



Python Coding and AI Development/Learning

Ethan Kelly, Joseph Farmer, and Ryan McClarren

McClarren Lab, Department of Aerospace and Mechanical Engineering, University of Notre Dame, IN, USA



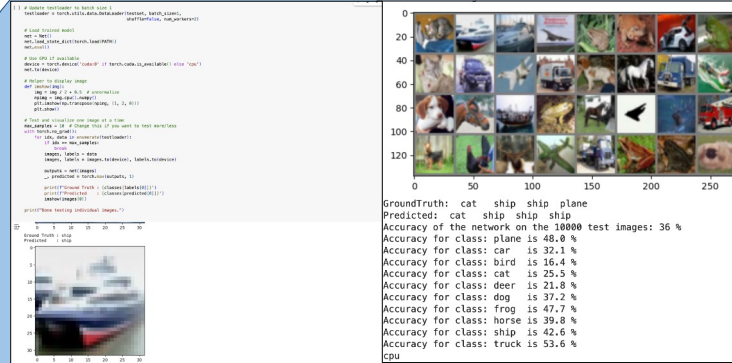
Introduction

- There were two different aspects of computer programming that were focused on:
 - 1. 3D Simulations/Python Coding
 - 2. AI Learning/Development
- 3D Simulations help to provide calculations for aeronautics and mechanical engineering and to run different combinations of physics problems
 - Ex. Heat radiation off of planes, Pressure Differentiation inside of machinery
- AI Learning contains the creation and teaching of AI to get it to recognize or do different things
 - Ex. Picture recognition, ChatGPT

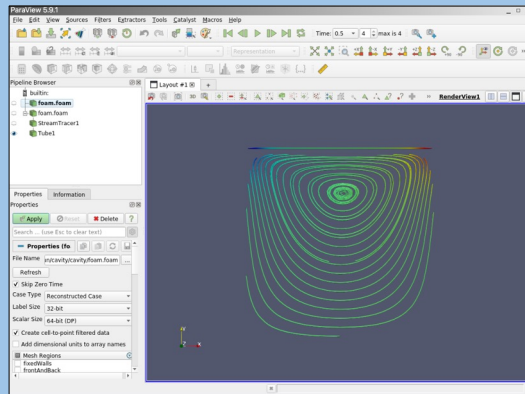
Methods

- Using different commands in Python, we were able to create the 3D simulations and the AI photo identification program
 - Ex. Is (List), vi (View), lr (Learn Rate), EPOCH, Batch Size
- Changing different numbers and commands help to change the simulation conditions or the accuracy of the AI predictions

Results



The AI's code and correct guess of a photo, Accuracies for the pictures



The pressure differentiation simulation created from the OpenFOAM code (viewed on Paraview)

Experience

- I have learned many different computer programming skills such as python coding, website development, and AI learning
- I have gotten the opportunity to work at ND in a professional setting and environment
- I learned many soft skills such as critical thinking, effective communication, and problem solving.

Conclusions

- Changing the batch size in a code will result in a lower loss, but not always a major difference in accuracy
- To get a significant change in accuracy, you need to change the EPOCH
- The lower the learning rate, the better the accuracy
 - 0.01 learning rate results in a terrible accuracy rate, but 0.001 and 0.0001 were way better

	LR, EPOCH					
	0.001, 2	0.001, 8	0.001, 8, BS 16	0.001, 16	0.001, 16, BS 16	0.0001, 32
Plane	71.3	66.4	63.5	68.7	70.1	71.3
Car	71.9	74.7	75.6	72.2	86.1	79.6
Bird	36	35	50.2	48.3	50.6	52.8
Cat	30.1	51	46.4	38.9	32	51.1
Deer	42.6	61.2	49.6	49.7	62.5	58.3
Dog	48.7	36.3	52	64.1	61.7	53.1
Frog	54.8	79.9	69.8	70.6	66.6	70.2
Horse	67.7	68.7	61.6	64.2	77.6	70.2
Ship	49.7	77.1	79.3	68	77	83.3
Truck	73.5	74.1	76.1	73.8	63.7	72
Loss (lowest)	1.254	0.89	0.099	0.649	0.072	0.059
Averages	54.63	62.44	62.41	61.85	64.79	66.19
Change Batch Size to 16, 32						

Data table showing the Learn Rate, the EPOCH, the Batch size, the loss, and the averages for each trial

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