Explainable Medical Image Classifier based on Human Diagnosis Behaviour

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Description

Diagnosis of skin diseases requires a tremendous amount of professional training and experience. Dermatologists base their decisions on the recognition of diagnostically relevant patterns and apply simple algorithms that have been statistically derived by experts over the last decades. Deep Learning based AI algorithms achieved superhuman performance in several medical imaging fields like ophthalmology, dermatology and radiology. However, the opaque nature of modern black-box algorithms hampers their practical usability in clinical applications due to the lack of user trust and legal restrictions.

The goal of this research project is to develop a new method imitating the explainable diagnosis behavior of human dermatologists. The project includes following tasks:

- Training of high performing CNN classifiers for skin lesion classification.
- Training of additional diagnostic criteria classifier on top of the network's embeddings.
- Training an explainable linear classifier on top of the selected, relevant criteria.

Requirements

- Language: Python
- Frameworks: TensorFlow or PyTorch
- Packages: Scikit-learn
- Software: Git
- Theoretical Knowledge: Image Processing, Machine Learning

Test Task

1. First, follow the instructions on https://git.opendfki.de/ to create an account.
2. Download the CIFAR-10 dataset.
3. Train an AlexNet classifier on CIFAR-10 in Tensorflow or PyTorch.
4. Train two separate linear SVM classifiers on training data embeddings extracted from two different intermediate locations of the AlexNet network.
5. Report the performances of vanilla AlexNet and the two SVM classifiers on the CIFAR-10 test data.
6. Push your code to a Gitlab repository and make it available to 'lucieri'.