Ekaterina Lobacheva

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I'm a deep learning researcher mainly focusing on understanding the properties of neural network training, loss landscape, and generalization. I am also interested in ensemble methods, properties of training dynamics and object representations obtained in different training paradigms, such as self-supervised and transfer learning, and scaling laws for neural networks. Currently, I am an independent researcher collaborating with Bayesian Methods Research Group, where I did my PhD advised by Dmitry Vetrov, and with Mila, working with Nicolas Le Roux and Irina Rish. The results of my work were published at NeurIPS, AAAI, EMNLP, ICCV.

PUBLICATIONS

* denotes joint first co-authorship

To Stay or Not to Stay in the Pre-train Basin: Insights on Ensembling in Transfer Learning, NeurIPS 2023 — paper
Ildus Sadrtdinov*, Dmitrii Pozdeev*, Dmitry Vetrov, **Ekaterina Lobacheva**

Training Scale-Invariant Neural Networks on the Sphere Can Happen in Three Regimes, NeurIPS 2022 — paper / code
Maxim Kodryan*, **Ekaterina Lobacheva***, Maksim Nakhodnov*, Dmitry Vetrov

On the Periodic Behavior of Neural Network Training with Batch Normalization and Weight Decay, NeurIPS 2021 — paper / code
Ekaterina Lobacheva*, Maxim Kodryan*, Nadezhda Chirkova, Andrey Malinin, Dmitry Vetrov

On Power Laws in Deep Ensembles, NeurIPS 2020 (Spotlight) — paper / code
Ekaterina Lobacheva, Nadezhda Chirkova, Maxim Kodryan, Dmitry Vetrov

Structured Sparsification of Gated Recurrent Neural Networks, AAAI 2020 (Oral) — paper / code
Ekaterina Lobacheva*, Nadezhda Chirkova*, Alexander Markovich, Dmitry Vetrov

Bayesian Compression for Natural Language Processing, EMNLP 2018 — paper / code
Nadezhda Chirkova*, **Ekaterina Lobacheva***, Dmitry Vetrov

Deep Part-Based Generative Shape Model with Latent Variables, BMVC 2016 — paper
Alexander Kirillov, Mikhail Gavrikov, **Ekaterina Lobacheva**, Anton Osokin, Dmitry Vetrov

Joint Optimization of Segmentation and Color Clustering, ICCV 2015 — paper
Ekaterina Lobacheva, Olga Veksler, Yuri Boykov

SELECTED WORKSHOP PUBLICATIONS AND PREPRINTS

Large Learning Rates Improve Generalization: But How Large Are We Talking About? — paper
NeurIPS 2023 M3L Workshop
Ekaterina Lobacheva*, Eduard Pockonechnyy*, Maxim Kodryan, Dmitry Vetrov

On the Memorization Properties of Contrastive Learning, ICML 2021 OPPO Workshop — paper
Ildus Sadrtdinov, Nadezhda Chirkova, **Ekaterina Lobacheva**

Deep Ensembles on a Fixed Memory Budget: One Wide Network or Several Thinner Ones?, 2020 — paper
Nadezhda Chirkova, **Ekaterina Lobacheva**, Dmitry Vetrov

Monotonic models for real-time dynamic malware detection, ICLR Workshop 2018 — paper
Alexander Chistyakov, **Ekaterina Lobacheva**, Alexander Shevelev, Alexey Romanenko

PROFESSIONAL EXPERIENCE

2023 - *now* **Independent Researcher**
I am currently working on an analysis of neural network training trajectories in the function space and related generalization metrics with Nicolas Le Roux. Additionally, I am leading a project on ensembling in transfer learning setup and participate in a project on training with large learning rates at Bayesian Methods Research Group.

2020 - 2022 **Research Fellow and Deputy Head, Centre of Deep Learning and Bayesian Methods, HSE University**
I worked mostly on understanding the properties of neural networks training and loss landscape. Specifically, my work was focused on sharp and flat optima, mode connectivity, ensembling methods and specifics of training of networks with normalization layers. I also worked on the scaling laws for deep ensembles. The results were published at NeurIPS.

2018 - 2020 **Research Fellow, Samsung-HSE Laboratory at HSE University**
I worked on Bayesian sparsification methods for recurrent neural networks, including embedding layers and gated layers such as LSTM. The results were published at EMNLP and AAAI.

2015 - 2018 **Junior Researcher, Kaspersky Lab**
I worked on feature extraction techniques and classification models for dynamic malware detection. The results were published at ICLR Workshops and were built into company antivirus products.

Summer 2014 **Research Intern, University of Western Ontario**
I worked on the improvement of energy-based segmentation methods for the case of camouflage images. The results were published at ICCV. **Advisors:** Yuri Boykov and Olga Veksler

EDUCATION

2022 **PhD** in Computer Science, **HSE University**
Thesis on: Deep learning architectures on a fixed memory budget **Advisor:** Dmitry Vetrov
Cum Laude

2009 - 2014 **Specialist degree (BSc+MSc)** in Computer Science, **Lomonosov Moscow State University**
Thesis on: Boltzmann machines for image segmentation **Advisor:** Dmitry Vetrov
Graduated with honors (GPA 5.0 out of 5.0)

TECHNICAL SKILLS

- I mostly program in **Python** but also have some experience with C++
- I am fluent with common data science tools such as **NumPy**, **matplotlib**, **scikit-learn**, **pandas**
- My primary deep learning framework is **PyTorch** (prior to that, I had experience with Theano+Lasagne and TensorFlow)
- I'm comfortable with the common data science environment e.g., **bash**, **git**, **Linux**, **GPU clusters**

THESIS SUPERVISION AND CO-SUPERVISION

- Ildus Sadrtdinov (now a PhD student at HSE University)
  - On the Memorization Properties of Contrastive Learning (BSc, 2021)
  - Ensembling Neural Networks in the Transfer Learning Setup (MSc, 2023)
- Sergey Troshin (now a PhD student at University of Amsterdam)
  - Deep Equilibrium ResNet (BSc, 2020)
- Maksim Ryabinin (PhD, now Distinguished Research Scientist at Together AI)
  - Gradient Optimization of Beam Search Hyperparameters (BSc, 2019)

- Polina Kirichenko (now a PhD student at NYU)
  - Study of Bayesian Regularization of Neural Networks (BSc, 2018)
- Nadezhda Chirkova (PhD, now Research Scientist at Naver Labs)
  - Bayesian Compression for Natural Language Processing, (MSc, 2018)

TEACHING

2016 - *Now*	**Research seminar Machine Learning and Applications,** Faculty of Computer Science at HSE University
2015 - 2021	**Bayesian Methods in Machine Learning (organization + seminars),** HSE University, MSU, and Yandex School of Data Analysis
2018 - 2019	**Neurobayesian models (organization + seminars),** HSE University, MSU, and Yandex School of Data Analysis
2017	**Introduction to Deep Learning (Online course at Coursera, lectures)**
2016 - 2017	**Deep learning (lectures and seminars)**, MSU
2016 - 2017	**Machine learning (lectures)**, HSE and HSE/NES Programmes in Economics
2015 - 2017	**Data analysis (seminars)**, HSE University

Additionally, I was one of the main organizers of Deep|Bayes Summer School at 2017-2019 and gave several lectures and seminars there. Also, we with Nadezhda Chirkova gave a tutorial on Bayesian machine learning at Machine Learning in High Energy Physics Summer School (Hamburg, Germany, July 2019 and online, July 2020 and 2021) and Workshop on Machine Learning and Applications to Physics (Madrid, Spain, Dec 2019).

PROGRAM COMMITTEE

Neural Information Processing Systems, NeurIPS (reviewer, 2019—2021, 2023):

- 2019: top-50% highest-scored reviewer
- 2021: outstanding reviewer award (top-8%)
- 2023: top reviewer