

# 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.
- Developing efficient *continual learning* methods to simultaneously alleviate catastrophic forgetting and reduce user labeling load.
- Improved motion-based activity recognition with acoustic alignment.
- Proposed SVFT (*Singular Value Fine-Tuning*) – an improved 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].
- Developed *zero-shot federated learning* frameworks to handle new heterogeneous classes and models for audio and mobile sensing tasks.
- Worked on *deep Bayesian active learning* for on-device human activity recognition; 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 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).
- 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-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.
- 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   Generative AI  
Human-Centric ML   Activity Recognition  
Continual Learning   Active Learning  
Data-Centric ML   LLMs   Audio Sensing  
Ubiquitous Computing   Federated Learning  
Cross-Modal AI   On-Device ML   Sparsity  
Limited Supervision   Bayesian/Robust ML

## 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   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 using 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 over 11 students* in their embedded machine learning research project and 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 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

🔍 Google Scholar Citations: 191

### 👥 Preprints

- 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*, [arXiv:2405.19597](#).

### 👥 Conference/Journal/Workshop

- Tata Ganesh\*, **Gautham Krishna Gudur\***, 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.
- **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 '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\*, **Gautham Krishna Gudur\***, *Bayesian Active Learning for Wearable Stress and Affect Detection*, **NeurIPS 2020** - Machine Learning for Mobile Health Workshop (**MLMH '20**).

\*indicates joint first authors.

## 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 42<sup>nd</sup> 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)

- **Gautham Krishna Gudur**, 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 (**AIoT '20**).
- 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 '19**) [Oral Presentation].
- Raghavan A K, Venkatesh Umaashankar, **Gautham Krishna Gudur**, *Label Frequency Transformation for Multi-Label Multi-Class Text Classification*, **KONVENS 2019** (GermEval '19).
- **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 '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, **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 '18**) [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)** [Oral Presentation].
- **Gautham Krishna G**, Krishna G, Bhalaji N, *Electroencephalography Based Analysis of Emotions Among Indian Film Viewers*, Springer, International Conference on Advanced Informatics for Computing Research (**ICAICR 2017**).
- **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, **Gautham Krishna Gudur**, Alice Zhang, 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

Expert Python C/C++  
 Intermediate Java SQL HTML/CSS  
 JavaScript Bash  
 Basic Android R

### Hardware & Software

LaTeX Git Arduino Raspberry Pi

### Tools & Frameworks

NumPy PyTorch Scikit-learn  
 Hugging Face TensorFlow OpenCV  
 Docker MATLAB GCP 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**