

# Rudresh Veerkhare

MSCSE Student, UC San Diego

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## Research Interests

My research sits at the intersection of **Discrete Differential Geometry**, **geometry processing**, and **physics-based simulation**. Right now I'm focused on:

- > **Point-vortex dynamics on genus- $g$  surfaces** — using discrete differential geometry operators to replicate smooth-theory vortex behavior on meshes and then generalizing the formulation to higher-genus surfaces.
- > **Geometric & topological algorithms for fluid flow** — harmonic decomposition, pressure projection, and efficient Poisson solvers that respect manifold structure.
- > **Physically based graphics** — leveraging the same DDG foundations for robust rendering and visualization.

## Experience

<b>Current</b> <b>Mar 2025</b>	<b>UC San Diego   CSE 8A: Intro to Programming [🔗]</b> <i>Teaching Assistant   Taught by: Prof. Leo Porter</i> <b>Designing</b> exams & quizzes, <b>coordinated</b> programming labs, and <b>conducted</b> office hours & discussion sessions.	<b>San Diego, USA</b>
<b>Mar 2025</b> <b>Jan 2025</b>	<b>UC San Diego   CSE 167: Computer Graphics [🔗]</b> <i>Teaching Assistant   Taught by: Prof. Albert Chern</i> Ran <b>weekly office hours</b> for one-on-one help and <b>hour-long discussion sessions</b> on engaging graphics topics; crafted a student-friendly <b>ray-tracing final project</b> ; and worked on a <b>Gradescope autograder</b> for fast, consistent grading.	<b>San Diego, USA</b>
<b>Aug 2024</b> <b>Jul 2022</b>	<b>Deutsche India   Chief Technology Office, TDI</b> <i>Senior Analyst</i> I worked on OCR and <b>Document Understanding</b> to streamline document processing. My work spanned <b>Custom Document Entity Extraction</b> , <b>Smart Document Splitting</b> , <b>LLM-aided Contract Drafting</b> , and innovative software automations like <b>Automated Vulnerability Scanning</b> . I have also worked on the adaptation of <b>Document AI</b> within the organization and have experience in <b>Software Governance</b> .	<b>Pune, India</b>
<b>Jul 2021</b> <b>Jun 2021</b>	<b>Deutsche India   Chief Technology Office, TDI</b> <i>Technology Analyst Intern</i> As part of the research project, I worked on Optical Character Recognition, which encompassed tasks such as <b>Table Detection</b> , <b>Table Structure Recognition</b> from scanned documents, <b>Signature Extraction</b> , <b>Custom Named Entity Recognition</b> , and <b>Intelligent Character Recognition</b> .	<b>Pune, India</b>
<b>Apr 2021</b> <b>Jan 2021</b>	<b>Sardar Patel Institute of Technology</b> <i>Research Assistant   Advisor: Prof. Pramod Bide</i> I conducted research in the field of <b>Cross Event Detection</b> and <b>Topic Evolution Mining</b> from Social Media Posts, developing innovative algorithms for Cross Event Detection and <b>Sub-Topic Evolution</b> through the application of statistical NLP techniques.	<b>Mumbai, India</b>

## Education

<b>Current</b> <b>Sept 2024</b>	<b>University Of California, San Diego</b> MS, Computer Science & Engineering   <b>GPA: 3.7/4</b>	<b>California, USA</b>
<b>May 2022</b> <b>Aug 2018</b>	<b>Sardar Patel Institute of Technology</b> B.Tech, Computer Engineering   <b>CGPA: 9.63/10</b>	<b>Mumbai, India</b>

## Relevant Course Work

- CSE 270: Discrete Differential Geometry • CSE 272: Advanced Image Synthesis • CSE 276C: Mathematics for Robotics
- CSE 203B: Convex Optimization • CSE 291: Physics Simulation

## Publications

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- [1] **HRescue: A Modern ML approach for Employee Attrition Prediction** [🔗]  
Rudresh Veerkhare\*, Parshwa Shah\*, Jiten Sidhpura\*, Sudhir Dhage (\* = Equal Contribution)  
*Springer Proceedings in Mathematics & Statistics, vol 401. Springer, Cham.* [ICMLBDA 2022]
- [2] **FedSpam: Privacy Preserving SMS Spam Prediction** [🔗]  
Jiten Sidhpura\*, Parshwa Shah\*, Rudresh Veerkhare\*, Anand Godbole (\* = Equal Contribution)  
*Communications in Computer and Information Science, vol 1793. Springer, Singapore.* [ICONIP 2022]
- [3] **Face To BMI: A Deep Learning Based Approach for Computing BMI from Face** [🔗]  
Jiten Sidhpura\*, Rudresh Veerkhare\*, Parshwa Shah\*, Surekha Dholay (\* = Equal Contribution)  
*In Proceedings of ICITIIT, Kottayam, India, 2022, pp. 1-6. IEEE* [ICITIIT 2022]

## Awards

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- **India Excellence Award (Deutsche Bank, Feb 2023)** Award granted to only **280 out of 17000** (1.65%).
- **Best Graduation Project Exhibition Award (SPIT Mumbai, Apr 2022)** Awarded **1st prize** for project FedSpam.

## Research Projects

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### FedSpam: Privacy Preserving SMS Spam Detection (Team Size: 3)

*Federated Learning, NLP, Edge Computing*

- FedSpam is an edge computing application which leverages **Federated ML** to **preserve the user data privacy** while using the advanced data-driven ML solutions for spam detection.

### CustomXGBoost: XGBoost Implementation with Optimizers (Solo) [in | 🔗]

*Gradient Boosting, Optimizers*

- XGBoost **Implementation from scratch** where I've modified the **gradient boosting** to utilize optimizers such as **ADAM** and **RMSProp**.

### Arbit: A Decentralized Crypto Exchange Arbitrage System (Solo)

*Linear Algebra & Graphs, Blockchain Smart Contracts*

- Developed an efficient algorithm with **O(1)** time complexity for detecting **Nth order arbitrage** opportunity in Decentralized Crypto Exchanges (DeX).
- Utilized graphs and linear algebra in the derivation process.
- Implemented the system on the Cloud with optimal regions for low network latency, enabling continuous real-time blockchain monitoring and swift execution of profitable arbitrage transactions.
- Created a profitable personal project, generating approximately **\$10,000** in cryptocurrency in early 2022.

### HRescue: A Modern ML approach for Employee Attrition Prediction (Team Size: 3)

*Gradient Boosting, Explainable AI, Data Augmentations*

- Numerous attrition prediction methods have been developed in the past. However, This approach focuses on **interpretability** of ML models for sensitive employee attrition decisions and **outperforms prior methods** while addressing **data imbalance**.

### Face To BMI: A Deep Learning Based Approach for Computing BMI from Face (Team Size: 3)

*Computer Vision, Transfer Learning, Discriminative Learning*

- Developed a BMI prediction model from facial images using **transfer learning** on deep convolution networks, implementing **discriminative learning** to train the last few layers with varying learning rates for further model fine-tuning.
- Used **Tensor Processing Unit** for training Deep Learning models.

## Technical Skill

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<b>Programming</b>	C++, Python 3, Java, C, JavaScript, Typescript, Solidity, PowerShell, Shell Script
<b>Frameworks &amp; Libraries</b>	PyTorch, Numpy, Taichi-Lang, Keras, Tensorflow, Scikit-Learn, Huggingface, LangChain, ReactJS, NextJS, Django, Flask, FastAPI, SpringBoot

## Software Projects

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### Catalyst (Solo) [🔗|📄|in]

Open Source, Node js, VSCode Extension

- > Catalyst is a VS code Extension to accelerate the process of solving problems on Codeforces. It has **3000+ installed user and 12000+ downloads**

### ReactPy (Solo) [🔗|in]

Open Source, Web Python, Algorithm

- > ReactPy is a implementation of React in Python using Brython. It's a **from scratch implementation** of **React Fiber**, along with **diffing and Virtual DOM** in Python 3.

### Numras (Solo) [🔗]

Open Source, Numpy, Neural Networks

- > A **mini-framework** completely **implemented from scratch** using Numpy. Its api is similar to **Keras**. All of the operations like forward pass, backward pass and optimizations are carried mathematically from scratch.

### Recruitment Assisting Platform (Team Size: 4) [🔗]

Data Mining, Data Visualization

- > Used **Latent Dirichlet Allocation (LDA)** for grouping candidates based on the Resume.

### Elliptical Curve Diffie Hellman (Solo) [🔗]

Cryptography, Algorithms

- > Implemented **Elliptical Curve Diffie Hellman Key Exchange algorithm**, from scratch.

## Volunteering

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### 40+ Hours of CSR, Deutsche India

2022 - Present

- > Volunteered for development of applications to spread awareness about Mental Health.
- > Volunteered for School Kit Assembly and Distribution for underprivileged children.
- > Volunteered for crafting of environment friendly paper bags.

### Scikit Learn Open Source Contribution [🔗|📄]

Nov 2022

- > Implemented an Enhancements Proposal for allowing Minkowski distance with  $0 < p < 1$ .

### 10+ Hours of SEVA, Mumbai

2019 - 2020

- > Volunteered for teaching Maths and Science to high school underprivileged children.
- > Volunteered for Mumbai's Beach Cleaning.

## Hackathons



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- > **Predicting House Prices In Bengaluru (Machine Hack, Feb 2021)** Ranked **6th** out of 403 submissions (Top 1.4%).
- > **Predict The Data Scientists Salary In India (Machine Hack, July 2020)** Ranked **3rd** out of 192 submissions (Top 1.5%).
- > **Predict The Price Of Books (Machine Hack, July 2020)** Ranked **46th** out of 847 submissions (Top 5%).
- > **Video Game Sales Prediction (Machine Hack, June 2020)** Ranked **24th** out of 231 submissions (Top 10%).
- > **Computer Vision Classic (Machine Hack, July 2020)** Ranked **10th** out of 87 submissions (Top 11%).
- > **JanataHack: Machine Learning for IoT (Analytics Vidya, May 2020)** Ranked **28th** out of 202 submissions (Top 14%).
- > **KJSCE HACK 6.0 (KJSCE Mumbai, Apr 2022)** Won the Filecoin Track Prize of **\$260**.
- > **SPIT Hackathon 2021 (SPIT Mumbai, Feb 2021)** Won the Best Hack Build on Ethereum + Matic Prize of **\$200**.
- > **HackNITR 3.0 (NIT Rourkela, Oct 2021)** Won the Best Dapp Built on Celo Prize of **\$265**.

## Online Certifications

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- > **Advanced Machine Learning and Signal Processing (IBM, April 2020)** 📄
- > **Neural Networks and Deep Learning (Deeplearning.ai, May 2020)** 📄
- > **Structuring Machine Learning Projects (Deeplearning.ai, May 2020)** 📄

- › Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization (Deeplearning.ai, May 2020) 
  - › Convolutional Neural Networks (Deeplearning.ai, June 2020) 
  - › Sequence Models (Deeplearning.ai, July 2020) 
  - › Image Super Resolution Using Autoencoders in Keras (Coursera, July 2020) 
  - › Generate Synthetic Images with DCGANs in Keras (Coursera, July 2020) 
  - › Regression with Automatic Differentiation in TensorFlow (Coursera, July 2020) 
  - › Sequences, Time Series and Prediction (Deeplearning.ai, March 2021) 
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