

Desh Raj

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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 activity 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 Wilcoxon's 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

- **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**, 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
- **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. (Accepted)
- **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: 17th World Congress of International Fuzzy Systems Association 2017.

ACHIEVEMENTS	<ul style="list-style-type: none"> • Receptient of INAE Travel Grant Scheme by Govt. of India for oral presentation at WCCI 2016 • Receptient 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	<p><i>Languages & Software:</i> Python, C, C++, Java, C#, Tensorflow, Xamarin, MATLAB, Visual Studio, Eclipse, Android Studio, L^AT_EX</p> <p><i>Operating Systems:</i> Linux, Windows.</p>
EXTRA-CURRICULAR ACTIVITIES	<ul style="list-style-type: none"> • Literary Secretary, Manas hostel (2014-2015) • Member, National Service Scheme (2014-2015) • Student Mentor, Counselling Cell, IIT Guwahati (2015-2016)
RELEVANT COURSEWORK	<p><i>Computer Science:</i> Data structures, Algorithms, Formal languages, Theory of computation, Operating systems, Databases, Compilers, Digital design, Computer architecture, Software engineering</p> <p><i>Math:</i> Linear algebra, Real analysis, Differential equations, Probability theory and random processes, Optimization</p> <p><i>Machine learning:</i> Data mining, Computer vision using machine learning, Artificial intelligence, Intelligent systems & interfaces</p> <p><i>Online courses:</i> Natural language processing (CS224N Stanford), Deep learning for NLP (CS224D Stanford), Convolutional neural networks for visual recognition (CS231N Stanford)</p>
REFERENCES	<p>Prof. Ashish Anand, Associate Professor, Dept. of Computer Science & Engineering, IIT Guwahati, India. Email: anand.ashish@iitg.ernet.in</p> <p>Prof. Frank Chung-Hoon Rhee, Professor, Dept. of Electrical & Electronic Engineering, Hanyang University (ERICA Campus), Republic of Korea. Email: frhee@fuzzy.hanyang.ac.kr</p>