Sacramento State University

Panda Trainer

Final Project Proposal

Project Type: B

CSC 180 Intelligent Systems

Due: April 5, 2021 @ 11:00am

Logan Hollmer (**ID:** 301559973)
Quinn Roemer (**ID:** 301323594)

Abstract:

In this project we will build a CNN deep learning model to play a custom built 2D game called Panda Runner. In this game the computer will be responsible for selecting 3 possible actions (jump, slide, or nothing). Using these actions, the computer must train the panda to navigate an obstacle course. The model created will use a genetic algorithm to assist with hyperparameter tuning. The end goal of this project being to further advance the understanding of game AI using deep learning techniques.

Motivation:

This project is important for several reasons. First off it advances the knowledge and understanding of not only machine learning but of genetic algorithms. We plan to self publish our results which will allow for future researchers to build off of our work. It will also further the development of AI that can play video games. This is important because video games are a simplified abstraction of real life and as AI learns how to play games it will set the stage for more complex models that will interact with the real world.

Background:

There have been many previous attempts to create machine learning algorithms that will play video games. In fact this very model was heavily inspired by previous projects such as MarIO. However, many of the current models use reinforcement learning to train the models. We plan to not use reinforcement learning and instead focus on using supervised learning which is different from the current approaches being explored.

Data sets:

For this project we will be building our own dataset. We will be gathering images of the screen at different points of time and be labeling them with the correct action to take in a given situation. This data will be compiled by both the members of the team with the goal to get a minimum of 1000 images.

System/Algorithmic design:

This is a categorical problem using image data. Thus we will be using a CNN model which will have several fully connected layers at the top of the model. We will build 2 models to compare how well they perform, one with

transfer learning and one without transfer learning. The model will take an image as an input and will have 3 possible outputs, those being: *Nothing*, *Jump*, and *Slide*. Finally this will be a genetic algorithm using Fitness Proportionate Selection to help tune the hyperparameters.

Evaluation plan:

We will evaluate the model using two methods. The first method will be using the dataset. We will split the data into a training and test set. We will then evaluate the model on the test data and use the precision, recall, F1-measure, confusion matrix and ROC curves as the evaluation metrics. This will give us a decent idea of how well each model is doing and an easy way to evaluate it by finding the model with the highest F1 score. The second method we will be using is to run the model with the game. The model that gets the highest score will be considered the best model. This is how we will evaluate how well the model "actually" performs.

Task Division:

Both Logan and Quinn will develop the game with Quinn doing the majority of the game development. Logan will create the project proposal and both members will work on the project proper and the final report. In addition, both members will help to create and compile the dataset.