Topic:

Mutation testing for CNN

Goal:

Understand if and how mutation testing can be applied to the evaluation of test cases for CNN

Methodology:

Study the state of art to see if someone is doing something similar or exactly the same

Define Mutation operators (mutate after training, before training, or mutate the training or validation data set)

-> Compilable code -> valid CNN

Empirical evaluation:

RQ: does it make sense to mutate CNN for evaluating test cases?

-> If no matter which test case you use all get high mutation score, then not good

RQ: Which mutation operator makes more sense? Or do expensive mutation operators (like re-training with a different data) pay off? Hard to kill?

RQ: Equivalence problem?

Next Task:

Read tons of paper about mutation testing and mutation testing for CNN

Find test subjects (test cases + CNN)

DeepTest - ICSE 2018,

DeepRoad - ASE 2108

ESSENCE:

1 - What is the problem you want to solve

2 - Its motivations: why it is important to solve it (nobody cares about problems that are not contributing anything)

3 - Its challenges: why it is difficult to solve it (nobody cares about problems that are trivial to solve)

2 - How you plan in very very general terms how to address it

3 - Optionally, what's the state of the art around this problem? Has anybody tried to solve the same problem?

Main goal is to prepare a **Thesis proposal** and **a short presentation** about what you want to do. You will deliver the presentation at the chair in one of our regular weekly meetings to collect feedback from the Chair members and Prof. Fraser.

The **Thesis proposal** is a short document (between 10/20 pages including tables, references, and the like) which

1 - introduces and motivates the problem you want to address with your thesis (Intro and motivation)

2 - clearly state the actual problem you solve with your thesis (Problem Statement)

3 - presents the background concepts required to understand it (Background and state of the art)

4 - summarizes the state of the art around the problem (Background and state of the art)

5 - sketches in a very high level how you would tackle the problem and the main ideas of the approach you propose (proposed methodology)

6 - delineates an evaluation plan, which includes the metrics to show that your solution solves the problem and the experiments you intend to run. Again, high level of abstraction (no implementation details), but with concrete ideas (the experiment must be doable)

7 - schedule and requirements list. The schedule shall represent how you intend to allocate the 6 months of the thesis and the requirements list formalizes yours and ours expectations.

Organize requirements in three categories:

- MUST have requirements, which define the final passing/fail. Missing any of them is a fail
- MIGHT have requirements, which define additional things you would like to have in the thesis but are not necessary. Those requirements help in defining your final passing grade. The more requirements you get the higher the grade you get.
- MUST NOT have requirements, which define the scope of your thesis and protect yourself against additional requests that might pop up during the course of action.

You can find the latex template for the thesis proposal and examples of thesis proposals at the following link:
https://www.dropbox.com/sh/z0q7024sxz7tfqa/AABzO420g3gUs0U8diu3T09ua?dl=0

For the presentation, prepare 10/15 slides max (total of 15 minutes) that summarize the main aspects of your thesis (proposal):

- Convince us that the problem you face is relevant and challenging (nobody cares for problems that are not worthy or easy to solve)
- Clearly show what you plan to do about it and the main points/overview of your solution
- Describe how you plan to experimentally evaluate the proposed solution (experiments, metrics and expected results)
- Summary your schedule

I understand that this is a lot to ask, but please, preparing this material is paramount for everybody to understand if you are on the right track since the beginning, adjust our expectations, and in general reduce the risk of failing the thesis to a minimum. In the end, having a well-defined plan is the way to achieve this, and the proposal IS your plan. Plus, whatever you put in the proposal you will reuse in the thesis, which saves
you a lot of time later.

In the meanwhile, if you have questions you can always send me emails

Best