Barun Patra

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Research Interests

Natural Language Processing, Representation Learning, Multilingual NLP

Education

Carnegie Mellon University, Pittsburgh August 2017 - December 2018
Master's of Science in Machine Learning
Cumulative Grade Point Average: 4.17

Indian Institute of Technology, Delhi July 2013 - June 2017
B.Tech in CS&E with a Specialization in Data Analytics and AI
Cumulative Grade Point Average: 9.494/10

Publications

ScopeIt: Scoping Task Relevant Sentences in Documents: Barun Patra*, Vishwas Suryanarayanan*, Pamela Bhattacharya, Chala Fufa, Charles Lee. Proceedings of the 28th International Conference on Computational Linguistics (**COLING 2020**). Industry Track. (**Oral**)

To Schedule or not to Schedule: Extracting Task Specific Temporal Entities and Associated Negation Constraints: Barun Patra, Chala Fufa, Pamela Bhattacharya and Charles Lee. Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (**EMNLP 2020**) (**Oral**)

Constrained BERT BiLSTM CRF for Understanding Multi-Sentence Entity Seeking Questions: Danish Contractor, Barun Patra, Mausam and Parag Singla. Natural Language Engineering (**JNLE 2020**)

Weakly Supervised Attention Networks for Entity Recognition: Barun Patra* and Joel Ruben Anthony Moniz*. Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (**EMNLP-IJCNLP 2019**)

Bilingual Lexicon Induction with Semi-Supervision in Non-Isometric Embedding Spaces: Barun Patra*, Joel Ruben Anthony Moniz*, Sarthak Garg*, Matthew R Gormley and Graham Neubig. Proceedings of the 57th Conference of the Association for Computational Linguistics (**ACL 2019**) (**Oral**)

Understanding complex multi-sentence entity seeking questions: Danish Contractor, Barun Patra, Mausam and Parag Singla. AAAI Reasoning for Complex Question Answering Workshop, 2018.

Compression and Localization in Reinforcement Learning for ATARI Games: Joel Ruben Anthony Moniz*, Sarthak Garg* and Barun Patra*. NeurIPS Deep Reinforcement Learning Workshop, 2018

* Equal Contribution

Preprints

A Survey of Community Question Answering: Barun Patra. ArXiv preprint arXiv:1705.04009

* Equal Contribution

Patents

Patra Barun, Fufa Chala, Bhattacharya Pamela, Lee Charles. Identifying contextual and task relevant time entities with constraints (filing in progress)

Suryanarayanan Vishwas, Patra Barun, Bhattacharya Pamela, Fufa Chala, Lee Charles. Artificial Intelligence For Identifying Relevant Content Related To Specific Tasks (MS# 407907-US-NP), filed on 12/06/2019

Patra Barun, Bhattacharya Pamela, Lee Charles. Sentence Attention Modeling For Event Scheduling via Artificial Intelligence and Digital Assistants (MS# 405393-US-NP), filed on 11/30/2018

Patra Barun, Bhattacharya Pamela, Lee Charles. Resolving Temporal Ambiguities in Natural Language Inputs Leveraging Syntax Tree Permutations (MS# 407193-US-NP), filed on 9/16/2019

Work Experience

Scheduler Team, Microsoft Redmond May 2018-August 2018, February 2019 - Present
Data And Applied Scientist
Work on different NLP components for an automated scheduling assistant, which schedules meetings via email by understanding intent, extracting different meeting parameters, balloting participants and understanding different aspects associated with scheduling meetings. Developed models around intent classification, entity extraction, time entity understanding and resolution. Also built models around negation scope detection for identifying times to avoid while scheduling. Concurrently, worked on scoping relevant parts of emails to improve performance of downstream tasks. The resulting impact was instrumental in taking automation levels from $< 20\%$ to $> 90\%$. Finally, also worked on organizing learning sessions, reading groups and workshops to help colleagues with NLP fundamentals.

Research and Technical Projects

Weakly Supervised Attention Networks for Entity Recognition JANUARY 2019 - MAY 2019
Proposed a novel method for extracting entities in a weakly supervised framework, where the only labels pertaining to presence / absence of entites is known. The proposed method utilized processing of attention weights for extracting entity mentions from texts. The final model achieved strong results compared to other baseline methods for the task.

Semi Supervised Bilingual Lexicon Induction SPRING 2018 - FALL 2018
Advised By Professor Graham Neubig and Professor Matthew Gormley at CMU
Proposed a novel way of investigating isomorphism between embedding spaces of different languages which showed strong correlations with predicting model performance for a variety of different models. Proposed a semi-supervised framework for aligning embedding spaces of different languages, obtaining state of the art results for 15 language pairs. Investigated the degree of isometry and the etymology of the languages, and showed that etymologically closer languages have more isomorphic embedding spaces.

Model Compression And Localization in RL for ATARI games SPRING 2018 - FALL 2018
Course Project for Reinforcement Learning
Reduced the parameters of a DQN network for playing ATARI games to 3% its original parameters, retaining performance using Knowledge Distillation. Also used max pooling as a proxy for an attention mechanism to visualize agent performance without any additional parameters.

MOQA: A Monte Carlo Search for Answers SPRING 2018
Research Project Advised by Professor Barnabàs Póczos
Worked on the task of KB completion by combining Deep RL with Monte Carlo Tree Search (MCTS). Used MCTS to generate supervision for the policy network, while also training the agent to estimate the value function used by MCTS. The resulting network yielded state of the art results on numerous benchmarking datasets.

Understanding and Answering Multi-sentence Recommendation Questions on Tourism FALL 2016
B.Tech Thesis under Prof. Mausam and Prof. Parag Singla at IIT Delhi
Worked on answering multi-sentence blog post questions, leveraging partially annotated data. The proposed model used a CRF with neural features, using Constrained Conditional Inference for incorporating global constraints for inference.

DERP : Deep Evaluation for Response Predictions (Automated Dialogue Scoring) FALL 2016
Course Project in Advanced NLP at IIT Delhi
Tackled automated evaluation of responses from dialogue systems. Exploited the thread structure of Reddit to generate context, response, alternate response triplets. Then proposed and trained a novel model to differentiate between relevant and randomly sampled negative responses. The final model achieved a zero shot correlation of 0.45 with human scores on the Ubuntu dataset.

Technical Skills

Languages : Python, C++, MATLAB
Tools/Libraries: PyTorch, Theano, NLTK / Spacy, AllenNLP

Teaching Experience

Advanced Introduction to Machine Learning (CMU) FALL 2018
Teaching Assistant under the guidance of Professor Nina Balcan
Worked on developing questions for assigments and exams, graded exams, provided mentorship and recitations for 70+ primarily PhD students.

Artificial Intelligence (IIT Delhi) SPRING 2017
Teaching Assistant under the guidance of Professor Mausam
Graded exams and quizzes and developed assigments for 125+ students in this grad/undergrad bridge course.

Relevant Courses

CMU : Advanced Intro to ML, Deep Learning, Deep Reinforcement Learning
Neural Networks for NLP, Statistical ML, Convex Optimization, Intermediate Stats, DAP
IIT Delhi : AI, Probabilistic Graphical Models, ML, NLP

Scholastic Achievements

Department Rank 3 : Top 3% among students of Computer Science and Engieering Department, Batch of 2017

Suresh Chandra Memorial Trust Bachelor's Thesis Award (2017) : Best B.Tech Project

Narotam Sekhsaria Postgraduate Scholarship (NSF Foundation) (2017) : Selected as one of the top 18 students in India pursuing Pure and Applied Sciences, Social Sciences, Law, Architecture and Management.

KC Mahindra Scholarship (2017) : Selected as one of the top 50 students in India for pursuing post-graduate studies abroad in varied fields

Merit Scholarship For being in the top 7% for 5 semesters.