

# 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 multi-vendor model sharing and *Federated Learning* in 5G, and AI-Native capabilities. Improved *user mobility prediction (UPF-Reselection)* 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]** – a framework for end-to-end *unsupervised anomaly detection*, along with resource-efficient model selection and dynamic threshold optimization simultaneously. Worked on anomaly detection of IP Multimedia Subsystem (IMS) metrics at scale.

### Independent Research

Dec 2018 – Ongoing    Chennai, India

- Enabling *calibration* to *aid in sample prioritization* in deep neural networks, thereby accelerating training.
- Currently working on **federated continual learning** on the edge to alleviate *catastrophic forgetting* for audio sensing and HAR tasks.
- Developed a **zero-shot federated learning** framework to handle *new classes with heterogeneous labels and models*.
- Worked on **deep Bayesian active learning** for on-device mobile & audio sensing, and video frame labeling.

### 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 with heterogeneities on resource-constrained devices capable of incremental model updation.
- Led a team of five to design a user-independent **Dynamic Gesture Recognition** system with machine learning approaches by extracting domain-specific features 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 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

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**, R Raaghul, Adithya A K, Shrihari Vasudevan, "Resource-Efficient Automatic Model Selection with Dynamic Threshold Optimization for Unsupervised Anomaly Detection" [*Under Submission*].
- **Gautham Krishna Gudur**, Satheesh Kumar Perepu, "FedNewSense: Zero-Shot Federated Learning for Continuous Heterogeneous Sensing with New Classes and Models" [*Under Submission*].

### 👤 Conference/Journal/Workshop

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

\*Equal Contribution

## HONORS AND AWARDS

- Our project *AIB (Automated Intelligent knowledge Base)* won **Ericsson's Top Performance Competition 2020**
- **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 42<sup>nd</sup> 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)

## 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

- **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, *ICRTCS 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.

## PATENTS

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

## TALKS

- Machine Learning & Ubiquitous Computing [*SSN College of Engineering*]
- Heterogeneous Zero-Shot Federated Learning with New Classes for On-Device Audio Classification [*MobiUK 2021*]
- Resource-Constrained Machine Learning for Ubiquitous Computing Applications [*Flipped by GAIUS*]
- Telecom-Specific Language Translation [*Ericsson/Google Cloud Day*]

## 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**