Desh Raj

R2-904, Alpine Eco Apartments, Doddanekundi, Bengaluru - 560037
r.desh26@gmail.com,r.desh@iitg.ac.in
https://desh2608.github.io
(091)8011025825, (091)9507840745

EDUCATION

Bachelor of Technology
Indian Institute of Technology Guwahati, India, June 2017
Major: Computer Science and Engineering
Aggregate: 9.35/10 (Latest GPA 9.81)

Senior Secondary
Loyola High School, Patna, India, May 2013
Aggregate: 95.2% (Ranked 2 among 250 students)

RESEARCH INTERESTS

Natural language processing, deep learning, computer vision, fuzzy logic systems

PROJECTS

Relation classification for clinical text — Bachelor Thesis
Guide: Prof. Ashish Anand, Dept. of CSE

- Devised and implemented a novel Convolutional Recurrent Neural Network (CRNN) model to learn long and short term dependencies
- Evaluated an attentive pooling strategy in comparison with conventional pooling methods
- Achieved state-of-the-art performance on two benchmark datasets (i2b2 and DDI) without any need for manual feature engineering

Identifying semantically equivalent questions — Ongoing
Guide: Prof. Ashish Anand, Dept. of CSE

- Working on a novel technique to identify duplicate questions using a joint representation and a template-based approach
- Comparing with baselines involving feature-based classifiers, kernel-based pairwise ranking, soft cosine similarity, and adversarial training
- Evaluation on the Quora dataset and a StackOverflow dataset

Text readability analysis using language models — Spring 2017
Guide: Prof. Ashish Anand, Dept. of CSE

- Developed an unsupervised approach for predicting text readability scores using different language models
- Implementing statistical and deep-learning models, for comparing results with vocabulary-based and syntactic approaches

Monitoring production line performance to reduce failures — Spring 2017
Guide: Prof. Rashmi Dutta Baruah, Dept. of CSE

- The objective was to model fault recognition as a classification problem consisting of very high-dimensional data containing thousands of instances
- Worked on feature selection using Gradient Boosting, and representation of categorical features by a single numeric feature using STG and RDA methods
- Also proposed a meta-optimization of the evaluation metric using Bayesian optimization, as a post-classification step

Spatial Transformer Networks — Fall 2016
Guide: Prof. Arijit Sur, Dept. of CSE

- Used the STN module from Jaderberg et al. (NIPS 2015) for object recognition and acitivity prediction from egocentric images

- Worked with GTEA and Intel Egocentric Vision data sets on Tensorflow

Fuzzy adaptive resonance theory (ART) clustering Summer 2015
Guide: Prof. Frank Rhee, Hanyang University

- Worked on improving clustering performance of fuzzy ART algorithm by integrating Interval Type-2 approach into vigilance parameter computation
- Obtained 5-10% better classification results compared to other methods

Similarity analysis on multidimensional fuzzy sets Summer 2015, Spring 2017
Guide: Prof. Frank Rhee, Hanyang University

- Analyzed various multidimensional fuzzy membership functions and compared similarity of data sets using Wilcoxons nonparametric tests
- Established guidelines for selecting appropriate MFs based on data set and application requirements
- Recently extended the proposed method for high-dimensional data using dimensionality reduction approaches like PCA, kernel PCA, probabilistic PCA, and t-SNE

EXPERIENCE

Research Engineer - Samsung R&D Bangalore July 2017 - Present
Manager: Vikram Mupparthi, AlterEgo (Smart Assistant)

- Part of the Context Engine module within the Smart Assistant team, responsible for building a collaborative mobile assistant
- Contributed in designing and developing a template-based model that stores history and infers input based on prior context

Software Developer Intern - Microsoft India Summer 2016
Manager: Sarang Date, OEM-ECIT

- Developed a cross-platform mobile application in Xamarin Forms for OEM digital contracting system
- Evaluated various notification services and implemented GCM for push notifications
- Conceptualized statistics APIs to improve business efficiency

Research Intern - Hanyang University, Korea Summer 2015
Guide: Prof. Frank Chung-hoon Rhee, Head of Computational Vision and Fuzzy Systems Lab

- Analyzed multidimensional fuzzy sets to establish directives for using membership functions
- Worked on extending Fuzzy ART clustering algorithm to interval-valued sets

PUBLICATIONS

Conference

- **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, K.Tanna, B.Garg, F.C.H.Rhee, *Principal component analysis approach in selecting type-1 and type-2 fuzzy membership functions for high-dimensional data.* In Proceedings: 17^{th} World Congress of International Fuzzy Systems Association 2017.
- **D.Raj**, B.Garg, K.Tanna, F.C.H.Rhee, *Visual analysis and representations of type-2 fuzzy membership functions.* In Proceedings: IEEE International Conference on Fuzzy Systems 2016. PP 550–554

Journal

- **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.

ACHIEVEMENTS

- Recepient of **INAE Travel Grant Scheme** by Govt. of India for oral presentation at WCCI 2016
- Recepient of **Kalyani Research Scholarship** from Alumni Affairs (IIT Guwahati) for publishing at an international conference during B.Tech.
- Among top 0.7% of all candidates (126,000+) in JEE-Advanced 2013 and 0.12% of all candidates (1,400,000+) in JEE-Mains 2013
- Offered INSPIRE scholarship by Dept. of Science and Technology, Govt. of India, for being among the top 1% in AISSCE-2013

COMPUTER SKILLS

Languages & Software: Python, C, C++, Java, C#, Tensorflow, Xamarin, MATLAB, Visual Studio, Eclipse, Android Studio, LaTeX
Operating Systems: Linux, Windows.

EXTRA-CURRICULAR ACTIVITIES

- Literary Secretary, Manas hostel (2014-2015)
- Member, National Service Scheme (2014-2015)
- Student Mentor, Counselling Cell, IIT Guwahati (2015-2016)

RELEVANT COURSEWORK

Computer Science: Data structures, Algorithms, Formal languages, Theory of computation, Operating systems, Databases, Compilers, Digital design, Computer architecure, Software engineering
Math: Linear algebra, Real analysis, Differential equations, Probability theory and random processes, Optimization
Machine learning: Data mining, Computer vision using machine learning, Artificial intelligence, Intelligent systems & interfaces
Online courses: Natural language processing (CS224N Stanford), Deep learning for NLP (CS224D Stanford), Convolutional neural networks for visual recognition (CS231N Stanford)

REFERENCES

Prof. Ashish Anand, Associate Professor, Dept. of Computer Science & Engineering, IIT Guwahati, India. Email: `anand.ashish@iitg.ernet.in`
Prof. Frank Chung-Hoon Rhee, Professor, Dept. of Electrical & Electronic Engineering, Hanyang University (ERICA Campus), Republic of Korea. Email: `frhee@fuzzy.hanyang.ac.kr`