Curriculum (Rough Outline):

What is Deep Learning being used for in the Real World
- How is deep learning being applied in the world right now
- What is Computer Vision and what are some ways we will cover this in our course right now.
- Preliminary research for Project Idea: Start Doing research into how Computer Vision can be used to solve problems.
  Note: While Learning about Neural Networks and the Coding Course, students will be required to come up with, develop, and collect data for their project Idea.

Note: While doing the neural network Lesson down below, I will have optional python lessons on very basic concepts like lists, functions, etc. on different days. Will email about when we reach there

What are Neural Networks Brief Theoretical Oversight (Theoretical)
- What are neural networks and what are they used for
- How do neural networks use backpropagation and gradient descent to learn a dataset
- Common problems when trying to train neural networks
- What are some training techniques for neural networks to better learn a dataset and avoid these common problems.

Getting started with Google's free but powerful coding environment: Google Collab
- Get started with setting up a gmail and creating a first google collab
- Connect Google Drive to Google Collab and upload datasets
- What is GPU and why is it important here
- How to set up GPU environments in Google Collab. Brief Demonstration.
- Set up github to post code

How to Label Data for Project (Happening in Parallel with Deep Learning Coding Course):
- Learn how to annotation tools to label data and form annotation files
- Use free labeling software like MakeSenseAi or more industry standard labelimg.
- Start Scraping Images of the Web and Organizing them in order to start data collection for Final Project
- Start Labeling Data for Final Project

Machine Learning Essentials Coding Course
- Quick Refresher of some important Python concepts: if statements, for loops, classes, functions etc. It is expected that previous Python knowledge is already there.
- Introduction to basic file management libraries like glob, os, tarfile, zip files etc.
- (How to Label Data)
- Processing Annotations files like xml, csv, or text
- Numpy and Pandas for data operations.
- Visualize Data with OpenCV or Matplotlib

Machine Learning Concept and Coding course

- Machine Learning techniques like SVM, Decision Trees, and Ensemble Methods
- Implementing these techniques in sklearn.
- Going over Project code Live about using sklearn to classify images.

Deep Learning Coding Course Part 1
- Pytorch as deep learning data structure and library
- Pytorch and Cuda (GPU)
- Any other coding concepts that will be needed to set up data in an environment ready to be trained will also be covered.
- Coding Concepts will be Implemented into the Final Project

Deep Learning Coding Course Part 2 the Preprocessing
- Go over live implementation of loading data.
- Augmentations
- Creating a data class
- Creating a data loader
- Visualizing Data
- Any other coding concept that is needed to train, validate, and infer on a model will be covered.

What are CNN's and how can they be used for Computer Vision (Theoretical)
- Convolutional Neural Networks
- Transfer Learning
- Image Classification
- Object Detection

Deep Learning Coding Course Part 3
- Implementing Transfer Learning to obtain pretrained models fine tuned for a certain task.
- Deep Exploration of how premade tools encode Deep learning concepts
- Implementation of training environment
- Saving Models
- Calculating Metrics like Accuracy, Recall, Precision, mAP, etc.
- Using model weights to Infer on brand new images (Visualizing the model results)
- Any other coding concept that is needed to train, validate, and infer on a model will be covered.
- Object Detection on Video
- Coding Concepts will be implemented into the Final Project

Finishing Up the Technical Side of the Project
- Load curated data into Google Collab Environment.
- Finish Implementing Coding Concepts to develop the Final Project.

Writing a Research Paper and Sharing Work
- Brief Overview of how to write a research paper
- Compiling Results of Final Project and Documenting them into a Paper
- **Optional:** Submitting Paper to an International High School Journal, a Science Fair project etc.
  Some Suggestions:
    - **International Journals of High School Research**
    - **Conrad Challenge**
    - **The Columbia Junior Science Journal**
    - **Microsoft Imagine Cup**
    - **(Student Choice)**

Timings:

(Yet to be decided).
Will be times that work favorable across both the time zones.