 25; arXiv '25) for brain-machine interfaces to improve 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-auth.* incl. 2 NeurIPS, 2 PNAS; *2 co-last*), 200+ citations; **see next page**
- **Reviewer:** NeurIPS, ICLR, ICML, COSYNE, AAAI, AISTATS; *5+x Top Reviewer;* **Guest Editor:** PNAS

## Skills and qualifications

- Python, PyTorch, git, shell, W&B, LaTeX; prior work: Matlab, Wolfram Mathematica, C, C++
- Foundation models, time series modeling, sEEG, DBS, Bayesian inference, POMDP, reinforcement learning, game theory, computer vision, computational neuroscience, Theory-of-Mind

## Awards

- Top Reviewer: ICLR '22; NeurIPS '22, '24, '25, AISTATS '24. *Awarded to top-5%/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                           December 2025

# Selected publications

PRISM: A Hierarchical Multiscale Approach for Time Series Forecasting (arXiv '25)
*Chen, Z., Andre, A., Ma, W., Knight, I., **Shuvaev, S.,** and Dyer, E.*

A scalable self-supervised method for modeling human intracranial recordings during natural behavior (NeurIPS '25 spotlight @BrainBodyFM)
*Mahato, S., Xiao, J., Andre, A., Chau, G., Ma, W., Knight, I., Nguyen, D., Hu, L., Brunton, B., Beauchamp, M., Pesaran, B., **Shuvaev, S.,** and Dyer, E.*

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