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 ± 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
- **97th percentile** in *HackerRank (Algorithms Domain)*
- Full fee waiver to attend Oxford Machine Learning Summer School (OxML2020)
- Top 10 percentile in 42nd 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

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

PROJECTS

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 (± 4 RPM) of a 12V DC Motor with external load using AtMega328 MCU.