PROJECT PROPOSAL HUBERT

TITLE: Automatic detection of angle and length of lines in images

OBJECTIVE

Detecting angles, as well as lengths, of lines in images has practical usage in robotics to determine the required orientation and positioning of a robotic arms that are being guided by a camera. The ability for a computer to 'see' lines will be useful for instance, to navigate, and position a robot arm so as to pick up objects from a table. The project's objective is to try out, and compare various Machine Learning Algorithms as to train models that can automatically detect angles and lengths lines in images.

PROBLEM FORMULATION:

The problem is how to best train a machine learning model in order to determine the length and angle of a line displayed in an image.

DATA PLAN

I will be writing code to generate data sets for the purpose training and testing (each image with a single line). I will be using the 'Bressenham' algorithm as to draw lines, with a pixel width of 1.

To allow for a progressively increase in complexity of input data for training, I will prepare the same dataset for the line in 3 versions:

i) displayed on white back-ground
ii) displayed on noisy back-grounds
iii) displayed on larger size together with reference objects
(so we can strive for training the model for scale independency)

Input data size will be at least 100 images (50*50 bmp images), which will then be later split 80% for training and 20% for testing. The corresponding angles and lengths of each line will be stored in a separate csv file.

FEATURE EXTRACTIONS

I will be using PCA to visualise the feature dependencies, as to see if features set can be reduced. It is foreseen that feature extraction will be done automatically by the model.

I consider to train the model gradually, starting with lines starting in the origin with fixed lines and random angles, followed with lines starting at random location and random angles, but fixed lengths, and lastly with lines with random location, angles and lengths.

EVALUATION METHODS

The model is going to predict angles and lengths, so we may measure the performance through Mean Square Errors and R2 score. Learning curve can be plotted to monitor the training the model for overfitting/under fitting.

PROPOSED METHODS

PROJECT PROPOSAL HUBERT

Tentatively I will consider to utilise Linear/ Logistic Regression, CNN may also be considered

CODE PLAN

Project will be coded in Jupyter Notebook