# Monisha Jegadeesan

## INDIAN INSTITUTE OF TECHNOLOGY MADRAS

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## Education

**2015-2020** **Dual Degree (B.Tech + M.Tech) in Computer Science and Engineering**
*Master's Thesis: The Von Mises-Fisher Loss for Language Generation [Prof. Yulia Tsvetkov]*
**Indian Institute of Technology Madras**, Chennai                    **CGPA: 8.78/10**

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## Research Projects

**Sep 2019 -** **Paraphrase Generation with a Bilingual Model and Continuous Embeddings**
**May 2020** Dual Degree Thesis, *Prof. Yulia Tsvetkov*, Language Technologies Institute, Carnegie Mellon University
- Machinated a novel technique for paraphrase generation using the von Mises-Fisher (vMF) Loss on the encoder-decoder framework, realised through the transformer network
- Employed bilingual data to induce zero-shot paraphrasing using artificial tokens and parameter sharing, by training on a combination of translation and rewriting tasks
- Showed that the vMF loss is highly suitable for the paraphrasing task and produces superior paraphrases as compared to the log-likelihood model through various evaluation metrics
- Evaluated the model on the IWSLT'16 (in domain) and ParaNMT-50M (out of domain) datasets and observed semantically equivalent yet diverse paraphrases in both the cases

**Aug - Dec** **Leveraging Ontological Knowledge for Neural Language Models**
**2018** Course: Computational Models of Cognition, *Prof. Sutanu Chakraborti*, Indian Institute of Technology Madras
- Incorporated Weight Initialization in learning word embeddings using the WordNet Ontology for a task in the *Construction* domain, resulting in a faster convergence rate and better representation of domain-specific terms
- Designed three models that induce hierarchical relations between words in the embeddings using the structure of the ontology, specifically for domain transfer applications

**July - Dec** **Multimodal Dialogue Generation**
**2018** Course: Undergraduate Research in Computer Science, *Prof. Mitesh Khapra*, Indian Institute of Technology Madras
- Conceived and implemented a model to prove the hypothesis that integrating domain-relevant features improves the performance of image retrieval in multimodal dialogue systems in the *Fashion* domain
- Proposed and explored the performance of attention and memory-based models with appropriate adaptations for multimodal dialogue, along with domain knowledge integration - on the MMD dataset
- Explored the use of Graph Convolutional Networks for modeling the various components of multimodal dialogue

**May - July** **Cognitive Approach to Natural Language Processing**
**2017** *Summer Internship, Prof. Veni Madhavan*, **Indian Institute of Science (IISc), Bangalore**
- Worked on a cognitive approach to Natural Language Processing that combines syntactic and semantic approaches
- Developed a cognitive parser which processes textual data into cognitive structure representation, that would be used as a feature extractor for various downstream tasks
- Demonstrated the correlation of the extracted cognitive features with both semantic and syntactic features

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## Professional Experience

**May - July** **Autocorrect Feature in Google Docs**
**2019** *Summer Internship,* **Google India, Bangalore** *[Received a Full-Time Pre-Placement Offer]*
- Developed a new feature comprising of user interface behaviour with corresponding actions for pre-existing autocorrect operations (such as capitalization), to alert the user that an autocorrect has occurred and provide an interface to undo it
- Worked on the implementation of an improved version of autocorrect that corrects automatically misspellings and grammatical errors
- Developed a feedback and logging mechanism for the autocorrect feature, engineered success metrics to assess the performance of the same, and devised a quality-testing design

**May - July** **Text to Scene Conversion in Augmented Reality**
**2018** *Summer Internship,* **Adobe Research Labs, Bangalore** *[Received an Internship-Callback Offer]*
- Conceptualized and developed a novel pipeline for converting natural language descriptions to 3D scenes in Augmented Reality, comprising of Natural Language Understanding components
- Utilized a machine learning model to predict the sizes and positions of objects, learnt from the Stanford Text2Scene dataset, and a scene augmentation algorithm learnt from the Visual Genome dataset
- Evaluated the system through human assessment of scenes generated from MS COCO captions, which substantiated its visual and empirical superiority over previous systems

## Publications and Patents

**[Publicationand Poster]** **Improving the Diversity of Unsupervised Paraphrasing with Embedding Outputs (Paper, Poster)**
*Monisha Jegadeesan*, Sachin Kumar, John Wieting, Yulia Tsvetkov
In Workshop on Multilingual Representation Learning,
The 2021 Conference on Empirical Methods in Natural Language Processing (EMNLP 2021)

**[Publication and Poster]** **Adversarial Demotion of Gender Bias in Natural Language Generation (Paper, Poster)**
*Monisha Jegadeesan*
In ACM CODS-COMAD 2020 - Young Researchers' Symposium

**[Poster]** **ARComposer: Authoring Augmented Reality Experiences through Text (Poster)**
*Sumit Kumar, Paridhi Maheshwari, **Monisha Jegadeesan**, Amrit Singhal, Kush Kumar Singh, Kundan Krishna*
In ACM User Interface Software and Technology Symposium 2019 (ACM UIST 2019)

**[Filed Patent]** **Visualizing Natural Language through 3D Scenes in Augmented Reality**
*Sumit Kumar, Paridhi Maheshwari, **Monisha Jegadeesan**, Amrit Singhal, Kush Kumar Singh, Kundan Krishna*
Filed at the US PTO (Application Number: 16/247,235)

**[Publication and Poster]** **Leveraging Ontological Knowledge for Neural Language Models (Paper, Poster)**
*Ameet Deshpande, **Monisha Jegadeesan***
In ACM CODS-COMAD 2019 - Young Researchers' Symposium

## Course Projects

**July - Dec 2019** **Graph Neural Networks for Extreme Summarization**
Course: Advanced Deep Learning, *Prof. Mitesh Khapra*, Indian Institute of Technology Madras
○ Formulated and implemented appropriate graph-based deep neural models for the Extreme Summarization (XSum) task
○ Experimented with inducing graph architectures in neural networks at the sentence-level and document-level, as well as at both the levels simultaneously
○ Obtained better performance in summarization than simple recurrent and hierarchical models by 2-3 ROUGE points

**March - April 2019** **Risk-Sensitivity in Multi-Armed Bandits**
Course: Multi-Armed Bandits, *Prof. L.A. Prashanth*, Indian Institute of Technology Madras
○ Empirically surveyed the existing methods for risk-sensitivity in stochastic bandit problems, spanning risk measures such as Variance, Value at Risk (VaR) and conditional Value at Risk (cVaR)
○ Implemented multiple risk-sensitive algorithms for each measure and performed a qualitative and quantitative analysis
○ Introduced novel modifications of the Explore-Then-Commit algorithm for VaR and cVaR measures; both showing performance competent with existing risk-sensitive algorithms

**Oct - Nov 2018** **Risk-Sensitive Reinforcement Learning**
Course: Reinforcement Learning, *Prof. L.A. Prashanth*, Indian Institute of Technology Madras
○ Empirically analyzed the existing methods for risk-sensitive reinforcement learning, spanning risk measures such as Variance Bounds and Probability of Risk Bounds
○ Tested the effectiveness of modified risk-sensitive versions of traditional algorithms such as Q-learning and SARSA
○ Introduced a new risk measure accounting for the distance from error states in a Gridworld and devised a successful algorithm sensitive to the same

**Feb - March 2018** **Summarization and Keyword Extraction using TextRank**
Course: Natural Language Processing, *Prof. Sutanu Chakraborti*, Indian Institute of Technology Madras
○ Performed a detailed analysis of the TextRank algorithm for keyword extraction and text summarization
○ Applied synctactic filters for keyword extraction and augmented the set of keywords extracted with TextRank through Explicit Semantic Analysis, and observed improvement in the F1 score by 1 point
○ Explored various representation and similarity methods for summarization and found that keyword-based representation and intersection-based similarity gave the best performance with an F1 score of 48.7

## Teaching Experience

**Jan - May 2020** **Natural Language Processing - Course Teaching Assistant,** *Indian Institute of Technology Madras*
○ Designed and evaluated theoretical and practical assignments on various topics in Natural Language Processing
○ Presented lectures on the Edit Distance and the Cocke-Young-Kasami (CYK) algorithms, to a class of 70 students
○ Mentored 16 pairs of students on research projects, with supervision through regular team-wise progress meetings

## Courses

**[Statistical Learning]** Advanced Deep Learning, Deep Learning, Machine Learning, Natural Language Processing, Reinforcement Learning, Multi-Armed Bandits, Probabilistic Graphical Models, Computational Models of Cognition

**[Curriculum]** Computer Networks, Database Systems, Operating Systems, Data Structures and Algorithms, Object-Oriented Programming

**[Mathematics]** Probability-Statistics-Stochastic Processes, Discrete Mathematics, Linear Algebra, Graph Theory

## Skills

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| Languages | C, C++, C#, Java, Python, HTML, CSS, Javascript |
| Tools | Unity, ARCore, Android Studio, Stanford CoreNLP, git, Bootstrap, jQuery, AngularJS |
| Libraries | NLTK, django, scipy, pandas, sklearn, gensim, keras, tensorflow, pytorch |

## Positions of Responsibility

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| June 2019 | **Organizer, Management Team,** *Tech Intern Connect,* Google, Bangalore |
| | ○ Member of the central managing committee that organized a networking event hosting technology interns from the city |
| June - Dec 2016 | **Technical Operations Coordinator,** *Shaastra 2017,* Indian Institute of Technology Madras |
| | ○ Developed the front-end components of major websites and internal portals for the technical fest of IIT Madras |

## Extra Curricular Activities

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| Cultural | Trained in and performed the classical dance form of Bharatanatyam for seven years |
| Sports | Part of NSO (Institute Sports) Basketball during the first year of study (2015-16) |