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***).

*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, **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***.

Posters/Extended Abstracts

- **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**) *[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 {PCT/IN2020/050618} *[Filed]*.
- System and Method to Identify and Detect Similarities of New Classes across Users 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