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 ± 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

👥 Conferences/Workshops

- **Gautham Krishna Gudur**, Satheesh Kumar Perepu, **"Federated Learning with Heterogeneous New Classes and Models for Audio Classification"**, *IEEE ICASSP 2021* [Under Review].
- **Gautham Krishna Gudur**, Satheesh Kumar Perepu, **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**), 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**).

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*Equal Contribution

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

- **Top 1 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 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)
- 29th Rank overall in Grade 3 Keyboard

TALKS

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

- Prahalathan Sundaramoorthy, <u>**Gautham Krishna Gudur**</u>, 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*).
- <u>**Gautham Krishna G**</u>, 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)*.
- <u>**Gautham Krishna G**</u>, Krishna G, Bhalaji N, **"Electroencephalography Based Analysis of Emotions Among Indian Film Viewers"**, Springer, International Conference on Advanced Informatics for Computing Research (*ICAICR 2017*).
- <u>**G Gautham Krishna**</u>, 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*.

📄 Posters/Extended Abstracts

- <u>**Gautham Krishna Gudur**</u>, Abhijith Ragav, Prahalathan Sundaramoorthy, Venkatesh Umaashankar **"Bayesian Active Learning for Wearable and Mobile Health"**, NeurIPS Europe meetup on Bayesian Deep Learning (**BDL 2020**) *[Submitted]*.
- <u>**Gautham Krishna Gudur**</u>, Prahalathan Sundaramoorthy, Venkatesh Umaashankar **"ActiveHARNet: Towards On-Device Deep Bayesian Active Learning for Human Activity Recognition"**, Eastern European Machine Learning Summer School (**EEML 2020**).
- <u>**Gautham Krishna Gudur**</u>, 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, <u>**G Gautham Krishna**</u>, **"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 Identify New Classes with Heterogeneous Label Distribution in Federated Learning *[Under Filing]*.

NOTABLE 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