Exploration: fast.ai

Eckel, TJHSST AI2, Spring 2020

# Background & Explanation

The use of deep learning is still a new and burgeoning field of computer science, and the makers of the fast.ai Python library have put together a series of lessons that will get you very nearly to the current state of the art in the field. We’ll finish out the year with you getting a chance to play around!

I want to be clear to start that I’m leaving a lot of instructions unwritten in this assignment because I want you to build skills at finding your way around websites like this yourself. We’re approaching the current state of the art, and that means you’re approaching a professional level of skill, and *that* means you’ll need to be able to get set up on websites like this without much help from a teacher! Of course if you have problems you can ask me questions, but I haven’t tried too hard to find all of the answers and I may tell you that you’re on your own; this is *part of the assignment*, and you should be prepared to spend time being resilient, googling things, searching the fast.ai documentation, etc. This is not intended to be 100% smooth!

I’m *delighted* for you to discuss any part of this assignment with peers – don’t be afraid to give step by step instructions to each other, etc. We’re learning a new tool here and collaboration is often how that works in reality!

# Tasks

1. We will do our work on Google Colab, so that everyone has access to hardware acceleration regardless of your actual hardware. You’ll need to follow some \*VERY SPECIFIC\* instructions \*VERY CAREFULLY\* to get this to work. The instructions are here: <https://course.fast.ai/start_colab.html> but please read this advice first:  
     
   - The first step, where you make sure you’re logged in to Google, is actually essential! Don’t skip it!  
   - Right after that, you’ll need to choose which notebook to use. If you aren’t familiar with Jupyter Notebook, be sure to choose nbs/dl1/00\_notebook\_tutorial.ipynb and follow along.  
   - FOLLOW ALL THE OTHER STEPS all the way to the bottom! Most of the problems last year came when students opened their notebook of choice and then started playing, without realizing that ALL THE REMAINING STEPS ARE IMPORTANT TOO!
2. Once you’re happy with the tutorial, go back to the beginning and follow all the steps again, this time choosing nbs/dl1/lesson1-pets.ipynb (once again, be sure to follow ALL THE STEPS so you make a local copy and save it to your own Drive). This notebook file goes with a video lesson. Open up lesson 1 at <https://course.fast.ai/videos/?lesson=1> and you have two options. You can either watch the video or you can find the link on the right hand side for “Detailed lesson notes” and read. To be clear: the notebook is a COMPANION to the lesson, not the lesson itself – you must read or watch the lesson to understand what the notebook is telling you.  
     
   Complete lesson 1.

1. Open nbs/dl1/lesson2-download.ipynb. Here, you’ll see instructions to follow to build your own data set. Either in this notebook file or in the lesson 1 notebook file, whichever feels easier to you, accomplish the following two things:  
   1. Put the entire MNIST data set into fast.ai and train on all 10 digits using resnet34. MNIST is a data set that’s already a part of fast.ai; it may take some searching around in the fast.ai documentation, but using it in fast.ai is functionality that is assumed. Getting it to function might be a bit tricky; feel free to share with other students (or with me!) when you get it working. See what the error rate is and how it compares to your own coded from scratch version!  
        
      Print out a confusion matrix in your notebook of all 10 possible outcomes.
   2. Build a new dataset of images of your own devising following the instructions at the beginning of lesson 2 and train a network on it. Print out a confusion matrix in your notebook for this as well.
2. Screenshot your confusion matrices from 3a and 3b and put them in a Word document alongside a brief analysis of your results – what happened? What surprised you? How did this compare to your hand-coded Perceptrons network? What was difficult about getting this to work? What was easy? How cool is this, in your opinion?

# Specification

Submit your **document** to <https://tinyurl.com/S20EckelFastai>.

This assignment is **complete** if:

* The “First Name” field on the Dropbox submission form contains your **class period**, not your name.
* The “Last Name” field on the Dropbox submission form contains your **last name then a comma then your first name** (like, for example, “Eckel, Malcolm”).
* Your document demonstrates what is described above.

For **resubmission**:

* Complete the specification correctly.

# Specification for up to three Outstanding Works

Once you have finished making your own dataset and running tests on it, the course of your learning is up to you through the end of the year. These lessons are comprehensive, and the forums on the site are helpful - if you so desire, you can become almost as much of an expert on this as anyone in the world is with only these resources. This is still a very new field! So, maybe you want to just work through as many lessons as you can, and see what you can learn. Maybe you want to join the forums and ask questions, beginning to formulate a project of your own. Maybe you want to play with the fast.ai library yourself, reading the documentation, and discover something on your own. It's up to you! The more ambitious your project, the more OWs I’ll grant. You can certainly get all three by working through all the code notebooks for all 7 lessons of the first course with fewer OWs for partial completion. And then there’s a second course, so you can *really* go nuts on this if you have the time and interest!  
  
**If you’d like to get OW credit for this assignment, email me a proposal for what you’d like to do and we’ll agree on it at any time before Friday, June 5th at midnight. Then, complete it by Wednesday, June 10th at midnight.**