SYEDA NAHIDA AKTER

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RESEARCH INTEREST

- Multimodal Commonsense Reasoning
- Social Intelligence Modeling
- Embodied AI
- Multimodal Machine Learning

EDUCATION

Masters in Language Technologies   August 2021 – Present
Carnegie Mellon University   *Pittsburgh, PA*

Research Area: Multimodal Question Answering
Advisor: Prof. Eric Nyberg, Professor and Director, Master of Computational Data Science Program, LTI, CMU
QPA: 4.06 (Summer 2021 - Spring 2022)

Bachelor of Science in Computer Science and Engineering   January 2016 – February 2021
Bangladesh University of Engineering and Technology   *Dhaka, Bangladesh*

Thesis: Geo-Distributed Machine Learning, Natural Language processing
Advisor: Dr. Muhammad Abdullah Adnan, Associate Professor, Department of CSE, BUET
CGPA: 3.72 out of 4.00
Major CGPA: 3.87 out of 4.00

PUBLICATIONS

WeightGrad: Geo-Distributed Data Analysis Using Quantization for Faster Convergence and Better Accuracy
Authors: *Syeda Nahida Akter, Dr. Muhammad Abdullah Adnan*

Proc. of the 26th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD 2020), San Diego, CA, USA, August 23-27, 2020. [Paper]

KnowUREnvironment: An Automated Knowledge Graph for Climate Change and Environmental Issues
Authors: *Md Saiful Islam, Adiba Proma, Yilin Zhou, Syeda Nahida Akter, Caleb Wohn, Ehsan Hoque*

The Role of AI in Responding to Climate Change, AAAI Fall Symposium Series, November 2022. [Paper]

WORK EXPERIENCE

Research Intern at LTI, CMU   Summer 2022, 2021
Multimodal Question Answering   *Carnegie Mellon University*

Advisor: Prof. Eric Nyberg, Professor and Director, Master of Computational Data Science Program, LTI, CMU
Contribution: Devised SSL framework to address social cognitive signals for low resource settings, developed a new multimodal QA dataset, developed ACAI framework for automatic training and evaluation of QA models.

ONGOING RESEARCH PROJECTS

Social Intelligence Modeling with Self Supervised Learning   Summer 2022 – Present
Keywords: Social Intelligence, Commonsense Reasoning, Video QA, SSL
Status: Preparing manuscript to be submitted to ACL'23
Resources: [Abstract]

- Proposed a novel self-supervised learning based continuous pretraining framework on top of the pretrained model that performs a new auxiliary task to learn the features of social interactions specifically in low resource setting.
- Models continuously pretrained on face and body features outperformed the random features with $\sim$**8%** improvement denoting the significance of domain specific cognitive signals.

GQA Alternative: Automatically Generated VQA Dataset   Fall 2021 – Present
Keywords: VQA, ML, SceneGraph, Visual Genome
Status: Preparing manuscript to be submitted to CVPR'23
Resources: [Slides]

- Automatically generated 2.5M VQA pairs along with scenegraphs from the Visual Genome dataset covering questions that requires complex and multihop reasoning as well as questions which have no possible answers.
- The dataset focuses on the similarity and differences between object features and their relationships, and requires verification of alignment between question text and image to pass the *No answer* cases.

- State-of-the-art models achieve **67.06%** accuracy on GQA while they reach up to **56.96%** accuracy on GQA Alternative - opening up space for new VQA models that ensures strong semantic grounding.

CLIRES: Cross Lingual Relation Extraction with Structured information
Spring 2022 – Present

Keywords: IR, KB, KGQA, Multilingual NLP
Status: Preparing manuscript to be submitted to ACL'23
Resources: [Poster]

- Proposed a framework for zero-shot cross-lingual relation extraction using two forms of structure, internal structure in the form of dependency parses, and external structure in the form of WikiData concepts.
- Incorporating internal structure does not bring about significant gains where using external knowledge provides improvement of 1.5 and 2.5 points in F1 score for in-domain and zero-shot transfer settings.

OTHER RESEARCH PROJECTS

KnowUREnvironment: An Automated Knowledge Graph for Climate Change and Environmental Issues
AAAI'22

Keywords: KG, IR, RDF triplets, AMR, Climate Change
Status: Accepted for publication in **AAAI'22** as a full-track research paper
Resources: [Paper]

- Automatically identified **210,230** domain-specific entities/concepts and encoded how these concepts are interrelated with **411,860** RDF triples backed up with evidence from the literature. Human evaluation shows our extracted triples are syntactically and factually correct (**81.69%** syntactic correctness and **75.85%** precision).

Answering Visual Questions Through Representation Learning
Fall 2021 – Present

Keywords: VQA, Multimodal ML, GraphVQA, ViLBERT, LXMERT, GQA
Resources: [Poster], [Report]

- Proposed three new architectures (a. Coarse to fine reasoning, b. Prompt Tuning, c. New pretrained model with two new tasks) to improve reasoning and answer complex questions of the GQA dataset which provide 2%, 3% and 3.17% improvement, respectively, over the state-of-the-art models.

MAC-R: Pretrained Models are Not All You Need
Spring 2022 – Present

Keywords: Multimodal ML, Visual Commonsense Reasoning
Resources: [Slides], [Report]

- Proposed an end-to-end differentiable reasoning module MAC-R that outperforms the baseline R2C model by 7.9% on the Q→A task on VCR dataset.

Improving Cross-lingual Factual Retrieval
Fall 2021 – Spring 2022

Keywords: Multilingual NLP, mBERT, XLM-R, IE
Resources: [Poster], [Report]

- Proposed a multilingual typed querying method to improve retrieval performance along with a back-probing method to generate more relevant outputs. The method shows using a weighted sum of forward and backward probabilities on the raw dataset improve accuracy on both high and low resource languages.

UNDERGRAD RESEARCH EXPERIENCE

WeightGrad: Geo-Distributed Data Analysis Using Quantization for Faster Convergence and Better Accuracy

Supervisor: Dr. Muhammad Abdullah Adnan (BUET)
Keywords: Distributed Deep Learning, Gradient Quantization
Status: Accepted for publication in **ACM SIGKDD'20** as a full-track research paper
Resources: [Paper], [Promo Video], [Code]

- Devised a loss-aware weight-quantized network with quantized gradients and proposed a synchronous two-level structure which attained **5.36×** speedup over baseline and **1.4-2.26×** speedup over the four state-of-the-art distributed ML systems with **1.06%** gain in top-1 accuracy.

Contextualized Entity-Aware Question Answering
June 2020 – Present

Supervisor: Dr. Muhammad Abdullah Adnan (BUET)
Keywords: NLP, Entity-Representation, ALBERT, XLM-Roberta, Contextual QA
Resources: [Report]

Responding to the Stigma and Misinformation Related to the COVID-19 Disease Outbreak
April 2020 – Present

Supervisor: Dr. Syed Ishtiaque Ahmed (University of Toronto)
Keywords: NLP, Data mining, Topic Modeling, Ensemble Learning, Text Classification
Resources: [Abstract]

Awards and Honors

- **CMU Research Fellowship**, from the academic year 2021-2023
- **KDD Student Registration Award**, 2020
- **University Merit Scholarship**, 2019
- **Dean's List Scholarship**, Bangladesh University of Engineering and Technology (BUET)
- **Champion on BUET CSE Fest Inter-University Hackathon** (Two consecutive years 2018, 2019)
- **Board Merit Scholarship: Government of Bangladesh** (Year: 2007, 2010, 2013, 2015)

Technical Skills

Languages: Python, Java, C/C++, SQL (Postgres), JavaScript, HTML/CSS, Shell, Matlab, Intel 8086 Assembly Language
Frameworks: PySpark, MXNet, BERT, XLNet, RoBERTa, ALBERT, OpenGL, Django, Arduino
Libraries: Jax, Pytorch, Tensorflow, Keras, OpenCV, NLTK, Theano, Pandas, NumPy, Matplotlib, Scikit-Learn
Operating System: Linux, Windows
Developer Tools: Latex, Git, Aamazon Web Service, Google Cloud Platform

Reference

- Prof. Eric Nyberg
  Professor and Director, Master of Computational Data Science Program
  Language Technologies Institute
  Carnegie Mellon Institute
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