Binod Singh

+49 1575 1360664 | singh96binod@gmail.com linkedin.com/in/singhbinod/

EDUCATION

Technical University of Munich — Munich, Germany
Masters of Science, Computational Mechanics, Grade: 1.9 — *Sep 2024*

- **Relevant Coursework**: Intro to Deep Learning, Machine Learning, Professional Software Development, Engineering Databases, Computational Linear Algebra, Parallel Programming, Computer Vision, Visual Data Analytics, Risk Analysis (Prob & Stat), Computation in Engineering (I & II)

EXPERIENCE

Stanford University, Gradient Spaces Lab — Stanford, California
Machine Learning Research Associate (Remote): — *Dec 2024-*

- Developed a zero-shot cross-modal scene graph alignment framework leveraging multi-modal data including point clouds, CAD meshes, RGB images, spatial referrals, and text captions
- Employed Open-vocabulary based alignment instead of closed form vocabulary, which significantly improved node alignment by 33% on real-world datasets
- Improved alignment even in low-overlap and noisy environments, significantly outperforming current state-of-the-art SG-PGM
- Paper Submitted to **RAL**: SGAligner++: Cross-Modal Language-Aided 3D Scene Graph Alignment **under-review**

Chair of Computational Modeling and Simulation — TUM, Munich
Master's Thesis: Deep Learning, Computer Vision, Graph-based Entity Alignment — *Aug 2023 - April 2024*

- Preprocessed and validated the structural, topological, and geometrical information of 3D point clouds into 3D scene graphs
- Encoded structural, topological and geometrical features using Graph Attention Network and Meta Encoders
- Developed a novel feature Encoder to encode semantic and geometric information, which led to a decrease of time cost by ˜10%
- Investigated the approach potential in solving partial-partial registration between PCD and its 3D model
- Improved Mean Reciprocal Rank to 0.97, from 0.79, improvement of 22%

ITQ GmbH (Part Time) — Garching Hochbruck, Munich
Software - Machine Learning Engineer — *Mar 2022 - Mar 2024*

- Performed Exploratory Data Analysis (EDA) on Time Series Data to identify key features
- Developed an anomaly detection model on multivariate time series with an accuracy of 98% using TCN, LSTM
- Deployed a Machine Learning pipeline using Docker and GitLab CI/CD for automated build and deployment
- Implemented MSTest and enhanced test coverage of a 3D Physics engine by 80%

Siemens — Neuperlach, Munich
Machine Learning Intern — *Mar 2022 – Nov 2022*

- Performed data cleaning preprocessing to predict traffic accidents using simulated Aimson AV data from Siemens
- Employed Machine Learning algorithms to design and deploy an ML pipeline to detect accident-prone sections and corners achieving F1 score: 0.89, Precision: 0.98 and Recall: 0.82
- Partnered with ML experts at Siemens and presented the solution to a team of Industry specialists

SKILLS

Languages: Python, C++, C#, SQL, InfluxDB
Tools: Git, CI/CD, Docker, Kubernetes, AWS, Bash, Weights and Biases,
Libraries: pandas, NumPy, Matplotlib, PyTorch, Tensorflow, Langchain, XGBoost, Scikit-learn, scipy

PROJECTS

Point Cloud Segmentation and automatic 3D reconstruction | *Python, C++, Docker, Computer Vision*
- Fine-tuned pre-trained PointNet and PointNet++ for segmentation on Naavis Dataset
- Optimized model performance and validated with a mean Jaccard score of 0.7
- Extraced parameters from segmentation using RANSAC to facilitate 3D reconstruction from point clouds

AI Supported - Pedestrian Routing | *Python, PyTorch, GANs*
- Leveraged Generative Adversarial Networks (GANs) to generate realistic pedestrian trajectories
- Trained GANs on simulated data and compared the distribution with test data, validating the model's ability to replicate realistic pedestrian behaviors and interactions

FEM-Model Optimization and Validation | *Python, Optimization*
- Implemented adaptive optimization techniques to dynamically update the model based on real-time data
- Successfully optimized the discrepancy between FEM-model and real-world structures using global optimization methods with Relative Error(RE): **0.01%** with Basin Hopping, **0.15%** with Steepest Descent, **0.21%** with SHGO, **1.44%** with Dual Annealing

Vectorisation and MPI one-sided Communication with RMA of shallow water equations | *C++, SIMD, MPI*
- Implemented SIMD Vector Intrinsics, improving the computation time by 42%
- Replaced standard MPI with MPI RMA, which reduced the communication overhead by 31%

Payment Console App | *C#, SQL*
- Developed a Money Tracking console application for payments and debts using Entity Framework
- Integrated CRUD functionality, enabling users to record, update, and retrieve transaction details
- Validated the quality and reliability of the app using comprehensive unit tests

SPOKEN LANGUAGES

Nepali(Native), English(C2), Hindi, German(B1)