GAUTHAM KRISHNA GUDUR

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RESEARCH & INDUSTRY EXPERIENCE

Data Scientist III
ERICSSON R&D - GLOBAL AI ACCELERATOR (GAIA)
📅 Feb 2019 – Ongoing　　⦿ Chennai, India

- Incorporating machine learning for network intelligence in telecom resulting in multiple publications, patents, and deployed products.
- *Telco:* Contributed to *3GPP* standardization for multi-vendor model sharing and **Federated Learning** in 5G; positioned Ericsson's *AI-Native* functional architecture. Created *temporal unsupervised XGBoost models* for *indoor building connectivity prediction* using drones; improved *mobility prediction* of user devices in Network Data Analytics Function (NWDAF) using *Bayesian Contextual Bandits* robust to concept drift.
- Created **E-ADF** *[Ericsson Blog]* – an end-to-end *unsupervised anomaly detection* framework, along with simultaneous *data-efficient Bayesian model selection* and *dynamic threshold optimization.* Worked on anomaly detection of IP Multimedia Subsystem (IMS) metrics at scale.
- 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.
- 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 *transformer models* and *active learning*; worked on telco-specific *language translation.*

Independent Research
📅 Dec 2018 – Ongoing　　⦿ Chennai, India

- Analyzing the **effect of calibration on sample prioritization** in deep neural networks, thereby *accelerating training.*
- Leveraging **explainable components** of deep neural networks to aid in **curriculum learning** and **subset selection.**
- Currently working on **federated continual learning** on the edge to alleviate *catastrophic forgetting* for audio sensing and HAR tasks.
- 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, video frame labeling; incorporated *adaptive acquisition.*

Machine Learning Engineer
SMARTCARDIA (EPFL)
📅 May 2018 – Nov 2018　　⦿ Chennai, India (Remote)

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

Research & Teaching Assistant
SOLARILLION FOUNDATION
📅 Feb 2016 – Jun 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).

RESEARCH INTERESTS

Deep Learning　Resource-Efficient ML
Limited Supervision　Ubiquitous Computing
Federated Learning　Active Learning
Bayesian DL　Continual/Curriculum Learning
Mobile/Audio Sensing　Activity Recognition
Anomaly Detection　Telecom

EDUCATION

B.Tech in Information Technology
Anna University [*SSN College of Engineering*]
📅 Grad. Apr 2017　　⦿ Chennai, India

Cum. GPA: 7.41/10 - First Class
Mentors: **Prof. Srinivasan R** and **Bhalaji N**
Thesis: *Intelligent Bus Stop Recognition*

Coursework

Programming & Data Structures: I & II
Design & Analysis of Algorithms
Artificial Intelligence　Signal Processing
Data Analytics　Data Mining

HSC (Class XII)
DAV Higher Secondary School, Gill Nagar
📅 Grad. May 2013　　⦿ Chennai, India

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* and *Zero-shot federated learning with new classes.*

Oxford Machine Learning Summer School (OxML 2020)
📅 Aug 2020　　⦿ Oxford, UK (Virtual)

Deep Learning and Healthcare.

- 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 students* to help them develop problem-solving approaches in embedded programming for their assignments and research project.

Undergraduate Student Researcher
SSN COLLEGE OF ENGINEERING

📅 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 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*.

PUBLICATIONS

👥 Under Submission/Preprint

- *Federated Active Learning with Adaptive Acquisition* [To be Submitted].
- <u>Gautham Krishna Gudur</u>, Satheesh Kumar Perepu, *FedNewSense: Zero-Shot Federated Learning for Continuous Heterogeneous Sensing* [Under Submission].

👥 Conference/Journal/Workshop

- 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 KA, Shrihari Vasudevan, *Data-Efficient Automatic Model Selection in Unsupervised Anomaly Detection*, *IEEE ICMLA 2022* [Oral Presentation].
- <u>Gautham Krishna Gudur</u>, 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*.
- <u>Gautham Krishna Gudur</u>, 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 (**AIoT '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].

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*Equal Contribution

HONORS AND AWARDS

- 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 grant* 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
- Certification of Merit for Grade A1 in all subjects in AISSE (CBSE 10th boards)
- Completed all 10 levels of UCMAS Mental Arithmetic (Abacus)
- Division-level badminton player (U-19)
- 29th Rank overall in Grade 3 Keyboard

PATENTS

- *Federated Learning using Heterogeneous Labels*, WO2022013879A1.
- *Distributed Machine Learning with New Labels using Heterogeneous Label Distribution*, WO2022162677A1.
- *System and Method for Approach Recommendation with Threshold Optimization in Unsupervised Anomaly Detection* [Filed].

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]

- Raghavan A K, Venkatesh Umaashankar, **Gautham Krishna Gudur**, *Label Frequency Transformation for Multi-Label Multi-Class Text Classification*, *KONVENS 2019* (GermEval '19) *[Oral Presentation]*.
- **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*). 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*) *[Oral Presentation]*.
- **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* *[Oral Presentation]*.

📄 Poster/Extended Abstract

- **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.

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

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 | TensorFlow | PyTorch | 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
- **University of Alberta | Coursera**
  Fundamentals of Reinforcement Learning
- **Stanford University | Coursera**
  Machine Learning
- **UC San Diego | Coursera**
  Algorithmic Toolbox | Data Structures
- **John Hopkins University | Coursera**
  R Programming
- **Stanford University** - CS231n