# 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 and benchmarks.
- 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, 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*].

(***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

- 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