



# Debargho Basak

## Master's Student

Highly motivated and hardworking computer science Master's Student with a strong background in software development and machine learning. Demonstrated ability to effectively address real-world problems by leveraging software solutions that meet business needs. Eager to expand expertise in machine learning and contribute to enhancing business effectiveness through AI technologies. Seeking opportunities to further develop skills and drive innovation in the field of machine learning.

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## WORK EXPERIENCE

### Master Thesis Student MMK group, TU Munich

10/2023 - 04/2024

Munich, Germany

#### Achievements/Tasks

- Working on creating a **robust end-to-end trainable Deep Neural Network** for **Long Range Multi-Modal (Camera + Radar) 3D object tracking**.
- Literature Review** on the topics of **3D object tracking** and the immediate impact of radar data on the performance and training of these networks.
- Performing **ablation** to infer the **suitability** and **practicality** of **integrating** radar based features into the DNN architectures.
- Conceptualization** of various **novel deep neural network architectures** for tracking objects based on appearance features.
- Training** different deep neural networks, **Evaluation** and **Analysis** of performance by benchmarking against public datasets i.e. **NuScenes**.

### Perception Developer Intern : Autonomous Driving MAN Truck & Bus SE

05/2023 - 04/2024

Munich, Germany

#### Achievements/Tasks

- Spearheading the creation of a cutting-edge **multimodal perception software stack (Camera + Radar + LiDAR)** for autonomous trucks, focusing on **3D perception** tasks like **detection**.
- Innovated by devising a **novel neural network architecture** tailored to exploit both **camera images** and **weak radar supervision**, resulting in robust depth estimation capabilities.
- Integrated the **proposed neural network** module seamlessly into the perception stack's feature backbone, enabling an **end-to-end training approach**. This strategic enhancement led to remarkable performance gains.
- Demonstrated the potency of our approach through rigorous benchmarking on the nuScenes dataset. Notably, our 3D perception (detection + tracking) performance surpassed **state-of-the-art baselines by an impressive 2% margin**.
- Deployed our solution to vehicle to using **TensorRT** and **C++**, performed **code review**, curated **documentation** and **unit/load testing**.

## PROGRAMMING SKILLS

### Languages

Python, C++, R, Javascript, MATLAB, Java, ROS

### Tools & Frameworks

PyTorch, Hugging Face, Keras, OpenCV, SpaCy, Git, JAX, CUDA, ONNX, Open3D, trimesh

### Database

SQL, MongoDB, Apache Spark

### Operating Systems

Linux, Microsoft Windows, Ubuntu

### Productivity

LibreOffice, Microsoft Office, LATEX

### Other

Kubernetes, Docker, FastAPI, AWS, GCP, Apache Airflow

## KEY PROJECTS

### Semantic Segment Anything (04/2023 - 08/2023)

- Developed an engine for seamless integration of existing semantic segmenters with SAM, enhancing generalization and mask precision.
- The SSA engine includes Mask and Semantic branches with a voting module to determine mask categories, offering clear mask boundaries and customizable pixel categorization.
- The resultant pipeline allows for combining the fine image segmentation masks from SAM with the rich semantic annotations provided by advanced close-set segmenters models (Segformer, Oneformer, etc.), allowing to generate semantic segmentation models with stronger generalization ability, as well as a large-scale densely categorized image segmentation dataset.
- Frameworks used** : Python, PyTorch, OpenCV, CUDA
- Github**: <https://github.com/ind4zy/Semantic-Segment-Anything>

### Overhead Direct Convolutions (10/2022 - 02/2023)

- Implemented an efficient convolution algorithm between 3D and/or 4D tensors to reduce memory overhead.
- Used Overhead Direct Convolutions proposed in Zhang et al., 2018.
- The resultant algorithm reduces memory overhead commonly encountered in convolution layers in deep neural networks.
- Frameworks Used** : C++, Makefile
- Github**: <https://github.com/ind4zy/Overhead-Direct-Convolutions>

## WORK EXPERIENCE

### Student Research Assistant Fraunhofer AISEC

11/2022 - 03/2023

Garching, Germany

#### Achievements/Tasks

- Investigating the effect of incorporating a **strong uniform continuity** in **Deep Learning training mechanisms** for greater robustness against **Adversarial attacks**.
- Designed a novel DL training mechanism that allows for the **simultaneous optimization** of both **training loss** and **estimation of Lipschitz constant/continuity**.
- Applied the newly devised training mechanism to the **refinement** of conventional 2D and 3D object detection models, including prominent architectures such as **YOLO** and **PointRCNN**.
- Benchmarking results on both 2D and 3D Object Detection datasets such as **COCO**, **KITTI**; etc.

### Natural Language Processing Research Intern Convase A.G.

05/2022 - 09/2022

Munich, Germany

A Munich based AI startup that provides NLP based solutions for the industry using their no code platform.

#### Achievements/Tasks

- Developed a **SOTA novel clause splitting** (i.e. **splitting the sentences into a main clause and subordinate clause**) approach in **English and German** to be integrated and deployed into the company's NLP software products.
- Created a model based by combining the latest research in **Text Simplification** and **Open Information Extraction** around the **T5 transformer with a novel decoder architecture** to achieve clause splits in sentences.
- Procured** and **curated** a custom German and English dataset for training the model.
- Performed **model quantization (ONNX)** and **pruning** to improve performance during deployment.
- Deployed the solution code stack to **GCP** utilizing a **docker container image** and **Kubernetes engine**, performed **code review**, and **unit/load testing**.

## EDUCATION

### MSc. Informatics Technische Universität München

10/2021 - 03/2024

München, Bayern, Deutschland

#### Courses

- Focus Areas:** Machine Learning, Deep Learning, Computer Vision, NLP and Software Engineering.
- GPA:** 8.3/10

### B.E. in Instrumentation And Control Engineering University of Delhi

06/2017 - 07/2021

New Delhi, India

#### Courses

- Focus Areas:** Software Engineering, Electronics and Robotics.
- GPA:** 9.04/10

## KEY PROJECTS

### Object-Detection (02/2021 - 06/2021)

- Designed an end-to-end architecture by combining YOLO and DeepSORT to perform real-time object detection, recognition and localization of objects in its camera view.
- Modified YOLOv3 and YOLOv4 to attain fast computations with lesser computational requirements and sub-second inference times.
- Proposed architecture allows for a diverse set of applications based on the detected object (Pedestrian Counting).
- Frameworks used** : Python, PyTorch, OpenCV, CUDA
- Github**: <https://github.com/ind4zy/Object-Detection>

### Data Warehouse for Skytrax (08/2020 - 12/2020)

- Engineered a setup combines Docker-based ETL pipelines, Apache Airflow for orchestration, AWS Redshift as a cloud data warehouse, and Metabase for data visualization, including analytical dashboards to create a cohesive data ecosystem to manage, process, and present data effectively.
- Used Apache Airflow to schedule and automate data workflows, ensuring reliable data processing and management.
- Docker containers enhance the portability and scalability of ETL pipelines. Together with Airflow it ensures efficient data extraction, transformation, and loading processes.
- Metabase empowers users to create analytical dashboards and visualizations, facilitating data-driven insights from AWS Redshift. This combination enables accessible and user-friendly data interpretation for informed decision-making.
- Frameworks used** : Python, Apache Airflow, AWS Redshift, Metabase, SQL
- Github**: <https://github.com/ind4zy/Data-Warehouse-for-SkyTrax>

## PUBLICATIONS

#### Research Paper

### A Comparative Analysis of Intelligent Classifiers for Seizure Detection Using EEG Signals

#### Author(s)

Debargho Basak, Arshdeep Singh, Upmanyu Das, Priya Chugh, Dr. Jyoti Yadav

22/07/2021

Springer/Advanced Computing and Intelligent Technologies /577-591

<https://lnkd.in/esWN7yJ>

## LANGUAGES

English

Native or Bilingual Proficiency

Dutch

Professional Working Proficiency

German

Professional Working Proficiency

Italian

Limited Working Proficiency

## INTERESTS/HOBBIES

Novels

Football

Video Games

Music