

Shib Sankar Dasgupta

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My research focuses on geometric representations for capturing implicit set-theoretic reasoning in real-world applications like user preference modeling, information retrieval, and recommendation. Beyond my PhD, I have collaborated with industry researchers to develop LLM-powered solutions for search, planning, and personalization, bridging foundational research with scalable ML systems.

Education

University of Massachusetts, Amherst

Amherst, Massachusetts

P.H.D. IN COMPUTER SCIENCE

Sept. 2019 - May 2025(Expected)

- Advisor - **Prof. Andrew McCallum** GPA - **4.0/4.0**
- **Thesis: Learning Set-theoretic Representation with Box Embeddings.**
- **Thesis Committee: Julian McAuley, Hamed Zamani, Cameron Musco, and Andrew McCallum.**
- Coordinator for **DARPA** Machine Common Sense Grant, **Meta CZI** research grant.
- Supervised 10+ masters students on their thesis/course research, and industry collaboration including IBM, Adobe, Spotify

Indian Institute of Science, Bangalore

Bengaluru, India

MASTER OF TECHNOLOGY IN SYSTEM SCIENCE AND AUTOMATION

Aug. 2016 - May. 2018

- Advisor - **Prof. Partha Pratim Talukdar** GPA - **9.1/10.0**
- Awarded **Gold medal** for being the Topper of the class in M.Tech
- Research focused on learning temporal representation for beliefs and unstructured text.
- Organized reading groups, invited talk series, and lab meetings.
- Published effective state-of-the-art solutions for both temporal representation learning in ACL and EMNLP (now highly cited.)

Jadavpur University

Kolkata, India

BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING

May. 2011 - April. 2015

- GPA - **8.41/10.0**

Research Experience

Microsoft Research

Summer 2024

RESEARCH INTERN, MANAGER - TOBIAS SCHNABEL

- Integrated LLMs in Recommendation Systems in an efficient and editable way, using a RAG-based approach with GPT-4.
- Achieved 50% improvement in human preference alignment over state-of-the-art algorithms.

IBM Research

Summer 2023

RESEARCH INTERN, MANAGER - ACHILLE FOKOUE

- Developed a dataset to evaluate and fine-tune LLM agents for business processes, emphasizing tool usage and multistep planning for accurate process execution.

Google Research

Summer 2022, Fall 2022

RESEARCH INTERN, MANAGER - STEFFEN RENDLE

- Introduced a benchmark to address compositional queries (e.g., *Jazz but not Smooth Jazz*) in recommendation systems.
- Designed a set-based embedding method, outperforming traditional vector baselines by 25% on the proposed benchmark.

IBM Research

Spring 2022

RESEARCH EXTERNSHIP, MENTOR - KEN CLARKSON (IBM), CAMERON MUSCO(UMASS AMHERST)

- Engineered a hashing-based fast and scalable technique for learning word embeddings with only a single pass over the data.

Adobe Research

Summer 2021

DOCUMENT INTELLIGENCE RESEARCH INTERN., MANAGER - DR. TONG SUN

- Proposed a dual embedding method to impose a hierarchical structure on vector representation using geometric embedding.

Minds.ai

2018 - 2019

NEURAL NETWORK ENGINEER, MANAGER - DR. TIJMEN TIELEMAN

- Developed a Graph Convolutional Network (GCN)-based molecular property predictor to aid automated drug discovery.
- Built a deep reinforcement learning-based controller to increase battery life and fuel efficiency for hybrid vehicles.

Skills

Programing Language Python, C++ **Libraries** PyTorch, Tensorflow **Tools** Git, Docker, Weights & Biases, Slurm
Courses Advanced Natural Language Processing, Information Retrieval, Reinforcement Learning, Convex Optimization.

Selected Publications (Full list: [Google Scholar Link](#))

A Geometric Approach to Personalized Recommendation with Set-Theoretic Constraints Using Box Embeddings.

Recommendation Systems

SHIB DASGUPTA, MICHAEL BORATKO, ANDREW MCCALLUM

ArXiv

Answering Compositional Queries with Set-Theoretic Embeddings.

Information Retrieval

SHIB DASGUPTA, ANDREW MCCALLUM, STEFFEN RENDLE, LI ZHANG

ArXiv

Word2Box: Capturing Set-Theoretic Semantics of Words using Box Embeddings

Machine Learning

SHIB SANKAR DASGUPTA, MICHAEL BORATKO, S. ATMAKURI, XIANG LORRAINE LI, D. PATEL, ANDREW MCCALLUM

ACL 2022

Improving Local Identifiability for Probabilistic Box Embeddings

Machine Learning

SHIB SANKAR DASGUPTA*, MICHAEL BORATKO*, DONGXU ZHANG, LUKE VILNIS, XIANG LI,, ANDREW MCCALLUM.

NeurIPS 2020

Learning Representations for Hierarchies with Minimal Support

Machine Learning

B.ROZONoyer, M.BORATKO, D.PATEL, W.ZHAO, SHIB DASGUPTA, H.LE, A.MCCALLUM

NeurIPS 2024

Box-To-Box Transformations for Modeling Joint Hierarchies

Graph Learning

SHIB SANKAR DASGUPTA, XIANG LORRAINE LI, MICHAEL BORATKO, DONGXU ZHANG, ANDREW MCCALLUM

ACL 2021 (Rep4NLP)

Representing Joint Hierarchies with Box Embeddings

Graph Learning

DHRUVESH PATEL*, SHIB SANKAR DASGUPTA*, MICHAEL BORATKO, XIANG LI, LUKE VILNIS, ANDREW MCCALLUM.

AKBC 2020

HyTE: Hyperplane-based Temporally aware Knowledge Graph Embedding

Graph Learning

SHIB SANKAR DASGUPTA, SWAYAMBHU NATH RAY AND PARTHA TALUKDAR.

EMNLP 2018

Probabilistic Box Embeddings for Uncertain Knowledge Graph Reasoning

Graph Learning

XUELIN CHEN, MICHAEL BORATKO, MUHAO CHEN, SHIB SANKAR DASGUPTA, XIANG LI, ANDREW MCCALLUM.

NAACL 2021

Measure-Theoretic Set Representation Learning.

ML theory

MICHAEL BORATKO, D. PATEL, SHIB SANKAR DASGUPTA, ANDREW MCCALLUM

ArXiv

Min/Max Stability and Box Distributions

ML Theory

MICHAEL BORATKO, JAVIER BURRONI, SHIB SANKAR DASGUPTA, ANDREW MCCALLUM.

UAI 2021

Box Embeddings: An Open-source Library for Representation Learning using Geometric Structures

Open Source Contribution

T. CHHEDA, P. GOYAL, T. TRANG, D. PATEL, M. BORATKO, SHIB SANKAR DASGUPTA, ANDREW MCCALLUM

EMNLP 2021 (Demo Track)

Awards & Achievements

2020	Scholarship , Awarded the W. Bruce Croft Graduate Scholarship in Computer Science	UMass Amherst
2019	Gold Medal , Awarded the N R Khambhati Memorial Medal for Topper of the class in M.Tech	IISc, Bangalore
2018	Scholarship , Awarded Non-Student Travel Scholarship by EMNLP, 2018	EMNLP
2016	All India Rank 47 , In GATE-2016(Competitive entrance examination for the Graduate program) Out of around 1,25,000 applicants in Electrical Engineering.	IISc, Bangalore
2013	Finalist , Autonomous robotics competition in Kshitij 2013, the Annual Techno-Management Fest.	IIT Kharagpur
2011	Scholarship , Awarded scholarship under the Scheme of Scholarship for College and University Students reg. of Govt. of India , 2011 for the result of Higher Secondary Examination.	Jadavpur University
2011	All state Rank 166 , In WBJEE-2011 WBJEE-2011 (Competitive entrance examination for Undergraduate program) out of around 1,30,000 applicants for Engineering.	Jadavpur University