Siddhant Rai

+91 7007184357 | rsiddhant73@gmail.com | github.com/siddhant230 | linkedin.com/in/siddhant-rai/ | Ⓜ rsiddhant73

Problem solver and Engineer

Highly skilled in core Deep learning, Computer vision, NLP, GenAI, multi-modal architectures, Self-supervised learning (Low resource/data regime tasks) and optimization

EXPERIENCE

Siemens, *Lead Research Professional (Vision, NLP & optimization)* (Bengaluru, India)   Aug 2021 - present

- Developed **GPT4-Vision** based sensor extraction and characterization module from schematic diagrams.
- **AiDAMA** : Developed end-to-end information extraction pipeline using **detection and custom one-shot-classification** systems for P&ID diagram digitaliztion, wrote **Synthetic diagram generation** algorithm to generate usable and trainable dataset.
- **AI4Safety** : Developed, **deployed and field tested** the Computer vision based Survelliance and alert mechanim., currently being **used in multiple Siemens factories**.
- **E-mobility** : Pioneered time-series **forecasting** and **trajectory modeling** for efficient vehicle routing, while also developing interactive dashboards for **anomaly detection** and **trend visualization**.
- **Core member in Foundation models team** for VQI and semantic tasks, development and benchmarking of available models.
- Part of **DeltaQ innovation team**; majorly dealing with **replication, enhancement and rule space maintainence** of existing **VQI** platform
- Auto annotation tool for **zero and one shot image annotation**, extensively used in Ai4Safety and other internal projects.
- Procedural Video generation : Mechanism to **generate sequential industry level instruction video** using text as prior, pipeline included models such as **SDXl and SDXl-turbo with controlNets** for end-to-end generation and video editing.
- Optimization for **EV route planning** and charge management using **Quantum inspired Computing**.

SpringWorks, *Machine learning Intern | Engineer (Vision, NLP)* (Remote) (Bengaluru, India)   May 2020 - May 2021

- Conducted satellite **image segmentation and one-shot retrieval** using custom designed architecture and training methods to assess lawn area, optimizing cost estimates for mowing and plowing services. The developed solution improved upon the previous by around 40% reaching accuracy of 98%.
- Developed **custom architectures and backend systems to extract entities from government documents**, enabling seamless e-verification for Aadhar card, PAN card, and more.
- Established a **face matching** service by integrating document proofs and applicant selfies, enhancing **identity verification processes**.
- Developed a **resume parsing service**, employing rule-based and custom LSTM architecture with attention mechanisms to extract essential information from resumes and CVs, enhancing information retrieval efficiency, the developed method was **10x faster than previously employed process**.
- Worked on the creation of a **Job recommendation engine**, leveraging resume data and previous performance metrics to optimize job matches with job descriptions, enhancing candidate placement accuracy.
- Developed procedure to **generate multi-choice QnA** using rule sets and advanced techniques including GPT-3 and prompt engineering.
- Designed **in-house profanity filter** for filtering out discriminating question-answers.

Astute Resolutions, *Machine learning Intern (Vision)* (Remote) (Lucknow, India)   Aug 2019 - Oct 2019

- Developed **surveillance algorithms**, including camera temperature detection and fire/smoke detection, enhancing safety measures using **custom designed light-weight CNNs**.
- Spearheaded a parallel parking project, configuring both backend and UI components. Devised an **algorithm for optimal vehicle positioning** within tight parking spaces.

MENTORSHIP

HealthFlex, *Technical mentor and advisor (optimzation)* (Bengaluru, India)   Jan 2024 - Present

- Mentoring and developing 9DoF IMU driven **pose estimation and trajectory alignment verification** for a given movement/exercise.
- Developed **core sensor signal parsing** and conversion module
- Helping interns to **develop rules and patient onboarding** protocols.

Springworks, *Technical mentor (Vision & NLP)* (Bengaluru, India)   Jan 2023 - Mar 2023

- Mentored and helped the internal team to develop RAG based slack chatbot (Albus) utilizing **Langchain and LlamaIndex** as well as **vector databases**.
- Helped in **prompt optimization** and design as well as code quality checks.
- Tackled various problems related to response management and profanity checks.

Springworks, *Technical mentor (Vision & NLP)* (Bengaluru, India)   Nov 2021 - Jan 2022

- Mentored interns, ensuring code quality and offering **technical support** to foster their growth.
- Delivered comprehensive explanations of various deep learning algorithms, building a strong foundation from the ground up.

SKILLS

Languages	Python, C/C++, Java
Framework	Tensorflow, Pytorch, JAX, HugggingFace, RAG, LangChain, LlamaIndex, Flask, Falcon, Streamlit, Gradio
Software	Linux, Docker, OpenCV, Git, Bash

PROJECTS

Self-conditioned Diffusion model for Time series modelling and interpolation   Feb 2024
- Developed custom **Score based Diffusion model** for approximating temporal state dynamics.
- The model follows a **Non-Equilibrium Time Dynamical system** to sample noise across time.
- Main task was to model trajectory of time-series data with missing data points and approximate them by **temporal interpolation**.
- The algorithm further used to **understand and quantify data complexity** by computing Jacobian of energy surface (basically a gradient map).

Visual Question Answering for scene analysis   Dec 2023
- Utilized open-sourced BLIP2, groundingDiNo and SAM to create framework for **scene understanding, localization and retrieval**.
- For more detailed and structured outputs, replicated same **setup with Gemini-pro (vision)** instead of BLIP2.

Crypto clustering and trajectory analysis   Dec 2021
- Implemented algorithms to find correlation between different cryptos and cluster them together using **DTW**.
- Idea was to **analyze the major cryptos and their associated sub-cryptos**, such that by analyzing few parent coins we can largely **predict other sub-crypto behaviours**..
- The project and algorithm was eventually used by SpringWorks for internal purposes and partnerships.

Vision transformer   Jan 2021
- Implemented original vision transformer from scratch including **the attention blocks and patching layers**.
- Idea was to have custom architecture for low resource downstream tasks.

Neuro - Evolutionary Algorithms for Games   Jan 2020
- The main idea of the project was to augment famous games like Flappy Bird,Pong and Space Invaders and automate them using concept of Evolutionary Learning.
- Implemented Multi-layered **Neural Net from scratch using Numpy** along with Back-propagation algorithm.
- Implemented a **custom weight updation module** inspired from randomised weighted gradients/weighted mutation.

INVENTIONS AND PUBLICATIONS

- Submitted **13 Invention disclosure** on topics ranging from VQI on digital twins to Encryption and data compression.
- Paper on **Object detection and zero-shot retrieval of symbols from P&ID diagrams** (under review).
- **Uncertainty estimation** in models for structure predictions (in progress).

COLABORATIONS and COMMUNITY

Genesis AI Labs, *Research Collaborator*   Feb 2024 - present
- Research on Protein structure prediction, drug discovery and other Geometric DL works.

CORD.ai, *Research Collaborator*   Jul 2022 - present
- Research collaboration on Computer vision and NLP tasks.

EDUCATION

Lovely Professional University, *B.Tech in Computer Science* | Punjab, India	GPA: 8.5 / 10		2017-2021
City Montessori school, *Class 12th | ISC | Computer Science* | Lucknow, India	percent: 94%		2015-2016
City Montessori school, *Class 10th | ICSE | Computer Science* | Lucknow, India	percent: 91.80%		2013-2014

INTERESTS

Technical Writing	I write descriptive blogs about topics ranging from Protein structure prediction to Generative models and core optimization some of them are on my LinkedIn and Medium.
Art	I have always enjoyed drawing and sketching, mostly I do landscapes.
Puzzles	I love solving puzzles, riddles and cubes
Books	Cherish reading about philosophy (both west and east) as well as fiction books.
Games	Quite skilled in track events like 100, 200m sprints as well as sports such as football and badminton.