Shib Sankar **Dasgupta**

GRADUATE RESEARCH ASSISTANT · IESL, UMASS AMHERST, CICS

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My research focuses on structured representations and their role in capturing implicit set-theoretic relationships in real-world applications like user preference modeling and information retrieval. Beyond my PhD, I have collaborated with numerous industry researchers on LLM-powered applications in search, planning, and recommendation, bridging theory with practical systems.

Education

University of Massachusetts, Amherst
Amherst, Massachusetts

P.H.D. IN COMPUTER SCIENCE
Sept. 2019 - March 2024(Expected)

- Advisor - **Prof. Andrew McCallum**   GPA - **4.0/4.0**
- Research focus is on Set-based representation learning.
- 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, & Uber.

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-based 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-based 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.
Under Review
SHIB DASGUPTA, MICHAEL BORATKO, ANDREW MCCALLUM
ArXiv

Answering Compositional Queries with Set-Theoretic Embeddings.
Under Review
SHIB DASGUPTA, ANDREW MCCALLUM, STEFFEN RENDLE, LI ZHANG
ArXiv

Word2Box: Capturing Set-Theoretic Semantics of Words using Box Embeddings
Dublin
SHIB SANKAR DASGUPTA, MICHAEL BORATKO, S. ATMAKURI, XIANG LORRAINE LI, D. PATEL, ANDREW MCCALLUM
ACL 2022

Improving Local Identifiability for Probabilistic Box Embeddings
Online
SHIB SANKAR DASGUPTA*, MICHAEL BORATKO*, DONGXU ZHANG, LUKE VILNIS, XIANG LI,, ANDREW MCCALLUM.
NeurIPS 2020

Learning Representations for Hierarchies with Minimal Support
Vancouver
B.ROZONOYER, M.BORATKO, D.PATEL, W.ZHAO, SHIB DASGUPTA, H.LE, A.MCCALLUM
NeurIPS 2024

Box-To-Box Transformations for Modeling Joint Hierarchies
Online
SHIB SANKAR DASGUPTA, XIANG LORRAINE LI, MICHAEL BORATKO, DONGXU ZHANG, ANDREW MCCALLUM
ACL 2021 (Rep4NLP)

Representing Joint Hierarchies with Box Embeddings
Online
DHRUVESH PATEL*, SHIB SANKAR DASGUPTA*, MICHAEL BORATKO, XIANG LI, LUKE VILNIS, ANDREW MCCALLUM.
AKBC 2020

HyTE: Hyperplane-based Temporally aware Knowledge Graph Embedding
Brussels
SHIB SANKAR DASGUPTA, SWAYAMBHU NATH RAY AND PARTHA TALUKDAR.
EMNLP 2018

Measure-Theoretic Set Representation Learning.
Under Review
MICHAEL BORATKO, D. PATEL, SHIB SANKAR DASGUPTA, ANDREW MCCALLUM
ArXiv

Box Embeddings: An Open-source Library for Representation Learning using Geometric Structures
Virtual
T. CHHEDA, P. GOYAL, T. TRANG, D. PATEL, M. BORATKO, SHIB SANKAR DASGUPTA, ANDREW MCCALLUM
EMNLP 2021 (Demo Track)

Min/Max Stability and Box Distributions
Virtual
MICHAEL BORATKO, JAVIER BURRONI, SHIB SANKAR DASGUPTA, ANDREW MCCALLUM.
UAI 2021

Probabilistic Box Embeddings for Uncertain Knowledge Graph Reasoning
Virtual
XUELU CHEN, MICHAEL BORATKO, MUHAO CHEN, SHIB SANKAR DASGUPTA, XIANG LI, ANDREW MCCALLUM.
NAACL 2021

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*