Gautham Krishna Gudur

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RESEARCH INTERESTS

I am interested in building resource-efficient, data-centric, and human-centric machine learning systems.
Focus Areas: Ubiquitous Computing, Human Activity Recognition, Cross-modal Learning (inertial, acoustic, and health sensing), Generative AI, Foundation models/LLMs, Continual Learning, Active Learning, Federated Learning, Limited Supervision

EDUCATION

The University of Texas at Austin, Austin, TX — Aug 2023 – Present
***Ph.D.**, Electrical and Computer Engineering, **GPA:** 3.89/4.00*
Advisor: Prof. Edison Thomaz

Anna University (SSN College of Engineering), Chennai, India — 2013 – 2017
***B.Tech.**, Information Technology*

RESEARCH AND WORK EXPERIENCE

University of Texas at Austin – Graduate Research Assistant — Austin, TX
Advisor: Prof. Edison Thomaz — Aug 2023 – Present

- Designing data-efficient continual learning techniques to alleviate catastrophic forgetting. Introduced dataset distillation as an alternative strategy to active learning, reducing user labeling efforts by up to 3000x for audio classification tasks.
- Developed multimodal acoustic-motion feature alignment methods to enhance IMU-based human activity recognition.
- Proposed SVFT (Singular Vector guided Fine-Tuning) – a Pareto-dominant PEFT technique *[Mentor: Prof. Sujay Sanghavi]*.
- Leveraging efficient sample selection approaches for LLM training and fine-tuning.

University of Texas at Austin – Graduate Teaching Assistant — Austin, TX
Primary Instructor: Prof. Edison Thomaz — Jan 2025 – Present

- Designing and grading assignments for the "Human Signals" course (full-time and part-time offerings) with ~80 students.
- Mentoring students on final research projects, writing effective paper reviews, and delivering paper presentations.

Independent Research — Dec 2018 – May 2023

- Analyzed the effect of calibration on prioritizing important samples during training *[Mentor: Prof. Emtiyaz Khan, RIKEN]*.
- Designed zero-shot federated learning frameworks to handle new heterogeneous classes and models for audio sensing.
- Worked on Bayesian active learning for on-device human activity recognition (HAR) and wearable sensing tasks.

Ericsson R&D, Global AI Accelerator (GAIA) – Data Scientist III — Chennai, India
Mentors: Dr. Shrihari Vasudevan, M J Prasath — Feb 2019 – Apr 2023

- Worked on ML for network intelligence and telecom resulting in multiple publications, patents, and deployed products.
- Contributed to 3GPP standardization for federated learning and multi-vendor model sharing; defined and positioned Ericsson's AI-Native design principles. Created spatiotemporal models for indoor building connectivity prediction with <5% error; improved mobility prediction of user devices in 5G Network Data Analytics Function (NWDAF).
- Developed E-ADF – an end-to-end unsupervised anomaly detection framework with data-efficient Bayesian model selection and dynamic threshold optimization with >60% reduction in data points.
- Created E-LangHub (Ericsson NLP Hub) with telco-rich data and SOTA models. Improved AIB (Automated Intelligent Knowledge Base) for customer symptoms using LLMs and active learning; worked on telco-specific language translation.
- Deployed an object detection system for infrastructure failures at cell sites, reducing field technician hours by over 20.

SmartCardia (EPFL) – Machine Learning Engineer — Chennai, India
Mentor: Dr. Srinivasan Murali — May 2018 – Nov 2018

- Implemented gradient-boosted ensembles and LSTM models for regression and classification on imbalanced time-series clinical data; extracted features from biomarkers such as sleep apnea, troponin, blood pressure, and hemoglobin.

Solarillion Foundation – Research Assistant — Chennai, India
Mentor: Vineeth Vijayaraghavan — Feb 2016 – May 2018

- Led the development of *HARNet* – deep ensemble models for activity recognition with on-device incremental learning.
- Designed dynamic gesture recognition models with efficient feature engineering on a low-cost Raspberry Pi Zero ($5).
- Deployed a movie occupancy predictor for a top Indian multiplex chain using tree-based models and branched LSTMs.

SSN College of Engineering – Undergraduate Student Researcher Chennai, India
Mentors: Prof. Bhalaji N, Prof. Srinivasan R Feb 2015 – Mar 2017

- Developed a vision-based intelligent bus stop recognition system using CNNs; employed data augmentation and active learning strategies to ensure scalability and adaptability in dynamic Indian environments, achieving ~96% accuracy.
- Led an HCI research project – Neurocinematics, to classify real-time cognitive responses of film viewers using EEG data.
- Evaluated routing protocol performance metrics on a Contiki testbed to select the optimal mote for two IoT scenarios.

SELECTED PUBLICATIONS [Conference/Journal/Workshop]

* denotes equal contribution and joint lead authorship *[Citations: 243, h-index: 9, i-index: 9]*

Conference/Journal/Workshop

- V Lingam*, A Tejaswi*, A Vavre*, A Shetty*, Gautham Krishna Gudur*, J Ghosh, A Dimakis, E Choi, A Bojchevski, S Sanghavi. SVFT: Parameter-Efficient Fine-Tuning with Singular Vectors, **NeurIPS 2024**.
  Abridged versions: **NeurIPS 2024 – FITML** workshop; **ICML 2024 – WANT *[Oral Presentation]*** and **ES-FoMo** workshops.
- Gautham Krishna Gudur, E Thomaz. Dataset Distillation for Audio Classification: A Data-Efficient Alternative to Active Learning, **NeurIPS 2024 – ENLSP** workshop.
- G Tata*, Gautham Krishna Gudur*, G Chennupati, ME Khan. Can Calibration Improve Sample Prioritization?, **NeurIPS 2022 – HILL** and **HITY** workshops.
- Gautham Krishna Gudur, R Raaghul, K Adithya, S Vasudevan. Data-Efficient Automatic Model Selection in Unsupervised Anomaly Detection, **IEEE ICMLA 2022**.
- Gautham Krishna Gudur, SK Perepu. Zero-Shot Federated Learning with New Classes for Audio, **INTERSPEECH 2021**.
  Abridged version: **ICLR 2021 – DPML** and **HAET** workshops.
- Gautham Krishna Gudur, SK Perepu. Resource-Constrained Federated Learning with Heterogeneous Labels and Models for Human Activity Recognition, **IJCAI-PRICAI 2020 – DL-HAR** and **NeurIPS 2020 – MLMH** workshops.
- A Ragav*, Gautham Krishna Gudur*. Bayesian Active Learning for Wearable Stress and Affect Detection, **NeurIPS 2020 – MLMH** workshop.
- Gautham Krishna Gudur, BS Balaji, SK Perepu. Resource-Constrained Federated Learning with Heterogeneous Labels and Models, **KDD 2020 – AIoT** workshop.
- S Venkataramani, A Ramesh, SS Sundar, AK Jain, Gautham Krishna Gudur, V Vijayaraghavan. A Dynamically Adaptive Movie Occupancy Forecasting System with Feature Optimization, **IEEE ICDM 2019 – LMID** workshop.
- Gautham Krishna Gudur, A Ramesh, R Srinivasan. A Vision-based Deep On-Device Intelligent Bus Stop Recognition System, **ACM UbiComp 2019 – PURBA** workshop.
- Gautham Krishna Gudur, P Sundaramoorthy, V Umaashankar. ActiveHARNet: Towards On-Device Deep Bayesian Active Learning for Human Activity Recognition, **ACM MobiSys 2019 – EMDL** workshop.
- P Sundaramoorthy, Gautham Krishna Gudur, MR Moorthy, RN Bhandari, V Vijayaraghavan. HARNet: Towards On-Device Incremental Learning using Deep Ensembles on Constrained Devices, **ACM MobiSys 2018 – EMDL** workshop.
- Gautham Krishna G, KS Nathan, BY Kumar, AA Prabhu, A Kannan, V Vijayaraghavan. A Generic Multi-modal Dynamic Gesture Recognition System Using Machine Learning, **IEEE FICC 2018**.

Preprints

- E Farahmand, RR Azghan, NT Chatrudi, E Kim, Gautham Krishna Gudur, E Thomaz, G Pedrielli, P Turaga, H Ghasemzadeh. AttenGluco: Multimodal Transformer-Based Blood Glucose Forecasting on AI-READI Dataset, arXiv:2502.09919.
- D Liang*, Y Shen*, Gautham Krishna Gudur*, E Thomaz. AMA-HAR: Improving Motion-based Human Activity Recognition with Acoustic Alignment *[Under Submission]*.

PATENTS

- Federated Learning using Heterogeneous Labels, WO2022013879A1.
- Distributed Machine Learning with New Labels using Heterogeneous Label Distribution, WO2022162677A1.
- Method and Apparatus for Approach Recommendation with Threshold Optimization in Unsupervised Anomaly Detection, WO2023166515A1.

HONORS AND AWARDS

- Graduate Ph.D. Fellowship from Cockrell School of Engineering at the University of Texas at Austin
- Top 1 percentile in HackerRank – Algorithms Domain – Problem Solving (Advanced)
- Full financial registration grants to attend ICLR 2021, NeurIPS 2020, OxML 2020
- Our project – “AIB” won Ericsson's Top Performance Competition 2020 in the Operational Excellence category

- Undergraduate research grant of INR 25,000 from SSN College of Engineering
- Winner of the GermEval Shared Task 1 Challenge (Subtask (a)), KONVENS 2019 in post-evaluation phase
- Certification of Merit for Grade A1 in all subjects in AISSE (CBSE 10th boards)

TECHNICAL SKILLS

Programming Languages & Tools: Python, C++, HTML/CSS, Bash, SQL, JavaScript, Git, LaTeX, GCP, Docker, Arduino, Raspberry Pi
Libraries & Frameworks: PyTorch, TensorFlow, Hugging Face Transformers, Keras, Numpy, Pandas, Scikit-learn, OpenCV, PySpark

SUMMER SCHOOLS

- Graduate Ph.D. Fellowship from Cockrell School of Engineering at the University of Texas at Austin
- 5th Summer School on Artificial Intelligence 2021, Indian Institute of Information Technology (IIIT) Hyderabad (Virtual)
- Eastern European Machine Learning Summer Schools – both EEML 2020 and EEML 2021 (Virtual)
  Presented ActiveHARNet (EEML '20); zero-shot federated learning and task-independent continual learning (EEML '21)
- Oxford Machine Learning Summer School, OxML 2020 (Virtual)

PROFESSIONAL SERVICE

- **Program Committee/Reviewer:** ICASSP 2025, ICML 2024 – ES-FoMo workshop, ICLR 2021 – DPML workshop, NeurIPS – ML4H 2020 and ML4H 2019 workshops, KONVENS 2019 – GermEval
- Mentored 11+ students in embedded ML assignments and research projects at Solarillion Foundation (Feb '17 - May '18).
- Technical Reviewer of the book titled "Hands-On Meta Learning With Python"
- Event Organizer of "Data Nuggets" – an inter-collegiate Data Science contest, Invente 2016, SSN College of Engineering
- Mentor at IEEE B.Tech. Student Branch – Python Programming for Underrepresented

POSTERS AND EXTENDED ABSTRACTS

- Adaptive Federated Learning in Conceptually Drifting Environments, Applied Machine Learning – Course Project.
- Heterogeneous Zero-Shot Federated Learning with New Classes for On-Device Audio Classification, **MobiUK 2021**.
- Bayesian Active Learning for Wearable and Mobile Health, **NeurIPS** Europe meetup on Bayesian Deep Learning **(BDL 2020)**.
- Handling Real-time Unlabeled Data in Activity Recognition using Deep Bayesian Active Learning and Data Programming, **MobiUK 2019**, University of Oxford.
- Neurocinematics: The Intelligent Review System, 3rd International Conference on Cognition, Brain and Computation (**CBC 2015**), Indian Institute of Technology (IIT) Gandhinagar.

SELECTED TALKS

- Machine Learning and Ubiquitous Computing – SSN College of Engineering (2022)
- Heterogeneous Zero-Shot Federated Learning with New Classes for On-Device Audio Classification – MobiUK 2021
- Telecom-Specific Language Translation using GCP – Ericsson/Google Cloud Day (2021)
- Resource-Constrained Machine Learning for Ubiquitous Computing Applications – Flipped by GAIUS (2020)

MOOCs AND TECHNICAL COURSEWORK

- **Relevant Coursework**: Advanced CV, Generative Models in Machine Learning, Human Signals: Sensing/Analytics, Applied ML, Spoken Language Technologies, AI in Health, Statistical Methods I & II
- HackerRank | Problem Solving – Advanced, Intermediate, Basic
- University of Washington | Coursera – Machine Learning Specialization (4 courses) –
  A Case Study Approach, Regression, Classification, Clustering & Retrieval
- NRU HSE | Coursera – Bayesian Methods for Machine Learning
- Stanford University | Coursera – Machine Learning
- UC San Diego | Coursera – Algorithmic Toolbox, Data Structures
- John Hopkins University | Coursera – R Programming
- Stanford University – CS231n