

# Shantanu Jaiswal

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## EDUCATION

### Nanyang Technological University (NTU Singapore)

Singapore

*Bachelor of Engineering in Computer Engineering, Specialization in Intelligent Systems*

*Aug 2014 – Jun 2018*

- **GPA:** 4.64/5.00 (Honours highest distinction)
- **Select Courses:** CE4041 (Machine Learning); CE4042 (Neural Networks); CE4034 (Information Retrieval); EE8087 (Living with Mathematics); CE1007 (Data Structures); CE2001 (Algorithms)

## RESEARCH INTERESTS

Cognitively-inspired AI; Scene Understanding and Reasoning; Language Grounding; Semantic Development; Computational Neuroscience

## PUBLICATIONS

### Papers

- [1] **Shantanu Jaiswal**, Basura Fernando, and Cheston Tan. “TDAM: Top-Down Attention Module for Contextually-Guided Feature Selection in CNNs”. In: *European Conference on Computer Vision (ECCV) (Poster)*. 2022. [\[Paper\]](#) [\[Suppl.\]](#) [\[Code\]](#).
- [2] **Shantanu Jaiswal**, Dongkyu Choi, and Basura Fernando. “What do CNNs gain by imitating the visual development of primate infants?” In: *31st British Machine Vision Conference (BMVC)*. 2020. [\[Paper\]](#) [\[Suppl.\(zip\)\]](#) [\[Code\]](#) [\[Abstract \(Cogsci 2020\)\]](#).

### Pre-prints and workshop papers

- [3] **Shantanu Jaiswal**, Liu Yan, Dongkyu Choi, and Kenneth Kwok. “A Probabilistic-Logic based Commonsense Representation Framework for Modelling Inferences with Multiple Antecedents and Varying Likelihoods”. In: *arXiv*. 2022. [\[Preprint\]](#) [\[Code & data release pending agency approval\]](#).
- [4] Annamalai Narayanan, Mahinthan Chandramohan, Rajasekar Venkatesan, Lihui Chen, Yang Liu, and **Shantanu Jaiswal**. “graph2vec: Learning Distributed Representations of Graphs”. In: *Proceedings of the 13th International Workshop on Mining and Learning with Graphs (MLG)*. 2017. [\[Paper\]](#) [\[Code\]](#).

## RESEARCH EXPERIENCE

### Research Engineer – A\*STAR Artificial Intelligence Initiative

Nov 2018 – Present

*Advisors: Dr. Basura Fernando and Dr. Cheston Tan; Topic: Cognitively-inspired computer vision*

*Singapore*

- Identifying relevant cognitive phenomena and their possible functions for scene understanding tasks, and accordingly proposing new computational blocks/operations and variations in training approaches.
- Past work: (i) Integration of top-down computation in CNN blocks for more contextually-guided feature selection across the model hierarchy; (ii) Analysis of a developmentally-inspired training approach wherein visual inputs are refined (in terms of resolution and colour) and base model is grown in parameters over discrete training stages.
- Ongoing work: (i) Using logic-representations for questions along with a recurrent visual attention method for more interpretable visual question answering (VQA) and description-based object counting; (ii) Adaptive feedback computation methods to make video QA models more efficient.

### Research Engineer – Social and Cognitive Computing, A\*STAR IHPC

Aug 2018 – Present

*Advisors: Dr. Kenneth Kwok and Dr. Erik Cambria; Topic: Commonsense knowledge for NLU*

*Singapore*

- Studying how to represent commonsense knowledge for machine-reading and language understanding tasks, and accordingly developing a knowledge-base that can be a more effective knowledge resource for language models.
- Designed a knowledge representation framework that – (i) utilizes a probabilistic logic representation scheme to model inferential knowledge with multiple antecedents and represent conceptual beliefs with varying likelihoods, and (ii) incorporates a hierarchical conceptual ontology to identify concept relevant relations and organize beliefs at different conceptual levels (thereby promoting re-use of knowledge through inheritance where applicable).

- Developed crowd-sourcing pipeline for knowledge collection, extended an existing knowledge-base with above stated representation framework (using ProbLog), and applied knowledge-base for rule-based semantic parsing and question answering on aerospace documents (this system is being utilized as part of a larger industrial project).

## Undergraduate Research Assistant – NTU School of EEE

Sep 2016 – Aug 2017

*Advisor: Dr. Lihui Chen; Topic: Deep learning for graph representation learning*

*Singapore*

- Studied and implemented deep learning and traditional machine learning approaches for problems of graph representation learning and aspect-based sentiment analysis.
- Contributed to the development of the graph2vec framework and the evaluation of existing graph representation learning approaches (incl. node2vec, deep graph kernels and Weisfeiler-Lehman graph kernels) on benchmark graph classification and clustering tasks.
- Presented a survey on deep learning approaches for graph representation learning and aspect-based sentiment analysis at International Conference of Undergraduate Research 2017.

## AWARDS AND HONOURS

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President's Research Scholar, Nanyang Technological University	<b>2017</b>
Ideasinc Collab4Good Seed Fund (worth 10,000 SGD; declined), Nanyang Technopreneurship Center	<b>2016</b>
Most Innovative Prize, NTU Hackathon on Digital Economy and Services	<b>2016</b>
Ministry of Education (MOE) Tuition Grant Recipient, Govt. of Singapore	<b>2014</b>
Scholarship for Higher Education (SHE-INSPIRE) for meritorious academic performance, Govt. of India	<b>2014</b>

## TECHNICAL REPORTS AND SELECT PROJECTS

### Unsupervised domain adaptation of aspect-based sentiment analysis models Sep 2017 – Apr 2018

*Final Year Project, NTU School of Computer Science and Engineering; Advisor: Dr. Sinno Pan*

*Singapore*

- Analysed impact of different word embedding methods and surveyed relevant transfer learning techniques for domain adaptation of deep learning models for aspect-based sentiment analysis.
- Developed an approach to model the semantic relevance of a word in a given sentence through sequence-to-sequence autoencoders and thereby obtain more contextualized and domain-agnostic word embeddings.
- Report link: <https://dr.ntu.edu.sg/handle/10356/74089>

### Clothe application – Encouraging philanthropy through social media

Mar 2016 – Oct 2016

*Lead of 3 member self-initiated project (Top-12 finalist for Ideasinc start-up accelerator)*

*Singapore*

- Designed application that enables social-media users to raise awareness and funds for charitable causes while obtaining referrals through promotion of purchases and activity at local clothing and food retailers.
- Collaborated with local retailers and events such as the Singapore Fashion Runway to pilot-test application and refined business strategy with industry mentors as part of a 9-month start-up accelerator program.

## INDUSTRY EXPERIENCE

### Government of Singapore Investment Corporation (GIC Private Ltd.)

Jun 2017 – Aug 2017

*Graduate Internship Program – Data and Analytics*

*Singapore*

- Adapted an expert-system time-series forecasting model to allow domain-experts to adjust relevant factors for real-estate investment trust (REIT) valuation predictions and reduce biases in REIT forecasting.
- Studied usage of “Deepdive” framework for extracting structured knowledge from stock analyst reports.
- Applied density-based anomaly detection techniques for quality checking of manually recorded stock metrics.

### SAP Innovation Center Network (Leonardo Machine Learning)

Jan 2017 – May 2017

*Developer Intern – Sales and Service Ticket Intelligence*

*Singapore*

- Developed a model evaluation framework to allow clients to evaluate performance of deployed models on custom datasets and provide feedback to data scientists.
- Utilized OpenFace framework and implemented Siamese Neural Network models for face clustering.

## SKILLS

**Programming languages:** Python, Java, Matlab, Prolog, C

**Select frameworks:** PyTorch, ProbLog, TensorFlow, Scikit-learn, CoreNLP, Networkx, Pandas, Git, MTurk

**Languages:** English (native), Hindi

## ORGANIZATIONS AND ACTIVITIES

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Hall Soccer Team Member (trained towards professional soccer in 2nd university year), NTU	Aug 2015 – Dec 2017
Press and Publicity Director, NTU Astronomical Society	Aug 2015 – May 2016
Head of Media, NTU Model United Nations Organizing Committee	Aug 2014 – May 2015
Computer Science Teacher, Shri Ram School Aravali	June 2014 - July 2014