

# 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 **Deep Bayesian Contextual Bandits** robust to concept drift in an online learning setting. Also worked on speeding up network simulation of 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 search recommendations of customer issues from long-descriptions, slogans/symptoms using *transformer models* like BERT, RoBERTa; used Active Learning to handle sentence labeling. Worked on language translation from English to Brazilian Portuguese.
- 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 for on-device **Federated Active Learning** with **heterogeneous new classes and models** for vision, audio and HAR tasks.
- Currently working on **Incremental/Continual Learning** on the edge to handle *catastrophic forgetting* for audio sensing and HAR tasks.

### Machine Learning Engineer

#### SMARTCARDIA (EPFL)

May 2018 – Nov 2018    Chennai, India (Remote)

- Developed machine learning, deep learning models for analyzing **biomarkers** like sleep apnea, troponin, haemoglobin, blood pressure, glucose, to provide unique insights into patients' health.
- Engineered features for imbalanced time-series clinical data; modeled classification, regression architectures using *gradient-boosted ensemble models* and *Recurrent Neural Networks (LSTMs)*.

### 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    IoT    NLP  
Continual Learning    Bayesian ML  
Active Learning    Activity Recognition  
Mobile Health    Reinforcement Learning  
Telecom    ML4Development

## EDUCATION

### B.Tech in Information Technology

#### Anna University [SSN College of Engineering]

Grad. Apr 2017    Chennai, India

Cum. GPA: 7.41/10 - First Class

**Thesis: Intelligent Bus Stop Recognition System.** Advised by Prof. Srinivasan R.

#### 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.

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 testbed*.

## PUBLICATIONS

### 👥 Conferences/Workshops

- Gautham Krishna Gudur, Satheesh Kumar Perepu, "Federated Learning with Heterogeneous New Classes and Models for Audio Classification", *IEEE ICASSP 2021* [Under Review].
- Resource-Constrained Federated Learning with Heterogeneous Labels and Models for Human Activity Recognition, *IJCAI 2020* - 2nd International Workshop on Deep Learning for Human Activity Recognition (*DL-HAR '20*).  
Abridged version: Gautham Krishna Gudur, Satheesh Kumar Perepu, "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*).

## 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

## SERVICES

- Program Committee Member/Reviewer
  - Machine Learning for Health Workshop **ML4H 2020 - NeurIPS 2020**, **ML4H 2019 - NeurIPS 2019**
  - GermEval 2019, KONVENS 2019
- Technical Reviewer of the book titled "Hands-On Meta Learning With Python"
- Event Organizer of "Data Nuggets" - a Data Science event, Invente 2016

## HONORS AND AWARDS

- **99<sup>th</sup> percentile** in *HackerRank* (Algorithms Domain/Problem Solving - Advanced)
- Undergraduate *financial research grant* of **INR 24,000** from SSN College of Engineering
- **Winner** of **GermEval** Shared Task 1 Challenge (Subtask (a)), KONVENS 2019 in Post-Evaluation Phase
- **Full fee waiver** to attend Oxford Machine Learning Summer School (**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)
- **29<sup>th</sup> Rank** overall in Grade 3 Keyboard

## 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, *ICRTCS 2016*.

## Posters/Extended Abstracts

- **Gautham Krishna Gudur**, Prahalathan Sundaramoorthy, Abhijith Ragav, Venkatesh Umaashankar "**Deep Bayesian Active Learning for Wearable and Mobile Health**", NeurIPS Europe meetup on Bayesian Deep Learning (*BDL 2020*) [*Submitted*].
- **Gautham Krishna Gudur**, Prahalathan Sundaramoorthy, Venkatesh Umaashankar "**ActiveHARNet: Towards On-Device Deep Bayesian Active Learning for Human Activity Recognition**", Eastern European Machine Learning Summer School (*EEML 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 {P81198 WO1 - PCT/IN2020/050618} [*Filed*].
- System and Method to Explore New Classes with Heterogeneous Label Distribution in Federated Learning [*Under Filing*].

## PROJECTS

### Weakly-Supervised Data Programming for Sensor Data

Working on *ground truth generation* by leveraging heuristic data labeling functions which are fed into a generative model and fine-tuned using a discriminative model - a *weakly supervised data programming paradigm*, for mobile, wearable sensing tasks.

## MOOCS

- **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