Evaluating Solution Correctness and Problem Difficulty Based on Code Metrics

Gurpreet Singh (# *250674134*) GSINGH95@UWO.CA
The University Of Western Ontario

Abstract

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1. Description of Applied Problem

1.1. Problem

A large amount of educational material related to programming exists on the internet but the majority of which is not well structured or presented. An applied problem that can be observed from educational material found online is that code quality is often left mutually exclusive from code functionality. This leads to some readers believing it is acceptable to write code that produces the correct result even if the process behind it is not correct. Online code challenge websites like CodeChef.com do not take into account the style and quality metrics of a code submission when judging competitions. Cutting corners in the learning process advances into a complete disregard for best practices in open source software and in the workplace which results in a larger amount of errors. (site bad code quality = errors)

Code quality post processing software is often used in production development environments to ensure good style choices. These checks are much less useful at this senior level than they would be at an educational level. If programming style can be judged on a submission, companies conducting technical interviews will be able to better judge applicants and make a more informed decision.

This study will focus on proving that code quality can have an influence on code functionality, as well as which kinds of questions influence good or bad code styles.

1.2. Proposed Solution

A solution to these problems is linking the scoring process in programming problems to a metric derived from running code quality checks on the submission.

Not only will this analysis benefit educational institutes but also companies and competitions that judge people on their code submissions.

2. Description of Available Data

2.1. CodeChef Dataset

CodeChef.com is a competitive programming web application that has posted all of their questions and solutions onto the data science website, Kaggle. The data consists of a questions comma separated file, a solutions comma separated file and 3 files that show the code associated with each solution id. The set contains about 1000 problem statements and over 1 million code solutions submitted. This should be a more than sufficient to make a training and test data set.

The important features available for each question are:

- title
- link
- difficulty level
- question statement
- time limit

Project report for CS4437/CS9637: Intro to Data Science. University of Western Ontario, Winter 2017.

The important features available for each solution are:

- status (correct or wrong)
- time taken
- memory taken
- language written in
- solution url

2.2. Filtering by popular languages

The code submissions are written in many different programming languages and each language has it's own code analysis tool. Therefore, to make the process simpler and come up with higher quality results, the data will need to be filtered by the top languages used. Figure 1 shows that C++, Java, C and Python are the most popular submissions in this dataset. There are 4 versions of C++ but it should be possible to process them with one tool.

[languages.png] Wang (2016)

3. Plan for Analysis and Visualization

3.1. Description

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3.2. Technology Breakdown

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References

Justin Wang. Nlp and ml experiments, December 2016. URL https://www.kaggle.com/justwjr/nlp-and-ml-experiments/notebook. [Accessed Oct 26, 2017].