# Rudresh **Veerkhare**

**MSCSE Student, UC San Diego**

rudresh.net | veerkharerudresh@gmail.com | RudreshVeerkhare | rudresh-veerkhare | Google Scholar


## 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

**Current – Mar 2025** | **UC San Diego | CSE 8A: Intro to Programming [🔗]** | **San Diego, USA**
*Teaching Assistant | Taught by: Prof. Leo Porter*

**Designing** exams & quizzes, **coordinated** programming labs, and **conducted** office hours & discussion sessions.

**Mar 2025 – Jan 2025** | **UC San Diego | CSE 167: Computer Graphics [🔗]** | **San Diego, USA**
*Teaching Assistant | Taught by: Prof. Albert Chern*

Ran **weekly office hours** for one-on-one help and **hour-long discussion sessions** on engaging graphics topics; crafted a student-friendly **ray-tracing final project**; and worked on a **Gradescope autograder** for fast, consistent grading.

**Aug 2024 – Jul 2022** | **Deutsche India | Chief Technology Office, TDI** | **Pune, India**
*Senior Analyst*

I worked on OCR and **Document Understanding** to streamline document processing. My work spanned **Custom Document Entity Extraction**, **Smart Document Splitting**, **LLM-aided Contract Drafting**, and innovative software automations like **Automated Vulnerability Scanning**. I have also worked on the adaptation of **Document AI** within the organization and have experience in **Software Governance**.

**Jul 2021 – Jun 2021** | **Deutsche India | Chief Technology Office, TDI** | **Pune, India**
*Technology Analyst Intern*

As part of the research project, I worked on Optical Character Recognition, which encompassed tasks such as **Table Detection**, **Table Structure Recognition** from scanned documents, **Signature Extraction**, **Custom Named Entity Recognition**, and **Intelligent Character Recognition**.

**Apr 2021 – Jan 2021** | **Sardar Patel Institute of Technology** | **Mumbai, India**
*Research Assistant | Advisor:* **Prof. Pramod Bide**

I conducted research in the field of **Cross Event Detection** and **Topic Evolution Mining** from Social Media Posts, developing innovative algorithms for Cross Event Detection and **Sub-Topic Evolution** through the application of statistical NLP techniques.

## Education

**May 2022 – Aug 2018** | **University Of California, San Diego** | **California, USA**
MS, Computer Science & Engineering | **GPA:** 3.7/4

**May 2022 – Aug 2018** | **Sardar Patel Institute of Technolgy** | **Mumbai, India**
B.Tech, Computer Engineering | **CGPA:** 9.63/10

## 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

**[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

- **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

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

## Software Projects

**Catalyst (Solo) [ | | ]**
*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) [ | ]**
*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

**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

› **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

› **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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