Tetiana Parshakova

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Objective

To develop efficient algorithms for computational problems using techniques from optimization, discrete mathematics and statistics, to analyze and to bring theoretical guarantees about these methods.

Education

Stanford University — USA
Ph.D. | Computational Mathematics. Advisor *Stephen Boyd* — 2019 – 2024
M.Sc. | Computational Mathematics — 2022

Korea Advanced Institute of Science and Technology — South Korea
M.Sc. | Electrical Engineering — 2019
B.Sc. | Industrial Design — 2017

Work Experience

Google Research — 2022
Student Researcher | Google Brain Robotics — USA
- Message passing and tree-based algorithms for fast graph field integration, generalization of Fast Multipole Method to discretized manifolds

Apple Inc. — 2020, 2021
Machine Learning Research Intern | Exploratory Design Group — USA
- Accelerating the training of Neural Networks using Hessian-vector products
- Constructive methods for Neural Networks on elementary functions

Naver Labs Europe — 2019
Machine Learning Researcher | Natural Language Processing Group — France
- Global Autoregressive Models (GAMs) combine an autoregressive component with a log-linear component, allowing the use of global a priori features to compensate for lack of data
- Different approaches for approximating the normalized distribution given by GAMs for fast inference

Patents

Interpolation Method and Apparatus for Arithmetic Functions — Apple Inc, 2022
William C. Athas, Zaid M. Nadeem, Tetiana Parshakova — US 17/085,971

Methods and Systems for Producing Neural Sequential Models — Naver Corp, 2022
Tetiana Parshakova, Marc Dymetman, Jean-marc Andréoli — US 17/018,754

Publications

Tetiana Parshakova, Trevor Hastie, Eric Darve and Stephen Boyd. *Factor Fitting, Rank Allocation, and Partitioning in Multilevel Low Rank Matrices.* ArXiv preprint arXiv:2310.19214. 2023

Krzysztof Choromanski, Arijit Sehanobish, Han Lin, Yunfan Zhao, Eli Berger, Tetiana Parshakova, et al. *Efficient Graph Field Integrators Meet Point Clouds*. International Conference on Machine Learning. 2023

Tetiana Parshakova, Fangzhao Zhang and Stephen Boyd. *Implementation of an Oracle-Structured Bundle Method for Distributed Optimization.* To appear, Optimization and Engineering. 2023.

Tetiana Parshakova, Marc Dymetman and Jean-Marc Andreoli. *Distributional Policies for Energy-Based Sequential Models*. NeurIPS Optimization Foundations of Reinforcement Learning Workshop. 2019

Tetiana Parshakova, Jean-Marc Andreoli and Marc Dymetman . *Global Autoregressive Models for Data-Efficient Sequence Learning*. In Proceedings of the SIGNLL Conference on Computational Natural Language Learning, ACL. 2019

Tetiana Parshakova, Francois Rameau, et al. *Latent Question Interpretation Through Variational Adaptation*. Accepted in IEEE/ACM Transactions on Audio, Speech, and Language Processing. 2019

Tetiana Parshakova and Dae-Shik Kim. *Latent Question Interpretation Through Parameter Adaptation Using Stochastic Neuron*. In Proceedings of ICML Workshop, MRC-2018, http://ceur-ws.org/Vol-2134/#paper07. 2018

Tetiana Parshakova and Daniel Saakes. *UMorph: Self-Change Tracker to Reflect Yourself to the Future and Past*. In Proceedings of the 2018 ACM Conference Companion Publication on Designing Interactive Systems, ACM. 2018

Tetiana Parshakova, Minjoo Cho, Alvaro Cassinelli, and Daniel Saakes. *Furniture that Learns to Move Itself*. In Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems, ACM. 2017

Tetiana Parshakova, Minjoo Cho, Alvaro Cassinelli, and Daniel Saakes. *Ratchair: Furniture learns to move itself with vibration*. In ACM SIGGRAPH 2016 Emerging Technologies, ACM. 2016

PROJECTS AND RESEARCH

Research Rotations 2019 – 2021
Stanford University USA

- with Prof. Aaron Sidford on hop constrained graph embedding onto a distribution of a dominating trees: minimax principle between probabilistic and distributional distance stretch, randomized algorithms for obtaining embeddings
- with Prof. Stephen Boyd on inverse neighborhood problem: explored different optimization schemes for inverting the operator of geometric random graph.
- with Prof. Tselil Schramm on graph embedding problem: finding minimum dimension of the vertex embedding that preserved information about the existence/absence of an edge.
- with Prof. Amin Saberi on finding optimal strategy for the card guessing game using partially observable Markov decision process.
- with Prof. Andrea Montanari: analysis and comparison of methods that discover causality in linear models using invariance across multiple environments.
- with Prof. Lexing Ying: explored the layerwise Hamiltonian for NNs and Hamilton-Jacobi-Bellman equation to approach the delayed gradient problem to decouple layers during the back propagation.
- with Prof. Eric Darve on deriving bounds for the number of neurons and layers of Relu NN necessary for approximate any analytic function arbitrarily close.

Graduate Researcher 2017 – 2018
Brain Reverse Engineering and Imaging Lab, KAIST South Korea

- "Latent Question Interpretation Through Variational Adaptation", a model that learns multiple interpretations of a given question.
- "Visual Question Answering" model with bottom-up, top-down attention and policy gradient to obtain image-aware question representation.
- "Abstractive Text Summarizer", combining Pointer generator with Seq2seq attention, by constructing a hybrid distribution over the vocabulary from which it generates the summary.
- "DDPG with Attention-based LSTM State Encoder", a sequential decision making agent for solving "Angry Birds" using Deep Deterministic Policy Gradient with Attention-based LSTM for state encoding.
- "Opinion Generator", a model for capturing a global "pathway" of an opinion as a response to other statement.

Undergraduate Researcher 2016
Brain Reverse Engineering and Imaging Lab, KAIST South Korea

- Machine Learning and Reinforcement Learning basics
- Worked on "Comic style generation using Neural Networks" using Lua and Torch

Undergraduate Researcher 2015 – 2016
My Design Lab, KAIST South Korea

- "Ratchair" is a strategy for displacing objects utilizing vibrations, http://mid.kaist.ac.kr/projects/ratchair/. Used: Python, Java, Android, OpenCV, Arduino, Inventor, Processing-Android, Myo Armband, hardware.
- "UMorph" is an unobtrusive self-image capturing system for tracking self changes over time. Used: PyQt, Dragon Board 410c, OpenCV, Dlib, hardware.

HONORS AND AWARDS

The Oliger Memorial Fellowship 2019 – 2022
A stipend during the Ph.D. at Stanford

Qualcomm-KAIST Innovation Awards 2018 2018
Paper Competition Awards for Graduate Students

Featured at Discovery Daily Planet Canada 2017
"Ratchair: Furniture That Learns to Move Itself" demonstration for Discovery Daily Planet Canada

KAIST Breakthroughs Newsletter 2017
"Furniture That Learns to Move Itself" featured in KAIST Breakthroughs Newsletter

Excellence Award for Bachelor's thesis 2017
Thesis "UMorph: Self-Change Tracker to Reflect Yourself to the Past and to the Future"

First prize in Qualcomm-KAIST Innovation Awards 2016
Embedded Systems Awards

SIGGRAPH 2016 Emerging Technologies DC EXPO Special Prize 2016
For "Ratchair: Furniture That Learns to Move Itself With Vibration"

Undergraduate Research Program Excellence Award 2016
For Extraordinary Efforts and Research Outcomes

KAIST International Student Scholarship 2012 – 2016, 2017 – 2019
A stipend during the B.Sc. and M.Sc. at KAIST

Kyiv Capital Olympiads in Mathematics 2009, 2012
Bronze medal

Regional Mathematics Olympiad 2009
Silver medal

Volyn Regional Mathematics Olympiad 2008
Gold medal

SKILLS

Languages: Ukrainian (native), Russian (native), English (fluent), Korean (elementary)
Programming: Python, Matlab, Java, Torch, Tensorflow, PyTorch, Git, LaTeX, OpenCV, Unix
Prototyping: Raspberry Pi, Arduino, Processing-Android, Autodesk Inventor, Rhino 5, Adobe Photoshop, Adobe Illustrator, Adobe After Effects, Adobe Premiere Pro

SERVICE & EXTRA-CURRICULAR

Reviewer 2021
Energy Based Models Workshop @ ICLR2021

Tutor at KAIST EE Co-op Program 2018
Taught undergraduate students basics of ML, NLP and Tensorflow South Korea

Tutor in Science Camp and English Camp 2017, 2018
Prepared schoolchildren for a science competition, taught schoolchildren English South Korea

Organizer of KAIST EE Promotion in Ukraine 2017
Helped to organize EE Visit Camp, recruited students South Korea, Ukraine

Teaching Assistant at KAIST 2015 – 2016
Intro to Philosophy, English Short Stories, Philosophy of Mathematics, Logic and AI South Korea

Volunteer at UEFA Euro 2012 2012
Participated in closing ceremony dance performance in Kyiv Ukraine

Candidate Master of Sports 2001 – 2007
Acrobatic gymnastics Ukraine