GAUTHAM KRISHNA GUDUR

@ gauthamkrishna@utexas.edu gauthamkrishna-g.github.io Google Scholar github.com/gauthamkrishna-g
Austin, TX +1 512-228-0520 linkedin.com/in/gauthamkrishna-g </> hackerrank.com/gauthamkrishna_g

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*** methods to 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 | Sparse Learning | Limited Supervision | Bayesian/Robust ML | 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 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 equal contribution.

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)

- **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 | 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