

RISHUBH SINGH

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Education

Indian Institute of Technology, Delhi

July 2014 – May 2019

Bachelor of Technology in Computer Science

GPA 8.95/10

Master of Technology in Computer Science

GPA 8.23/10

Research Experience

Pre-Doctoral Researcher

September 2020 – Present

Google Research India : Cognitive Modeling and Machine Learning Group

Factorize and Zoom - A Model Agnostic Framework for Improved Object-part Scene Segmentation *Under Review*

- Propose a scalable modeling framework based on label-space factorisation for multi-object multi-part parsing.
- Propose the IZR (inference-time zoom refinement) technique that refines segmentation maps by zooming in on objects, without additional training, significantly improving segmentation quality for small objects/parts.
- Propose the most comprehensive and challenging version of the Pascal-Part segmentation dataset : Pascal-Part-201.
- Obtain improvements of over 8% for mean IOU over the previous SoTA on PASCAL-Part-201 and over 2% on previously proposed smaller subsets - Pascal-Part 58/108.

Object Centric Learning for Robust and Interpretable Image Classification

In progress

- Designing object centric bottlenecks for creating robust latent representations for classification.
- Creating segmentation sub-tasks for increased interpretability of the model's predictions.
- Applying part based feature generation and contrastive learning via graph matching for improved generalization.

GrowL : Dynamically Growing Networks in Continual Learning

In progress

- Designing a dynamically growing network introducing a task interference criterion for iteratively selecting local network changes to promote learning of the new task and backward transfer in task agnostic class incremental settings.

Master's Thesis

July 2018 – April 2019

Indian Institute of Technology Delhi

Published at ACL Student Workshop 2020

- Analyzed neural nets that are structurally and biologically more plausible and replicate human behaviour.
- Compared various recurrent models like EIRNNs, LSTMs, RNNs against human performance to better understand cognition on high level tasks like learning subject-verb agreement.
- Showed that vanilla RNNs are significantly inferior to LSTMs on tasks like learning grammaticality.
- Showed that no one recurrent architecture performs best at all/most types of sentences.
- Proposed a new model : Decay RNN which is biologically more plausible while performing almost at par with LSTMs.
- Paper accepted at the ACL Student Workshop 2020.

Character Based Sentiment Analysis

February 2018 – May 2018

Course Project : Indian Institute of Technology Delhi

- Finding the sentiment and word understanding capability of a neural network with only character sequence information.
- Achieved SoTA accuracies on multiple datasets using character BiLSTMs, CNNs and their combinations.

Summer Undergraduate Research Award

May 2016 – February 2017

Indian Institute of Technology Delhi

- Parallelized a Dynamic Verification Engine (INSPECT) that verifies parallel programs for correctness.
- Parallelized the dynamic partial order reduction algorithm using parallel depth first search algorithm.
- Used MPI and workload sharing to achieve an efficient optimization reducing runtime by upto 5 times.

Publications

Factorize and Zoom - A Model Agnostic Framework for Improved Object-part Scene Segmentation

Rishubh Singh, Pranav Gupta, Pradeep Shenoy, Ravi Kiran Sarvadevabhatla

Under Review

How much complexity does an RNN architecture need to learn syntax-sensitive dependencies?

Rishubh Singh, Gantavya Bhatt, Hritik Bansal, Sumeet Agarwal

Accepted for poster presentation at the ACL Student Workshop 2020.

Engineering Experience

Graviton Research Capital LLP

July 2019 – August 2020

Software Engineer

Gurgaon, India

- Focused on code optimization at the compiler, OS and hardware levels to ensure the fastest processing of market events.
- Responsible for writing and maintaining the backend of four markets traded by the company.
- Experienced in navigating complexities and setting up the backend for new markets.

Google

May 2018 – August 2018

Software Engineering Intern

Mountain View, USA

- Designed and created an API to generate customizable images/videos given camera specifications and orientation from Street View data.
- Parallelized the internals of data generation of the API using Flume obtaining a 10x increase in efficiency.
- Synthesized videos (over 100GBs) are supplementing existing collected data and are being used to train and test internal algorithms and ML models at scale.

Google

May 2017 – July 2017

Software Engineering Intern

Mountain View, USA

- Built a system to filter false on-call escalations and remove noise from the feedback and monitoring system.
- Improved the ad serving system to reduce the loss of ad impressions, having direct revenue impact.
- Worked with external (to Google Fiber) API's, DFP (Ad server), Spanner (large scale database) and a pipeline based task processing system.

Selected Achievements

Competitive Coding

- Qualified for ACM-ICPC Amritapuri Regional 2015 and secured 71st rank in India.
- National Top 25 in Indian National Olympiad in Informatics(INOI), selected and participated in International Olympiad in Informatics(IOI) Training Camp 2013 and 2014.

Scholastic Achievements

- National Top 40 in Indian National Astronomy Olympiad(INAO) and attended the Astronomy Orientation Camp in 2014. Top 300 in 2010 and 2011 in the same.
- Scholarship under National Talent Search Examination(NTSE) - 2010 by Govt. of India.
- National Rank 36 and fellowship under Kishore Vaigyanik Protsahan Yojana(KVPY) (Young Scientist Program) - 2013 conducted by IISc Bangalore and Govt. of India.

Extra Curricular

- Attended a semester (5th) exchange to the prestigious KTH Royal Institute of Technology, Stockholm, Sweden.
- Selected for the JENESYS program among Top 10 students from CISCE schools. A 10 day cultural exchange initiative between the Ministries of Foreign Affairs' of India and Japan.