

DR. NIKOLA KONSTANTINOV

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EMPLOYMENT

- 06.2023 - **INSAIT, Sofia University: Tenure-Track Faculty**
- Leading the machine learning group
- Research focus: mathematical guarantees for trustworthy ML
- 04.2022 – 04.2023 **ETH Zurich AI Center: Postdoctoral fellow**
- Mentors: Prof. Martin Vechev and Prof. Fanny Yang

EDUCATION

- 2017 – 03.2022 **IST Austria (ISTA): PhD Student; Member the ELLIS PhD Program**
- Supervisor: Prof. Christoph H. Lampert
- Thesis: *Robustness and Fairness in Machine Learning*
- Nominated for the best ISTA PhD thesis award of 2022
- 2013 – 2017 **University of Oxford: Master in Mathematics and Statistics; Grade: 1.1**
- Master Thesis: “*Kernel Dependence Measures for Unsupervised Learning*”, supervised by Prof. Dino Sejdinovic
- Focus on Probability Theory, Stochastic Analysis, Statistics
- 2005 – 2013 **Sofia High School of Mathematics**
- Bulgarian High School Diploma, grade 5.99 out of 6
- Extracurricular classes in Mathematics, Informatics and English

INTERSHIPS AND ACADEMIC VISITS

- Spring of 2021 **University of Milan, Italy: ELLIS PhD Exchange Visit (3 months)**
- Host: Prof. Nicolò Cesa-Bianchi
- Studying models for online learning from multiple unreliable data sources
- Summer of 2019 **Amazon.com, Berlin, Germany: Applied Research Internship (3 months)**
- Group: Intelligent Cloud Control; Mentor: Paul Vazquez
- Evaluation and model comparison of predictive models for cloud computing
- Summer of 2016 **ATASS Sports, Exeter, UK: Research Internship (7 weeks)**
- Statistical modelling for sports prediction
- Experience in statistical programming with R and manipulating large datasets
- Summer of 2015 **IST Austria (ISTA): Research Internship (11 weeks)**
- Supervisor: Prof. Nick Barton
- Mathematical models of evolution: quantifying the effects of various genetic phenomena on spatially extended populations

Supervision and group

PhD Students (current): Nikita Tsoy (joint with Martin Jaggi), Ivan Kirev (joint with Andreas Krause), Kristian Minchev, Kostadin Garov (joint with Martin Vechev)

M.Sc. Students: Andor Vari-Kakas (ETH, 2023), Kristof Szabo (ETH, 2023-ongoing), Florian Dorner (ETH, 2022-2023)

University Interns: Anna Mihalkova (INSAIT, 2023), Anna-Maria Gueorguieva (INSAIT, 2023)

High School Interns: Teodora Todorova (INSAIT, 2023), Georgi Pashaliev (ETH, 2022)

PAPERS

Publications

1. Nikita Tsoy, Anna Mihalkova, Teodora Todorova, **N.K.**: Provable Mutual Benefits from Federated Learning in Privacy-Sensitive Domains
To appear in: *Conference on Artificial Intelligence and Statistics (AISTATS)*, 2024
2. Nikita Tsoy, **N.K.**: Strategic Data Sharing between Competitors
In: *Conference on Neural Information Processing Systems (NeurIPS)*, 2023;
3. Florian E. Dorner, **N.K.**, Giorgi Pashaliev, Martin Vechev: Incentivizing Honesty among Competitors in Collaborative Learning and Optimization
In: *Conference on Neural Information Processing Systems (NeurIPS)*, 2023;
4. Florian E. Dorner, Momchil Peychev, **N.K.**, Naman Goel, Elliott Ash, Martin Vechev: Human-Guided Fair Classification for Natural Language Processing
In: International Conference on Learning Representations (**ICLR**), **Spotlight**
Short version in: **TSRML@NeurIPS workshop**, 2022
5. Dimitar I. Dimitrov, Mislav Balunović, **N.K.**, Martin Vechev: *Data Leakage in Federated Averaging*
In: Transactions of Machine Learning Research (**TMLR**), 2022
6. Eugenia Iofinova[#], **N. K.**[#], Christoph H. Lampert: *FLEA: Provably Fair Multisource Learning from Unreliable Training Data*
In: Transactions of Machine Learning Research (**TMLR**), 2022; **# Equal contribution**
7. **N. K.**, Christoph H. Lampert: *Fairness-Aware PAC Learning from Corrupted Data*
In: Journal of Machine Learning Research (**JMLR**), 2022
8. **N. K.**, Christoph H. Lampert: *On the Impossibility of Fairness-Aware Learning from Corrupted Data*
In: **AFRC@NeurIPS workshop, Contributed talk**, 2021
9. **N. K.**, Elias Frantar, Dan Alistarh, Christoph H. Lampert: *On the Sample Complexity of Adversarial Multi-Source PAC Learning*
In: *International Conference on Machine Learning (ICML)*, 2020
10. **N. K.**, Christoph H. Lampert: *Robust Learning from Untrusted Sources*
In: *International Conference on Machine Learning (ICML)*, **Long Talk**, 2019
11. Dan Alistarh, Torsten Hoeftler, Mikael Johansson, **N. K.***, Sarit Khirirat, Cedric Renggli: *The Convergence of Sparsified Gradient Methods*
In: *Conference on Neural Information Processing Systems (NeurIPS)*, 2018; *** Alphabetic order**
12. Dan Alistarh, Chris De Sa, **N. K.***: *The Convergence of Stochastic Gradient Descent in Asynchronous Shared Memory*
In: *ACM Symposium of Principles of Distributed Computing (PODC)*, 2018; *** Alphabetic order**

Preprints

1. **N. K.**, Christoph H. Lampert: Fairness Through Regularization for Learning to Rank
Arxiv: <https://arxiv.org/abs/2102.05996>

TALKS AND OUTREACH

Talks

1. December 2023: Massachusetts Institute of Technology (MIT); New York, USA
Title: *Incentivizing Collaboration in Federated Learning*

2. December 2023: Microsoft Research; New York, USA
Title: *Incentivizing Collaboration in Federated Learning*
3. December 2023: Google Research; New York, USA
Title: *Incentivizing Collaboration in Federated Learning*
4. November 2023: INSAIT- RIKEN AIP Joint Workshop on Artificial Intelligence; Sofia Bulgaria
Title: *Incentivizing Collaboration in Federated Learning*
5. November 2023: New Horizons of Journalism Conference; Sofia Bulgaria
Title: *Generative AI: Risks, Responsibilities and Research*
6. July 2023: Third Annual Meeting of Young Bulgarian Mathematicians, IMI-BAN; Sofia, Bulgaria
Title: *Statistical Aspects of Trustworthy Machine Learning*
7. June 2023: Sofia Business School, NBU; Sofia, Bulgaria
Title: *Learning from Unreliable and Distributed Data*
8. April 2023: MLO group seminar; EPFL, Lausanne, Switzerland
Title: *Federated Learning in the Presence of Strategic Behavior*
9. March 2023: IML Seminar Series; ETH Zurich, Switzerland
Title: *Federated Learning in the Presence of Strategic Behavior*
10. October 2022: TrustML Young Scientists Seminars (online)
Title: *Statistical Aspects of Trustworthy Machine Learning*
11. October 2022: INSAIT Annual Conference, Tutorial Session; Sofia, Bulgaria
Title: *Statistical Machine Learning: Foundations and Present Challenges*
12. July 2022: MLO group seminar; EPFL, Lausanne, Switzerland
Title: *Statistical Aspects of Trustworthy Machine Learning*
13. February 2022: ETH AI Center Postdoctoral Symposium (online)
Title: *Statistical Aspects of Trustworthy Machine Learning*
14. December 2021: Guest lecture at the ETH Zurich course on Trustworthy ML (online)
Title: *Statistical Aspects of Group Fairness-Aware Learning*
15. May 2021: GILT seminar series, University of Milan
Title: *On the Sample Complexity of Adversarial Multi-Source PAC Learning*

Interviews

1. [November 2023: Bulgarian National Radio \(BNR\), Program Horizont](#); Sofia, Bulgaria
Topic: AI safety and regulations
2. [October 2023: Bulgarian National Radio \(BNR\), Program Hristo Botev](#); Sofia, Bulgaria
Topic: Research abroad and in Bulgaria and career at INSAIT
3. [October 2023: Bulgarian National Television \(BNT\), Program "100% awake"](#); Sofia Bulgaria
Topic: Bulgaria's breakthrough at NeurIPS; appearing together with INSAIT interns
4. June 2023: Fireside chat at VMWare; Sofia Bulgaria
Topic: *Trustworthy Machine Learning*

AWARDS AND SCHOLARSHIPS

Academic	<ul style="list-style-type: none">- ETH AI Center Postdoctoral Fellowship, 2022- <i>PODC student travel award</i>, SIGOPS, 2018- <i>Davies Prize for MMath Part C</i>, Jesus College, Oxford, 2017- <i>Department of Statistics Prize for MMath Part A</i>, Oxford, 2015- <i>Open Scholarship</i>, Jesus College, Oxford – 3 awards (2014-2016)- <i>Bulgarian National Scholarship</i> for gifted students – 4 awards (2008 – 2011)
Olympiads	<ul style="list-style-type: none">- 20th international “DUEL” competition 2012 (Czech Republic): <i>First place</i>- Princeton University Mathematical Competition 2011, Power Round (Team Project): <i>Third Place</i>- Junior Balkan Mathematical Olympiad 2008: Bronze medal

SKILLS

IT skills	Experienced with: Python, Tensorflow, NumPy, R, LaTeX, Ubuntu Have worked with: JAX, C++, Matlab, HTML, Mathematica
Languages	Fluent: English, Bulgarian; Conversational: German, Russian

MISCELLANEOUS

Reviewing	- NeurIPS (2021-), ICML (2021-), AISTATS (2022-), COLT(2023-), JMLR
Teaching	ETH Zurich: Teaching Assistant - 09.2022 – 12.2022: Reliable and Trustworthy Artificial Intelligence (RTAI) IST Austria (ISTA): Teaching Assistant - 02.2020 – 04.2020: <i>Formal Methods for Learned Systems</i> - 11.2018 – 01.2019: <i>Deep Learning with Tensorflow</i> - 10.2018 – 11.2018: <i>Statistical Machine Learning</i>
Responsibilities	INSAIT: Internal seminar organizer - 2023 – present: organizing a weekly seminar and coordinating visitors’ talks IST Austria (ISTA): ML meetup organizer - 2020 – 2021: Organizing a reading group for the ML students at ISTA IST Austria (ISTA): Student representative in Data Science - 2018 – 2020: Representing Data Science students at ISTA; providing feedback about related postgraduate courses; welcoming first-year Data Science students Oxford University Bulgarian Society - 2015 – 2016: <i>President</i> – organising weekly talks, film nights, joint meetings with other university societies; maintaining the society's website - 2014 – 2015: <i>Secretary</i> – communicating with members and applicants
Summer Schools	Machine Learning Summer School (MLSS), Madrid 2018 - Two weeks of talks about various areas of machine learning, taught by world-leading experts in the respective fields
Hobbies	Sports: running, dancesport, squash, (table) tennis; Others: reading fiction