Abdullah As Sami

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Research Interests

Machine Learning, Deep Learning, Computer Vision, NLP, Computational Cognitive Science

Education

Bachelor of Science in Computer Science and Engineering February 2018 - May 2023
Chittagong University of Engineering & Technology (CUET) (1 year delay due to COVID-19)

Research Experience

Transfer Learning for Sentiment Analysis Using BERT-Based Supervised Fine-tuning.
Independent Research Group June 2021 – May 2022

- Collaborated with a team of researchers to leverage BERT-based transfer learning for Bangla sentiment analysis.
- Conducted performance comparison: Compared CNN-BiLSTM to classical ML, showing BERT-based approach superiority.
- Analyzed word embeddings: Explored Word2Vec, GloVe, fastText, confirming BERT's top performance.
- Achieved state-of-the-art results: Outperformed all embeddings and algorithms for Bangla sentiment analysis.

Bangla-BERT: transformer-based efficient model for transfer learning and language understanding.
Research Assistant, Center for Intelligent Computing June 2021 – May 2022

- Developed Bangla-BERT, a monolingual model trained on BanglaLM data, advancing NLP for underrepresented languages.
- Achieved superior performance in linguistic classification, multilabel extraction, and named entity recognition, surpassing multilingual BERT and prior research.
- Demonstrated Bangla-BERT's effectiveness against non-contextual models (Bangla fasttext, word2vec) and hybrid deep learning models (LSTM, CNN, CRF).
- Pre-trained Bangla-BERT on the largest Bangla language model dataset, BanglaLM (40 GB of text data), enhancing its capabilities.
- Outperformed state-of-the-art methods by 3.52%, 2.2%, and 5.3% on benchmark datasets, advancing language understanding for Bangla.

Synthetic Evaluation of Fairness in Transformer Models with Multiple Sequential Masks: Insights from Multi-Kernel Methods
Research Assistant, Center for Intelligent Computing July 2023 –September 2023

- Introduced "Synthetic Evaluation" method to assess fairness in transformer models with multiple sequential masks (Manuscript under review).
- Utilized diverse datasets and advanced kernel methods for evaluating transformer models (BERT, RoBERTa, DistilBERT) in complex masking contexts.
- Revealed valuable insights into model performance, emphasizing the effectiveness of the "Synthetic Evaluation" approach, particularly the Multi-kernel method.
- Contributed to ethical NLP system development, promoting fairness and equity in AI-driven applications.

Improved YOLOv5 based Real-Time Road Pavement Damage Detection in Road Infrastructure Management
Undergrad Thesis May 2022 – May 2023

- Revolutionized road infrastructure management through deep learning, providing a secure, cost-effective, and efficient solution.
- Utilized the latest benchmark Road Damage Dataset (RDD 2022) for training, encompassing various pavement damage types.

- Incorporated critical techniques such as Efficient Channel Attention (ECA-Net), label smoothing, K-means++, Focal Loss, and an additional prediction layer for model refinement.
- Achieved a significant 1.9% improvement in mean average precision (mAP) and a 1.29% increase in F1-Score compared to YOLOv5s, with minimal parameter increase.
- Outperformed YOLOv8s with a 0.11% improvement in mAP and 0.05% in F1 score, while utilizing 3 million fewer parameters and 12 gigabytes fewer GFlops.

Road Damage Detection and Classification using YOLOv7
Undergrad Thesis May 2022 – May 2023

- Employed YOLOv7, enhanced road management through advanced object detection, presented research findings at conferences, and secured acceptance for a book chapter in Taylor & Francis.
- Enhanced YOLOv7 with the Convolutional Block Attention Module (CBAM) and optimized anchor box selection using the K-means++ algorithm.
- Achieved exceptional results with 68.61% mAP and a 66.87% F1 score, surpassing previous object detection models for road damage detection and classification.

Publications

Journal Articles

- **Sami, A. A.**, Sakib, S., Deb, K., & Sarker, I. H. (2023). **Improved YOLOv5-Based Real-Time Road Pavement Damage Detection in Road Infrastructure Management**. Algorithms, 16(9), 452.
- Kowsher, M., **Sami, A. A.**, Prottasha, N. J., Arefin, M. S., Dhar, P. K., & Koshiba, T. (2022). **Bangla-BERT: transformer-based efficient model for transfer learning and language understanding**. IEEE Access, 10, 91855-91870.
- Prottasha, N. J., **Sami, A. A.**, Kowsher, M., Murad, S. A., Bairagi, A. K., Masud, M., & Baz, M. (2022). **Transfer learning for sentiment analysis using BERT based supervised fine-tuning**. Sensors, 22(11), 4157.

GitHub Projects

Executed over 30 dynamic real-world projects for diverse global clients, harnessing the power of Transformers, NLP, Deep Learning, Data Analysis, Machine Learning, and Python**.**

Recent Projects

Personalized Text-to-Image Generation (2023)

- Unlocked the potential of personalized image generation to create context-rich visuals in diverse scenarios, poses, and perspectives.
- Enabled personalized image generation using minimal subject images for diverse scenarios.
- Leveraged AI and GANs for efficient text-to-image transformation.
- Developed a versatile pipeline for context-rich visuals across various contexts.

Efficient Fine-Tuning for Llama 2 on a Single GPU (2023)

- Explored fine-tuning strategies to enhance the performance of large language models.
- Focused on memory-constrained GPUs for efficient utilization.
- Utilized LoRA (Low-Rank Adaptation), 4-bit quantization, and GPU optimization techniques.
- Improved fine-tuning efficiency and model performance on single GPUs.

Ongoing Project

Data-driven Insights for Maximizing Positive Outcomes (2023)

- Analyzing a complex Excel sheet containing 50 variables.
- Conducting over 5000 simulations to extract valuable insights.
- Utilizing statistical analysis, machine learning, and deep learning techniques.
- Applying Python and Excel methodologies to identify optimal variable combinations.
- Pinpointing sweet-spot variable ranges for maximizing positive contributions.
- Aiming to optimize binary positive outcomes based on data-driven insights.

Teaching Experience

Online Programming Teacher: (Preply) August 2021 – Present

- Accumulated 1600+ teaching hours on the Preply platform, specializing in guiding students through Python programming, machine learning, data science, and AI integration.
- Guided a diverse global student base, enhancing their coding skills and understanding of AI.
- Adapted teaching methods to diverse learning styles, resulting in 50+ five-star reviews.

Research & Technical Skills

- **Expertise:** ML/DL, Computer Vision, NLP, Data Analysis, Scientific Writing
- **Libraries:** Keras, TensorFlow, Pandas, PyTorch, NumPy, Scikit-Learn, Matplotlib
- **Code Artistry:** HTML, CSS, Javascript, Django, Git
- **Languages:** Python, Java

Additional Experience

IEEE Access Reviewer September 2023 – Present

- Engage in reviewing research articles related to sentiment analysis for IEEE Access.
- Contribute to the peer-review process and ensured the quality of published research.

Freelance Scientist May 2023 – Present

- Provide research support at Kolabtree by assisting researchers in model development, data analysis, and scientific problem-solving.

Certificates

Neural Networks and Deep Learning (Coursera)
Issued – Jan 23, 2022 **[Grade Received 92.80%],** Mastered Deep Learning principles, Neural Network architecture, Backpropagation techniques, and adept Python Programming for Deep Learning.

Google Certificate for Python (Google)
Issued- Aug 2, 2021 **[Grade Received 95.50%],** A dynamic acceleration through Python's core principles, swiftly imparting essential skills in a concise timeframe for rapid programming proficiency.

Introduction to TensorFlow for Artificial Intelligence, Machine Learning and Deep Learning (DeepLearning.AI)
Issued- Mar 14, 2022 **[Grade Received 98%],** Attained TensorFlow mastery, built neural networks, excelled in computer vision, grasped convolutions, became a Computer Vision expert, applied TensorFlow proficiently, and mastered Machine Learning.

Convolutional Neural Network (DeepLearning.AI)
Issued- July 30, 2022 **[Grade Received 96%],** Mastered Deep Learning principles, Neural Network architecture, Backpropagation techniques, and Python Programming for Deep Learning.

Convolutional Neural Networks in TensorFlow (DeepLearning.AI)
Issued- Aug 12, 2022 **[Grade Received 96.17%],** Handled real-world images, mitigated overfitting, excelled in transfer learning, and mastered TensorFlow and machine learning techniques.

Links

Google Scholar **Preply** **GitHub** **Personal Portfolio Website** **Linkedin** **Kolabtree**