Roman Beltiukov

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Research Interests

My current research lies at the intersection of networking, security, and machine learning. Specifically, I am interested in developing credible ML-based artifacts for different networking and security problems, and democratizing a network research by creating public measurement infrastructures and tools.

Education

University of California, Santa Barbara **Expected: August 2025**
Doctor of Philosophy (Ph.D.), Computer Science
Adviser: Arpit Gupta.
I have been working on democratizing networking research in the era of AI/ML, and developing credible ML artifacts for networking problems. Specifically, I have been working on fundamentally redesigning the ML pipeline for networking, enabling development of credible and explainable ML models, and a diverse and representative network infrastructure to collect data from.

Peter the Great St.Petersburg Polytechnic University **August 2019**
Master of Science (M.S.), Computer Science

Peter the Great St.Petersburg Polytechnic University **August 2017**
Bachelor of Science (B.S.), Computer Science

Professional Experience

Graduate Research Assistant **January 2021 – Present**
University of California Santa Barbara *Santa Barbara, California*

- Developed a novel data-collection tool, *netUnicorn*, that simplifies (iteratively) curating high-quality data for different learning problems from diverse network environments.
- Created a university-based network measurements infrastructure, *PINOT*, that allows collection of representative networking datasets from real-world environment.
- Developed a model analysis tool, *Trustee* [3] that aims to identify underpsecification issues in existing blackbox ML models.

On-Device Machine Learning Researcher **March 2020 – September 2021**
Huawei *St.Petersburg, Russia*

- Team: Network services for mobile devices
- Researched onboard machine learning techniques, including better neural network distillation, pruning, and mobile device inference optimization strategies
- Developed an ML-based network connection optimization system for Android devices
- Developed a custom Forward Error Correction algorithm for Huawei mobile devices.
- Developed a system for user network performance using both on-device and operator information.

Junior Reinforcement Learning Researcher **October 2019 – June 2020**
JetBrains Research *St.Petersburg, Russia*

- Reproduced and adapted several approaches to domain-specific tasks.
- Researched how to improve the usage of the Prioritized Experience Replay for World Models approach.

Selected Publications

[1] **Beltiukov, Roman**, Sanjay Chandrasekaran, Arpit Gupta, and Walter Willinger. Pinot: Programmable infrastructure for networking. In Proceedings of the Applied Networking Research Workshop, pages 51–53, 2023.

[2] **Beltiukov, Roman**, Wenbo Guo, Arpit Gupta, and Walter Willinger. In search of netunicorn: A data-collection platform to develop generalizable ml models for network security problems. arXiv preprint arXiv:2306.08853, 2023.

[3] A. S. Jacobs, **R. Beltiukov**, W. Willinger, R. A. Ferreira, A. Gupta, and L. Z. Granville. Ai/ml and network security: The emperor has no clothes. In ACM CCS, LA, USA, 2022.

[4] **Beltiukov, R.** Optimizing q-learning with k-fac algorithm. In Analysis of Images, Social Networks and Texts (Springer), Cham, 2020.

Invited Talks

netUnicorn: A Unified and Modular Data-Collection Platform for Developing Credible ML Models for Networking
UC Santa Barbara (05/22), The University of Chicago (10/22), ACM SIGMETRICS Workshop on Measurements for Self-Driving Networks (06/23)

Honors & Awards

***Winner**, UCSB CS Department Summer Fellowship Award*	*2023*
***Finalist**, Junction Hackathon, "Mobility Track", QOCO*	*2018*
***Track Winner**, World IT Planet championship, Cloud Computing Track by Huawei*	*2018*
***Special Award**, Institue of BioInformatics, EPAM Systems*	*2018*
***Track Winner**, World IT Planet championship, Cloud Computing Track by Huawei*	*2017*
***Challenge winner**, Junction Hackathon, "Robots and Learning Machines track", Eficode*	*2017*

Selected Projects

netUnicorn

- netUnicorn simplifies (iteratively) curating high-quality data for different learning problems from diverse network environments.
- Provides abstractions and infrastructure interaction for developers of data collection pipelines and measurement experiments.
- Contribution: system architecture, platform backend, team leading.
- Technologies: Python, REST API, PostgreSQL, Networking, Explainable AI
- Deployed in University of California, Santa Barbara.

PINOT

- PINOT is a physical active measurement infrastructure deployed in the public university and provides a real-world view of the campus network.
- Democratizes networking research by allowing researchers to easily collect diverse and representative datasets from a real user perspective.
- Contribution: system architecture, backend services, physical deployment, team leading.
- Technologies: Python, REST API, PostgreSQL, SaltStack
- Deployed in University of California, Santa Barbara

Trustee

- Decision tree -based framework for explainable AI in networking.
- Best Paper Honorable Mention & IETF/IRTF Applied Networking Prize (ANRP)
- Contribution: public ML models dissection and verification, experiments reproducibility

Technical Skills

Machine Learning	Reinforcement Learning, Classic Machine Learning, Deep Learning, PyTorch
Programming	Python, C#, Rust, SQL, C/C++
Other	Docker, Virtual Machines (Hyper-V, Xen), Clouds (Azure, AWS, GCP, SCVMM), Databases, Spark, Linux (Debian-based) systems, Networking, Data Storage Systems, Git

Volunteering

Queer Trans Community of University of California, Santa Barbara
Events organizing, community building and moderation.