Neeraj Varshney

Ph.D. Student (Third Year)
Computer Science (NLP)
Arizona State University, CGPA: 4.1/4

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Profiles

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Education

Ph.D. Computer Science (NLP)
Arizona State University, USA
2019-2024 EXPECTED
CGPA: 4.1/4

B.E.(Hons.) Computer Science
Birla Institute of Technology
and Science (BITS Pilani, India)
2014-2018
CGPA: 9.11/10

Coursework

Natural Language Processing
Statistical Machine Learning
Artificial Intelligence
NLP Methods in BioMedical
Knowledge Representation &
Reasoning, Data Mining

Technical Skills

ML, DL, PyTorch, Transformers,
Pytorch-lightning, Python,
Jupyter, Pandas, Git, GitHub,
Google Colab, Spacy, Linux,
NumPy, Matplotlib, Huggingface,
NLTK, word2vec

OTHERS

● Worked with Dr. Ayush Choure (MSR) in a project lead by Dr. Prateek Jain (MSR).
● Published 10+ ML/NLP related articles on medium with 2000+ monthly views.
● Organized 6th edition of Alumni Research Talks being the Campus Coordinator of Computer Science Association at BITS.
● Worked at "Web Intelligence & Social Computing" lab under Prof. Poonam Goyal at BITS.
● Won 2nd prize in Technical fest prototype project at BITS Pilani.

Publications

ILDAE: Instance-Level Difficulty Analysis of Evaluation Data   *ARR, SEP, 2021*
Conducted Instance-Level difficulty analysis in a large-scale setup of 23 datasets with 27 models and demonstrated its five novel applications such as:
● Efficient Evaluations: Proposed an instance selection technique that achieves 0.72 Kendall correlation with full dataset evaluation using just 20% instances.
● Dataset Quality: Proposed a model-and-human-in-the-loop technique that modifies/repairs trivial and erroneous instances to improve the quality of evaluation datasets.

Unsupervised NLI Using PHL Triplet Generation   *ARR, NOV, 2021*
● Designed three novel unsupervised settings for NLI and proposed a procedural data generation approach that outperforms the existing approaches by ~13% and raises the SOTA unsupervised performance to 66.75% on the SNLI dataset.
● Provided a strategy to efficiently collect high-quality task-specific data that helps achieve 12.2%, 10.4% higher accuracy on SNLI and MNLI with just 500 human-authored instances.

It's Better to Say "I Can't Answer" than Answering Incorrectly   *PREPRINT, 2020*
● Demonstrated that MaxProb as a selective answering technique performs well on In-Domain inputs but fairs poorly on Out-of-Domain inputs.
● Proposed a novel selective answering approach that incorporates prediction confidence and instance-level difficulty score to calibrate model's outputs and achieves an improvement of up to 7.47% over existing methods on AUC of risk-coverage curve.

Investigating Selective Prediction in IID, OOD, and ADV settings   *ARR, NOV, 2021*
● Systematically studied 'selective prediction' in a large-scale setup of 17 datasets across NLI, QA, Duplicate Detection tasks under in-domain, out-of-domain, and adversarial settings.
● Showed that despite leveraging additional resources (held-out data/computation), none of the existing approaches consistently and considerably outperforms MaxProb. ● Demonstrated that performance of these approaches does not translate well across tasks.

Let the Model Decide its Curriculum for Multitask Learning   *PREPRINT, 2020*
● Proposed two classes of techniques (dataset and instance-level) to arrange training instances into a learning curriculum based on model's own interpretation of difficulty.
● Achieved 4% accuracy improvement over other methods on experiments conducted for 12 datasets covering varied sentence pair tasks such as NLI, duplicate detection.

NumGLUE: A Suite of Mathematical Reasoning Tasks   *ARR, AUG, 2021*
● Proposed a multi-task benchmark that evaluates the performance of AI systems on eight different tasks that require simple numerical understanding.
● Showed that this benchmark is far from being solved with neural models including large language models performing significantly worse than humans (lower by 46.4%).

Interviewer-Candidate Role Play: Towards Real-World NLP Systems   *PREPRINT, 2021*
● Designed a multi-stage selective prediction task in which a system is assisted with instance-related information such as knowledge when it is not sufficiently confident in its prediction.
● Achieved improvements of up to 72.02% in Out-of-Domain generalization.

Ongoing Projects

● Compare selective prediction ability of Autoregressive, Autoencoding, and Sequence-to-sequence models that achieve similar accuracy.
● Learning from instructions: Investigating the impact of conditioning large language models like GPT-3 on task instructions and a few examples in natural language format.

Experience

Microsoft   *JAN 2018 - JULY 2019*   **Software Engineer**
● Contributed towards development of a Machine Learning driven chat recommendation system aimed at augmenting user engagement with Microsoft's product 'Teams'.
● Collaborated with MSR researchers for a feature titled 'Intelligent Feeds' that finds relevant messages for users based on their prior activities and message text features.