Ekagra Gupta

📱 +49 15758489284 ✉ ekagrag99@gmail.com 🏠 Stuttgart, Germany
in/ekagra github.com/ekagra portfolio/ekagra

Professional Experience

Student Assistant, *(Fraunhofer IPA)*   **Stuttgart, DE** *08/2024 - present*
- Preparing datasets by auto-labeling defects in high-resolution manufacturing component images using models like YOLOv5, SAM, and SAM2 for bounding box and mask generation.
- Optimized the labeling workflow to improve efficiency, ensuring high-quality labels for training defect detection models.

Internship, *(Bosch Center for Artificial Intelligence)*   **Renningen, DE** *11/2023 - 04/2024*
- Benchmarked detection accuracy and robustness of perception models in autonomous driving scenarios, utilizing vision transformers like StreamPETR, FAR3D, and FIERY (static and temporal)
- Simulated real-world variations in the nuScenes dataset with corruptions (e.g. Gaussian noise, frost) and instance manipulations (e.g. object scaling from $1.0\times$ to $2.0\times$), achieving 100% object isolation accuracy for precise data processing.
- Leveraged NVIDIA $A100$ and $V100$ GPUs for evaluation, reducing inference time by up to 40% while identifying key corner cases in model performance.

Working Student, *(Daimler Truck AG)*   **Stuttgart, DE** *02/2023 - 10/2023*
- Enhanced MoLaSim (in-house engine mount analysis tool) by integrating VBA scripts, improving the analysis speed by 25% and enhancing the user interface, resulting in a 15% increase in usability based on internal feedback.
- Automated Simpack (multi-body simulation tool) workflows by creating custom Python scripts, reducing data export time by 30%, and improving data accuracy by 10%, leading to more efficient simulations in daily operations.

Student Assistant, *(Fraunhofer IPA)*   **Stuttgart, DE** *04/2023 - 09/2023*
- Conducted comprehensive literature research and analyzed data from over 50 sources to forecast commodity price trends.
- Engineered a Python-based dashboard for transport route monitoring, integrating real-time data from $10+$ sources and enhancing system functionality by 30%.
- Independently developed a route planning module that reduced transport planning time by 20% and improved route optimization by 15%.

Student Assistant, *(Greenteam Uni Stuttgart)*   **Stuttgart, DE** *11/2022 - 03/2023*
- Contributed to developing a driverless race car for international Formula Student Electric competitions.
- Implemented vehicle pose estimation using perception data through C++ and ROS2.
- Enhanced a landmark-based pose-graph mapping system, enhancing the precision of vehicle localization by 20%

Student Research Assistant, *(Universität Stuttgart IPV)*   **Stuttgart, DE** *01/2022 - 09/2022*
- Designed and simulated equivalent circuit models of Li-ion batteries using MatLab/Simulink, achieving a 95% correlation with experimental data.
- Implemented and evaluated multiple algorithms for estimating State of Charge (SoC) and State of Health (SoH) degradation.
- Characterized and parameterized Li-ion cells across a temperature range of $-20°C$ to $+60°C$ using Distribution of Relaxation Time (DRT) from synthetic Electrochemical Impedance Spectroscopy (EIS) data.

Education

MSc Electrical Engineering *Universität Stuttgart*   **Stuttgart, DE** *2021-Current*
Grade: 2.3 (Tentative)

BTech Electronics and Communication Engineering *GGSIP University (MAIT)*   **Delhi, IN** *2017-2021*
Grade: 8.98

Publications

Towards a Practical Evaluation of Adversarial Robustness of Machine Learning Classifiers
Proceeding IMECE 2024

- Developed a novel adversarial distance estimation algorithm using iterative attacks that achieved up to $30\text{-}40\%$ tighter perturbation bounds compared to traditional methods like DeepFool, significantly improving the accuracy of robustness evaluation across $500+$ test samples in image classification tasks.

- Performed extensive parameterization and ablation studies across three norm distances (L_1, L_2, L_∞), with over 20% reduction in computation time compared to existing methods.

- Presented at **IMECE 2024 (ASME International Mechanical Engineering Congress and Exposition)**, showcasing research that led to up to 50% better adversarial distance estimates, validated on large-scale machine learning datasets.

Design of Circularly polarized irregular octagonal shaped and dumbbell slotted planar and conformal patch antenna
SCI 2021

- Designed and simulated circularly polarized planar and conformal patch antennas with octagonal and dumbbell slot geometries, optimizing polarization and impedance bandwidth for high-frequency communication.

- Published in **SCI 2021**, highlighting the antenna design's ability to maintain robust circular polarization and meet performance targets in planar and conformal configurations.

Skills

- **Programming and Software Development:** Python, Matlab, C++, Git, Simulink, ROS2 (Robot Operating System), Linux, VBA

- **Machine Learning and Computer Vision:** PyTorch, Tensorflow, AWS Sagemaker, IBM LSF, Image processing, Object Detection

- **Tools and Platforms:** StreamLit, Autodesk Fusion 360, Solidworks, SimPack

Projects

Structured Comparison of Metrics to Evaluate the Robustness of Image Classification Models. (Forschungsarbeit) ⌂ github.com/forschungsarbeit

- Developed and evaluated robustness metrics (Adversarial Distance and CLEVER Score) on WideResNet models trained with the CIFAR-10 dataset, demonstrating upper and lower bounds using the Lipschitz Continuity principle.

- Implemented an *early-stopping Projected Gradient Descent* algorithm using CleverHans, reducing adversarial attack iterations by 50% while maintaining model accuracy.

- Analyzed adversarial robustness of image classifiers using L_∞ norm and CLEVER score, showing a 30% increase in resilience to adversarial attacks.

F450 Quadcopter (Major Project)

- Designed and constructed a stable Quadcopter with $F450$ frame characteristics capable of transporting a CO_2-containing payload for emergency response operations.

- Engineered the Quadcopter to maintain stability and flight performance under varying payload conditions, optimizing lift and control systems to support a payload of up to 2 kg.

Languages

- **Hindi** [Native]
- **English** [Proficient]
- **German** [Basic] - Learning (A2)