**Syllabus for UVicAI’s Fall 2023 Tensorflow Certification workshops**

These are notes for the tasks covered in the Tensorflow Certification series of workshops. This performs a similar function to a syllabus. The aim of the course is to cover those topics outlined in the [TF certification handbook](https://www.tensorflow.org/certificate) in manageable chunks over a semester such that participants can gain practical experience while taking courses. Taking the certificate exam is $100, but this step is optional; the goal of this course is to build up an understanding of ML using Tensorflow.

We will start with Google Colab because it is easy for participants to get a model up and running. Writing the certificate exam requires doing so in [PyCharm](https://www.jetbrains.com/pycharm/) (a free IDE), so those interested in writing will need to become familiar with this program.

**Week 1 (Sept 27th)**: Image Classification

Get a model up and running following a simple tutorial. Become familiar with convolutional neural networks and evaluating classification results with a confusion matrix.

Slides: [Week 1: Cifar 10 Classification](https://docs.google.com/presentation/d/1fLOpsOvyr7ssn8fJcvwZnTkxsCTripSkioDtqdz9E0s/edit?usp=sharing)

Accompanying Tutorial: [From machinelearningmastery.com](https://machinelearningmastery.com/how-to-develop-a-cnn-from-scratch-for-cifar-10-photo-classification/)

Additional Resources: <https://www.youtube.com/watch?v=NmLK_WQBxB4> (MIT lecture that covers image processing in ML. The other tasks are outside of what we’re trying to do.)

**Week 2 (October 4):** Image Classification

We’ll develop a framework for understanding a general ML pipeline (load data, preprocess data, define model, train model, evaluate) and use this framework to decompose the image classification problem into manageable chunks.

Learning objectives: confusion matrix, learning rate curves, and managing overfitting

We will be iterating on, modifying, and investigating the posted notebook.

Slides: [google slides](https://docs.google.com/presentation/d/1S0T5SHawl9W6qcDiPtbK-w9VnCpX65Y2GF16janaxLA/edit?usp=drive_link)

Tutorial notebook: <https://drive.google.com/file/d/1CBAz4_L-SdvAUFiqQ4JKhJfSA1H7dxBe/view?usp=drive_link>

**Week 3 (October 11):** Intro to time series

Timeseries data requires different preprocessing functions. This intro will focus on preparing the data to be used for forecasting, different normalization techniques, and multiple input channels. We’ll begin to look at recurrent models, but not expecting to get completely through that.

Slides: [slides](https://docs.google.com/presentation/d/1Cj1ckepJ8v4jEoYpudoUf20jbfOVJ1GrtXfwe3SaTFk/edit?usp=drive_link)

Tutorial Notebook: [notebook (colab)](https://colab.research.google.com/drive/1LU3SZalXqi9n2K82wmSbIFWhN_emHJfW?usp=drive_link)

Additional References: <https://www.tensorflow.org/tutorials/structured_data/time_series>

**Week 4 (October 18):** Recurrent Neural Networks

Building on the foundations from week 3, we will look at how recurrent networks are built and how they are designed for sequential data. We look at local weather forecasting, and defining a model with multiple inputs.

Slides: [slides](https://docs.google.com/presentation/d/1iQ1LvE7NDed_ARYM0xUVj6a3pmdtOiISX30r31zB9cE/edit?usp=drive_link)

Tutorial notebook: same as week 3

Additional References: <https://www.tensorflow.org/guide/keras/working_with_rnns>

**Week 5 (October 25):** Work session

We’re going to review what we have covered by building a full ML pipeline for new datasets. Datasets include: Fashion MNIST for image classification, Sunspot activity for timeseries, and maybe smartwatch-gestures (from tensorflow datasets).

(Very minimal) Slides: [Slides](https://docs.google.com/presentation/d/1DOFFlcNnow_UZQSmKtIw0youVGP5HT3B3kE-rCrfmFw/edit?usp=share_link)

Additional References: previous notebooks

**Week 6 (November 1):** Intro to Text Embedding and Work Session

We’re introducing the ideas behind how we get natural language inputs into ML models. This is a short introduction to the preprocessing steps commonly used. Instead of jumping into a notebook to see how this is performed, we will continue our work session from last time with a focus on the timeseries dataset (sunspots).

Slides: [Slides](https://docs.google.com/presentation/d/12tPwz2JmGmO1BLUD1RB5XRn8OP1YTHf2sR7V0uAY7Rw/edit?usp=drive_link)

**Week 7 (November 8):** Sentiment classification

We are recapping text processing and applying it to a simple task: movie review classification. The movie reviews are short user written reviews for some movie, with the task being to classify whether the reviewer gives it a thumbs up or thumbs down. This approaches the review as a disordered “bag of words”, relying on the words, but not considering the word order.

Slides: - We’ll use the previous slides for recapping the ideas behind encoding.

Notebook: [notebook](https://colab.research.google.com/drive/1PBNHMoJdst6V5nr-NQHOV7ONtQ5suZ6A?usp=drive_link)

**Week 8 (November 15):** Using (local) pretrained models and fine-tuning

**Week 9 (November 22):**

**Week 10 (November 29):**

How far into December do we go?

**Week 11 (December 6):**

**Week 12 (December 13):**