Shubhangi Ghosh | Curriculum Vitae

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Education

Bachelor of Technology   **Jul 2015–Present**
Electrical Engineering
CGPA: 9.13/10
Research Interests: Machine Learning, Deep Learning, Natural Language Processing
Relevant Courses: Machine Learning, Deep Learning, Natural Language Processing, Convex Optimisation, Probability and Stochastic Processes, Linear Algebra, Data Structures and Algorithms, Information Theory and Coding Theory

Research Experience

Bachelor's Thesis Project

Graph Convolutional Networks for solving math word problems   **Oct 2018–Present**
Indian Institute of Technology Madras
Guide: Prof. Mitesh Khapra
- Proposed the use of Graph Convolutional Networks (GCNs) for modelling the semantics of math word problems. The GCN embeddings are used in conjugation with an attention-based seq2seq model to obtain the output equation template.
- Proposed the development of a ConceptNET for math to incorporate common-sense knowledge into the model.
- Proposed to incorporate attention mechanism over mathematical operators.

Research Projects

**Mathematical Interpretation of Convolutional Networks
for Image Deblurring**   **Jul 2018–Present**
Indian Institute of Technology Madras
Guide: Prof. Avhishek Chatterjee
- This project attempts to interpret the behaviour of Convolutional Neural Networks (CNNs) in the form of a Maximum-A-Posteriori formulation.
- This is explored in the context of blind, non-uniform image deblurring.   [Report]

Time Series Forecasting   **May 2018–Jul 2018**
Nanyang Technological University, Singapore
Guide: Prof. Suresh Sundaram
- Developed a **novel architecture** which introduced recurrence in fuzzy neural networks, while using a faster one-shot projection based learning algorithm, for time series forecasting.
- These time series forecasting algorithms were further tested on synthetic dynamical system identification problems and chaotic time series problems.
- Achieved **ten times faster** performance than previously known algorithms, while also achieving similar or **better accuracy**. This work has been accepted by the **IEEE SSCI conference 2018**.   [conference paper]

Automatic Speech Recognition for Indian Languages   **Nov 2017–Present**
Indian Institute of Technology Madras
Guide: Prof. S.Umesh
- Developed a **full-scale system** that utilizes both conventional machine learning models and the more recent deep learning methods.
- Collected, processed and standardized native language text to create a **corpus with over 15 million words**. This was used to train a RNNLM (Recurrent Neural Network Language Model) for the languages Tamil, Telugu and Gujarati.
- Proposed a **novel architecture** which uses a common encoder for similar sounding languages - Telugu and Tamil, while using a separate decoder for each, to overcome the challenge of under-resourced languages.   [report]

Extraction of Definitional Sentences   **Jan 2018–Apr 2018**
Indian Institute of Technology Madras
Guide: Prof. Sutanu Chakraborti
- Proposed a hybrid model for Definition Extraction from text. The strength of lexicosyntactic pattern-matching approaches as well as the generalization capability of the Word Class Lattice approach were leveraged for better performance.
- Achieved **improved F-measure (by 10%)** on definition extraction tasks.   [report]

Number Theory study   **May 2016–Jul 2016**
Indian Statistical Institute Bangalore
Guide: Prof. B. Sury
- Studied proofs of congruence theorems such as Fermat's theorem, Euler's theorem and Chinese Remainder Theorem and solved numerical problems based on the aforementioned concepts.   [report]

Talks and Presentations

○ **Recurrence in Fuzzy Neural Networks and a faster training algorithm for Time Series forecasting**   **Apr 2018**
IEEE Symposium Series on Computational Intelligence (IEEE SSCI 2018), Bangalore
Presented our novel approach of introducing recurrence in fuzzy neural networks, while using a faster one-shot projection based learning algorithm, for time series forecasting.   [SLIDES]

○ **Page Rank for Word Sense Disambiguation**   **Apr 2018**
Indian Institute of Technology Madras
Presented the idea of exploiting the capability of the Page Rank algorithm to handle the circularity of word definitions for an application in word sense disambiguation.   [SLIDES]

Industrial Experience

○ **Defence Research and Development Organization Bangalore**   **May 2017–Jul 2017**
Manager: Regu Kumar
Mentor: Alka Soni   *Bangalore, India*

The project was aimed at building a Real Time Executive for an Avionics system. It involved developing optimized code for task scheduling, interrupt handling and context switching for PowerPC P1024RM processor, e500v2 core. The developed application will be used in production of an airborne platform application.   [REPORT]

○ **DrumUP Bangalore**   **May 2017–Jul 2017**
Manager: Vishal Dutta
Mentor: Raghavendra Kumar   *Bangalore, India*

The internship involved developing Javascript applications to edit images and add captions online, and download analytics reports as CSV files from the DrumUp web frontend. The developed application **went into production**.   [GITHUB]

Awards and Fellowships

○ **NTU-India Connect Research Fellowship**: The NTU-India Connect Research Fellowship is offered to **meritorious undergraduate or graduate students** from Indian universities to pursue their research at Nanyang Technological University, Singapore (NTU) for a period of two to six months.
○ **4th rank all over India** in the entrance exam conducted by **Indian Statistical Institute** in 2015.
○ Placed **third** in the Amazon AWS Deep Learning Hackathon at Shaastra, 2018.
○ **INSPIRE Fellowship**: The INSPIRE Fellowship is offered by the **Govt. Of India** to students who feature in the national **top 1 percent** of students among those who clear the CBSE board Class XII Exam.
○ **Certificate of Merit** received from the **HRD Ministry, Govt. of INDIA** for excellent performance in the CBSE class X Examination, 2012.

Skills and Tools

○ **Programming languages**: C, Python, C++, Bash, TeX
○ **Libraries**: TensorFlow, Scikit-learn, NLTK, SpaCy
○ **Applications and Tools**: Embedded C, Scientifc Python, MATLAB, Octave, LTSpice
○ **Operating Systems**: Linux, Windows

College Activities

○ **The Fifth Estate Correspondent**: The Fifth Estate is the student media body of IIT Madras.   Apr 2017–Present
  - Initiated and authored magazine segments, reported campus matters.
  - Interviewed top researchers and other guest speakers.
○ **Shaastra Web-Operations Coordinator** Shaastra is the annual technical festival of IIT Madras.   May 2016–Jan 2017
  - Handled the Shaastra participant-details database and web-signup forms.

Extra-Curricular Activities

○ **Sports**:   Jul 2015 - May 2016
Was a part of the National Sports Organisation trained swimming team in my first year of college.
○ **Music**
Certified to have completed Grade 3 Keyboard Examination by Trinity College, London.
Active participant of several events organised by Music Club, IIT Madras.