# 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* [1] 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.

**Python tutor** **September 2018 – September 2020**

*Higher School of Engineering* *St.Petersburg, Russia*

- Participated as an instructor of Python professional education program.
- Developed several Python courses (from scratch) for a diverse group of participants.
- Wrote a task book for Python learners with tasks of different complexity.
- Served as a member of the thesis defense committee for the Python education program for three years in a row.

## Selected Publications

[1] 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.

[2] **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 (06/22)*

## Honors & Awards

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| ***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

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| **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 |