Rachit Bansal

Pre-doctoral Researcher, **Google Research**

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Education

Delhi Technological University, *India*   08/2018 – 07/2022
B.Tech. in Electrical Engineering — CGPA: 8.86/10
> Recipient of the *Research Excellence Award* 2022 (1 in ∼2000 students): The highest research honor at the university.
> First to pursue a bachelor's thesis abroad: at the Technion, Israel (02/2022 – 07/2022).

Experience

Google Research, *India*   07/2022 – Present
Pre-doctoral Researcher with Partha Talukdar

Technion, *Israel*   09/2021 – 07/2022
Research Intern (Bachelor's Thesis) with Yonatan Belinkov

Adobe Research, *India*   01/2021 – 09/2021
Research Intern with Balaji Krishnamurthy

Google Summer of Code, *Remote | University of Oxford*   05/2020 – 01/2021
Contributor at CDLI with Jacob Dahl

IIIT Delhi, *India*   04/2020 – 04/2021
Research Intern with Tanmoy Chakraborty

Publications

[1] **LLM Augmented LLMs: Expanding Capabilities through Composition** 📄⊘
     Rachit Bansal, Bidisha Samanta, Siddharth Dalmia, Nitish Gupta, Shikhar Vashishth, Sriram Ganapathy, Abhishek
     Bapna, Prateek Jain, Partha Talukdar
     International Conference on Learning Representations (under review; positive reviews)   **[ICLR 2024]**

[2] **Linear Connectivity Reveals Generalization Strategies** 📄○
     Jeevesh Juneja, Rachit Bansal, Kyunghyun Cho, João Sedoc, Naomi Saphra
     International Conference on Learning Representations   **[ICLR 2023]**

[3] **Measures of Information Reflect Memorization Patterns** 📄⊘🎥
     Rachit Bansal, Danish Pruthi, Yonatan Belinkov
     Conference on Neural Information Processing Systems   **[NeurIPS 2022]**

[4] **Evaluating Explanations: How much do explanations from the teacher aid students?** 📄○
     Danish Pruthi, Rachit Bansal, Bhuvan Dhingra, Livio Baldini Soares, Michael Collins, Zachary C. Lipton, Graham Neu-
     big, William W. Cohen
     Transactions of the Association for Computational Linguistics
     Presented at the Annual Conference for the Association of Computation Linguistics   **[TACL 2022]**

[5] **CoSe-Co: Text Conditioned Generative CommonSense Contextualizer** 📄🎥
     Rachit Bansal, Milan Aggarwal, Sumit Bhatia, Jivat Kaur, Balaji Krishnamurthy
     North American Chapter of the Association for Computational Linguistics   **[NAACL 2022]**

[6] **LM-CORE: Language Models with Contextually Relevant External Knowledge** 📄🎥
     Jivat Kaur, Sumit Bhatia, Milan Aggarwal, Rachit Bansal, Balaji Krishnamurthy
     North American Chapter of the Association for Computational Linguistics (Findings)   **[NAACL 2022]**

[7] **How Low is Too Low? A Computational Perspective on Extremely Low-Resource Languages** 📄📖○
     Rachit Bansal, Himanshu Choudhary, Ravneet Punia, Niko Schenk, Jacob L Dahl, Émilie Pagé-Perron
     Student Research Workshop (SRW) at **ACL**   **[ACL SRW 2021]**

[8] **Combining exogenous and endogenous signals with a co-attention network for early fake news detection** 📄
     Rachit Bansal, William Scott, Nidhi Sultan, Tanmoy Chakraborty
     Pacific-Asia Conference on Knowledge Discovery and Data Mining   **[PAKDD 2021]**

[9] **Cross-SEAN: A Cross-Stitch Semi-Supervised Attention Model for COVID-19 Fake News Detection** 📄
     Rachit Bansal, William Scott, Abhay Kaushik, Tanmoy Chakraborty, Shubhashis Sengupta

Featured Academic Projects and Collaborations

Augmenting New Knowledge in Language Models through Composition
Advisors: Partha Talukdar, Prateek Jain, Nitish Gupta, Sid Dalmia

07/2022 – Present
Google Research

> Worked as a part of a massive moonshot effort to create inclusive and equitable language representations.
> Led a large collaboration to introduce composition of language models as a paradigm to augment new knowledge.
> Proposed CALM: Using knowledge-specific models to augment new capabilities in a frozen language model. [**ICLR'24**]
> Working with Google DeepMind and the Bard team to test CALM for serving custom models to users.

Relationship between Information Distribution and Model Behavior
Advisors: Yonatan Belinkov, Danish Pruthi

01/2022 – 07/2022
Technion

> Evaluating generalization of neural models is difficult: Requires creation of labeled out-of-distribution sets.
> Employed information-theoretic metrics to study the information distribution across neurons as an intrinsic metric.
> For the first time, showed that such intrinsic metrics strongly correlate with generalization behaviors of a model.
> Demonstrated the usefulness of the study for model selection. [**NeurIPS'22**]

Mode Connectivity in Loss Surfaces for Text Models
Advisors: Naomi Saphra, João Sedoc, Kyunghyun Cho

10/2021 – 10/2022
New York University

> Analyzed linear model connectivity for multiple fine-tuned models from the same pre-trained language model.
> For the first time, observed clusters of models that lie in separate basins within the loss surface.
> Further observed that models belonging in the same cluster show identical generalization behaviors. [**ICLR'23**]
> Future work has utilized insights from our work for weight averaging and mechanistic interpretability. [⊙]

Teacher-Student Paradigm to Evaluate Model Explanations
Advisors: Danish Pruthi, Bhuwan Dhingra, Zachary Lipton, Graham Neubig

09/2020 – 12/2021
Carnegie Mellon University

> A number of model explainability approaches exist but no means to quantitatively evaluate and measure progress.
> Established a student-teacher communication paradigm for automatic evaluation of explanations. [**TACL'22**]

Grounding Language Models in Factual and Commonsense Knowledge
Advisors: Milan Aggarwal, Sumit Bhatia, Balaji Krishnamurthy

01/2021 – 09/2021
Adobe Research

> Developed a framework to augment language model inputs with factual and commonsense knowledge on the fly.
> Demonstrated that our generic and efficient framework outperform large task-tuned models. [**NAACL'22**]

Neural Machine Translation for Sumerian
Advisors: Jacob Dahl, Émilie Pagé-Perron, Niko Schenk

05/2020 – 01/2021
University of Oxford

> Sumerian is the earliest written language in Mesopotamia and perhaps the world—dating back to 4th millennium BC.
> Led this open-source initiative with CDLI to adapt modern NMT for extremely low-resource languages [**SRW, ACL'21**].
> Built an end-to-end information extraction pipeline for Sumerian widely used by Sumerian assyriologists today. [○]

Teaching and Featured Positions

Google Summer of Code, Cuneiform Digital Library Initiative (CDLI). *Mentor* — Summer 2022

Reinforcement Learning, Coding Blocks. *Student Instructor w/ Prateek Narang* — 2020
> Recorded 10-hours worth of lectures and held a number of live webinars. Collaborated with course mentors to build project ideas, assignments, and quizzes.

Foundations of Machine Learning & Deep Learning, Coding Blocks. *Teaching Assistant w/ Prateek Narang* — 2019
> Conducted classes and doubt sessions for a batch of 60 senior undergraduate students from all across the country. Built course quizzes and programming assignments in collaboration with other TAs.

Reviewer: ICLR'24, NeurIPS'23, EMNLP'23, ACL'23, NeurIPS'22
Volunteer: NeurIPS'21, EMNLP'21, ICML'21, NAACL'21, NeurIPS'20, EMNLP'20, ICML'20, ACL'20

Featured Coursework

> **Mathematics**: Advanced Linear Algebra (2nd Sem., DTU; *University Rank-1*); MIT RES-6-012: Introduction to Probability, MIT OCW; Abstract Algebra, Group Theory, and Linear Algebra, IIT-KGP (NPTEL); Numerical and Engineering Optimization Methods (3rd Sem., DTU); Swarm and Evolutionary Optimization (7th Sem., DTU)
> **Machine Learning**: IFT 6760A: Matrix and tensor factorization techniques for machine learning, University of Montreal; MIT 18-065: Matrix Methods in Signal Processing, and Machine Learning, MIT OCW; Probabilistic Graphical Models Specialization, Stanford University; Bayesian Methods for Machine Learning, National Research University of Russia
> **Natural Language Processing**: CS11-737: Multilingual NLP, CMU; CS11-747: Neural Networks for NLP, CMU; Natural Language Processing (6th Sem., DTU)