GAUTHAM KRISHNA GUDUR

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RESEARCH & INDUSTRY EXPERIENCE

Graduate Research Assistant

UNIVERSITY OF TEXAS AT AUSTIN *[Advisor: Prof. Edison Thomaz]*

Aug 2023 – Present | Austin, TX, USA

- Working on resource-efficient, data-centric, and human-centric ML.
- Designing data-efficient *continual learning* methods to alleviate catastrophic forgetting and reduce user labeling load simultaneously.
- Developed dataset distillation strategies alternative to active learning.
- Improved acoustic-motion alignment techniques for activity recognition.
- Proposed *SVFT (Singular Vector guided Fine-Tuning)* – a Pareto-dominant PEFT technique over low-rank adaptation *[Mentor: Prof. Sujay Sanghavi]*.
- Leveraging efficient sample selection techniques for LLM training.

Independent Research

Dec 2018 – Present

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

Data Scientist III

ERICSSON R&D - GLOBAL AI ACCELERATOR (GAIA)

Feb 2019 – Apr 2023 | Chennai, India

- Incorporated machine learning for network intelligence in telecom resulting in multiple publications, patents, and deployed products. *[Mentors: Dr. Shrihari Vasudevan and M J Prasath]*
- Contributed to 3GPP standardization for federated learning and multi-vendor model sharing; positioned Ericsson's AI-Native design principles. Created spatiotemporal models for predicting indoor building connectivity to achieve $< 5\%$ error; improved mobility prediction of user devices in 5G Network Data Analytics Function (NWDAF).
- Developed *E-ADF [Ericsson Blog]* – 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, state-of-the-art models, services. Improved capabilities of *AIB (Automated Intelligent Knowledge Base)* from customer symptoms using LLMs and active learning; worked on telco-specific language translation.
- Deployed *iSite (Intelligent Site Acceptance)* for object detection of physical infrastructure failures at cell sites, thereby replacing field technicians.

Machine Learning Engineer

SMARTCARDIA (EPFL) *[Mentor: Dr. Srinivasan Murali]*

May 2018 – Nov 2018 | Chennai, India (Remote)

- Developed *gradient-boosted ensembles* and *LSTM models* for regression, classification tasks on imbalanced time-series clinical data.
- Extracted features from *biomarkers* like sleep apnea, troponin, blood pressure, haemoglobin to provide unique insights into patients' health.

RESEARCH INTERESTS

Resource-efficient ML | Generative AI | Human-Centric ML | Activity Recognition | Ubiquitous Computing | Audio Sensing | Data-Centric AI | LLMs | On-Device ML | Continual Learning | Active Learning | Federated Learning | Limited Supervision

EDUCATION

Ph.D. in Electrical and Computer Engineering

University of Texas at Austin

Aug 2023 – Present | Austin, TX, USA

Advisor: *Prof. Edison Thomaz*

Selected Coursework

- Advanced Computer Vision
- Generative Models in Machine Learning
- Human Signals: Sensing/Analytics
- Spoken Language Technologies

B.Tech in Information Technology

Anna University [*SSN College of Engineering*]

2013 – 2017 | Chennai, India

Thesis: Intelligent Bus Stop Recognition

SUMMER SCHOOLS

5th Summer School on Artificial Intelligence (2021)

Aug 2021 | IIIT Hyderabad (Virtual)

Computer Vision and Machine Learning.

Eastern European Machine Learning Summer School (EEML 2020 & 2021)

Jul 2020 & 2021 | Eastern Europe (Virtual)

Deep Learning and Reinforcement Learning.

- Presented *ActiveHARNet* at EEML '20, *Zero-shot Federated Learning* at EEML '21.
- Presented task-independent continual learning at unconference sessions.

Oxford Machine Learning Summer School (OxML 2020)

Aug 2020 | Oxford, UK (Virtual)

Deep Learning and Healthcare.

Research & Teaching Assistant

SOLARILLION FOUNDATION *[Mentor: Vineeth Vijayaraghavan]*

Feb 2016 – May 2018 Chennai, India

- Led the development of ***HARNet*** – a set of deep ensemble models for activity recognition capable of on-device incremental model updation.
- Designed user-independent *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 & branched LSTMs to analyze crowd behavior.
- *Mentored 11+ students* in embedded ML research projects/assignments.

Undergraduate Student Researcher

SSN COLLEGE OF ENGINEERING *[Advisors: Dr. Bhalaji N, Dr. Srinivasan R]*

Feb 2015 – Mar 2017 Chennai, India

- Developed a vision-based *Intelligent Bus Stop Recognition System* using CNNs. Used data augmentation and active learning strategies to handle scalability and adaptability in dynamic Indian environments.
- Led a team to work on a funded HCI research project – *Neurocinematics*, to classify real-time cognitive responses of film viewers from EEG.
- Worked on choosing the best-suited mote for two IoT scenarios, by analyzing their *RPL performance* metrics on a *Contiki test bed*.

SELECTED PUBLICATIONS

Google Scholar Citations: 201

Conference/Journal/Workshop

- Vijay Lingam*, Atula Tejaswi*, Aditya Vavre*, Aneesh Shetty*, Gautham Krishna Gudur*, Joydeep Ghosh, Alex Dimakis, Eunsol Choi, Aleksandar Bojchevski, Sujay Sanghavi, *SVFT: Parameter-Efficient Fine-Tuning with Singular Vectors*, ***ICML 2024*** - Workshop on Advancing Neural Network Training (***WANT***): Computational Efficiency, Scalability, and Resource Optimization *[Oral Presentation]* & Efficient Systems for Foundation Models (***ES-FoMo***) workshop.
- Tata Ganesh*, Gautham Krishna Gudur*, Gopinath Chennupati, Mohammad Emtiyaz Khan, *Can Calibration Improve Sample Prioritization?*, ***NeurIPS 2022*** - Human in the Loop Learning (***HILL***) & Has It Trained Yet? (***HITY***) workshops.
- Gautham Krishna Gudur, Raaghul R, Adithya K, Shrihari Vasudevan, *Data-Efficient Automatic Model Selection in Unsupervised Anomaly Detection*, ***IEEE ICMLA 2022*** *[Oral Presentation]*.
- Gautham Krishna Gudur, Satheesh Kumar Perepu, *Zero-Shot Federated Learning with New Classes for Audio Classification*, ***INTERSPEECH 2021***. *Abridged versions:* ***ICLR 2021*** - Distributed and Private Machine Learning (***DPML***) & Hardware Aware Efficient Training (***HAET***) workshops. Also presented at ***EEML 2021***.
- Gautham Krishna Gudur, Satheesh Kumar Perepu, *Resource- Constrained Federated Learning with Heterogeneous Labels and Models for Human Activity Recognition*, ***IJCAI-PRICAI 2020*** - Workshop on Deep Learning for Human Activity Recognition (***DL-HAR***). *Abridged version:* ***NeurIPS 2020*** - Machine Learning for Mobile Health Workshop (***MLMH***).
- Abhijith Ragav*, Gautham Krishna Gudur*, *Bayesian Active Learning for Wearable Stress and Affect Detection*, ***NeurIPS 2020*** - Machine Learning for Mobile Health Workshop (***MLMH***).
- Gautham Krishna Gudur, Bala Shyamala Balaji, Perepu Satheesh Kumar, *Resource-Constrained Federated Learning with Heterogeneous Labels and Models*, ***KDD 2020*** - Workshop on Artificial Intelligence of Things (***AIoT***).

*denotes equal contribution and joint lead authorship.

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.

SERVICES

- **Program Committee Member/Reviewer**
  - **ICML 2024** - Efficient Systems for Foundation Models Workshop (**ES-FoMo**)
  - **ICLR 2021** - Distributed and Private Machine Learning Workshop (**DPML**)
  - **NeurIPS** - Machine Learning for Health Workshop (**ML4H 2020, ML4H 2019**)
  - **KONVENS 2019** - GermEval '19
- Technical Reviewer of the book titled "Hands-On Meta Learning With Python"
- Event Organizer of "Data Nuggets" – a Data Science event, Invente 2016
- Mentor at IEEE B. Tech. Student Branch – *Python Programming for Underrepresented*

HONORS AND AWARDS

- ***Graduate Ph.D. Fellowship*** from Cockrell School of Engineering at UT 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 (Automated Intelligent knowledge Base)* 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 **GermEval** Shared Task 1 Challenge (Subtask (a)), KONVENS 2019 in post-evaluation phase
- Top 10 percentile in 42nd National Mathematics Talent Competitions, India
- **Certification of Merit for Grade A1 in all subjects** in AISSE (CBSE 10th boards)
- Completed all 10 levels of UCMAS Mental Arithmetic (Abacus)

- Sundararaman Venkataramani, Ateendra Ramesh, Sharan Sundar S, Aashish Kumar Jain, **Gautham Krishna Gudur**, Vineeth Vijayaraghavan, *A Dynamically Adaptive Movie Occupancy Forecasting System with Feature Optimization*, ***IEEE ICDM 2019*** - Workshop on Learning and Mining with Industrial Data (***LMID***).
- Raghavan A K, Venkatesh Umaashankar, **Gautham Krishna Gudur**, *Label Frequency Transformation for Multi-Label Multi-Class Text Classification*, ***KONVENS 2019*** (GermEval).
- **Gautham Krishna Gudur**, Ateendra Ramesh, Srinivasan R, *A Vision-based Deep On-Device Intelligent Bus Stop Recognition System*, ***ACM UbiComp 2019*** - 8th International Workshop on Pervasive Urban Applications (***PURBA***) *[Oral Presentation]*.
- **Gautham Krishna Gudur**, Prahalathan Sundaramoorthy, Venkatesh Umaashankar, *ActiveHARNet: Towards On-Device Deep Bayesian Active Learning for Human Activity Recognition*, ***ACM MobiSys 2019*** - 3rd International Workshop on Embedded and Mobile Deep Learning (***EMDL***) *[Oral Presentation]*. Also presented at ***EEML 2020***.
- Prahalathan Sundaramoorthy, **Gautham Krishna Gudur**, Manav Rajiv Moorthy, R Nidhi Bhandari, Vineeth Vijayaraghavan, *HARNet: Towards On-Device Incremental Learning using Deep Ensembles on Constrained Devices*, ***ACM MobiSys 2018*** - 2nd International Workshop on Embedded and Mobile Deep Learning (***EMDL***) *[Oral Presentation]*.
- **Gautham Krishna G**, Karthik Subramanian Nathan, Yogesh Kumar B, Ankith A Prabhu, Ajay Kannan, Vineeth Vijayaraghavan, *A Generic Multi-modal Dynamic Gesture Recognition System Using Machine Learning*, IEEE Future for Information and Communication Conference (***FICC 2018)***.
- **G Gautham Krishna**, G Krishna, N Bhalaji, *Analysis of Routing Protocol for Low-power and Lossy Networks in IoT Real Time Applications*, Procedia Computer Science, Elsevier, ***ICRTCSE 2016***.

Poster/Extended Abstract

- Oguzhan Baser, Alice Zhang, **Gautham Krishna Gudur**, Manisha Bandi, *Adaptive Federated Learning in Conceptually Drifting Environments*.
- **Gautham Krishna Gudur**, Satheesh Kumar Perepu, *Heterogeneous Zero-Shot Federated Learning with New Classes for On-Device Audio Classification*, ***MobiUK 2021***.
- **Gautham Krishna Gudur**, Abhijith Ragav, Prahalathan Sundaramoorthy, Venkatesh Umaashankar, *Bayesian Active Learning for Wearable and Mobile Health*, **NeurIPS** Europe meetup on Bayesian Deep Learning (***BDL 2020***).
- **Gautham Krishna Gudur**, Prahalathan Sundaramoorthy, Venkatesh Umaashankar, *Handling Real-time Unlabeled Data in Activity Recognition using Deep Bayesian Active Learning and Data Programming*, ***MobiUK 2019***, University of Oxford.
- N Bhalaji, G Krishna, **G Gautham Krishna**, *Neurocinematics: The Intelligent Review System*, 3rd International Conference on Cognition, Brain and Computation (***CBC 2015***), Indian Institute of Technology (IIT), Gandhinagar.

TALKS

- *Machine Learning and Ubiquitous Computing*
  [June 2022, SSN College of Engineering]
- *Heterogeneous Zero-Shot Federated Learning with New Classes for On-Device Audio Classification*
  [July 2021, MobiUK 2021]
- *Telecom-Specific Language Translation using GCP*
  [May 2021, Ericsson/Google Cloud Day]
- *Resource-Constrained Machine Learning for Ubiquitous Computing Applications*
  [Sept 2020, Flipped by GAIUS]

SKILLS

Programming

Python | C/C++ | HTML/CSS | Bash | Java | SQL | JavaScript

Hardware & Software

LaTeX | Git | Arduino | Raspberry Pi

Tools & Frameworks

NumPy | PyTorch | Scikit-learn | Hugging Face | TensorFlow | GCP | OpenCV | Docker | PySpark

MOOCS

- **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