

# Tathagat Verma

Master's in Computer Science at Stanford University

📧 [tathagatv.github.io](mailto:tathagatv.github.io) | [in](#) [tathagatv](#) | [verma.tathagat](#) | [tathagatv](#) | [tathagatswagverma@gmail.com](mailto:tathagatswagverma@gmail.com)

## EDUCATION

**Stanford University**, Stanford, USA

Sep 2022 - May 2024 (expected)

*Master of Science in Computer Science, Specialization - Artificial Intelligence*

GPA - **3.97/4**

**Indian Institute of Technology Bombay**, Mumbai, India

Jul 2018 - Dec 2021

*Bachelor of Technology in Computer Science and Engineering with Honors*

CPI - **9.64/10**

## SCHOLASTIC ACHIEVEMENTS

- Secured **All India Rank 53** in **JEE Advanced** out of 200,000 candidates 2018
- Secured **All India Rank 34** in **JEE Main** out of 1.2 million candidates 2018
- Clear Ventures Deeptech Fellow**: 6-month program connecting researchers and company builders 2023
- Recipient of the **Quadeye Excellence Scholarship**, awarded on the basis of academic achievements 2021
- Amongst top **30** in India selected for the **International Astronomy Olympiad Selection Camp** 2018
- Amongst top **35** in India selected for the **International Mathematical Olympiad Training Camp** 2017
- Awarded **Advanced Performer (AP)** grade in **3** courses for exceptional performance 2018-21
- Amongst top 300 students selected for the **Indian National Physics and Chemistry Olympiads** 2018
- Recipient of the **Kishore Vaigyanik Protsahan Yojana (KVPY)** fellowship by **Govt. of India** 2017

## PUBLICATIONS

- Title: **VarScene: A Deep Generative Model for Realistic Scene Graph Synthesis** [\[paper\]](#)  
Authors: **Tathagat Verma**, Abir De, Yateesh Agrawal, Vishwa Vinay, Soumen Chakrabarti  
Conference: International Conference on Machine Learning (ICML) 2022

## RESEARCH EXPERIENCE

**Object Importance Classification and Natural Language Explanation Generation** Autumn 2022  
Guides: [Prof. Mykel Kochenderfer](#), [Jiachen Li](#) | Research Assistantship SISL, Stanford University

- Developed a deep learning model for importance classification and explanation generation in autonomous driving
- Utilized **CNN**, **Graph Neural Networks** and **attention** based **GRU** for image feature extraction, learning inter-object relationships and natural language generation respectively for the joint task in **PyTorch**

**VarScene: A Deep Generative Model for Realistic Scene Graph Synthesis** Autumn 2021  
Guides: [Prof. Soumen Chakrabarti](#), [Prof. Abir De](#) | R&D Project InfoLab, IIT Bombay

- Developed a deep generative model for novel scene graph synthesis using **VAE** and **Graph Neural Networks**
- Designed a goal oriented decoder for minimizing the maximum mean discrepancy between graph distributions
- Developed code in **PyTorch** and used the Visual Genome and Visual Relationship Detection datasets
- Significantly outperformed baselines on the Fréchet Inception Distances (**FID**), Inception Scores (**IS**) and achieved better results on the Shortest Path, Weisfeller Lehman and Neighborhood Subgraph Pairwise Distance kernels

**Deep Learning for Medical Image Quality Enhancement** Spring 2021, Autumn 2021  
Guide: [Prof. Suyash Awate](#) | R&D Project, Bachelor's Thesis Project IIT Bombay

- Enhanced the quality of MRI images with sub-sampling and Gaussian noise in the frequency domain and PET images with Poisson noise in the sinogram domain under the weakly-supervised regime
- Trained models using the **RED-CNN** and **UNet** architectures with Bayesian learning in **PyTorch**
- Utilized intermediate VGG-16 layers for **style based losses** and Fourier and Wavelet transform loss functions

## INTERNSHIPS

**Bad Label Detection** Summer 2023  
[Scale AI](#) | Machine Learning Research Engineer Intern San Francisco, USA

- Developing bad label detection algorithms for IG reels genre classification using 0-shot video classification models

**Student Venture Partner** Summer 2022  
[Venture Highway LLP](#) | Guides: [Aviral Bhatnagar](#), [Akul Jindal](#) Bengaluru, India

- Gained exposure to sourcing and evaluating **seed stage startups** and interacted with many founders

## Image Functionality in the Whiteboard Android Application

Microsoft India (R&D) Pvt. Ltd. | Software Engineer Intern

Summer 2021

Noida, India

- Integrated **Microsoft Lens SDK** into Whiteboard Android, to support image and OCR tools provided by Lens
- Worked in **Java Android** backend, building the bridge to send images from native Android to the web application
- Developed code in **React** for the web application, making the UI component for triggering image workflow

## Attribute Value Extraction from Product Descriptions

Coupa Software India Pvt. Ltd. | Data Science Intern

Summer 2020

Pune, India

- Developed unsupervised and semi-supervised methods for extracting attribute values from product descriptions
- Implemented an **RNN** model for sequence tagging using **CRF**, **BiLSTM** and attention mechanisms
- Optimized hyper parameters using **Bayesian Optimization**, reducing time required for tuning the model
- Automated taxonomy creation by clustering on co-occurrence graphs using the **Chinese Whispers Algorithm**

## Business Monitoring and Alerting Systems

Delta Exchange | Software Engineer Intern

Summer 2019

Mumbai, India

- Made real time predictions for prices of multiple Crypto Derivative contracts by implementing ARIMA model
- Developed a dashboard using **Django** to monitor Business Performances, now being used on a daily basis
- Used **MySQL** database along with APIs and **WebSockets** of various exchanges for obtaining real time data

## TECHNICAL PROJECTS

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### Mitigating Scams and Catfishing on Dating Apps through Automatic Moderation

Guide: [Alex Stamos](#) | Trust and Safety Engineering | [Demo](#)

Spring 2023

Course Project

- Developed a **Discord bot** to mitigate scams and catfishing on a dating app simulation on Discord
- Built user-reporting and moderation workflows to handle multiple types of offences in different scenarios
- Leveraged **regex**, **image-captioning** and **GPT-3.5** to handle automated flagging and prevent adversarial cases

### Blockchain Simulation and Applications

Guide: [Prof. Vinay Ribeiro](#) | Blockchains, Cryptocurrencies and Smart Contracts

Autumn 2021

Course Project

- Implemented a peer-to-peer cryptocurrency network simulation in **C++** following the **Bitcoin** protocols
- Simulated selfish and stubborn mining attacks, analyzing the effects of hash power and network connectivity
- Developed a decentralized payment application on top of **Ethereum** in Solidity, utilizing smart contracts

### Foreshadow Attack and its Variants

Guide: [Prof. Bernard Menezes](#) | Advanced Network Security and Cryptography

Spring 2021

Course Project

- Studied the **Foreshadow** attack and its impact on **Intel SGX** and **VM** systems due to speculative execution
- Simulated the proof-of-concept attack on **Linux** kernel with **x86** processor in the absence of Intel TSX

### Route Optimization Algorithm

Inter IIT Technical Meet

Winter 2019

IIT Roorkee

- Proposed solution for the Vehicle Scheduling Problem in the setting of buses, winning **gold** medal among 20 teams
- Reduced the problem to multiple instances of the Travelling Salesman Problem(**TSP**) using  $k$ -means clustering
- Generated routes while taking real time traffic into account using **Google Maps APIs** in Python

## TECHNICAL SKILLS

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|-----------------|---|
| Programming     | C++, Python, C, Java, Bash, Solidity, Racket, SQL, MATLAB                 |
| Packages        | PyTorch, TensorFlow, Keras, NLTK, SciPy, Pandas, Statsmodels, NumPy       |
| Software        | Git, L <sup>A</sup> T <sub>E</sub> X, AutoCAD, SOLIDWORKS, Android Studio |
| Web Development | HTML, CSS, JavaScript, Django, Bootstrap                                  |

## LEADERSHIP POSITIONS

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### Institute Student Mentor

Student Mentorship Program

Jun 2021 - Jun 2022

IIT Bombay

- Mentoring **12 freshmen**, helping them adjust to the institute environment, focusing on their holistic development
- Amongst 130 out of over 300 applicants selected through a rigorous procedure of interviews and peer reviews

### Senior Department Academic Mentor

Computer Science and Engineering Department

Jun 2020 - May 2022

IIT Bombay

- Mentoring **6 sophomores** of CSE department to assist them in navigating department specific curriculum
- Working in a supportive, facilitative and developmental role for the student community in general as a mentor

## Teaching Assistant

- **Design and Analysis of Algorithms** | [CS 161](#) *Stanford University, Apr 2023 - Jun 2023*
- **Natural Language Processing with Deep Learning** | [CS 224n](#) *Stanford University, Jan 2023 - Mar 2023*
- **Artificial Intelligence and Machine Learning** | [Prof. Ganesh R](#) *IIT Bombay, Jul 2021 - Nov 2021*
- **Data Structures and Algorithms** | [Prof. Sharat C](#) *IIT Bombay, Jan 2021 - May 2021*
- **Logic for Computer Science** | [Prof. Krishna S](#) *IIT Bombay, Jul 2020 - Nov 2020*

Responsible for conducting doubt sessions, preparing problem sets, programming labs and grading examinations

## Organiser in Corporate Relations

*Nov 2018 - Mar 2019*

*Entrepreneurship Cell*

*IIT Bombay*

- Responsible for speaker handling and handling overall logistics in multiple events
- Part of the execution team for **The Panel Discussion** at Entrepreneurship Summit, 2019

## OTHER PROJECTS

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### E-Commerce Recommender System

*Spring 2021*

*Guide: [Prof. Umesh Bellur](#) | Database Management*

*Course Project*

- Built an E-Commerce recommendation website using **Neo4j** graph database and **Node.js** runtime environment
- Included the features of user history, trending products and text similarity metrics to generate recommendations

### Compiler for C-like Language

*Spring 2021*

*Guide: [Prof. Uday Khedker](#) | Implementation of Programming Languages*

*Course Project*

- Built compiler for a C-like language, constructing Three Address Code and Register Transfer Language incrementally
- Implemented the scanner in **lex**, parser in **yacc** and conversion of abstract syntax tree to TAC and RTL in C++

### Portal for Selecting and Evaluating Teaching Assistants

*Autumn 2019*

*Undergraduate Academic Council*

*IIT Bombay*

- Revamped the selection portal for Teaching Assistants being used in the Institute by faculty and students
- Developed a **full-stack** application with backend in Django, MySQL DB and frontend with HTML and JavaScript

### Splitwise Clone Web Application

*Autumn 2019*

*Guide: [Prof. Amitabha Sanyal](#) | Software Systems Lab*

*Course Project*

- Built a **Django** web app to automate addition and splitting of bills among stakeholders, similar to **Splitwise App**
- Designed a database in **MySQL** for efficiently implementing features like settling up expenses from all groups
- Provided statistical insights on the type of expenditures made by users, using **JavaScript** and **Highcharts**

## EXTRACURRICULAR

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- Won **gold** medal in Route Optimization Competition at the **Inter IIT Technical Meet, IIT Roorkee** *2019*
- Represented IIT Bombay at the **34<sup>th</sup> Inter IIT Aquatics Meet, IIT Guwahati** *2018*
- Awarded **second** position in **CoDecode** (coding competition) organized by Techfest, IIT Bombay *2020*
- Covered a distance of **23.2 km** swimming continuously for **12 hours** at Swimathon, IIT Bombay *2019*
- Awarded Certificate of Merit for **winning** the Inter Department Football Tournament IIT Bombay *2019*
- Awarded Diploma Certificate for competing in the **Gothia Football Cup, Gothenburg, Sweden** *2011*
- Completed 2 levels of graded examination in communication skills from **Trinity College London** *2013*
- Phonathon: Pitched to 50 alumni the events conducted by Student Alumni Relations Cell, IIT Bombay *2019*