BHAWNA PALIWAL

Research Engineer, Microsoft Research

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EDUCATION

Indian Institute of Technology (IIT), Ropar *2017 - 2021*
Bachelor of Technology in Computer Science
Awarded with **Director's Gold Medal**
Grade (CGPA): 9.4/10

EXPERIENCE

Microsoft Research Sep 2021 - Present
Research Engineer *Bangalore*

- *Advisor: Dr. Manik Varma*
- Focused on developing machine learning models for large-scale systems in search and recommendation impacting hundreds of millions of users.
- My work on developing scalable deep learning architectures and training algorithms has resulted in four research papers (currently under review and published at top conferences such as ICLR, WSDM, WWW) in addition to major tech transfers to Microsoft's production systems.

Monash University Aug 2020 - Jan 2021
Research Intern *Remote*

- *Advisor: Dr. Abhinav Dhall*
- Developed an interpretable deep learning architecture for generating medical diagnosis reports, resulting in a publication at the iMIMIC workshop at MICCAI.
- Led the design and implementation of a multi-modal deepfake detection model. The developed approach incorporating physiological signals alongside audio and video modalities from counterfeit videos, contributed to a research paper currently under review.

Microsoft May 2020 - July 2020
Software Engineering Intern *Remote*

- Developed a task aware chatbot and channel for android applications, leveraging efficient intent classification models for seamless user interaction

Indian Institute of Science (IISc) May 2019 - July 2019
Research Intern *Bangalore*

- *Advisor: Dr. Vijay Natarajan*
- Worked on matrix visualization tools for visualizing large-scale topological data structures.

RESEARCH PAPERS

Under Review

CROSS-JEM: Cross-encoder Joint Efficient Modeling for Ranking in Sponsored Search
Bhawna Paliwal*, Deepak Saini*, Mudit Dhawan, Jian Jiao, Manik Varma
Under review at The Web Conference (WWW), 2024

Enhancing Tail Performance in Extreme Classifiers by Label Variance Reduction
Anirudh Buvanesh*, Rahul Chand*, Jatin Prakash, **Bhawna Paliwal**, Mudit Dhawan, Neelabh Madan, Deepesh Hada, Vidit Jain, Sonu Mehta, Yashoteja Prabhu, Manish Gupta, Ramachandran Ramjee, Manik Varma
Under review at International Conference on Learning Representations (ICLR), 2024

Improved Retrieval of Novel Keywords for Sponsored Search
Sachin Yadav*, Deepak Saini*, Anirudh Buvanesh, **Bhawna Paliwal**, Kunal Dahiya, Jian Jiao, Manik Varma
Under review

Visual Representations of Physiological Signals for Fake Video Detection
Kalin Stefanov, **Bhawna Paliwal**, Abhinav Dhall
arXiv preprint [PDF]

Published

NGAME: Negative Mining-aware Mini-batching for Extreme Classification
Kunal Dahiya et al. including **Bhawna Paliwal**
International Conference on Web Search and Data Mining (WSDM), 2023 [PDF]

This explains That: Congruent Image–Report Generation for Explainable Medical Image Analysis with Cyclic Generative Adversarial Networks
Bhawna Paliwal*, Abhineet Pandey*, Abhinav Dhall, Ramanathan Subramanian, Dwarikanath Mahapatra
iMIMIC Workshop, MICCAI, 2021 [PDF]

SELECTED RESEARCH PROJECTS

Real-Time Query Completion using Extreme Classification 2022-23
Advisors: Dr. Yashoteja Prabhu, Dr. Manish Gupta, Dr. Manik Varma

- Query Completion is a real-time service that provides suggestions for incomplete queries entered by users on search engines.
- Developed a new approach where Query Completion is reformulated as a classification task with a large label set consisting of all possible completions of a query. Different from conventional autoregressive methods, the devised architecture enables the generation of a set of completions in a single pass of the language model.
- Outperformed autoregressive models in both accuracy and latency, providing suggestions four times more accurately with a two-fold reduction in CPU latency. A/B tests on Bing demonstrated a 7% decrease in user typing effort.

Efficient Ranking for Large-scale Recommendation Systems 2023
Advisors: Dr. Nagarajan Natarajan, Dr. Manik Varma

- In large-scale recommendation systems, the ranking task involves reordering retrieved items based on relevance scores derived from a computationally intensive transformer-based language model.
- By showcasing the token position-invariance of the standard transformer architecture in handling short text inputs, I introduced a joint architecture capable of scoring multiple items per query in a single encoder pass.
- This approach achieved a 10× speed improvement compared to vanilla cross-encoders, with a less than 1% accuracy loss. This work is currently under review at WWW'24.

Physiological Signals for Improving Deepfake Detection 2022
Advisor: Dr. Abhinav Dhall

- The proliferation of realistic fake videos created by deep learning models poses a significant risk for the dissemination of harmful misinformation.
- In contrast to traditional methods that rely on audio and visual artifacts for video classification, my work demonstrated substantial improvement in deepfake detection accuracy by incorporating physiological signals in addition to audio and visual modalities.
- Devised graph convolutional network (GCN) based approach for incorporating physiological signals to the standard classification architecture. This work is out on arxiv.

Explainable Medical Report Generation 2021

Advisors: Dr. Abhinav Dhall, Dr. Ramanathan Subramanian

- Addressed the limitation of deep learning-based black-box models in medical diagnosis by providing prototypical explanations alongside model predictions.
- Recognized the common reliance on post-hoc modules for explanation generation, which often results in explanations inconsistent with model decisions.
- Proposed and implemented a cycle-GAN based architecture to produce coherent image-report pairs for chest X-Ray image diagnosis, ensuring that the generated report effectively clarifies the image, and vice versa. This research was published at iMIMIC, MICCAI, 2021.

HONOURS AND AWARDS

- Patent under filing for CROSS-JEM: Cross-encoder Joint Efficient Modeling for Ranking
- Class of 2021 Director's Gold Medal recipient for best all-round performance in academics, research, and leadership (one awardee out of 250 students)
- Global Rank 2 in CVPR 2021 workshop challenge on eye gaze detection
- Awarded with Merit scholarship during all 8 semesters at IIT Ropar
- Academic Rank 2 among 250 students at IIT Ropar Class of 2021
- Winner of Smart India Hackathon 2020 organized by MHRD, Govt. of India
- Top 0.1% in Joint Engineering Entrance (JEE) 2017 Exam among 1.3M candidates.

SKILLS

Programming Languages: Python, C, C++, Java, SQL
Libraries and Frameworks: PyTorch, Numpy, HuggingFace, OpenCV, Weights and Biases

PROFESSIONAL OUTREACH

Presented our work on **Real-Time Query Completion using Extreme Classification** to Microsoft Research India's annual advisory board meeting (2023)

Volunteer: WiCV (CVPR'21), Microsoft Booth@NeurIPS'22, COLT'23

Mentor: Coding Club and Debating Society at IIT Ropar