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.
- ***Telco:*** Contributed to *3GPP* standardization for multi-vendor model sharing and *Federated Learning* in 5G; positioned Ericsson's *AI-Native* functional architecture. Created *temporal graph neural networks* 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.
- 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*.
- 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.

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

- Gautham Krishna Gudur, Satheesh Kumar Perepu, **"FedNewSense: Zero-Shot Federated Learning for Continuous Heterogeneous Sensing"** *[Under Submission]*.

Conference/Journal/Workshop

- Tata Ganesh*, Gautham Krishna Gudur*, Gopinath Chennupati, Mohammad Emtiyaz Khan, **"Can Calibration Improve Sample Prioritization?"** ***NeurIPS 2022*** - Has It Trained Yet? Workshop (**HITY '22**).
- Gautham Krishna Gudur, Raaghul R, Adithya KA, Shrihari Vasudevan, **"Data-Efficient Automatic Model Selection in Unsupervised Anomaly Detection"**, ***IEEE ICMLA 2022***.
- 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*** - 2nd International Workshop on Deep Learning for Human Activity Recognition (***DL-HAR '20***), Springer.
  Abridged version: **"Federated Learning with Heterogeneous Labels and Models for Mobile Activity Monitoring"**, ***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***).
- 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***).

*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).
- **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***).
- **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***).
- **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)***.
- **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

- **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