Development of a Neural Network for Motion Simulation

Overview
Our sponsor, the Carderock Division of the Naval Surface Warfare Center, regularly uses trained neural networks to aid in the modelling of surface and undersea vessels’ manoeuvring. The software application they are currently using is outdated, lacks functionality and basic features, and is not user-friendly.

Objectives
The team’s objective was to design an updated neural network solver to replace the current software being used. This application will incorporate a graphical user interface, multiple neural network training algorithms, and be able to save, export, and load the weights corresponding to a semi- or fully-trained neural network architecture.

Approach
• Gathered customer needs and requirements in an initial meeting
• Updated needs and requirements and informed our sponsor of the project’s current status during weekly teleconferences
• Generated multiple concepts for the graphical user interface, selected a concept that best fit our sponsor’s needs and was achievable in our limited timeframe
• Reviewed patent and copyright databases as well as existing consumer products to ensure our design would not infringe on any existing work
• Researched and tested multiple neural network training algorithms, decided to fully implement those that would best suit our sponsor’s current needs
• Created a prototype of the graphical user interface to test basic functionality
• Created prototypes of the neural network training algorithms to ensure functionality through proper training and simulation
• Tested graphical user interface and back-end neural network algorithms throughout design phase
• Validated our final release functionality against our written software requirements
• Tested our final release against the existing product it was designed to replace

Outcomes
• Our final product testing showed comparable training accuracy with less required computation time
• Successfully provided software product to our sponsors that trained neural networks with increased functionality and user-friendliness
• Use of our product should increase efficiency by decreasing turnaround time requirement between the training of different neural network architectures