Samuel **Horváth**

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Education

King Abdullah University of Science & Technology (KAUST)   *Thuwal, Saudi Arabia*

PhD in Machine Learning and Optimization   *1/2019 – 7/2022(Expected)*

- Supervised by Prof. Peter Richtárik
- GPA: 4.00/4.00

King Abdullah University of Science & Technology (KAUST)   *Thuwal, Saudi Arabia*

MSc in Statistics   *8/2017 – 12/2018*

- Supervised by Prof. Peter Richtárik
- GPA: 3.82/4.00

Comenius University   *Bratislava, Slovakia*

B.S. in Financial Mathematics   *9/2014 – 6/2017*

- GPA 4.00/4.00 # 1
- Thesis: Visualization of Portfolio Optimization with R Shiny

Honors & Awards

2021	**Al-Kindi Statistics Research Student Award**, a research award for top Statistics PhD student(s) at KAUST	*Saudi Arabia*
2021	**Progress Towards PhD Rated as "Outstanding"**, KAUST	*Saudi Arabia*
2020	**Best Paper Award (+ 1,888 USD cash prize)**, NeurIPS 2020–SpicyFL Workshop	*Online*
2020	**Best Reviewer Award (Top 10%)**, NeurIPS 2020	*Online*
2020	**Progress Towards PhD Rated as "Outstanding"**, KAUST	*Saudi Arabia*
2020	**MLSS Acceptance**, Machine Learning Summer School (MLSS) 2020, Tübingen (acceptance rate 180/1300+), also accepted to MLSS 2020 Indonesia	*Germany*
2019	**Top Reviewer Award**, NeurIPS 2019	*Canada*
2019	**Progress Towards PhD Rated as "Outstanding"**, KAUST	*Saudi Arabia*
2018	**157th/4049**, IEEEXtreme 24-Hour Programming Competition 12.0 joint with Dmitry Kovalev	*Saudi Arabia*
2018	**Best Poster Award (+ 500 EUR cash prize)**, Data Science Summer School, awarded as one of 2 out of total 170 posters presented at DS^3 at École Polytechnique	*France*
2017	**131st/3,350 place**, IEEEXtreme 24-Hour Programming Competition 11.0 joint with Konstantin Mishchenko	*Saudi Arabia*
2017	**KAUST Fellowship**, A generous fellowship provided for MSc/PhD students at KAUST	*Saudi Arabia*
2017	**Accepted to 3 MSc Programs in the UK (offers rejected)**, Imperial College London (Statistics), University College London (Data Science) and University of Edinburgh (Statistical Data Science)	*United Kingdom*
2017	**2nd place**, CFA Institute Research Challenge hosted by CFA Society Czech Republic	*Czech republic*
2017	**37th place**, Vojtech Jarnik International Mathematical Competition- Category II	*Czech republic*
2017	**Excellence Scholarship**, Scholarship for top 5% students at Comenius University	*Slovakia*
2016	**3rd place**, 23rd International Mathematics Competition for university students	*Bulgaria*
2016	**36th place**, Vojtech Jarnik International Mathematical Competition- Category I	*Czech republic*
2016	**Excellence Scholarship**, Scholarship for top 5% students at Comenius University	*Slovakia*
2015	**Excellence Scholarship**, Scholarship for top 5% students at Comenius University	*Slovakia*
2014	**18th place**, Slovak national round of Mathematical Olympiad for high school students	*Slovakia*
2014	**1st place**, District round of Mathematical Olympiad for high school students	*Slovakia*

Publications

FL_PyTorch: optimization research simulator for federated learning

KONSTANTIN BURLACHENKO, SAMUEL HOVÁTH, PETER RICHTÁRIK   *12/2021*

- Proceedings of the 2nd ACM International Workshop on Distributed Machine Learning (DistributedML 2021)
- `https://dl.acm.org/doi/pdf/10.1145/3488659.3493775`

Long-term Outcome in Patients with Takotsubo Syndrome

EDITA POGRAN, ABD EL-RAZEK, LAURA GARGIULO, VALERIE WEIHS, CHRISTOPH KAUFMANN, SAMUEL
HORVÁTH, ALEXANDER GEPPERT, MICHAEL NÜRNBERG, EMIL WESSELY, PETER SMETANA, KURT HUBER   *8/2021*

- `https://link.springer.com/article/10.1007/s00508-021-01925-9`

A Field Guide to Federated Optimization

WANG ET AL. (50+ AUTHORS, INCLUDING ME)   *7/2021*

- The paper provides guidelines for formulating, designing, evaluating and analyzing federated optimization algorithms.
- `https://arxiv.org/pdf/2107.06917.pdf`

FLIX: A Simple and Communication-Efficient Alternative to Local Methods in Federated Learning

ELNUR GASANOV, AHMED KHALED, SAMUEL HOVÁTH, PETER RICHTÁRIK   *7/2021*

- Proceedings of the 25th International Conference on Artificial Intelligence and Statistics (AISTATS 2022)
- International Workshop on Federated Learning for User Privacy and Data Confidentiality (ICML 2021)
- `https://arxiv.org/pdf/2111.11556.pdf`

FjORD: Fair and Accurate Federated Learning Under Heterogeneous Targets with Ordered Dropout

SAMUEL HORVÁTH, STEFANOS LASKARIDIS, MARIO ALMEIDA, ILIAS LEONTIADIS, STYLIANOS I. VENIERIS,
NICHOLAS D. LANE   *1/2021*

- **Spotlight (Top 3%):** Proceedings of the 35th Conference on Neural Information Processing Systems (NeurIPS 2021)
- Federated Learning Workshop (ICML 2021)
- `https://arxiv.org/pdf/2102.13451.pdf`

Hyperparameter Transfer Learning with Adaptive Complexity

SAMUEL HORVÁTH, AARON KLEIN, PETER RICHTÁRIK, CEDRIC ARCHAMBEAU   *1/2021*

- Proceedings of the 24th International Conference on Artificial Intelligence and Statistics (AISTATS 2021)
- `https://arxiv.org/pdf/2102.12810.pdf`

Optimal Client Sampling for Federated Learning

WENLIN CHEN, SAMUEL HORVÁTH, PETER RICHTÁRIK   *10/2020*

- Privacy Preserving Machine Learning Workshop (NeurIPS 2020)
- `https://arxiv.org/pdf/2010.13723.pdf`

Lower Bounds and Optimal Algorithms for Personalized Federated Learning

FILIP HANZELY, SAMUEL HORVÁTH, SLAVOMÍR HANZELY , PETER RICHTÁRIK   *9/2020*

- Proceedings of the 34th Conference on Neural Information Processing Systems (NeurIPS 2020)
- `https://arxiv.org/pdf/2010.02372.pdf`

A Better Alternative to Error Feedback for Communication-Efficient Distributed Learning

SAMUEL HORVÁTH, PETER RICHTÁRIK   *6/2020*

- **The Best Paper Award:** Workshop on Scalability, Privacy, and Security in Federated Learning (NeurIPS 2020)
- Proceedings of the 9th International Conference on Learning Representations (ICLR 2021)
- Federated Learning One World Online Seminar, one hour talk: `https://www.youtube.com/watch?v=AAXcjq8OLVU`
- `https://openreview.net/pdf?id=vYVI1CHPaQg`

Adaptivity of Stochastic Gradient Methods for Nonconvex Optimization

SAMUEL HORVÁTH, LIHUA LEI, PETER RICHTÁRIK, MICHAEL I. JORDAN   *2/2020*

- Proceedings of the SIAM Journal on Mathematics of Data Science (SIMODS)
- **Spotlight:** Optimization for Machine Learning Workshop (NeurIPS 2020)
- `https://arxiv.org/pdf/2002.05359.pdf`

On Biased Compression for Distributed Learning

ALEKSANDR BEZNOSIKOV, SAMUEL HORVÁTH, PETER RICHTÁRIK, MHER SAFARYAN   *2/2020*

- **Oral:** Workshop on Scalability, Privacy, and Security in Federated Learning (NeurIPS 2020)
- `https://arxiv.org/pdf/2002.12410.pdf`

Natural Compression for Distributed Deep Learning

SAMUEL HORVÁTH, CHEN-YU HO, ĽUDOVÍT HORVÁTH, ATAL SAHU, MARCO CANINI, PETER RICHTÁRIK *5/2019*

- Workshop on AI Systems at Symposium on Operating Systems Principles (SOSP 2019)
- `https://arxiv.org/pdf/1905.10988.pdf`

Stochastic Distributed Learning with Gradient Quantization and Variance Reduction

SAMUEL HORVÁTH, DMITRY KOVALEV, KONSTANTIN MISHCHENKO, SEBASTIAN STICH, PETER RICHTÁRIK *4/2019*

- **Best Poster Prize:** Control, Information and Optimization Summer School, Voronovo, Russia, presented by D. Kovalev
- `https://arxiv.org/pdf/1904.05115.pdf`

Don't Jump Through Hoops and Remove Those Loops: SVRG and Katyusha are Better Without the Outer Loop

DMITRY KOVALEV, SAMUEL HORVÁTH, PETER RICHTÁRIK *1/2019*

- Proceedings of the 31st International Conference on Algorithmic Learning Theory (ALT 2020)
- `https://arxiv.org/pdf/1901.08689.pdf`

Nonconvex Variance Reduced Optimization with Arbitrary Sampling

SAMUEL HORVÁTH, PETER RICHTÁRIK *9/2018*

- **Best Poster Prize:** Data Science Summer School (DS³), École Polytechnique, Paris, 2018
- Proceedings of the 36th International Conference on Machine Learning (ICML 2019)
- `http://proceedings.mlr.press/v97/horvath19a.html`

Internships and Research Visits

Facebook AI Research
Montreal, CA

RESEARCH INTERN *8/2021 – 12/2021*

- Research focus: federated learning
- Supervisors: Dr. Michael Rabbat and Dr. Lin Xiao

Samsung AI Center, Embedded AI Team
Cambridge, UK

RESEARCH INTERN *9/2020 – 2/2021*

- Research focus: federated learning
- Supervisors: Prof. Nicholas I. Lane, Stefanos Laskaridis, Dr. Mario Almeida, and Dr. Ilias Leontiadis,
- While on the internship, I was invited to deliver a talk in the Machine Learning Systems lab at the University of Cambridge, led by Nicholas I. Lane.
- Coauthored paper: **FjORD: Fair and Accurate Federated Learning Under Heterogeneous Targets with Ordered Dropout**

Amazon, AI Core Team
Berlin, Germany

APPLIED SCIENTIST INTERN *Summer 2019*

- Research focus: hyperparameter optimization
- Supervisors: Dr. Cédric Archambeau and Dr. Aaron Klein.
- Coauthored paper: **Hyperparameter Transfer Learning with Adaptive Complexity**

University of California, Berkeley
Berkeley, California

VISITING PHD STUDENT *Spring 2019*

- Research focus: nonconvex optimization
- Supervisor: Prof. Michael I. Jordan
- Coauthored paper: **Adaptivity of Stochastic Gradient Methods for Nonconvex Optimization**
- During the visit I attended the "Deep Learning Foundations" workshop at the Simons Institute

Exponea, Recommendation Team
Bratislava, Slovakia

AI INTERN *Summer 2018*

- Focus: sorting and ranking for personalized e-commerce recommendation

Dell Technologies, Global Tax Automation Team
Bratislava, Slovakia

INTERN *6/2016 – 6/2017*

Conferences and Seminars

AI Seminar Series *Abu Dhabi (Online), UAE*
MBZUAI *12/2021*
- Title: **On Several Challenges in Cross-Device Federated Learning**.

Conference on Neural Information Processing Systems (NeurIPS 2021) *Online*
VIRTUAL CONFERENCE *12/2021*
- One paper accepted as **Spotlight (Top 3%)**–**FjORD: Fair and Accurate Federated Learning Under Heterogeneous Targets with Ordered Dropout**.

Federated Learning and Analytics Workshop *Online*
GOOGLE *11/2021*
- **Invitation only** event organized by Google researchers.
- Topics: federated learning and analytics, distributed optimization, cryptography, algorithmic fairness, differential privacy, and policy.
- I gave a talk and presented a poster based on **FjORD: Fair and Accurate Federated Learning Under Heterogeneous Targets with Ordered Dropout**.

International Conference on Machine Learning (ICML 2021) *Vienna (online), Austria*
VIRTUAL CONFERENCE *7/2021*
- I presented two posters based on our papers: **FjORD: Fair and Accurate Federated Learning Under Heterogeneous Targets with Ordered Dropout** and **FedMix: A Simple and Communication-Efficient Alternative to Local Methods in Federated Learning.**

Conference on Neural Information Processing Systems (NeurIPS 2020) *Online*
VIRTUAL CONFERENCE *12/2020*
- Main conference (1 paper accepted): **Lower Bounds and Optimal Algorithms for Personalized Federated Learning**
- Workshops (**4 papers accepted – Best Paper Award, Oral Presentation, Spotlight Talk and Poster**):
  - Privacy Preserving Machine Learning: **Optimal Client Sampling for Federated Learning** (poster)
  - Optimization for Machine Learning: **Adaptivity of Stochastic Gradient Methods for Nonconvex Optimization** (Spotlight Talk)
  - Workshop on Scalability, Privacy, and Security in Federated Learning: **A Better Alternative to Error Feedback for Communication-Efficient DistributedLearning** (**Best Paper Award**), **On Biased Compression for Distributed Learning** (Oral Presentation)

Federated Learning One World Seminar *Online*
FLOW *8/2021*
- Title: **A Better Alternative to Error Feedback for Communication-Efficient Distributed Learning**.
- Talk link: `https://www.youtube.com/watch?v=AAXcjq8OLVU`.

The Machine Learning Summer School (MLSS 2020) *Tuebingen (online), Germany*
MAX PLANCK INSTITUTE FOR INTELLIGENT SYSTEMS *7/2020*
- I gave a talk about our paper: **Natural Compression for Distributed Deep Learning**.

KAUST–Tsinghua Workshop on Artificial Intelligence *Thuwal, Saudi Arabia*
KAUST *11/2019*
- I presented a poster about the paper **Natural Compression for Distributed Deep Learning.**

Amazon Research Days *Berlin, Germany*
AMAZON *10/2019*
- Amazon Conference to promote collaboration with academia.

EMEA Research Internship Colloquium *Cambridge, United Kingdom*
AMAZON *8/2019*
- Amazon Conference for all theirs interns from the EMEA region.
- I presented a poster about our work **Natural Compression for Distributed Deep Learning.**

International Conference on Continuous Optimization (ICCOPT) *Berlin, Germany*
TU BERLIN *8/2019*
- I organized a minisymposium and gave a talk about the paper **Stochastic Distributed Learning with Gradient Quantization and Variance Reduction.**

International Conference on Machine Learning (ICML 2019) *Long Beach, USA*
LONG BEACH CONVENTION CENTER *6/2019*
- We had our paper **Nonconvex Variance Reduced Optimization with Arbitrary Sampling** accepted, which I gave a talk about, and we also presented a poster.

Deep Learning Boot Camp
SIMONS INSTITUTE FOR THEORY AND COMPUTING

Berkeley, USA

5/2019

- The Boot Camp was intended to acquaint program participants with the key themes of the program such as Generalization, Approximation Power, Adversarial Examples and Over-parametrized Neural Networks.

Data Science Summer School (DS^3)
ÉCOLE POLYTECHNIQUE

Paris, France

6/2018

- The primary focus of the event is to provide a series of courses and practical sessions covering the latest advances in the field of data science
- Speakers: Cédric Villani, Yann Lecun, Suvrit Sra, ...
- I presented a poster poster, which won the **Best Poster Award**, and attracted a cash prize of **500 Euros** as one of two out of total 170 posters presented.

Optimization and Big Data
KAUST

KAUST, Saudi Arabia

2/2018

- Four days conference aimed at novel optimization algorithms and distributed systems capable of working in the Big Data setting.

Applied Machine Learning Days
EPFL

Lausanne, Switzerland

1/2018

- Two days of hands-on workshops on Machine Learning and two days of conference with speakers such as Christopher Bishop from Microsoft Research.

Extracurricular Courses and Activities

Seminar co-organizer
FEDERATED LEARNING ONE WORLD SEMINAR SERIES

Online

2020 – Present

- together with Peter Richtárik, Virginia Smith, Aurélien Bellet and Dan Alistarh, we organize Federated Learning One World (FLOW) seminar, `https://sites.google.com/view/one-world-seminar-series-flow`

Volunteer
ICML 2020

Online

2020

Reviewer
ICML 2022, 2021, 2020, 2019 — AISTATS 2020 — NEURIPS 2022, 2020, 2019, 2018 — DISTRIBUTEDML WORKSHOP AT CONEXT 2021, 2020 — OPTIMIZATION METHODS AND SOFTWARE — JMLR — MATHEMATICAL PROGRAMMING — ACM TRANSACTIONS ON INTERNET OF THINGS — FL-ICML 2021 — NFFL 2021 — FL-AAAI 2022

2018 – Present

Minisymposium organizer
ICCOPT

Berlin, Germany

2019

- Together with Filip Hanzely, we organized a minisymposium on the topic "Large-Scale Stochastic First-Order Optimization" consisting of 6 talks

Nanodegree mentor
UDACITY

Online

2019 – 2020

- I served as a mentor providing 1-on-1 meetings, code and project reviews and extra seminars for the students enrolled in the Deep Learning Nanodegree

Seminar Organizer
ALL HANDS MEETINGS ON BIG DATA OPTIMIZATION

KAUST, Saudi Arabia

2018

- Organizer of a group seminar, gave 6 talks given the time period

Teaching Assistant
PHD LEVEL COURSES

KAUST, Saudi Arabia

2018 - 2022

- I was teaching assistant for two PhD level courses: "Special topics in Data Science" and "Advanced topics in Federated Learning".

Entrepreneurship program
CORNELL UNIVERSITY

Saudi Arabia

2018

- 7-days course covers the basic process of how to move from generating a new business idea to turning that idea into a real business
- taught by Cornell professors Chad Carlos, Wesley Sine, Thomas Kurz

Deep Learning Nanodegree *Online*

UDACITY *2018*

- Topics covered: Keras and TensorFlow, convolutional and recurrent networks, deep reinforcement learning, and GANs
- Taught by authorities such as Sebastian Thrun, Ian Goodfellow, and Andrew Trask

Divide and Conquer, Sorting and Searching, and Randomized Algorithms *Online*

COURSERA/STANFORD UNIVERSITY *2018*

- Taught by Prof. Tim Roughgarden
- Passed with Distinction (98% Grade)

Statistical Learning *Online*

STANFORD UNIVERSITY *2017*

- Topics covered: Linear Regression, Classification, Tree-based Methods, SVM, Unsupervised Learning
- Based on the book "An Introduction to Statistical learning, with Applications in R"
- Passed with Distinction (100% Grade)
- `https://verify.lagunita.stanford.edu/SOA/7e92a12167684ec7ba2fd1313b96fb5d/`

Machine Learning *Online*

COURSERA/STANFORD UNIVERSITY *2017*

- Topics covered: Linear and Logistic Regression, Neural Networks, SVM, Unsupervised Learning, Recommend Systems, ...
- Taught by Machine Learning Expert Dr. Andrew Ng
- Passed with Distinction (100% Grade)

Skills

Mathematics	Probability and Statistics, Calculus, Linear Algebra, Statistical Learning, Deep Learning
Programming	Python, PyTorch, MXNet, Tensorflow, Keras, Pandas, Julia, R, R Shiny, Matlab, VBA, SQL
Languages	Slovak C2, English C1, German A2