Muhammad Moosa

+4741248691 chmoosa6@gmail.com linkedin.com/m-moosa Gjovik, Open to relocate

Education

Norwegian University of Science & Technology (NTNU), Norway August 2022 - June 2024
MS Applied Computer Science *Norway*

- NORPART-CONNECT Fellow with complete scholarship coverage.

Sukkur IBA University, Pakistan January 2017 - June 2021
B.S. Software Engineering *Pakistan*

- NTHP, OGDC Fellow with complete scholarship coverage.

Technical Skills

Programming: Python, JAVA, JavaScript

Backend: FastAPI, REST APIs, Authentication, Containerization (Docker)

Machine Learning: Supervised & Unsupervised Learning, Model Optimization ,PyTorch, TensorFlow, Scikit-learn, NumPy, Pandas, Matplotlib

Object Detection: YOLO-X, YOLO-NAS, EfficientDet

Object Tracking: SORT, FairMOT, OC-SORT, ByteTrack, DeepSORT

Frontend: React

Databases: Firebase, PostgreSQL

Tools: Git, Jupyter Notebooks, Linux, VS Code, JIRA

Language: English (Proficient), Norsk (Level 1)

Experience

IIK, NTNU, Norway Sept 2024 – Present
Backend developer

- Developed RESTful API endpoints using FastAPI, ensuring scalability and performance.
- Designed and implemented relational database models with PostgreSQL.
- Created dynamic SQLAlchemy models with constraints, validation, and back-referencing for seamless integration with the application logic.
- Deployed the application in a Dockerized environment, configuring multi-service setups with Docker Compose.

Norsvin & NTNU, Norway Aug 2023 – June 2024
Thesis

- Enhanced EfficientDet with Barlow Twins (Self-Supervised Learning) to improve feature extraction and robustness in occlusions.
- Fine-tuned MobileNet on a re-identification dataset to recover lost object tracklets using appearance-based similarity.
- Extended OC-SORT by incorporating Kalman Filters, IoU-based association, and an improved tracklet reconnection mechanism for handling occlusions.
- Introduced a mechanism to create and merge temporary tracklets for occluded objects, reducing ID switches and improving long-term tracking consistency.

IDI, NTNU, Norway January 2023 – June 2024
Student Assistant

- Aiding course instruction through student support, grading, and assisting in class activities
- PROG2051 - Artificial Intelligence - Spring 2023 & 2024
- IDATG2204 - Database management system - Spring 2023

- IDG2003 - Back-end web development - Autumn 2023
- TDT4127 - programming and numerics - Autumn 2023

IIK, NTNU, Norway June 2023 – August 2023

Backend Developer *Python, FastAPI, Docker*

- Led the development of a FastAPI-based CTF Generator at NCR, ensuring efficient API deployment.
- Implemented secure backend functionalities using FastAPI, including authentication and real-time event handling.
- Collaborated cross-functionally to design and integrate RESTful APIs for a scalable CTF generation platform.

Projects

BRUA | *FastAPI, PostgreSQL, SQLAlchemy, Alembic, Docker, Pydantic*

- Designed and implemented a robust RESTful API for managing organisational data, enabling CRUD operations
- Developed database models and relationships using SQLAlchemy with PostgreSQL.
- Implemented data validation and serialization using Pydantic models for API request and response schemas.
- Implemented comprehensive logging for monitoring API requests and debugging, improving overall system reliability.

Animal Tracking System | *Python, TensorFlow, NumPy, OpenCV, EfficientDet, Barlow Twins, Kalman Filter*

- Enhanced EfficientDet with Barlow Twins, a self-supervised learning method, to improve detection performance in occluded and cluttered environments.
- Extended OC-SORT by integrating a Kalman Filter for motion prediction and IoU-based association for frame-to-frame object tracking.
- Implemented an appearance-based re-identification module using a fine-tuned MobileNet, allowing recovery of tracklets during occlusion and reconnection of fragmented tracks.
- Introduced imaginary tracklets for occluded objects and a matching mechanism to reconnect broken tracklets based on motion, spatial proximity, and appearance similarity.

Underwater Acoustic Signal Classification Using Deep Learning | *Deep Learning, CNNs, PyTorch, Audio Spectrograms*

- Iimplemented classification models (ResNet18 and MobileNet) to analyze and classify underwater acoustic data using spectrograms and mel-spectrograms.
- Preprocessed large-scale acoustic datasets by converting audio recordings into visual representations, enabling the application of advanced image classification techniques.
- Evaluated models using key metrics such as precision, recall, F1 score, and confusion matrices, providing detailed insights into their performance across diverse sound categories.

OSN Analysis Dashboard | *Python, Flask, Plotly, NLTK, Tweepy, Twitter API*

- Integrated the Twitter API to programmatically fetch tweets for real-time analysis.
- Implemented text preprocessing techniques such as stop word removal, punctuation elimination, and text normalization to clean and standardize tweet data.
- Utilized NLTK for natural language processing tasks including tokenization and part-of-speech tagging to enhance the analysis process.
- Designed and executed data visualization scripts using Matplotlib to represent sentiment analysis results, facilitating easy interpretation of trends and patterns in tweet sentiments.

Publications

13th International Conference on Image Processing Theory, Tools and Applications IPTA 2024

Self-supervised Animal Detection, Tracking & Re-Identification *Accepted*

- Moosa, M., Faouzi Alaya Cheikh., Muadassar, Muhammad., Beghdadi, Azeddine. & Ullah, Mohib.(2024).

20th International Conference on Artificial Intelligence Applications and Innovations 2024

SMT: Self-supervised approach for Multiple Animal Detection & Tracking *Published: 19 June 2024*

- Moosa, M., Ullah, Mohib., Imran, A. S., Hashmi, Ehtisham., Muadassar, Muhammad. & Faouzi Alaya Cheikh.(2024). *Link*

Computers in Biology and Medicine (IF 7.7) September 2023

Literature Review *Published: September 2023*

- Ali, S., Akhlaq, F., Imran, A. S., Kastrati, Z., Daudpota, S. M., & Moosa, M. (2023). The enlightening role of explainable artificial intelligence in medical and healthcare domains: A systematic literature review. Computers in Biology & Medicine, 107555.*Link*

Awards & Achievements

- OGDCL NTHP – Fully Funded Scholarship (BS) - (2017 - 2021)
- NORPART-CONNECT Scholarship for MACS at IDI, NTNU - (2022 - 2024)
- HEC Football Division Champion (Captain) - (2021)
- Winner of the Inter-Dorm Football & Cricket Championship (Captain) - (2018)

Extra Curricular Activities

- Acted as Coordinator for Sports & Adventure Society, Sukkur IBA University, 2020-21.
- Served as captain of the University football team from 2018 to 2021.
- Executive member of ACM society, chapter 2021, Sukkur IBA.
- Organized the university's Sports Gala event as a coordinator in 2021.
- Arranged over four blood donation drives, collecting more than 800 bags of blood.

References

Md Mujahid Islam Peal: Senior Engineer at NTNU, Gjøvik, Norway — Email: *md.m.i.peal@ntnu.no*, Contact #: *tel:+4748509803*

Ali Shariq Imran: Associate Professor at NTNU, Gjøvik — Email: *ali.imran@ntnu.no*, Contact #: *+47 96822072*

Muhammad Mudassar Yamin: Associate Professor at NTNU, Gjøvik, Norway — Email: *muhammad.m.yamin@ntnu.no*, Contact #: *+47 96999968*