

# 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.
- Working 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 **Ericsson-NLP data/model zoo**.
- Our team created **E-ADF** – an *end-to-end framework for anomaly detection on time-series*, with a focus on existing/novel unsupervised machine learning algorithms, metrics, explainability, visualization, etc.

### 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, "Zero-Shot Federated Learning with New Classes for Keyword Spotting", [Under Review at *ICLR 2021* - Distributed and Private Machine Learning (*DPML '20*) and *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 (*EMDL '19*). Also presented as a poster at Eastern European Machine Learning Summer School (*EEML 2020*).

\*Equal Contribution

## HONORS AND AWARDS

- **Top 1 percentile in HackerRank** (Algorithms Domain/Problem Solving - Advanced)
- Our project AIB (Automated Intelligent knowledge Base) won **Ericsson's Top Performance Competition 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
- *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 2020* - 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

## TALKS

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

- 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

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

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