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Unser Zeichen

Erlangen, 26.07.2022

## To Whom It May Concern

I am writing this letter to certify that **Mr. Shorya Sharma** (Roll No.-19EE01017), a third year B. Tech student of Electrical Engineering, Indian Institute of Technology Bhubaneswar, did his research internship at our **Pattern Recognition Lab** at **University of Erlangen-Nuremberg** from **May 16, 2022** to **July 24, 2022** under my supervision.

During his internship, Mr. Sharma worked for our Computer Vision research group on the ongoing project '**Deep Learning Algorithms in Remote Sensing Image Scene Classification: Adversarial Attacks and Defenses**'. This project explores the properties of adversarial examples of RSI scene classification and develop novel defense approaches to make targeted classifier models more robust to adversarial attacks.

Mr. Sharma has successfully supported this research and in doing so, he learned and applied the scientific procedures and working techniques within this field of research. I observed that he is quite well versed in adapting to multiple programming languages and machine learning libraries along with being dedicated to his work with an interest in providing novel approaches to solve the limitations faced in this new field of research in adversarial learning. His work included the following tasks:

- Literature review on current state-of-the-art adversarial attacks and defense mechanisms in the area of RSI scene classification
- Design and Implementation of a range of white-box adversarial attacks on aerial imagery datasets with the help of Machine Learning libraries such as PyTorch, FoolBox, OpenCV, Scikit-Learn in Python language
- Implementation of algorithms to defend against these attacks using techniques like adversarial training, stochastic activation pruning, Generative Adversarial Networks
- Analysis, evaluation and presentation of his work and findings

The tasks entrusted to Mr. Sharma have always been carried out by him very reliably and to our full satisfaction. During the internship period, he was disciplined and consistent with his work and constantly kept me updated about his ongoing works. His behavior towards supervisors and employees was impeccable at all times. Overall, I appreciate Shorya's work in my lab and wish him all the best for his future career.

Best Regards,

Prof. Dr.-Ing. habil. Andreas Maier



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