School of Computing  
CA326 Year 3 Project Proposal Form

**SECTION A**

**Project Title:** Cooperative Machine Learning\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Student 1 Name:** Connell Kelly\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **ID Number:** 17480902\_\_

**Student 2 Name:** Patrick Gildea\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **ID Number:** 17374013\_\_

**Student 3 Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **ID Number:** \_\_\_\_\_\_\_\_\_\_

*(A third team member is exceptional and requires detailed justification.)*

**Staff Member Consulted:** Tomás Ward\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Project Description (1-2 pages):**  
**Description:**

Our project goal is to facilitate a working machine learning environment using a top-down racing game as our format for doing so. It would be an environment where the user, through keyboard inputs, can race a car on a simple square circuit against various generations of an AI agent that has been trained to complete the track as fast as possible without hitting the boundaries. We would hope to provide it the ability to do so using the concept of reinforcement learning. The AI agent will be presented as a ghost (translucent outline of a car) that the player’s car can pass through as we do not want to implement collision between either agent.

Our aim is that the user will be able to see the effects of reinforcement learning first hand, as the first few generations that the user races against will be slow and inefficient, but the later ones will be so efficient the user may not even be able to keep up. Upon finishing a lap the user will see their finish time and the finish time of the particular generation of AI they just competed with, and will then be shown their position on a leaderboard compared to all of the other generations of the AI opponent. We would be interested in better learning the fundamentals of reinforcement learning using the toolkit, OpenAI Gym and if suitable, presenting the project with it instead of Godot depending on our test results.

Our overall goal is to demonstrate the versatility of machine learning by creating a program that thoroughly uses reinforcement learning to guide an AI opponent. Doing so would require using a scripting language of our choice from a list of compatible options or Godot’s in-house language, GDScript which is extremely similar to Python. Thank you for considering our proposal.

**Division of Work:**

* Car Sprite Design - Pat
* Map/Track Design - Connell
* Leaderboard - Both
* Reinforcement AI Research & Development - Both
* Car Movement - Pat
* Out of Bounds Triggers - Connell

**Programming language(s):**

GodotScript, Python and C#

**Programming tool(s):**

Godot 3.1.1 and OpenAI Gym

**Learning Challenges:**

Understanding Reinforcement Learning

Learning Godot’s Programming Environment and language bespoke language GodotScript

Sprite and Map Design

Choosing the Best Environment to Present With

**Hardware / software platform:**

PC/Laptop and Linux (openSUSE Leap 15.1 and Ubuntu)

**Special hardware / software requirements:**

None