## Introduction:

Project Introduction:

<https://docs.google.com/document/d/1hvRkhopdLXerg6SosruiYPKj_sL79PwBgikVlChodio/edit?usp=sharing>

## Week 1:

IMPORTANT: Please do not get overwhelmed by the length of this section. This is just to provide you with essential exposure. Feel free to skip some or all of Week 1 if you have exposure to the libraries.

Installation:

-Python

Firstly, install Python3 on your system. Follow these links to install if you are facing issues:

Ubuntu:<https://phoenixnap.com/kb/how-to-install-python-3-ubuntu>

Windows:<https://phoenixnap.com/kb/how-to-install-python-3-windows>

Mac:<https://flaviocopes.com/python-installation-macos/>

-Conda

Install Anaconda and learn to use conda environments

OR

Laarn Jupyter Notebooks. You can run almost all code on Google Collab without downloading a single library and software on your system.

Familiarity:

1. APIs

Get a feel of libraries and tools from the following tutorials. You do not need to mug up all these. Just go through these. You can refer them back if you need. You will mostly use Google to find the code patches.

IMPORTANT: Develop the habit to learn from the official(authentic) help/man pages.

Python:

<https://www.w3schools.com/python/>

<https://www.programiz.com/python-programming/tutorial>,

<https://youtu.be/lW5gtBGGyjU>

Jupyter Notebook tutorial:<https://towardsdatascience.com/a-beginners-tutorial-to-jupyter-notebooks-1b2f8705888a>

Numpy:-

<https://numpy.org/devdocs/user/quickstart.html>

<https://www.w3schools.com/python/numpy/default.asp>

Pandas:-

<https://www.w3schools.com/python/pandas/default.asp>

<https://www.datacamp.com/community/tutorials/pandas-tutorial-dataframe-python>

Matplotlib:-

<https://towardsdatascience.com/matplotlib-tutorial-learn-basics-of-pythons-powerful-plotting-library-b5d1b8f67596>

<https://matplotlib.org/users/pyplot_tutorial.html>

Tensorflow:

<https://www.tensorflow.org/tutorials/keras/regression>

<https://www.tensorflow.org/tutorials> (Beginner Quickstart and Keras Basics)

2. GitHub and Git (to submit assignments):

The Git and GitHub will be really helpful for you. It is a must-learn for coders.

<https://www.w3schools.com/git/>

<https://www.freecodecamp.org/news/git-and-github-for-beginners/>

## Week 2:

Main:

Basics of Machine Learning:

<https://towardsdatascience.com/machine-learning-basics-part-1-a36d38c7916>(MAIN)

Basics of Deep Learning

<https://www.analyticsvidhya.com/blog/2021/05/beginners-guide-to-artificial-neural-network/> (MAIN)

[https://machinelearningmastery.com/what-is-deep-learning](https://machinelearningmastery.com/what-is-deep-learning/)/ (layman’s overview of Deep Learning)

Neural Networks

<https://www.youtube.com/watch?v=aircAruvnKk&vl=en>(MAIN)

<https://towardsdatascience.com/math-neural-network-from-scratch-in-python-d6da9f29ce65>(sample exercise to get you acquainted with the neural networks)

<https://towardsdatascience.com/the-differences-between-artificial-and-biological-neural-networks-a8b46db828b7>(optional: intuition on NN)

<https://medium.com/free-code-camp/want-to-know-how-deep-learning-works-heres-a-quick-guide-for-everyone-1aedeca88076> (optional: intuition of neural networks)

<https://towardsdatascience.com/an-introduction-to-deep-learning-af63448c122c> (optional: intuition of neural networks)

Activation functions:

<https://www.v7labs.com/blog/neural-networks-activation-functions> (MAIN : 12 different types of activation functions - most practical guide to choose the right activation function)

<https://www.analyticsvidhya.com/blog/2021/04/activation-functions-and-their-derivatives-a-quick-complete-guide/> (optional: activation functions)

<https://medium.com/the-theory-of-everything/understanding-activation-functions-in-neural-networks-9491262884e0> (optional: activation functions)

Overfitting and Underfitting:

<https://medium.com/towards-data-science/overfitting-vs-underfitting-a-conceptual-explanation-d94ee20ca7f9> (MAIN: overfitting and underfitting)

Assignment 1 : (due on **9th June (Thursday) 6 PM** )

We will be implementing a Neural Network from scratch. We are going to use NumPy to make the Neural Network. There is a steep learning curve in this assignment and all additional theory is covered in the ipynb notebook.

Notebook link- <https://drive.google.com/file/d/1-02_V2m51wkTo1YMw2Op2H0joR7cQew4/view?usp=sharing>

Submission Form: <https://docs.google.com/forms/d/e/1FAIpQLSciY-LngYpr-MpKPVtDiVMGYczmVZ8-Lgj5o9zwvw39lIWtyg/viewform?usp=pp_url>

Solution1 <https://colab.research.google.com/drive/1kufrAW_SHBnJZgJ2p-KpTSEiklBUw4pk#scrollTo=5IucezTTXiSM>

Extra:

1. This is a very good book. It will provide great insight into Deep Learning. You can read chapters 1 to 5, and 8 to 15. (We won’t be needing CNNs in this project)

<https://d2l.ai/>

1. Andrew Ng’s Deep Learning Specialisation (Doing this will equip me with the knowledge to deal with half of this project)
2. Graph of Major AI Models:

<https://www.stateoftheart.ai/models>

1. Overview of Deep Learning

<https://www.youtube.com/playlist?list=PLtBw6njQRU-rwp5__7C0oIVt26ZgjG9NI>

## Week 3:

Main:

Understanding RNNs and LSTMs:

<https://www.youtube.com/watch?v=qjrad0V0uJE&t=191s> (gives great intuition on RNNs)

<https://towardsdatascience.com/a-practical-guide-to-rnn-and-lstm-in-keras-980f176271bc> (how to develop RNN models in keras)

NLP in tensorflow:

<https://www.youtube.com/playlist?list=PLQY2H8rRoyvzDbLUZkbudP-MFQZwNmU4S>

(from part 1-5)

Assignment 2: <https://colab.research.google.com/drive/1BnuDXwsCW2w7iI57_Nly_SfH-mb8Zhu_?usp=sharing>

Incomplete/Empty code snippets are marked by the keyword “pass”. For each occurrence of “pass”, replace it with your own code. Comments have been added to guide you about the corresponding code snippet.

Submission: <https://forms.gle/1G1njQqpySRxsU656>

Solution 2: (will be uploaded after the due date)

## Week 4:

Now that we have covered the basics, we can start with the real project!! We will now focus on detecting emotion in the text! You will implement a **research paper**-<https://thesai.org/Downloads/Volume10No6/Paper_45-Emotion_Detection_in_Text.pdf> This paper describes 2 LSTM networks to detect emotions from text- a vanilla LSTM and a nested LSTM.

You can read about nested LSTMs here-<https://www.tutorialexample.com/understand-nested-lstm-network-a-beginner-guide-lstm-network-tutorial/> You can choose any network and implement it. Your primary task is to tweak the architecture described in the paper (changing hyperparameters, number of layers/units etc.) to achieve highest validation accuracy. **Dataset**: we will use huggingface tweet emotion dataset. It has about 16k tweets classified into 6 emotions for training. This notebook describes how you can load this datasets using huggingface dataset API-<https://drive.google.com/file/d/1ErB9gDc-dArqExZK2ukTcG5NHnQFAd6a/view?usp=sharing>

**NOTE**- to implement the nested LSTM you can use this-<https://github.com/titu1994/Nested-LSTM> Try to implement the first version before mid-term evals (which is on the 22nd ) so that you will have something cool to present in mid term.

## Week 5 and 6:

We hope that your exams went well. Now its time we move forward with the project and start the most important part of it- **the transformers**. Transformers are a new wave in NLP, and have proved to be the current state of the art in both NLP and CV.

To boost your interest, here is a website where you can see the power of the latest transformer model, DALL-E mini, which can generate images from the text!<https://www.craiyon.com/> Have fun!

So let's get started with transformer, here are some of the resources to get started-

Youtube videos-

<https://www.youtube.com/watch?v=-QH8fRhqFHM><https://www.youtube.com/watch?v=4Bdc55j80l8&t=596s>

Articles-<https://towardsdatascience.com/a-deep-dive-into-the-transformer-architecture-the-development-of-transformer-models-acbdf7ca34e0#:~:text=Unlike%20previous%20state-of-the-art%20architectures%20for%20NLP%2C%20such%20as,lack%20of%20memory%20by%20perceiving%20entire%20sequences%20simultaneously>.<https://towardsdatascience.com/intuition-behind-transformers-architecture-nlp-c2ac36174047>

An article on understanding BERT- a SOTA model which we will use for sentimental analysis-

<https://towardsdatascience.com/keeping-up-with-the-berts-5b7beb92766>

After you get a decent idea of what are transformers, head to huggingface tutorial-<https://huggingface.co/docs/transformers/pipeline_tutorial> to learn how to implement and use pre trained transformers.

Please go through this material, we will soon release the next Assignment.

## Week 7:

Due to multiple requests, we are not giving out the next assignment as a fill in the blanks.

So there are only 2 assignments for the project.

We are providing you with the Emotion Classifier using BERT. Please feel free to play around with the model and compare the performance with vanilla LSTM, Nested LSTM and BERT:

<https://colab.research.google.com/drive/1nwCE6b9PXIKhv2hvbqf1oZKIGkXMTi1X>

Thank you for learning and implementing some cool stuff this summer. Hope you will further dive deeper into the contents and explore more…

## Project Statistics:

Mentors:

1. Shashwat Gupta
2. Hitesh Anand
3. Sahil Bansal

Mentees Ratified:

<https://docs.google.com/spreadsheets/d/1GTxw4pWjqN-26sx0UrfV2OmvUbrSo0qMvytl27BCdQM/edit#gid=0>

EndTerm Evaluation:

<https://docs.google.com/presentation/d/1zKmLmZTdhtNtA8OLqHRFIWbF6FI3vAoTlLyQt5F-09g/edit?usp=sharing>

(Will be updated after EndTerm Evaluation)