

# 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, computer vision, reinforcement learning, NLP, IoT, time-series. Developing multiple patents and publications.
- Currently working on **mobility prediction** of user equipment (UE) to eNodeBs in 5G NetWork Data Analytics Function (NWDAF) using uncertainty-aware **Deep Bayesian Contextual Bandits** robust to concept drift in an online learning setting.
- Successfully delivered **iSite (Intelligent Site Acceptance)** – a set of **on-mobile multi-object detection/localization** tasks like weatherproofing, mounting bracket for accurate detection of physical infrastructure failures at cell-sites, thereby replacing field technicians. Used YOLO, SSD, FasterRCNN networks; handled detection of blurred images.
- Improving **search recommendations** of customer issues from long-descriptions, slogans/symptoms and fine-tuning **transformer models** like BERT, RoBERTa; used **Active Learning** to handle sentence labeling.
- Our team created **E-ADF** – an **end-to-end framework for anomaly detection and time-series**, with a focus on existing/novel machine learning algorithms, metrics, explainability, visualization, etc.

### Independent Researcher

Dec 2018 – Ongoing    Chennai, India

- Currently working on **Incremental/Continual Learning** on the edge to handle **catastrophic forgetting** for audio sensing and HAR tasks.
- Developed a framework for on-device **Federated Learning** with **heterogeneous labels and models** by leveraging **Knowledge Distillation**.
- Currently developing an efficient framework for **Continual Learning for NLP** tasks, particularly NMT, on resource-constrained devices.
- Worked on incremental updation of incoming unlabeled data on-device using deep **Bayesian Active Learning** for Human Activity Recognition (HAR) and fall detection 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, and 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 novel deep learning ensemble models for heterogeneous **Human Activity Recognition (HAR)** tasks on resource-constrained devices capable of incremental model updation.

## RESEARCH INTERESTS

Machine Learning    Resource-Efficient AI  
On-Device ML    Ubiquitous Computing  
Computer Vision    IoT    NLP  
Continual Learning    Bayesian ML  
Active Learning    Healthcare  
Activity Recognition    AI4SocialGood  
Reinforcement Learning    Telecom

## EDUCATION

### B.Tech in Information Technology

#### Anna University

Grad. Apr 2017    Chennai, India

Cum. GPA: 7.41/10 - First Class

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

### Oxford Machine Learning Summer School (OxML 2020) [Accepted]

Aug 2020    Oxford, UK (Virtual)

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

July 2020    Warsaw, Poland (Virtual)

### HSC (Class XII)

#### DAV Higher Secondary School, Gill Nagar

Grad. May 2013    Chennai, India

Scored an overall of 94.25%.

## 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  
PySpark    Flask

- Developed a **Movie Occupancy Prediction** engine by engineering dynamically adaptive behavioral features of the crowd from terabytes of transactional data, and employed tree-based ensemble models and branched LSTMs (with  $\pm 6$  MAPE). Deployed the beta application into production for a *top 3 Indian movie multiplex chain*.
- Led a team of five and designed a user-independent *on-device* **Dynamic Gesture Recognition** system using accelerometers with machine learning approaches on a low-cost *Raspberry Pi Zero* (\$5).
- *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 an on-device vision-based **Intelligent Bus Stop Recognition System** using light-weight CNNs. Utilized data augmentation, *Incremental Bayesian Active Learning* strategies to handle bus stop 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**, 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 V, 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 Workshop '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**).
- 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)**.

## SERVICES & HONORS

### Services

- **Reviewer** - Machine Learning for Health Workshop (**ML4H 2019**), **NeurIPS 2019**
- **Reviewer, PC Member** - 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

- Undergraduate **Financial Research Grant of ₹24,000** from SSN College of Engineering
- **Winner** of **GermEval** Shared Task 1 Challenge (Subtask (a)), **KONVENS 2019** in Post-Evaluation Phase
- **97<sup>th</sup> percentile** in **HackerRank** (*Algorithms Domain*)
- Full fee waiver to attend Oxford Machine Learning Summer School (**OxML2020**)
- Top 10 percentile in **42<sup>nd</sup> National Mathematics Talent Competitions**
- Certification of Merit for Grade A1 in all subjects in **AISSE**
- Completed all 10 levels of **UCMAS Mental Arithmetic** (Abacus)
- Division Level Badminton Player (U-19)

## 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

- **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*.

## Posters/Extended Abstracts

- **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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- System and Method to Explore Heterogeneous Labels and Models in Federated Learning [*Filed*].

## PROJECTS

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### Modeling Scalable Social Media Comments

Working on modeling scalable, ambiguous (multilingual, short) *topic modeling from noisy social-media comments* from movies/TV shows with an illustrated heat-map of the closely-knit topics.

### Data Programming for Sensor Label Generation

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.

### Gest-Face

Developed a simple Gesture & Facial recognition application to identify real-time simple hand gestures, and faces of users (and total counts).

### Speed Control of DC Motor using Arduino

Devised a feedback based Proportional controller algorithm to self-stabilize the error between reference and measured speed ( $\pm 4$  RPM) of a 12V DC Motor with external load using AtMega328 MCU.