

Emil Biju

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EDUCATION

Stanford University

2023–2025

M.S. in Electrical Engineering, Focus Area: Machine Learning/AI

GPA: 4.12/4

- Research in LLMs and autonomous driving, Coursework in deep learning/NLP/vision

IIT Madras (Indian Institute of Technology Madras)

2017–2021

B.Tech (Honors) in Electrical Engineering, Minor in Deep Learning

GPA: 9.70/10

- Department **2nd topper**, highest grade in all courses from the CS and Math departments.

PUBLICATIONS AND PATENTS

1. **Input-specific Attention Subnetworks for Adversarial Detection** | ACL 2022 Findings [\[Paper\]](#)
2. **Joint Transformer/RNN Architecture for Gesture Typing in Indic Languages** | COLING 2020 [\[Paper\]](#)
3. **Perturbation Analysis of Practical Algorithms for the Maximum Scatter TSP** | ALENEX 2022 [\[Paper\]](#)
4. **Vocabulary-constrained Question Generation with Rare Word Masking** | CODS-COMAD 2021 [\[Paper\]](#)
5. **Low-Cost Adaptive Compression of Product Twins in Transformers** | ArXiv Preprint [\[Paper\]](#)
6. **Graph-AI based Methods and Solutions for Detecting Malicious Applications** [Patent pending]

WORK EXPERIENCE

Microsoft | Data & Applied Scientist (Full-time, 2 years)

2021–2023

- Pursued ML research in the Microsoft Security team, focused on cloud app security.
- Contributed to the development of Copilot for Security focused on using LLMs like GPT-4 to help security analysts investigate threats alerts. Promoted to Data Scientist 2 role for exceptional work.
- Used NLP, computer vision, graphs, and anomaly detection to model attack patterns and track app behavior. Successfully detected 4 real-world cyberattacks using a patent-pending graph model.

Microsoft | Data Scientist Intern

June–Sept 2024, May–July 2020

- Developed a cost-efficient LLM pipeline to analyze responses from Microsoft Copilot and derive insights on frequent failure patterns. Used LoRA adapters and fine-tuned embeddings to improve performance.
- Developed CNN and Transformer-based deep learning models to analyze multi-spectral satellite images for estimating biomass in agricultural fields and identifying prospective areas for oil exploration.

GE Healthcare | Data Scientist Intern

May–July 2019

- Used graph-based keyword clustering and topic ranking to analyze service logs of healthcare machines and identify quality improvement opportunities. Reduced document analysis time by 11x.

PROJECTS

Risk Assessment in Autonomous Driving using VLMs and NeRFs | Stanford NAV Lab

- Used multimodal LLMs to query 3D NeRF models for renderings along the planned route of an autonomous vehicle and predict risk factors based on road characteristics and accident records.
- Developed a pipeline to improve real-time AV safety by using LLMs to control the sensitivity of on-board algorithms based on rendered images in the context of driving conditions (weather, time, and holidays).

Low-Rank Compression of Speech Transformer models | Stanford Pilanci Lab

[\[Paper\]](#)

- Developed an approach to jointly compress weight matrices in the attention layer of a transformer using SVD-based low rank approximation while prioritizing performance on a target speaker.
- Compressed Whisper and Distil-Whisper models by 45% with less than 2% increase in error rate. Showed higher data efficiency than SOTA methods requiring just 8 hours of speech data for adaptation.

RNN-based Swipe Decoding for Indic Smartphone Keyboards | UG Research [\[Paper\]](#)[\[GitHub\]](#)

- Curated datasets in 7 languages using a mathematical model that simulates swipe inputs to a smartphone keyboard based on the brain's motor control principle of jerk minimization.
- Developed a Transformer-LSTM model for accurate swipe decoding and a word embedding model for parallelized spelling correction. Achieved SOTA accuracies of 70-95% across 7 languages.

Adversarial Detection in Deep Transformer Models | UG Thesis [\[Paper\]](#)[\[GitHub\]](#)

- Demonstrated that Transformers contain input-specific attention subnetworks that are useful in detecting adversarial inputs and improving model explainability.
- Used attention subnetworks to increase the state-of-the-art (SOTA) accuracy in adversarial detection by 7.5% across 10 NLP tasks and 11 adversarial attack types.

Cyberattack Detection using Knowledge Graphs | Microsoft [\[Patent pending\]](#)

- Built a knowledge graph representation of 10M cloud apps and designed a risk propagation algorithm to discover hidden relationships and malicious clusters of apps.
- This work **uncovered 4 cyberattacks** involving 2k+ apps that were taken down by Microsoft.

Deep CNN for detecting Logo Impersonation | Microsoft

- Developed deep CNNs to detect impersonated versions of legitimate brand logos using object localization, colorspace/edge analysis, and embedding-based proximity detection.
- Deployed the model efficiently using PySpark to evaluate 30k logos within 10 minutes with 80% recall.

Approximation Algorithms for the Maximum Scatter TSP | UG Research [\[Paper\]](#)[\[GitHub\]](#)

- Devised 6 algorithms for efficiently solving the NP-hard maximum scatter traveling salesman problem.
- Used perturbation analysis to demonstrate their superior real-world performance in terms of stability, speed, and accuracy.

TECHNICAL SKILLS

Programming Languages: Python, C, C++, Apache Spark, SQL, HTML, ARM

Libraries: TensorFlow, Keras, PyTorch, OpenCV, NLTK, Numpy, Matplotlib, Sklearn, other ML libraries

Interests: ML, NLP, Deep Learning, Computer Vision, LLMs, Discrete algorithms

AWARDS

IIT Madras Silver Medal: Institute 2nd topper based on overall GPA and performance in H.S. courses.

Best Paper Honorable Mention: Awarded for my publication at ACM CODS-COMAD 2021.

JN Tata Scholar: Awarded to the top 100 students from India for pursuing graduate study abroad.

NTSE Scholar: Awarded to the top 750 students by the Govt. of India based on a nationwide exam.

KVPY Fellow: Awarded to the top 1500 students by IISc based on a nationwide exam.

RELEVANT COURSEWORK

ML: *Stanford:* Deep Generative Models (CS236), Computer Vision (CS231N), Robot Autonomy (CS237B), Meta Learning (CS330), Bandit Learning (EE277) | *IIT Madras:* Machine Learning, Deep Learning, NLP

CS: Data Structures & Algorithms, Design & Analysis of Algorithms, Computer Organization, Introduction to Programming, Applied Programming

Mathematics: Linear Algebra, Probability, Graph Theory, Series & Matrices, Differential Geometry

EXTRA-CURRICULAR ACTIVITIES

Blogging: Created a [blog](#) to mentor engineering aspirants in India & clocked over 6k views to date.

Learning champ, Microsoft: Curated learning material and organized sessions for 1000+ employees.

School Head Boy: Popularly elected by the school community in high school.

Public Speaking: Featured as the lead emcee/speaker at several prominent events in school and at work.

Academic service: Served as a paper reviewer for the MLADS 2021 conference.