

Generation: 0  
Birds Alive: 7  
Pipes Remained: 4989

Score: 11  
Timer: 17.0 s

# Flying through Obstacles

AI Term Project (Spring 2022)

## Group Members

Manahil Fatima Anwar	20K-0134
Anmol Zehrah	20K-0199
Hamza Sameer Khan	20K-1744
Usman Yaqoob	20K-0355

# Contents

1	Introduction to the Project	3
1	Methodology	3
1	Tools, Technologies and Programming Concepts Used	3
4	Results	4
5	Applications	4
6	Conclusions	4
7	Project Breakdown	5
8	Timeline	5
9	References	6
10	Poster	6

# Basics

## Introduction to the Project

“Flying through the obstacles” is a playable game which the model learns to play and trains itself to perform best even in the most difficult levels. The model trains to emerge victorious against human players in any stage. Our model produces the best gaming results that are possible to achieve.

## Methodology

Initially, a game is developed using pygames (add other libraries here) which enables the player to play a game of avoiding to collide with the obstacles encountered on the path. Next, the model uses reinforcement learning to train and learn to play the game in the best achievable way. Once the model completes its learning, it becomes the perfect player and is the toughest competitor to any human player.

## Tools, Technologies and Programming Concepts Used

1. PyCharm
2. NeuroEvolution of Augmenting Topologies (NEAT)
3. Genetic Algorithm (GA)
4. Neural Networks
5. Reinforcement Learning

# Outcomes

## Results

The final result that is achieved from our project is a perfect gaming model, which over the course of its runtime, has made itself learn and adapt, by recognising the patterns, to the ever-changing situations in the game. It basically helps the flying object avoid colliding with the obstacle, hence keep the game going on indefinitely

## Applications

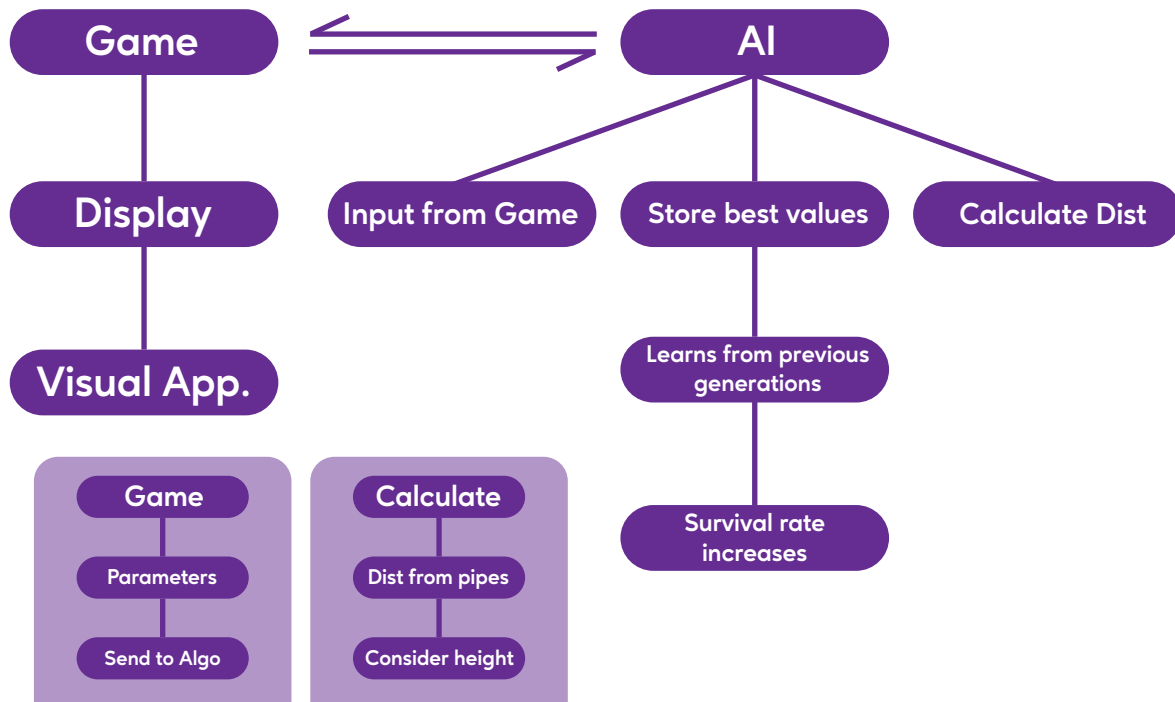
Our project has used reinforcement learning as the main tool to train the model on how to perform the best, given the situation and state. Since reinforcement learning is a reward based agent; ergo, it can be used in a number of day to day activities. Self driving car is the most famous and probably the most common application, as it trains the car not to hit any obstacle, instead take necessary actions. It can be of help to the economic institutions, for example predict the prices of the stocks. A traffic signal can also be made efficient using reinforcement learning by tracking the flow of traffic and learning the daily high traffic time, and then turning the signal green for the road with heavy traffic accordingly.

## Conclusion

Our project initiates as a fairly simple game, a flying object that tries to avoid hitting any obstacle which would obstruct its path. The aim of the project is to master this game. Therefore, we embedded a reinforcement learning agent in our game, which would experience and adapt, to the unforeseen states in the game.

# Workload Distribution

## Project Breakdown



## Timeline

### Stage 1

The concept and libraries and technologies chosen through help of similar projects, building a basic pygame proof of concept.

### Stage 2

Game built with all it's classes and parameters and user playability added to test it out initially. Game parameters given more control to give more control in future.

### Stage 3

NEAT Algo integrated through with help from examples. Functionality added to see distance and height for sending to algorithm.

### Stage 4



Testing done with user playability and different amounts of population sizes with different levels of game difficulty from easy to impossible and ensuring efficiency.

# Conclusion

## References

<https://www.youtube.com/watch?v=MMxFDaIOHsE>  
<https://www.geeksforgeeks.org/genetic-algorithms/>  
[https://en.wikipedia.org/wiki/Genetic\\_algorithm](https://en.wikipedia.org/wiki/Genetic_algorithm)  
<https://neat-python.readthedocs.io/en/latest/>

## Poster



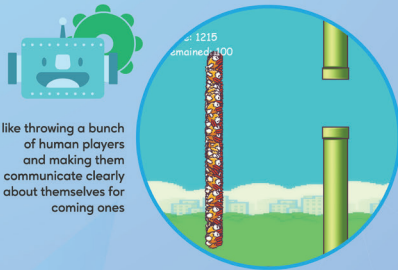
### FLYING THROUGH OBSTACLES

USMAN YAQOOB   MANAHIL FATIMA ANWAR   ANMOL ZEHLRAH   HAMZA SAMEER KHAN

NATIONAL UNIVERSITY OF COMPUTING & EMERGING SCIENCES

#### INTRODUCTION

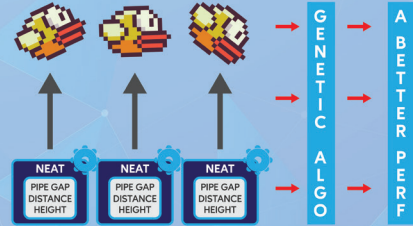
"Flying through the obstacles" is a playable game which the model learns to play and trains itself to perform best even in the most difficult levels. The model trains to emerge victorious against human players in any stage. Our model produces the best gaming results that are possible to achieve.



It's like throwing a bunch of human players and making them communicate clearly about themselves for coming ones

#### METHODOLOGY

Initially, a game is developed using pygame & other dependencies which enables the system to play a game of avoiding to collide with the obstacles encountered on the path. Next, the model uses reinforcement learning to train and learn to play the game in the best achievable way. Once the model completes its learning, it becomes the perfect player and is the toughest competitor to any human player.



#### WHERE ELSE CAN THIS BE USED?

Our project has used reinforcement learning as the main tool to train the model on how to perform the best, given the situation and state. Since reinforcement learning is a reward based agent; ergo, it can be used in a number of day to day activities. Self driving car is the most famous and probably the most common application, as it trains the car not to hit any obstacle, instead take necessary actions. It can be of help to the economic institutions, for example predict the prices of the stocks. A traffic signal can also be made efficient using reinforcement learning by tracking the flow of traffic and learning the daily high traffic time, and then turning the signal green for the road with heavy traffic accordingly.

#### WHAT DID WE ACHIEVE?

The final result that is achieved from our project is a perfect gaming model, which over the course of its runtime, has made itself learn and adapt, by recognising the patterns, to the ever-changing situations in the game. It basically helps the flying object avoid colliding with the obstacle, hence keep the game going on almost indefinitely.