

IISc CSA: Deep Learning(Spring 2020)

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Project 1.1: Software 1.0 Versus Software 2.0

Due Date: Monday, January 27

1 Objective

The project is a simple task that is to be solved using two approaches to software development: the logic-based approach (Software 1.0) and the machine learning approach (Software 2.0). It is also designed to quickly gain familiarity with neural network basics, Python and machine learning frameworks.

2 Task

We consider the task of FizzBuzz. In this task an integer divisible by 3 is printed as *Fizz*, and integer divisible by 5 is printed as *Buzz*. An integer divisible by both 3 and 5 is printed as *FizzBuzz*.

Your programs will be tested on how well they perform in converting integers from 1 to 100 to the FizzBuzz labels.

2.1 Software 1.0 (Logic-based)

Implement the logic in Python using standard logic (if-then-else statements using modulo arithmetic). With the simple logic that is needed, your program will presumably work perfectly on all 100 input integers.

2.2 Software 2.0 (Machine Learning)

First you need to create a training data set for numbers ranging from 101 to 1000. We avoid training on integers 1 to 100 because that forms the testing set (In machine learning it would be considered cheating to train on the testing set). Present this training set to the program in the form of (input,output) pairs.

To design the learning program, you will have to make decisions on the neural network architecture (no. of layers, no of units per layer), hyper-parameters such as the learning rate, number of epochs, loss function, regularizer, etc. Since outputs are

discrete, you can use cross-entropy as your loss function. Evaluate performance for different settings for the architecture and the hyper-parameters.

There is Python/Tensorflow code available online for FizzBuzz. You can look at it and use it, but try and understand the decisions being made. You may wish to implement it using any of the alternative machine learning frameworks such as Pytorch, Keras and Gluon.

3 Deliverables

There are three deliverables: report, code and executable. After finishing the project, you may be asked to demonstrate it to the TAs, particularly if your results and reasoning in your report are not clear enough.

1. Report

The report should describe the performance of your program using accuracy measures. Also accuracy for Fizz, Buzz and FizzBuzz. Show how the choice of hyper-parameters affects performance.

Submit the PDF on a CSA student server.

2. Code

The code for your two implementations. Code in Python is the only accepted one for this project. You can submit multiple files, but the name of the entrance file should be `main.py`. All Python code files should be packed in a ZIP file named `proj1.1code.zip`. After extracting the ZIP file and executing command `python main.py` in the first level directory, the program should print all the related variables according the following format:

```
IISc IT Name = ...  
personNumber = XXXXXXXX  
...
```

3. Executable

Submit the Python code on a CSA student server with the following script:

```
submit_CSAXXX proj1.1code.zip
```