

# CYSF Logbook

Oct 15: Started brainstorming, thought of the idea of airfoil efficiency testing.

Oct 18: Created a plan for building a wind tunnel and 3d printing airfoils.

Oct 25: Researched ANN's and realised I wanted to change my idea.

Oct 26: Developed new idea: using ANNs to save computational time for airfoil sims.

Oct 26-Nov 12: Took a break from the project.

Nov 12: I have fall break from 10-16. Watched a long tutorial and made a simple neural network. Spent 5 hours straight on it.

Nov 13: Watched another video to make a data classifier on the Iris Dataset.

Nov 13: Tried to apply it to airfoil data but it didn't work. The loss value kept going up. After reading more about loss functions, I realized I needed to change mine to MSE.

Nov 14: Coded part of my next Neural Network which I will use my own simulation data to train.

Nov 15: Finished coding it and had a great result.

Nov 25: Exported the model's weights and biases and coded a program to simulate NACA airfoils using the neural network.

Took a longer break.

Dec 7: Changed idea to a more complex one. Using that model as an environment, I want to code a Reinforcement Learning model to optimize airfoils for different angle of attacks based on user priorities. This applies the current neural network and uses its fast computation time as an environment for the reinforcement learning model.

Took another break and studied for exams.

Dec 26: Creating a new dataset for my new ANN which will be the environment.

Jan 5-7: Created the CD ANN.

Jan 10-12: Created the CL ANN.

Results from both were good, with over 95% accuracy.

Jan 20: Researched more on Reinforcement Deep Q Learning models.

Jan 25: Started coding a reinforcement learning model from a tutorial on YouTube for a spaceship game.

Jan 26: Finished coding the model, but there were multiple error and the code was dated. I then fixed it by using the newer “gymnasium” import as well as changing the code to account for the newer variable truncated, which I added to the done variable. The reinforcement learning model still didn’t perform well however.

Jan 27-Feb 2: Spent some time each day learning more about Deep Q Learning model and I realised I need to add a target network to increase stability.

Feb 5-7: Spent time adding in a target network. Results are good!

Feb 7-10: Spent 3 full days coding the first variant of the RL model and environment.

Feb 11: Realised that the Reynolds number of 1.5 million was not sufficient for practical uses of my model. I would need to change that later.

Feb 12-15: Spent most of family day weekend refining and making new versions until finally completing the model, using variable Reynolds numbers.