Anirudh Buvanesh

Ph.D. Stduent at Université de Montréal and Mila 🎓 Google Scholar 🏠 Website Github

EDUCATION

Université de Montréal *August 2024-Present*
Ph.D. in Computer Science GPA: 4.3/4.3
Advisors: Prof. Aaron Courville and Prof. Laurent Charlin

Birla Institute of Technology and Science (BITS), Pilani *2016 - 2021*
M.Sc. Mathematics and B.E. Computer Science GPA: 9.36/10 (Distinction)
Advisors: Dr. Soumendu Sinha & Prof. Pratik Narang Department Rank: 3 / 70

WORK EXPERIENCE

Microsoft Research Bangalore, India
Pre-doctoral Research Fellow in Extreme Classification Group *2022 - 2024*
Developing algorithms to tackle long-tail and zero-shot classification in large-scale retrieval systems.
Advisors: Dr. Amit Sharma, Dr. Manish Gupta, Dr. Manik Varma

Salesforce Bangalore, India
Software Engineer in Consumer Goods Cloud | Supervisor: Mr. Abhinav Kumar *2021-2022*
Worked on integrating the Trade Promotion Management product from the Accenture acquisition into the Salesforce ecosystem. Implemented multiple microservices and deployed them by setting up a Kubernetes cluster.

Central Electronics Engineering Research Institute (CEERI) Pilani, India
Research Intern | Advisors: Dr. Soumendu Sinha & Prof. Pratik Narang *Jan-Jul 2021*
Worked on segmenting aerial imagery of farmlands into crops and weeds using computer vision techniques.

Amazon Bangalore, India
Software Engineer Intern in Supply Quality Team | Supervisor: Mr. Nishanth Ramaprakash *Aug-Dec 2020*
Improved advertisement brand safety campaigns by integrating 3rd party signals into Amazon's brand safety engine. Migrated hadoop jobs running on dedicated clusters to EMR, which resulted in cost savings for the team.

Salesforce Hyderabad, India
Software Engineer Intern in Loyalty Cloud | Supervisor: Mr. Ganesh Dendukuri *May-Jul 2020*
Worked on building a framework to define complex business rules without writing multiple nested if-else conditions. The framework could scale to a rule set with a 1 million size rule set. Received a pre-placement offer from the internship

Tata Institute of Fundamental Research Mumbai, India
Research Intern in Gnowledge Lab | Advisor: Prof. Gadiraju Nagarjuna *May-Jul 2018*
Developed data curation and analysis pipeline for the gstudio-hosted NROER website, which housed study material for physics, chemistry and mathematics.

PUBLICATIONS

On the Necessity of World Knowledge for Mitigating Missing Labels in Extreme Classification.
Jatin Prakash*, <u>Anirudh Buvanesh*</u>, Bishal Santra, Deepak Saini, Sachin Yadav, Jian Jiao, Yashoteja Prabhu, Amit Sharma, Manik Varma.
KDD 2025

Extreme Meta-Classification for Large-Scale Zero-Shot Retrieval.
Sachin Yadav*, Deepak Saini*, <u>Anirudh Buvanesh*</u>, Bhawna Paliwal, Kunal Dahiya, Siddarth Asokan, Yashoteja Prabhu, Jian Jiao and Manik Varma.
KDD 2024

Enhancing Tail Performance in Extreme Classifiers by Label Variance Reduction.
<u>Anirudh Buvanesh*</u>, Rahul Chand*, Jatin Prakash, Bhawna Paliwal, Mudit Dhawan, Neelabh Madan, Deepesh Hada, Vidit Jain, Sonu Mehta, Yashoteja Prabhu, Manish Gupta, Ramachandran Ramjee and Manik Varma
ICLR 2024

[Re] AdaBelief Optimizer: Adapting Stepsizes by the Belief in Observed Gradients.
<u>Anirudh Buvanesh*</u>, Madhur Panwar*
ReScience C, vol. 8, no. 2, 2022 (accepted under ML Reproducibility Challenge 2021).
NeurIPS 2022 Journal Track (Spotlight.)

Modelling War Phenomena with an emphasis on Operations Research.
Anirudh Buvanesh, Sumanta Pasari.
IEEE ICCCNT 2021

PREPRINTS

What Can You Do When You Have Zero Rewards During RL?
Jatin Prakash* and Anirudh Buvanesh*
Under Review

PATENTS

Retrieval of novel keywords for search
Deepak Saini, Jian Jiao, Sachin Yadav, Bhawna Paliwal, Anirudh Buvanesh, Manik Varma
US Patent Application No. 18/608,061 | Microsoft Inc

THESIS

Deep Learning Based Architecture for Agriculture Vision
Anirudh Buvanesh, Soumendu Sinha & Pratik Narang.
Undergraduate Thesis, Computer Science and Information Systems, BITS Pilani, 2021.

SELECTED AWARDS AND HONORS

- **BITS Merit Scholarship** (2017-21) Awarded 40% tuition fee waiver for being in the top 2% students in a batch of 950 students.
- **Menezes Scholarship** (2016-20) Awarded INR 600,000 during the course of undergraduate degree.
- **INSPIRE Scholarship** (2016-20) Awarded INR 320,000 from the Government of India for securing a top 1% rank in Class XII examinations.
- **JEE Mains** (2016) Secured All India Rank 780 amongst 150,000 candidates.

SELECTED PROJECTS

Reinforcement Learning for Large Language Model Reasoning   *2024-2025*
Advisors: Prof. Aaron Courville and Prof. Laurent Charlin, *Université de Montréal*
- Demonstrated the limitations of reinforcement learning algorithms in environments with zero rewards. [Blog Post] [Paper]
- Working on improving value functions for LLM Reasoning

Zero Shot Classification in Retrieval Systems   *2023*
Advisor: Dr. Manik Varma, *Microsoft Research India*
- Proposed an architecture that enhanced text representations for unseen classes by incorporating similar one-versus-all (OvA) classifiers, resulting in a 4% improvement in Recall@100 compared to previous state-of-the-art methods.
- Implemented an efficient version of the algorithm, which allowed scaling to 100 million classes by training on 5 million classes. The algorithm is currently deployed into Microsoft's retrieval systems.

Improving Tail Label Performance in Retrieval Systems   *2022-23*
Advisors: Dr. Yashoteja Prabhu, Dr. Manish Gupta, Dr. Manik Varma, *Microsoft Research India*
- Identified limitations of existing approaches in modeling label correlations to address the overfitting issue of tail classifiers.
- Proposed a Siamese model that was accurate on tail classes. Leveraging this model as a teacher resulted in a 5% enhancement in the tail performance of OvA classifiers without compromising head label performance.

Agriculture Vision   *2021*
Advisors: Dr. Soumendu Sinha & Prof. Pratik Narang, *CEERI Pilani*
- Developed a deep learning architecture based on graph convolutions that used features from multiple colour spaces to improve the accuracy of semantic segmentation tasks on farmland images. [leaderboard][report]

Modeling War Phenomena with an Emphasis on Operations Research   *2021*
Advisor: Prof. Sumanta Pasari, *BITS Pilani*
- Developed war trajectory prediction models and devised an optimal food stocking inventory plan for military applications. The work resulted in a publication at IEEE ICCCNT 2021 [paper].

Statistical Tests for Pseudo Random Number Generators (PRNG)   *2019*
Advisor: Prof. Ashutosh Bhatia, *BITS Pilani*
- Designed a deep learning-based statistical test for PRNGs using LSTM networks, achieving 49.86% and 62.55% next-bit prediction accuracy for AES and English text, respectively, confirming English text predictability [report].

Leadership Roles, Teaching and Services

Reviewer at Machine Learning Conferences: Served as a reviewer for ICLR 2025, KDD 2025, and ICLR 2026.

Reading Group Organizer, Extreme Classification Group (2022-2024) Organized weekly meet-ups discussing recent papers and trends in Information Retrieval and NLP and arranged invited talks in related areas.

Core Member, QBOX (2017-18): QBOX is a startup that aims to transform the writing domain with a competitive e-learning approach. I enhanced online visibility through SEO, elevating our website to the second search result for the query "competitive writing" website rankings on Google search. Additionally, I organized writing competitions at Birla Balika Vidyapeeth and managed technical team recruitment.

Teaching Assistant, Dept. of Computer Science and Information Systems (2018): Assisted professors in designing course material, evaluating assignments, & supporting students' learning objectives. *Course: Logic In Computer Science*