Curriculum Vitae

Aleksanteri Sladek
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Profile

*I am a first year doctoral student researching **robust, trustworthy, and explainable machine learning models** via **probabilistic methods**. I focus on bridging the gap between expressive but intractable models like neural networks and tractable models such as **probabilistic circuits**. My goal is to advance **probabilistic reasoning** and **uncertainty quantification** in neural networks particularly for improved **human-AI collaboration** in tasks where communicating uncertainty can improve interaction and outcomes.*

Education

Doctor of Science in Computer Science
Aalto University
August 2024 - August 2027 (*exp.*)
Espoo, Finland

- ***Topic**: Advancing Probabilistic Reasoning in NNs for Improved Human-AI collaboration*

Master of Science in Machine Learning, Data Science and Artificial Intelligence
Aalto University
September 2021 - June 2024
Espoo, Finland

- ***Thesis:** Positive Semi-Definite Probabilistic Circuits*
- ***Honors**: Summa Cum Laude*

Bachelor of Science in Computer Science
Drexel University
September 2017 - June 2020
Philadelphia PA, USA

- ***Honors:** Summa Cum Laude*

Publications

[1] Approximate Bayesian Inference via Bitstring Representations
A. Sladek, M. Trapp, A. Solin
2025
41st Conference on Uncertainty in Artificial Intelligence (UAI)

[2] Are Your Continuous Approximations Really Continuous? Reimagining VI with Bitstring Representations
A. Sladek, M. Trapp, A. Solin
2025
7th Symposium on Advances in Approximate Bayesian Inference (AABI)

[3] Subtractive Mixture Models via Squaring: Representation and Learning (ICLR spotlight)
L. Loconte, A. Sladek, S. Mengel, M. Trapp, A. Solin, N. Gillis, A. Vergari
2024
12th International Conference on Learning Representations (ICLR)

[4] Encoding Negative Dependencies in Probabilistic Circuits
A Sladek, M. Trapp, A. Solin
2023
6th Workshop on Tractable Probabilistic Modelling (TPM)

[5] ADHD Prediction via Time Series Ensemble Fed Driving Simulator Data
D. Grethlein, A. Sladek, S. Ontañón
2021
34th International Conference of The Florida Artificial Intelligence Research Society (FLAIRS)

[6] iNNk: A Multiplayer Game to Deceive a Neural Network
J. Villareale, A.V. Acosta-Ruiz, S.A. Arcaro, T. Fox, E. Freed, R.C. Gray, M. Löwe, A. Sladek, R. Weigelt, Y. Li, S. Risi, J. Zhu
2020
Annual Symposium on Computer-Human Interaction in Play (CHI PLAY)

Work Experience

Doctoral Researcher August 2024 - August 2027
Aalto University | Department of Computer Science | AaltoML Group Espoo, Finland

- ➢ *Pursuing research under the supervision of Arno Solin and Samuel Kaski on a doctoral dissertation topic of "Advancing Probabilistic Reasoning in NNs for Improved Human-AI collaboration"*
- ➢ *Work on research studying methods to quantify uncertainty in quantized machine learning model parameters with variational inference over bitstring representations [1, 2]*
- ➢ *Served as a teaching assistant for the Gaussian Processes 2025 course at Aalto*

Master's Thesis Worker / Research Assistant January 2023 - June 2024
Aalto University | Department of Computer Science | AaltoML Group Espoo, Finland

- ➢ *Derived algorithms and mathematical formulations for an extension to probabilistic circuits called positive semi-definite probabilistic circuits, which loosen a non-negative parameter constraint in probabilistic circuits to increase their ability to express complicated probability distributions more efficiently [3, 4]*
- ➢ *Implemented and experimented with positive semi-definite circuits in Julia for my thesis and workshop paper [4]*
- ➢ *Worked as a teaching assistant in the Gaussian Processes 2024 course, and implemented automatic grading of assignments in JupyterLab*
- ➢ *Conducted preliminary research involving neural network quantization, variational inference and probabilistic circuits*

Summer Research Assistant June 2022 - September 2022
Aalto University | Department of Computer Science | Probabilistic ML Group Espoo, Finland

- ➢ *Worked on the AI-Assisted UAV Design -project, which aims to extend previous work in creating an AI assistant for assisting humans with unknown objectives and decision-making biases in a sequential decision-making task to a more complex decision-making problem domain*
- ➢ *Explored and experimented with methods for improving the computational speed of the assistance algorithm using deep learning, such as Deep Q-Learning and learning effective data feature embeddings*

Summer Research Assistant July 2020 - September 2020
Drexel University | College of Computing & Informatics | Games, Artificial Intelligence and Media Systems Lab Philadelphia PA, USA

- ➢ *Worked with an interdisciplinary team of researchers and professionals on the DARPA ASIST project, which aims to develop an AI powered assistant for first responders*
- ➢ *Designed and conducted preliminary research experiments evaluating the usefulness of neural networks for inferring situational knowledge and skills of a first responder acting in a simulated emergency situation*
- ➢ *Implemented a data analysis pipeline for regression tasks on real-time streams of data using neural networks*

Research Assistant April 2019 - September 2019
Drexel University | College of Computing & Informatics | Games, Artificial Intelligence and Media Systems Lab Philadelphia, PA, USA

- ➢ *Worked on the Diagnostic Driving research project at Drexel's GAIMS laboratory. The project evaluated utilizing data gathered from driving a car as a non-invasive method to diagnose medical conditions [5]*
- ➢ *Designed and conducted research experiments utilizing supervised machine learning models such as Long Short-Term Memory and Convolutional Neural Networks on driving simulator time-series data*

Honors & Service

- ➢ **Awards:** *Finnish Doctoral Program Network in Artificial Intelligence AI-DOC Funding (2024), Helsinki Institute for Information Technology HIIT Short Term Project Grant (2023), Upsilon Pi Epsilon Computing and Informatics Honor Society Inductee (2019), Drexel University Dean's List (2017-2020), A.J. Drexel Scholarship (2017-2020), DCCC Academic Gold Award (2016)*
- ➢ **Service:** *AISTATS 2025 emergency reviewer, UAI TPM Workshop 2023 reviewer, Shaking Up Tech AI Workshop assistant (2024 & 2025)*
- ➢ **Talks:** *AI-DOC Launch Event poster presentation (2025), Aalto AI Day research presentation (2024), Aalto Macadamia new student orientation presentation (2024)*