Python - Anaconda Installation + First Examples

EECE-4710 IoT and Machine Learning

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1. Objective

The objective of this activity is to install Python on your laptop (i.e., Anaconda + Spyder) and see examples of ML models at work.

2. Python

In this course, we will use quite a few different software technologies. We need to install them in order to set-up a working environment that has all that is needed to work on examples and projects in tinyML. The main steps described here are for my specific case – a windows laptop. If you are a Mac or Linux machine user, you may have an easier task setting-up all this – however, it will be up to you to figure that out.

In the tinyML examples, we need to use Python. To execute Python code you can use Google Colab in the cloud or you can do it locally on your machine, using an IDE such as Anaconda. We will use both working modes depending on the project.

The Colab approach is easy and convenient, but, requires an Internet connection at all times. What is Colab? Colab, or "Colaboratory", allows you to write and execute Python in your browser, with: Zero configuration required, access to GPUs free of charge, and easy sharing. One can run Jupyter Notebooks, which is very nice. *Jupyter Notebook* is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text. Uses include: data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning, and much more.

To run Python programs on your local machine, you must install something like Anaconda. To set-up a Python development environment for machine learning and deep learning on your Windows machine, follow the following tutorial to install all you need:

- https://machinelearningmastery.com/setup-python-environment-machine-learning-deep-learning-anaconda/

You must do that now in order to be able to continue and do the assignment below.

3. Assignment

As part of the hands-on activities this week, you must do the following Python examples. In doing these examples, follow the approach discussed in class.

Example 1: Your First Machine Learning Project in Python Step-By-Step

- https://machinelearningmastery.com/machine-learning-in-python-step-by-step/

Example 2: Your First Deep Learning Project in Python with Keras Step-by-Step

- https://machinelearningmastery.com/tutorial-first-neural-network-python-keras/

Then, you must do the second example above to investigate several different network architectures and different number of units per layer in order to find out if the number of layers or the number of unites per layer can be used to improve model performance.

Part 1: In the first phase of this experiment, you must study the dataset. To do that you must generate the scatter matrix plot and discuss it.

Part 2: In the second phase of this experiment, you shall investigate **four** network architectures with a number of layers = {3,4,5,6} (note that the case of 3 layers is the current example itself) and a number of 8 units on the middle layers.

Part 3: In the third phase of this experiment, you take the best model from the previous phase and investigate its performance for a number of units on middle layers = {4,8,16,24}.

4. Deliverables

You must write (typed) a report and upload it as a PDF file on D2L. The report should be named "**LastName_hw1.pdf**". The report should include the following sections:

1) Title + course info + your name
2) **Summary.** Describe in one paragraph what the objective of the assignment is.
3) **Dataset Study.** Describe what a scatter matrix plot is. Include the one you generated and discuss what it tells you.
4) **Architecture Exploration.** Describe the steps in conducting your experiments. You must create and include two plots in two separate figures: one that shows performance (i.e., model accuracy) as function of number of layers and one that shows performance as function of number of units per layer. Figures must be numbered and have captions!
5) **Conclusion.** Present your conclusions and describe what issues you encountered and how you solved them.
6) **References.** Include all references that you used, as a numbered list. Cite them in the report itself; do not just list them here.