

# Gautham Krishna Gudur

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## RESEARCH & INDUSTRY EXPERIENCE

### Data Scientist

#### ERICSSON R&D - GLOBAL AI ACCELERATOR (GAIA)

Feb 2019 – Ongoing    Chennai, India

- Incorporating Machine Learning for Network Intelligence broadly in the spaces of telecom and IoT.
- Worked on *mobility prediction* of user equipment (UE) to base stations (eNodeBs) in 5G NetWork Data Analytics Function (NWDAF) using *Bayesian Contextual Bandits* and *Graph Convolutions* robust to concept drift during online learning. Improved speed of network simulation (*digital twin*) for optimal eNodeB placement in heterogeneous user load environments.
- Successfully delivered *iSite* (Intelligent Site Acceptance) – a set of tasks for *on-mobile multi-object detection* of physical infrastructure failures at cell-sites, thereby replacing field technicians. Used YOLO, SSD, FasterRCNN networks; handled detection of blurred images.
- Improved capabilities of *AIB* (Automated Intelligent knowledge Base) from customer issues/symptoms using *transformer models* like BERT, RoBERTa; used *Active Learning* to handle sentence labeling. Worked on domain-specific language translation from English to Brazilian Portuguese using AutoML on GCP. Created *E-LangHub* - Ericsson NLP Hub with telco-rich data, state-of-the-art models, benchmarks and services.
- Our team created *E-ADF* – an *end-to-end framework for anomaly detection on time-series*, with a focus on existing/novel unsupervised learning algorithms, metrics, explainability, visualization, etc. [Ericsson Blog]

### Independent Researcher

Dec 2018 – Ongoing    Chennai, India

- Worked on handling unlabeled data using *Deep Bayesian Active Learning* for on-device audio sensing, Human Activity Recognition (HAR), fall and stress/affect detection, and video frame labeling.
- Developed a framework to handle *new classes with heterogeneous labels and models* during *federated learning* for vision, audio and HAR tasks.
- Currently working on *Incremental/Continual Learning* on the edge to alleviate *catastrophic forgetting* for audio sensing and HAR tasks.

### 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 AI  
On-Device ML    Ubiquitous Computing  
Computer Vision    Mobile Health    IoT  
Activity Recognition    Active Learning  
Bayesian ML    Continual Learning  
NLP    Graph Nets    HCI    Telecom  
Reinforcement Learning    ML4D

## 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

Scored an overall of 94.25%.

## SUMMER SCHOOLS

### Oxford Machine Learning Summer School (OxML 2020)

Aug 2020    Oxford, UK (Virtual)

Organized by AI for Global Goals, CIFAR, Saïd Business School, Deep Medicine.  
Provided full fee waiver.  
Focus Areas: Deep Learning and Healthcare.

### Eastern European Machine Learning Summer School (EEML 2020)

Jul 2020    Warsaw, Poland (Virtual)

Organized by DeepMind.  
Presented our poster on ActiveHARNet.  
Focus Areas: Deep Learning and Reinforcement Learning.

- Developed a **Movie Occupancy Prediction** engine by engineering adaptive behavioral features of the crowd using tree-based ensemble models and branched LSTMs (with  $\pm 6$  MAPE). Deployed the beta application 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.
- Worked 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

### Conference/Workshop

- **Gautham Krishna Gudur**, Satheesh Kumar Perepu, "Heterogeneous Zero-Shot Federated Learning with New Classes for Audio Classification", *ICLR 2021* - Distributed and Private Machine Learning Workshop (DPML '21) & Hardware Aware Efficient Training Workshop (HAET '21) [Also under review at *Interspeech 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).
- **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

\*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)
- 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
- *Full financial registration grant* to attend **NeurIPS 2020** and **OxML 2020**
- 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, Inventa 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

## TALKS

- Resource-Constrained Machine Learning for Ubiquitous Computing Applications [Flipped by GAIUS].

(*EMDL '19*). Also presented as a poster at Eastern European Machine Learning Summer School (*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**, 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

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- Federated Learning using Heterogeneous Labels [*Filed*].
- Distributed Machine Learning with New Labels using Heterogeneous Label Distribution [*Filed*].

## MOOCS

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- **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
- **Google | Udacity** - Deep Learning
- **Stanford University** - CS231n