

DESH RAJ

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1 E University Pkwy, Unit 904, Baltimore 21218

EDUCATION

Johns Hopkins University

ongoing

Ph.D. in Computer Science

Advisors: Sanjeev Khudanpur, Dan Povey

Research Interests: Speech recognition

Indian Institute of Technology Guwahati

June 2017

B.Tech. in Computer Science & Engineering

GPA: 9.35/10

Thesis: Relation extraction in clinical text using deep learning

PROJECTS

CHiME-6 challenge

Ongoing

- Created baseline Kaldi recipe for the challenge: TDNN-stats based SAD (5.1% error rate on dev) and x-vector + PLDA backend for diarization (~36% DER on dev)
- Working on array selection methods for combining multi-array diarization outputs.

Noise-adaptive training of acoustic models for hybrid ASR

Ongoing

- Proposed noise vectors (comprising mean of speech and silence frames) for utterance-level noise adaptation.
- Performs better than i-vector based adaptation on Aurora4 and AMI SDM datasets, while requiring no additional extractor training.
- Working on a Bayesian model of noise vector estimation for online decoding.

Sub-word based methods for OCR

Fall 2018

- Experimented with subword modeling methods such as BPE, unigram probability, and LZW compression, for OCR applications.
- Implemented a subword-based hybrid HMM-DNN system for Bentham dataset, improving SOTA by 7% relative WER.

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Relation classification in biomedical text

Bachelor Thesis

Guide: Prof. Ashish Anand, Dept. of CSE

- Implemented a novel CRNN model to learn long and short term dependencies and evaluated attention-based pooling
- Achieved state-of-the-art performance on two benchmark datasets (i2b2 and DDI) without any manual feature engineering

- Recently devised a Graph CNN model to leverage information from dependency parse of the sentence; this outperforms earlier model.

EXPERIENCE

Samsung Research Institute Bangalore

Research Engineer

June 2017 - June 2018

Bangalore, India

- Conceptualized and implemented several key features like undo, selective delete, etc., as part of Context Engine team in Conversational Intelligence
- Devised a bit truncation method to reduce word embeddings size for on-device AI; achieved 75% compression with 95% correlation in word similarity task

Microsoft India

Software Development Engineering Intern

May 2016 - July 2016

Hyderabad, India

- Developed a cross-platform mobile application in Xamarin Forms for OEM digital contracting system
- Conceptualized statistics APIs to improve business efficiency

SELECTED PUBLICATIONS

D.Raj, D.Snyder, D.Povey, S.Khudanpur, *Probing the information encoded in x-vectors*. IEEE Workshop on Automatic Speech Recognition and Understanding (ASRU) 2019.

D.Raj, S.K.Sahu, A.Anand, *Learning local and global contexts using a convolutional recurrent network model for relation classification in biomedical text*. SIGNLL Conference on Computational Natural Language Learning (CoNLL) 2017. PP 311–321

D.Raj, A.Gupta, B.Garg, K.Tanna, F.C.H.Rhee, *Analysis of data generated from multidimensional type-1 and type-2 fuzzy membership functions*. IEEE Transactions on Fuzzy Systems.

S.Majheed, A.Gupta, **D.Raj**, F.C.H.Rhee, *Uncertain Fuzzy Self-organization based Clustering: Interval Type-2 Approach to Adaptive Resonance Theory*. Information Sciences 424 (2018). PP 69–90

ACHIEVEMENTS

Receipient of **INAE Travel Grant Scheme** by Govt. of India for oral presentation at WCCI 2016

Receipient of **Kalyani Research Scholarship** from Alumni Affairs (IIT Guwahati) for publishing at an international conference during B.Tech.

TECHNICAL SKILLS

Programming Languages

Python, C, C++, Bash

Libraries & Frameworks

Kaldi, ESPNet, PyTorch, Tensorflow

GRADUATE COURSEWORK

ML courses

Machine Learning, Data to Models, Information Extraction

Math courses

Bayesian Statistics, Matrix Analysis, Nonlinear Optimization

Other

Parallel Programming, Causal Inference, Information Theory