


Arindam Mitra

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Crafting next-generation foundation models that align better to human; powers emerging tasks and applications with natural language interactions (Copilot); provides a trustworthy and collaborative environment for humans and machines to work together. My work has been integrated into Bing and [Science Engine](#), the latter of which empowers scientists across multiple enterprises with cutting-edge AI products. Looking for exciting research opportunities in the space of Large foundation models.

Experience

Senior Researcher/ Microsoft Research, Washington

June 2023 - Present

Orca: I am leading the Orca project in MSR. My current research direction includes building LLMs that are safe, does not hallucinate and are excellent reasoner. I'm mainly working on RLHF, Explanation Tuning, and Instruction Learning.

Applied Scientist II/ Microsoft Research, Washington

December 2020 – June 2023

Orca: How to use the emerging abilities of Large Foundational models (LFMs) to build adept vertical models? I co-led the development of Orca, a 13B model, that learns to imitate the reasoning process of LFMs. Orca shows promising improvements over existing works which makes it lucrative for applications that demand efficient vertical models.

Science Engine Co-Pilot: Over the years, numerous specialized knowledge bases and models have been developed to help scientists manage the ever-growing body of information and to simplify the complexities of scientific research. However, working with such a wide variety of tools hinders adaptability. The Co-Pilot feature of the Science Engine aims to address this pain point. I developed the planner that figures out which apis to call and in which order given a user request. ([demo](#))

Table Retrieval: One of the important sources of information in scientific documents is Tables. However, interpreting the data presented in tables often requires additional context which is not part of the table. Built an encoder-decoder based data-to-text model that generates a detailed description for the table given which helps in Table retrieval.

Clinical trial Search: Can we list *all* the clinical trials that studies effects of Covid-19 on some existing health condition? Traditional search engines are not suitable for such exhaustive and fine-grained search. Developed an ontology for clinical trial inclusion-exclusion criteria in collaboration with end users, developed a highly accurate criteria classifier and an efficient searching functionality over clinical trials.

Data Scientist/ Microsoft Bing, Washington

October 2019 – December 2020

Knowledge Panel: Knowledge panels are typically shown on search pages as a sidebar (info boxes) for queries regarding an entity (e.g., a person, a place). Extended the knowledge panel entity types to cover product as well. I was responsible for developing a model that extracts product name and description from web pages.

Paragraph Ranking: For some user queries Bing will highlight a span as the answer. These models that directly answer a user query operate under latency constraint and requires few pre-curated paragraphs per page. I developed a model that re-ranks paragraphs from webpage and returns top-k paragraphs.

Research Intern/ Allen Institute of Artificial Intelligence, Washington

May 2018 – July 2018

Developed a novel method that combines symbolic solver and neural networks (a natural language inference system) to answer sophisticated questions over text. Developed dataset using Amazon Mechanical Turk. ([Work](#) accepted in AAAI'19)

Research Associate (PhD) / Dr. Chitta Baral, Arizona State University

August 2014 – August 2019

Some of the areas I worked on includes: • Aristo (Science QA) • Euclid (Math Word Problems) • α NLI: Abductive Natural Language Inference • Social IQA: Commonsense Reasoning about Social Interactions • Physical IQA: Commonsense Reasoning about Physical Interactions • Winograd Schema Challenge • Natural Language Inference (SNLI, MNLI). To tackle these challenges, I've proposed novel solutions with deep neural models, traditional statistical ML models or a combination of symbolic solvers (Answer Set Programming, Probabilistic Soft Logic) and ML models.

Software Development Engineer/Amazon, India

June 2012 – June 2014

- Developed features for an existing ML model that detects abuse of amazon policies (e.g., trying to use a coupon twice).
- Developed website and a backend service to store rates of different carriers for Amazon Fresh.
- A website and a backend service to manage and communicate issues between amazon and third-party carriers.

Education

AUGUST 2014 – AUGUST 2019

GPA: 4.0/4.0

PhD, Computer Science/Ira A. Fulton Schools of Engineering, Arizona State University, USA

JUNE 2008 – MAY 2012

GPA: 8.61/10

Bachelor of Engineering, Computer Science & Engineering/Jadavpur University, Kolkata, India

Publications

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| <i>Orca: Progressive Learning from Complex Explanation Traces of GPT-4</i>
Subhabrata Mukherjee*, Arindam Mitra* , Ganesh Jawahar, Sahaj Agarwal, Hamid Palangi, Ahmed Awadallah | Arxiv, 2023 |
| <i>Instruction Tuned Models are Quick Learners</i>
Himanshu Gupta, Saurabh Arjun Sawant, Swaroop Mishra, Mutsumi Nakamura, Arindam Mitra , Santosh Mashetty, Chitta Baral | Arxiv, 2023 |
| <i>NumGLUE: A Suite of Fundamental yet Challenging Mathematical Reasoning Tasks</i>
Swaroop Mishra, Arindam Mitra , Neeraj Varshney, B Sachdeva, Peter Clark, C Baral, Ashwin Kalyan | ACL 2022 |
| <i>Improving Biomedical Information Retrieval with Neural Retrievers</i>
Man Luo, Arindam Mitra , Tejas Gokhale, Chitta Baral | AAAI 2022 |
| <i>Commonsense Reasoning with Implicit Knowledge in Natural Language</i>
Arindam Mitra* , Pratyay Banerjee*, Swaroop Mishra*, Kuntal Kumar Pal*, Chitta Baral | AKBC 2021 |
| <i>Deeply Embedded Knowledge Representation & Reasoning For Natural Language Question Answering: A Practitioner's Perspective</i>
Arindam Mitra , Sanjay Narayana and Chitta Baral | SPNLP (EMNLP 2022) |
| <i>Enhancing natural language inference using new and expanded training data sets and new learning models</i>
Arindam Mitra , Ishan Shrivastava, and Chitta Baral | AAAI 2020 |
| <i>Careful selection of knowledge to solve open book question answering.</i>
Arindam Mitra* , Pratyay Banerjee*, Kuntal Kumar Pal*, and Chitta Baral | ACL 2019 |
| <i>Combining knowledge hunting and neural language models to solve the Winograd schema challenge</i>
Ashok Prakash, Arpit Sharma, Arindam Mitra , and Chitta Baral. | ACL 2019 |
| <i>Declarative Question Answering over Knowledge Bases containing Natural Language Text with Answer Set Programming</i>
Arindam Mitra , Peter Clark, Oyvind Tafjord and Chitta Baral. | AAAI 2019 |

<i>Incremental and Iterative Learning of Answer Set Programs from Mutually Distinct Examples.</i> Arindam Mitra , and Chitta Baral	TPLP 2018 (Journal)
<i>Knowledge Representation and Reasoning in Answering Science Questions: A Case Study for Food Web Questions</i> Arindam Mitra , Chitta Baral, and Peter Clark.	KR 2018
<i>Addressing a question answering challenge by combining statistical methods with inductive rule learning and reasoning</i> Arindam Mitra , and Chitta Baral	AAAI 2016
<i>Learning to use formulas to solve simple arithmetic problems</i> Arindam Mitra , and Chitta Baral	ACL 2016
<i>The NL2KR platform for building natural language translation systems</i> Nguyen Vo, Arindam Mitra , and Chitta Baral.	ACL 2015
<i>Learning to automatically solve logic grid puzzles</i> Arindam Mitra , and Chitta Baral.	EMNLP 2015

* = equal contribution

Selected Courses

- Deep Learning • Logical & Distributional Semantics of NLP • Statistical Machine Learning • Semantic Web Mining
- Distribution Theory (Statistics) • Convex Optimization Algorithms • Applied Linear Algebra • Game Theory
- Introduction to Artificial Intelligence • Knowledge Representation and Reasoning.

Awards

- Recipient of Allen Institute for Artificial Intelligence (AI2) Key Scientific Challenges Award.
- Secured rank 108 out of more than 100,000 examinees in WBJEE for admissions in engineering colleges, 2008.
- Recipient of ‘Government of India - Scheme of Scholarship for Higher Secondary Students - Secondary Examination’, 2006-2008.

Patents

- Constructing a computer-implemented semantic document. Ziliu Li, Junaid Ahmed, Kwok Fung Tang, Arnold Overwijk, Jue Wang, Charumathi Lakshmanan, Arindam Mitra
- Searching and locating answers to natural language questions in tables within documents. Sarah Panda, Arindam Mitra, Liang Du.