

Jaswanth Reddy Katthi

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Education

- **Indian Institute of Science** **Bengaluru, India**
M.Tech (Research) Electrical Engineering *2018–2021*
Courses: Machine Learning for Signal Processing, Speech Information Processing, Time-Frequency Analysis, Compressed Sensing and Sparse Signal Processing, Data Analysis and Visualization, Matrix Theory, Linear and Nonlinear Optimization, Stochastic Models and Applications, Advanced Deep Learning, Data Structures and Algorithms.
 - **Thesis: Deep Correlation Analysis for Audio-EEG Decoding** **Prof. Sriram Ganapathy**
Proposed deep learning framework, for intra- and inter-subject analyses, that significantly improves over the linear methods (TRF & CCA) for single-trial audio-EEG stimulus-response correlation analysis. It alleviated the effect of substantial noise prevalent in the EEG data. Also examined reconstructing the auditory stimuli purely from their EEG responses.
- **Jawaharlal Nehru Technological University, Anantapur** **Anantapur, India**
B.Tech, Electronics and Communication Engineering *2013–2017*
Courses: Data Structures, Signals and Systems, Analog and Digital Communications, Digital Signal Processing, Digital Image Processing, Electronic Circuit Analysis, Neural Networks and Fuzzy Logic, Calculus
 - **Final Project: Smart Automotives using MSP430**
Using MSP430, the project is aimed at supervising an automobile through IoT to inform the family, nearby automobiles and emergency services in the hour of need. Performed PCB design, wrote the Embedded-C code, and website facilitating IoT.

Research Interests

Machine Learning, Language Technologies, Neuroscience, Computer Vision, ML for Perception, Cognition and Memory.

Publications

- **Deep Correlation Analysis for Audio-EEG Decoding**, *Jaswanth Reddy Katthi and Sriram Ganapathy*, IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE) 2021. (**Journal**)
- **Deep Multiway Canonical Correlation Analysis for Multi-Subject EEG Normalization**, *Jaswanth Reddy Katthi and Sriram Ganapathy*, IEEE ICASSP 2021. (**Conference**)
- **Deep Canonical Correlation Analysis For Decoding The Auditory Brain**, *Jaswanth Reddy Katthi, Sriram Ganapathy, Sandeep Kothinti and Malcolm Slaney*, IEEE EMBC 2020. (**Conference**)

Research Experience

- **Reconstructing speech stimuli from EEG Recordings** **Prof. Sriram Ganapathy**
Department of Electrical Engineering, Indian Institute of Science *Spring 2021*
Studied various deep learning models like CNN, LSTMs and transformers for reconstructing speech stimuli from their corresponding EEG responses in the single-trial analysis setting.
- **Latent representation of Hi-C intra-chromosomal interactions** **Kevin D'Souza**
ECE, The University of British Columbia *Fall 2020*
Deployed variational LSTMs for modelling the latent 3D intra-chromosomal interactions from a Hi-C contact matrix.

Work Experience

- **Qualcomm** **Hyderabad, India**
Camera Systems Engineer *May 2021–Present*
Working on incorporating Deep Learning models into the image preprocessing pipeline. Worked on improving the algorithm for chromatic aberration and blooming correction. Got exposed to industry level solutions, NEON intrinsics and SVE instruction sets.
- **Smaya (Startup)** **Anantapur, India**
AI features and UI Chief *2015–2017*
Our aim was to develop a wearable smart assistant (like a smart watch). Worked on integrating smart features like speech recognition, designed an adaptable and fresh UI based on circles, and actively involved in the overall design of the device.

- **Robolabs (Startup)** **Anantapur, India**
Intern *2016*
Participated in multiple embedded systems projects. Notably, I have worked on design and implementation of a coin based mobile charging point which looked similar to a pay-and-talk telephone.

Teaching Experience

- **Professional Mentor at JNTUA's Skill Development and Incubation Centre** **(2021 - Present)**
The program is aimed at encouraging the university's students towards research (funded by DST SERB) and startups.
- **Teaching Assistant for Deep Learning (CCE Course), IISc** **(Spring 2020)**
Maintaining course website, setting assignments, examinations and tutorial sessions.
- **Teaching Assistant for E9:309 Advanced Deep Learning, IISc** **(Fall 2020)**
Maintaining course website, setting assignments, examinations and tutorial sessions.
- **Career Guidance and Tutoring** (Online and Offline, Part-time) **(2014 - Present)**
Guided and tutored 30+ students (in Linear Algebra, Signal Processing, ML, DL, C++, Python, and GATE exam).

Projects

Course Projects

- **Change-Point Detection and Estimation of Piece-wise Constant Parameters using Sparse Linear Regression** **Prof. K.V.S Hari**
Compressed Sensing and Sparse Signal Processing, IISc *Spring 2019*
Worked on leveraging the quasi-stationarity of speech signals to estimate time-varying (TV) piece-wise constant auto-regressive (AR) coefficients. These AR coefficients can be used to compress the speech signal.
- **Spectral Offline Clustering for Speaker Diarization with LSTM** **Prof. Prasanta Kumar Ghosh**
Speech Information Processing, IISc *Spring 2019*
Built a speaker diarization model that performs non-parametric spectral clustering on the LSTM-based d-vector audio embeddings. Tested this published model on the VoxCeleb dataset.
- **Which factor correlates with the crime rate in India?** **Prof. Phaneendra K. Yalavarthy**
Data Analysis and Visualization, IISc *Spring 2019*
Visualized the crime rates in India against various factors like crime against women, population density, total and female education enrolments, literacy rate, and poverty using Tableau. The data used are publicly available by the government of India.

Other Projects

- **Biologically Inspired Optimization and Learning** **Prof. Edward Kim**
Neuromatch Academy 2020 *Fall 2020*
Explored Predictive Coding (PC) based learning algorithm to compare with Gradient Descent. Finally, tried the Nengo framework.
- **Telebot** **Prof. E. Keshava Reddy**
Department of Mathematics, JNTU Anantapur *Fall 2016*
Worked on design and implementation of MSP430 based tele-presence robot, Telebot. Programmed for the motor and camera control in Embedded C, using MotorControl BoosterPack. Submitted to India Innovation Challenge Design Contest, 2016.
- **Artificial Intelligence Development Board** **Prof. E. Keshava Reddy**
Department of Mathematics, JNTU Anantapur *Spring 2016*
Incorporated the Hebbian Learning for an ATMEGA328 based low-power and low-memory neural network of 16 neurons with 4 digital inputs and 4 digital outputs. Trained and tested it for switching a light source on and off.

Personal Projects

- Built a **Facial Keypoints Detector** that predicts the 68 keypoints on each face using CNNs & Haar Cascades.
- An **Image Captioning System** using CNNs, attention and LSTMs, trained and validated on the MS COCO dataset.
- Implemented **SLAM** using kalman filter, and particle filter **for localizing a robot in a 2D grid world**.
- **Finding Lane lines** and **Advanced Lane Finding** using Canny edge detection, Hough transforms, Camera Calibration, and perspective transforms which can detect lanes even on a curved road.
- **Traffic Sign Classifier** using a Le-Net CNN on German Traffic Signs Dataset.
- Implemented **Behaviour Cloning** model, using an 11 layer CNN model, which clones a user's driving pattern.

○ Language Technologies

Sentiment Analysis (used word2vec, GloVe); **Neural Machine Translation** with Attention; **Emojify**; Modify word embeddings to **reduce gender bias**; **Writing like Shakespeare** using LSTMs; **Trigger word Detection** in Speech Recognition; **Generating Jazz** using LSTM.

○ Images

Neural Style Transfer; Face **Emotion Detection** using tensorflow; Residual Networks for **Sign Language Classification**; YOLO for object detection; Face Recognition and Face Verification using Triplet Loss.

○ C++ Projects

- An **OpenStreetMap Route Planner** using A* search algorithm, a **Memory Management Chatbot**, and a **Concurrent Traffic Simulator** which runs each vehicle on a separate thread, and manages their intersections.

Scholastic Achievements

- Presented a talk for IEEE-IISc Communications Society & Signal Processing Society Chapters, as a part of the Student Research Seminar Series 2021.
- Secured an All India Rank of 68 (99.9 percentile) in GATE (EC) 2018.
- Acquired a score of 220/360 (99.5 percentile all over India) in JEE MAINS 2013.
- Got a 1078 Rank (99.7 percentile) in EAMCET 2013, a state common entrance test for B.Tech.
- Awarded scholarships (3 times) by the South Central Railway Office for academic excellence.

Technical and Personal Skills

- **Programming Languages:** Python, MatLab, C, C++, Embedded C, HTML, CSS, JavaScript, Bash.
- **Frameworks/ Libraries:** Pytorch, Scikit, Librosa, Keras, Tensorflow, NLTK, SpaCy, Praat, NEON Intrinsics, VueJS.
- **Technical Knowledge:** Speech Processing, Computer Vision, Natural Language Processing, Computational Neuroscience, Reinforcement Learning, Arduino, Energia, Raspberry, UNIX, Git.
- **Other:** Adobe Photoshop, Illustrator, Audition, Premiere Pro, Logic Pro X.
- **Human Skills:** Teamwork, Leadership, Patient Listener, Time Management, Event Management.
- **Languages:** Telugu, Hindi, English, Kannada, Tamizh, Malayalam and French (currently learning).

Workshops and Courses

- 'Brain, Computer and Learning 2019', 'Indo-French Centre for Applied Mathematics 2020', 'CNS 2020' & numerous talks visiting our Institute.
- Attended **WISSAP 2020** (Winter School on Speech and Audio Processing, 2020) ; theme was 'Machine Listening'.
- **Online courses** (with projects and assignments) on ML and DL covering CS229, CS230, CS231n and CS224n, offered by Stanford and Coursera ; CS50 by Harvard, and CS188 By UC Berkeley ; Reinforcement Learning by NPTEL.
- **Udacity NanoDegree Programs** on C++, Computer Vision, and Self-Driving Car Engineer.
- Attended a **workshop on "Internet of Things"** at Indian Institute of Science, Bengaluru, in 2016.
- Topped at **"Embedded Systems" workshop** at NIT Warangal, 2014, and got selected for Nationals at IIT Madras.

Extra-Curricular Activities

- **Open Day:** Organized the annual 'Open Day' for our lab (LEAP) in 2019 and 2020.
- **Theatre Club (Rangmanch), IISc** **Bengaluru, 2020**
Part of Kabuki (Japanese dance-drama form) style Sitayana, Freedom struggle in India, and an unnamed production.
- **Elected coordinator for student body, ECHO** **Anantapur, 2015-2017**
Got elected as coordinator for the department's student body, and organized various student programs in my bachelors.
- **Co-founder and an active member of Pravartak** **Anantapur, 2016**
It is an NGO that focuses on improving resources for local underrepresented school students.
- **Personality Development workshop** **Anantapur, 2016**
Coordinated and organized the 3 days personality development program by Impact Foundation.
- **NSS Student Coordinator** **Anantapur, 2015**
Organized the litter-free and tree-plantation campaigns, and blood and medical check-up camps.
- **Workshop on Fuzzy Logic** **Anantapur, 2014**
In collaboration with Prof. Keshava Reddy and Robolabs, organized a workshop on Fuzzy logic at our department.
- **Member of the Notebook drive club at IISc.**