

Alibek T. Kaliyev

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Education	University of Texas at Austin, <i>Master of Science, Computer Science</i> Part-time studies with a specialization in Machine Learning	Austin, TX Aug 2024 - Dec 2027 (Expected)
	Lehigh University, <i>Bachelor of Science, Computer Science and Business</i> Minor: Cognitive Science GPA: 3.78/4.00 Computer Science Coursework: Computer Vision — Fundamentals of Machine Learning — Biomedical Image Computing — Operating Systems Design — Algorithms & Data Structures — Database Systems, Algorithms & Applications — Design and Analysis of Algorithms — Blockchain Systems, Algorithms and Applications — Software Engineering — Computer Organization & Architecture — Systems Software — Programming Languages — Fast Machine Learning. Mathematics Coursework: Calculus (I, II) — Statistical Methods — Linear Methods — Foundations of Discrete Structures & Algorithms.	Bethlehem, PA June 2020 - May 2024
Publications	S. Qin, Y. Guo, A.T. Kaliyev , J.C. Agar, 2022. Why it is Unfortunate that Linear Machine Learning Models “Work” so well in Electromechanical Switching of Ferroelectric Thin Films. <i>Advanced Materials</i> . 2202814.	
In Preparation	A.T. Kaliyev , R. Forelli, P. Sales, S. Qin, Y. Guo, S.O. Memik, M.W. Mahoney, A. Gholami, R.K. Vasudevan, S. Jesse, N. Tran, P. Harris, M. Takáč, J.C. Agar. Rapid Fitting of Band-Excitation Piezoresponse Force Microscopy Using Physics Constrained Unsupervised Neural Networks.	
Accepted Work (Peer-reviewed)	AI for Accelerated Materials Design NeurIPS 2023 Workshop. “ <i>Rapid Fitting of Band-Excitation Piezoresponse Force Microscopy and Piezoelectric Hysteresis Loops Using Physics Constrained Unsupervised Neural Networks.</i> ” Dec 2023, New Orleans, LA.	
Presentations	Gulf Coast Undergraduate Research Symposium 2022 (Rice University). “ <i>Rapid Fitting of Band-Excitation Piezoresponse Force Microscopy and Piezoelectric Hysteresis Loops Using Physics Constrained Unsupervised Neural Networks.</i> ” Oct 2022, Houston, TX. Fast Machine Learning for Science Workshop 2022 (SMU). “ <i>Rapid Fitting of Band-Excitation Piezoresponse Force Microscopy and Piezoelectric Hysteresis Loops Using Physics Constrained Unsupervised Neural Networks.</i> ” Oct 2022, Dallas, TX. MSE Undergraduate Research Symposium (Lehigh University). “ <i>Rapid Fitting of Band-Excitation Piezoresponse Force Microscopy and Piezoelectric Hysteresis Loops Using Physics Constrained Unsupervised Neural Networks.</i> ” Sep 2021, Bethlehem, PA. Drexel AI Research Conference. “ <i>Accelerated Fitting of Band-Excitation Piezoresponse Force Microscopy.</i> ” May 2021, Remote. David and Lorraine Freed Undergraduate Research Symposium (Lehigh University). “ <i>Accelerated Fitting of Band-Excitation Piezoresponse Force Microscopy.</i> ” Apr 2021, Bethlehem, PA. Gulf Coast Undergraduate Research Symposium 2020 (Rice University). “ <i>Pre-trained Deep-Learning Models for Rapid Analysis of Piezoelectric Hysteresis Loops.</i> ” Oct 2020, Remote. Center for Nanophase Materials Sciences User Meeting (ORNL). “ <i>Pre-trained Deep-Learning Models for Rapid Analysis of Piezoelectric Hysteresis Loops.</i> ” Aug 2020, Remote.	

Research Experience **Multifunctional Materials and Machine Learning Group** Bethlehem, PA
Undergraduate Deep Learning Researcher June 2020 - Dec 2023

- Accelerated extraction of mechanical properties of quantum materials by 3.5 times by building a deep neural network with convolutional layers in the form of an autoencoder.
- Optimized a neural network's training and inference processes in PyTorch by reducing the model size by a factor of 3,000, and performing a quantized-aware training using hls4ml.
- Visualized and preprocessed 1.3 million data samples from HDF5 files by leveraging Matplotlib, Seaborn, Scikit-learn, and NumPy.
- Reduced the number of bits needed to train the neural network by 54% while keeping the same MSE by performing quantization-aware training using AutoQKeras.
- Prepared the deployment of the model on Xilinx K60 FPGA using HLS4ML library for fast and real-time inference; benchmarks demonstrate the latency of 40 microseconds/fit.

PI: Dr. Joshua C. Agar

Brain Imaging & Computation Lab Bethlehem, PA
Undergraduate Research Assistant Aug 2022 - Mar 2023

- Developed Graph Attention Neural Networks for depression severity prediction in patients achieving R^2 value of 0.91 between predicted and true values of Beck Depression Inventory (BDI) and Spielberger Trait Anxiety Inventory (TAI)

PI: Dr. Yu Zhang

Industry Experience **Amazon Web Services** New York City, NY
Software Development Engineer June 2024 - Present

Capstone Project for Merck & Co.: Machine Assisted Contextualization Bethlehem, PA
Machine Learning Engineer/Researcher Jan 2023 - Dec 2023

- Fast-forwarded team's development of machine learning pipeline to classify manufacturing labels using Scikit-learn, Pandas and NumPy
- Improved an accuracy of predictions from 47% to 92% on the test set by utilizing feature engineering methods, which optimized the labeling process at Merck by 10x
- Further researched and developed state-of-the-art semi-supervised GAN-BERT model to improve the accuracy of labeling algorithm to 96% on the test set
- Integrated the human-in-the-loop component of the project by deploying the model on AWS using FastAPI and Nginx to enable the retraining process

Advisor/sponsor: Vincent R. Capodanno

Amazon Web Services (Edge ML Services Team) New York City, NY
Software Development Engineer Intern May 2023 - Aug 2023

- Designed and implemented an automated CloudFormation stacks updater in the CI/CD production pipeline, which resulted in the team's deployment 15 times faster
- Shipped a production-level and ready code 3 times faster than expected, saving the team's time to deliver updates for customers. Utilized AWS CDK, Step Functions, Lambda, VPC and Custom Resources
- Communicated effectively with senior engineers across 3 teams to discuss and implement the service into their AWS back-end. Worked on unblocking pipelines and handling failure behaviors
- Tracked and monitored behavior of the service by implementing CloudWatch alarms and ticketing actions

GrainBound, LLC Bethlehem, PA
Machine Learning Technical Associate Feb 2022 - May 2023

- Developed and applied machine learning techniques and algorithms to provide consulting services for a large international chemicals manufacturer
- Improved the manufacturing efficiency by 40% by providing insights on dataset with 50,000 rows using Pandas, and predicting the manufacturing settings for each material using Tensorflow and Scikit-learn

Teaching Experience **Lehigh University, Computer Science & Engineering Department**
Course Assistant & Grader

	Computer Vision (CSE 398/498)	Spring 2024
	Database Systems & Applications (CSE 241)	Fall 2023
	Data Structures & Algorithms (CSE 017)	Fall 2022 & Spring 2023
	Introduction to Programming (CSE 007)	Spring & Fall 2021
Honors & Awards	Trustees Scholarship (given to 1% of applicant pool), \$30,000/year	2020-2024
	Lehigh Grant, \$35,000/year	2020-2024
	Beta Gamma Sigma Business Honors Society (top 10% undergrad)	2023
	Lehigh University Dean's List	Fall 2020 - Spring 2023
	Nano-Human Interfaces Presidential Fellowship, \$8,000	2022
	STEM-SI Fellowship, \$5,500	2021
	Most Novel Research Award at Drexel AI Conference	2021
	Facebook ABCS Fellowship	2021
	Data for Impact Fellowship	2020
Community Involvement	Secretary, Lehigh Central Asian Students Association	Mar 2023 - May 2024
	Vice President, Lehigh Comp. Sci. & Business Association	Apr 2022 - Apr 2023
	Technical Development Chair, Lehigh Comp. Sci. & Business Association	Apr 2021 - Apr 2022
Skills	Programming Languages: Python, Java, TypeScript, C/C++, SQL, HTML/CSS ML/DS Libraries: NumPy, SciPy, PyTorch, TensorFlow, Pandas, Matplotlib Software Engineering: AWS, React, Docker, Git, Google Cloud, Heroku Languages: English, Russian, Kazakh	