Master's Thesis

Anomaly Detection and Active Learning for Semantic Segmentation Tasks
Clean, labeled datasets are an invaluable asset to research and industry for training and deploying machine learning algorithms such as convolutional neural networks (CNN). Procuring such datasets involves data collection, sorting and labeling, all of which are typically done by humans. This expensive process is time consuming, costly and does not scale well, even when outsourced.

The field of anomaly detection and active learning aims to tackle these challenges. In active learning, a CNN can be trained on a small set of labeled data. Once deployed in a real-world scenario, an uncertainty or loss predictor can be implemented alongside the algorithm to predict which data would result in high loss for the model. These non-trivial examples can be collected actively during deployment and forwarded to humans or more complex algorithms to observe, label and retrain the deployed CNN on. In anomaly detection, a network can predict which samples represent outliers or interesting anomalies with respect to the rest of the dataset. This further helps humans clean and sort such examples accordingly.

The goal of this thesis is to implement an anomaly detector and an uncertainty head to a CNN-based semantic segmentation application. The implementation will be tested on a real-world industrial AI application.

Prerequisites

To successfully complete this project, you should have the following skills and experiences:

- Good programming skills in Python and Tensorflow
- Good knowledge of neural network training theory
- Experience with convolutional neural networks for semantic segmentation

The student is expected to be highly motivated.

Contact

Nael Fasfous
Department of Electrical and Computer Engineering
Chair of Integrated Systems

Phone: +49.89.289.23858
Building: N1 (Theresienstr. 90)
Room: N2116
Email: nael.fasfous@tum.de

Advisors

Nael Yousef Abdullah Al-Fasfous