

# Archit Rathore

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## EDUCATION

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### University of Utah

*Ph.D. in Computer Science (Expected graduation: May 2022)*

August 2017- Present

### Indian Institute of Technology (IIT) Kanpur

*B.Tech in Computer Science and Engineering*

July 2012- April 2016

## RESEARCH INTEREST

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Ph.D

## WORK EXPERIENCE

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### OpenSesame, Portland, OR

*ML Engineer Intern*

May 2021 - Aug 2021

*Data Science Team*

- Implemented a NLP based conversational AI assistant to provide low-friction discovery of advanced features.
- Created end-to-end architecture and APIs to deploy trained models in a scalable and secure manner using Docker.
- Managed and deployed MLOps infrastructure on AWS.

### VISA Research, Palo Alto, CA

*Research Intern*

May 2019 - Aug 2019

*Risk Modelling Team*

- Proposed a method to create an auto-encoding framework using Recurrent Neural Networks for time-series data.
- Developed models to create embeddings for entities that capture multiple facets using unsupervised learning.
- Implemented an end-to-end pipeline in PyTorch to interface with upstream tasks.
- Implemented efficient and scalable models capable of handling more than a million data points.

### Samsung R&D Institute, Bangalore, India

*Data Engineer*

Jun 2016 - July 2017

*Data Analytics Team*

- Built and optimized ETL pipelines for processing device logs for Samsung smartphones using Apache Spark.
- Proposed and implemented methods to find recurrent temporal patterns in smartphone usage and app activities.
- Developed server side aggregation for upto 500 million daily users with nearly 5 billion data points.
- Integrated the output from above into the intelligence module for Bixby in low-resource high-throughput setting.

## PROGRAMMING EXPERIENCE

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Programming Languages - Python, Javascript, C, Terraform

Data Science - Tensorflow, Pytorch, Scikit-Learn, Numpy, Pandas, Apache Spark (PySpark), SQL

Frameworks - Vue, Angular, CSS, HTML, D3.js (frontend), Docker (container technology), Hadoop, Spark, AWS (cloud and distributed computing)

## PUBLICATIONS

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*VERB: Visualizing and Interpreting Bias Mitigation Techniques for Word Representations.* A. Rathore, S. Dev, J.M. Philips, S. Srikumar, *et al.* Tutorial at [AAAI 2021](#) and [KDD 2021](#). Under review at TVCG. [[code](#)]

*TopoAct: Exploring the Shape of Activations in Deep Learning.* A. Rathore, N. Chalapathi, S. Palande, B. Wang. Computer Graphics Forum, 2020. [[pdf](#) | [demo](#) | [code](#) | [video](#)]

*Autism Classification Using Topological Features and Deep Learning: A Cautionary Tale.* A. Rathore, S. Palande, J. S. Anderson, *et al.* 22nd International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2019. [[pdf](#) | [code](#)]

*Mapper Interactive: A Scalable, Extendable, and Interactive Toolbox for the Visual Exploration of High-Dimensional Data.* Y. Zhou, N. Chalapathi, A. Rathore, Y. Zhao and B. Wang, 2021 IEEE 14th Pacific Visualization Symposium (PacificVis), 2021. [[code](#)]

## KEY PROJECTS

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### **VERB: Visualizing and Interpreting Bias Mitigation Techniques for Word Representations**

- Decomposed multiple debiasing algorithms into atomic operations for interpretability and interactivity.
- Built an interactive system to allow exploration of societal biases present in word vector embeddings and tweak parameters for debiasing algorithms in real-time.
- Chosen as part of the systems presented at the ‘Discover Engineering’ outreach program for students interested in data science across 1000 high-schools in Utah.

### **TopoAct: Exploring the Shape of Activations in Deep Learning**

- Proposed a method to extract topological structures in the activation space of object detection and language modeling neural networks.
- Implemented deep learning models and data processing in Python and PyTorch.
- Built visualization tools using JavaScript, HTML and D3js which allows layer-wise analysis of activation vectors.
- Presented exploration scenarios that provide valuable insights about the learned representations of the deep neural network.

### **Autism Classification Using Topological Features and Deep Learning**

- Developed a novel multi-branch neural network that combines vanilla features with topological information obtained from functional MRI scans to predict autistic vs control patients.
- Used TDA (persistent homology) in conjunction with deep learning to improve classification scores.
- Performed rigorous statistical testing to establish the significance of the accuracy scores.

### **Scalable Mapper Algorithm for Big Data**

- Optimized the Mapper algorithm, a central tool in TDA, to efficiently parallelize the clustering step.
- Achieved speedup of upto 10x on dataset sizes of more than 1 million points.

## RELEVANT COURSEWORK

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|--------------------------|-------------------------------|--------------------------|
| • Machine Learning       | • Natural Language Processing | • Advanced Algorithms    |
| • Computational Geometry | • Probabilistic Modeling      | • Database Systems       |
| • Vis for Data Science   | • Data Mining                 | • Computational Geometry |

## TEACHING AND TALKS

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- Teaching Mentor for Discrete Mathematics at University of Utah, Spring 2020.
- Teaching Mentor for Theory of Computation at University of Utah, Fall 2020.
- Tutorial on debiasing word vector embeddings at AAAI 2021 and KDD 2021.
- Invited talk on analyzing embeddings from transformer models at Michigan State University in Oct 2021