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 efficient, data-centric, and human-centric machine learning.
- Developing efficient *human-in-the-loop continual learning* techniques to alleviate *catastrophic forgetting*.
- Efficient generation of virtual IMU from audio using diffusion models.
- Improving low-rank adaptation techniques for parameter efficient fine-tuning [Mentored by Prof. Alex Dimakis, Prof. Sujay Sanghavi].
- Leveraging efficient sample selection techniques for LLM training.

Independent Research

🛗 Dec 2018 – Present

- Analyzing the effect of *simplicity bias in curriculum learning*.
- Analyzed the *effect of calibration on sample prioritization* in deep neural networks, thereby accelerating training [Mentored by Prof. Emtiyaz Khan].
- Developed *zero-shot federated learning* frameworks to handle new heterogeneous classes and models for mobile and audio sensing tasks.
- Worked on *deep Bayesian active learning* for on-device mobile sensing; currently incorporating *adaptive acquisition* for active learning.

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 (Director)]
- **Telecom:** Contributed to 3GPP standardization for **Federated Learning** and multi-vendor model sharing; positioned Ericsson's Al-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).
- Created **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-ofthe-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.
- Successfully delivered *iSite* (*Intelligent Site Acceptance*) a set of tasks for object detection of physical infrastructure failures at cell-sites, thereby replacing field technicians; handled detection of blurred images.

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

Efficient Deep Learning Human-Centric ML
Generative AI Ubiquitous Computing
LLMs Continual Learning Active Learning
Data-Centric ML Federated Learning
Sparse Learning Limited Supervision
Activity Recognition Audio Sensing
Bayesian/Robust Learning Computer Vision

EDUCATION

Ph.D. in Electrical and Computer Engineering

University of Texas at Austin

🛗 Aug 2023-2028 🔹 🕈 Austin, TX

Coursework

- Advanced Computer Vision
- Applied Machine Learning
- Generative Models in Machine Learning
- Human Signals: Sensing/Analytics

B.Tech in Information Technology Anna University [SSN College of Engineering]

🛗 Grad. Apr 2017 🛛 💡 Chennai, India

Thesis: Intelligent Bus Stop Recognition

SUMMER SCHOOLS

5th Summer School on Artificial Intelligence (2021)

Aug 2021 **Q** IIIT Hyderabad (Virtual)

Computer Vision and Machine Learning.

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

High Barry Strategy and Strategy an

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 **O**xford, UK (Virtual)

Deep Learning and Healthcare.

Research & Teaching Assistant

SOLARILLION FOUNDATION [Mentor: Vineeth Vijayaraghavan]

🛗 Feb 2016 – May 2018 🛛 🛛 😯 Chennai, India

- Led a team of four to develop **HARNet** a set of *deep learning ensemble models* for HAR on edge devices capable of incremental model updation.
- Led a team of five to design user-independent ML approaches for *dynamic gesture recognition* on a low-cost *Raspberry Pi Zero* (\$5).
- Deployed a *Movie Occupancy Prediction* engine by engineering adaptive behavioral features of the crowd using tree-based ensemble models and branched LSTMs for a *top 3 Indian movie multiplex* chain.
- *Mentored over 11 students* in embedded machine learning, and in their assignments and research project.

Undergraduate Student Researcher

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

🛗 Feb 2015 – Mar 2017

🕈 Chennai, India

- Developed a vision-based *Intelligent Bus Stop Recognition System* using ConvNets. Used data augmentation and active learning strategies to handle scalability and adaptability to 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

Conference/Journal/Workshop [Citations: 188]

- Tata Ganesh*, <u>Gautham Krishna Gudur</u>*, Gopinath Chennupati, Mohammad Emtiyaz Khan, *Can Calibration Improve Sample Prioritization*?, *NeurIPS 2022* - Human in the Loop Learning (HILL '22) & Has It Trained Yet? (HITY '22) workshops.
- <u>Gautham Krishna Gudur</u>, 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 '21) & Hardware Aware Efficient Training (HAET '21) 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 '20) [Oral Presentation]. Abridged version: NeurIPS 2020 - Machine Learning for Mobile Health Workshop (MLMH '20).
- Abhijith Ragav*, <u>Gautham Krishna Gudur</u>*, Bayesian Active Learning for Wearable Stress and Affect Detection, NeurIPS 2020 - Machine Learning for Mobile Health Workshop (MLMH '20).
- <u>Gautham Krishna Gudur</u>, Bala Shyamala Balaji, Perepu Satheesh Kumar, *Resource-Constrained Federated Learning with Heterogeneous Labels and Models*, ACM KDD 2020 - 3rd International Workshop on Artificial Intelligence of Things (AloT '20).
- Sundararaman Venkataramani, Ateendra Ramesh, Sharan Sundar S, Aashish Kumar Jain, <u>Gautham Krishna Gudur</u>, Vineeth Vijayaraghavan, A Dynamically Adaptive Movie Occupancy Forecasting System with Feature Optimization, IEEE ICDM 2019 - Workshop on Learning and Mining with Industrial Data (LMID '19) [Oral Presentation].

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
 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
- Our project AIB (Automated Intelligent knowledge Base) won Ericsson's Top Performance Competition 2020 in Operational Excellence category
- Top 1 percentile in HackerRank (Algorithms Domain/Problem Solving Advanced)
- Full financial registration grants to attend ICLR 2021, NeurIPS 2020, OxML 2020
- 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)

- Raghavan A K, Venkatesh Umaashankar, <u>Gautham Krishna Gudur</u>, Label Frequency Transformation for Multi-Label Multi-Class Text Classification, KONVENS 2019 (GermEval '19).
- <u>Gautham Krishna Gudur</u>, Ateendra Ramesh, Srinivasan R, A Visionbased Deep On-Device Intelligent Bus Stop Recognition System, ACM UbiComp 2019 - 8th International Workshop on Pervasive Urban Applications (PURBA '19) [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 '19) [Oral Presentation]. Also presented at EEML 2020.
- Prahalathan Sundaramoorthy, <u>Gautham Krishna Gudur</u>, 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 '18) [Oral Presentation].
- Gautham Krishna G, Karthik Subramanian Nathan, Yogesh Kumar B, Ankith A Prabhu, Ajay Kannan, Vineeth Vijayaraghavan, A Generic Multimodal Dynamic Gesture Recognition System Using Machine Learning, IEEE Future for Information and Communication Conference (FICC 2018) [Oral Presentation].
- <u>Gautham Krishna G</u>, Krishna G, Bhalaji N, *Electroencephalography Based Analysis of Emotions Among Indian Film Viewers*, Springer, International Conference on Advanced Informatics for Computing Research (*ICAICR* 2017).
- <u>G Gautham Krishna</u>, 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, <u>Gautham Krishna Gudur</u>, Alice Zhang, Manisha Bandi, Adaptive Federated Learning in Conceptually Drifting Environments.
- <u>Gautham Krishna Gudur</u>, Satheesh Kumar Perepu, Heterogeneous Zero-Shot Federated Learning with New Classes for On-Device Audio Classification, MobiUK 2021.
- <u>Gautham Krishna Gudur</u>, Abhijith Ragav, Prahalathan Sundaramoorthy, Venkatesh Umaashankar, *Bayesian Active Learning for Wearable and Mobile Health*, NeurIPS Europe meetup on Bayesian Deep Learning (*BDL* 2020).
- <u>Gautham Krishna Gudur</u>, 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, <u>G Gautham Krishna</u>, *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

Expert Python C/C++
Intermediate Java SQL HTML/CSS
JavaScript Bash
Basic Android R
Hardware & Software
LATEX Git Arduino Raspberry Pi
Tools & Frameworks
NumPy Scikit-learn PyTorch
TensorFlow Keras OpenCV
Docker MATLAB PySpark GCP

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