



# An Attempt at Training AI Components in Video Games

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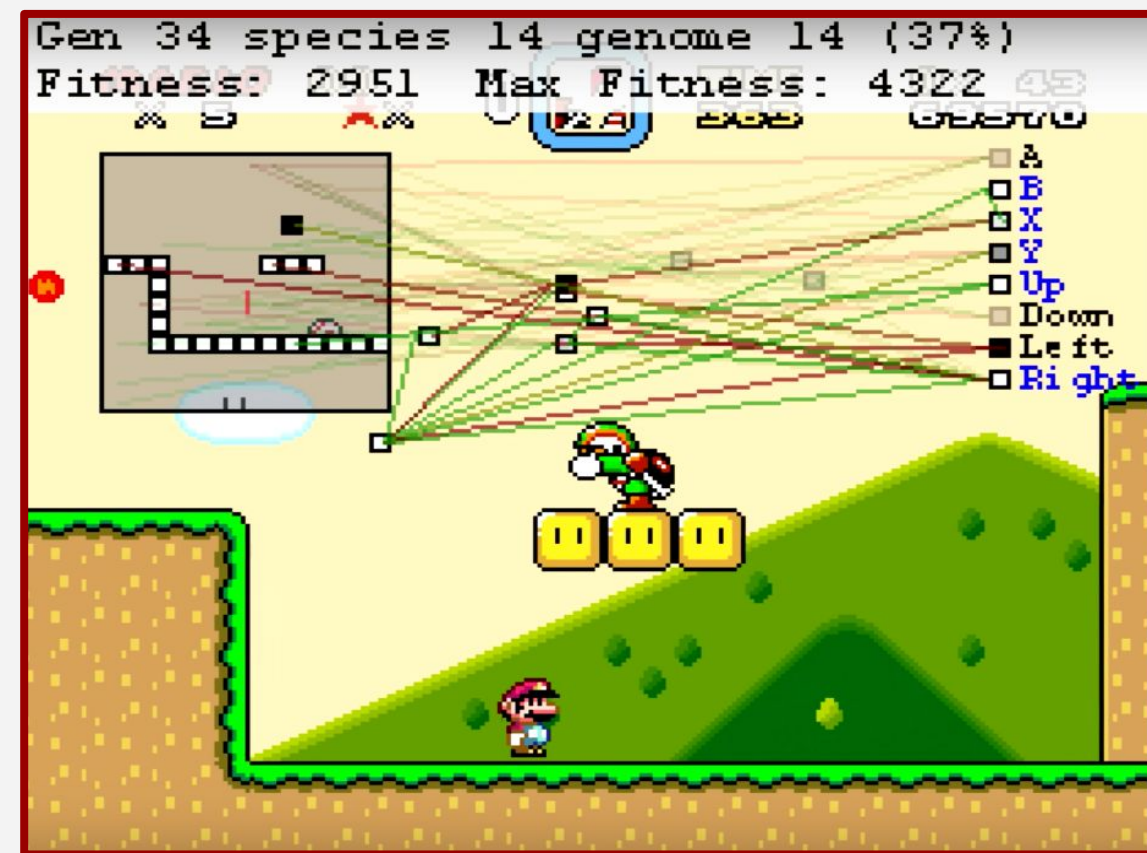
## Introduction

Artificial Intelligence (AI) is intelligence exhibited by machines. Attempts are being made to create AI for video games (*Computer Science Majors*). Video games are essential test vehicles for development of AI (*Togelius*). AI can be used to enhance the gaming experience (Baral). This project was inspired by SethBling, a youtuber who implemented an algorithm called "NEATEvolve" into a game (Bling). The video game is Super Mario bros but played by an AI agent. The human's role is to observe and make improvements to the code to make the AI agent more efficient. Although Bling did it magnificently well, an attempt could still be made to make the AI learn the game faster by improving its fitness\* function. And this project is a step in that direction.

\*Fitness in this game is defined as "Rightmost - Time". Where "Rightmost" means how far to the right the AI agent travels and "Time" means how long it takes to do this. Implying the longer it takes, the lower is its fitness

## Materials/Methodology

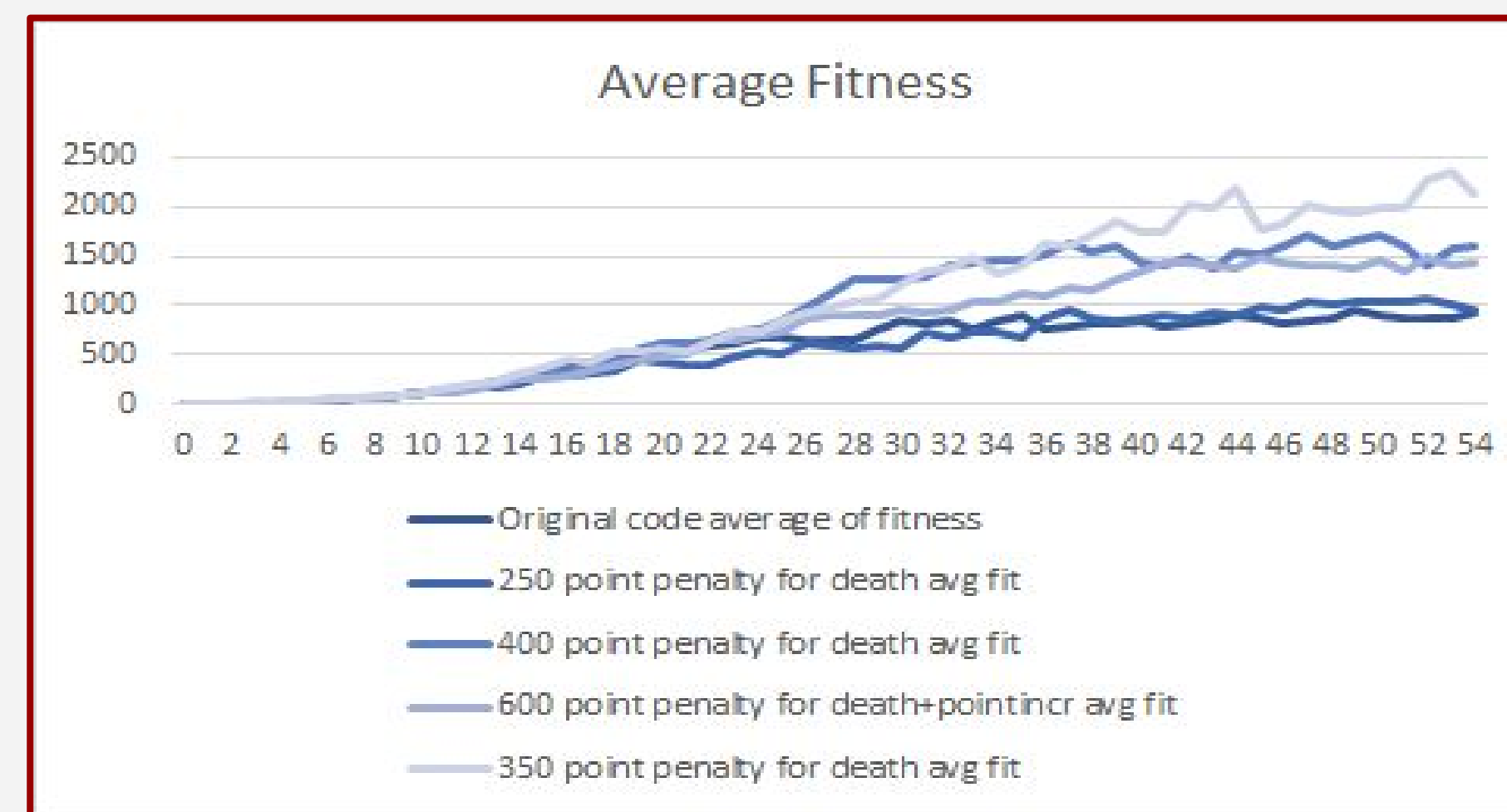
- 1.) Emuhawk (Super Nintendo Emulator used to run Marl/O)
- 2.) SethBling's algorithm NEATEvolve
- 3.) ZeroBrane Studio (Lua IDE) for editing the source code.
- 4.) Asus Zenbook.
- 5.) Excel workbook



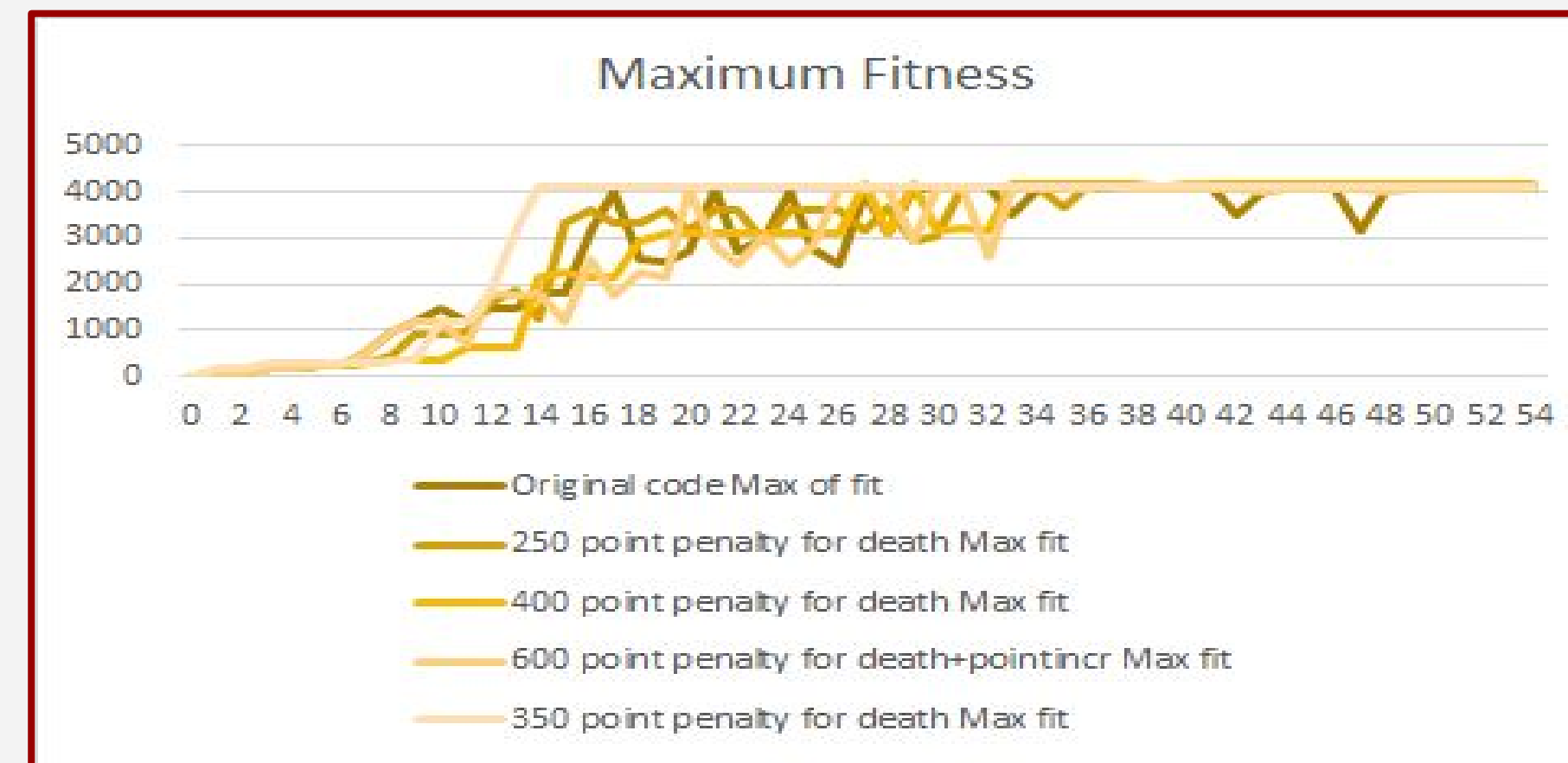
LEFT: Neural network- The AI does not know what exactly to do at this point so it presses buttons that it think will lead it to success

The game was first run "as is" and data collected (*Bizhawk*). Subsequently, I changed the code using LUA and data was again collected ("RAM Addresses") All this was plotted. Some changes to the code I made were: Penalty for dying, when Mario dies the fitness score actually goes down. The purpose of this is to encourage Mario to be more careful because now he knows that if he dies, there will be a penalty. Another change: Point increase- Mario's fitness score goes up when he gains more points, he gains more points from killing enemies, collecting coins, and eating mushrooms.

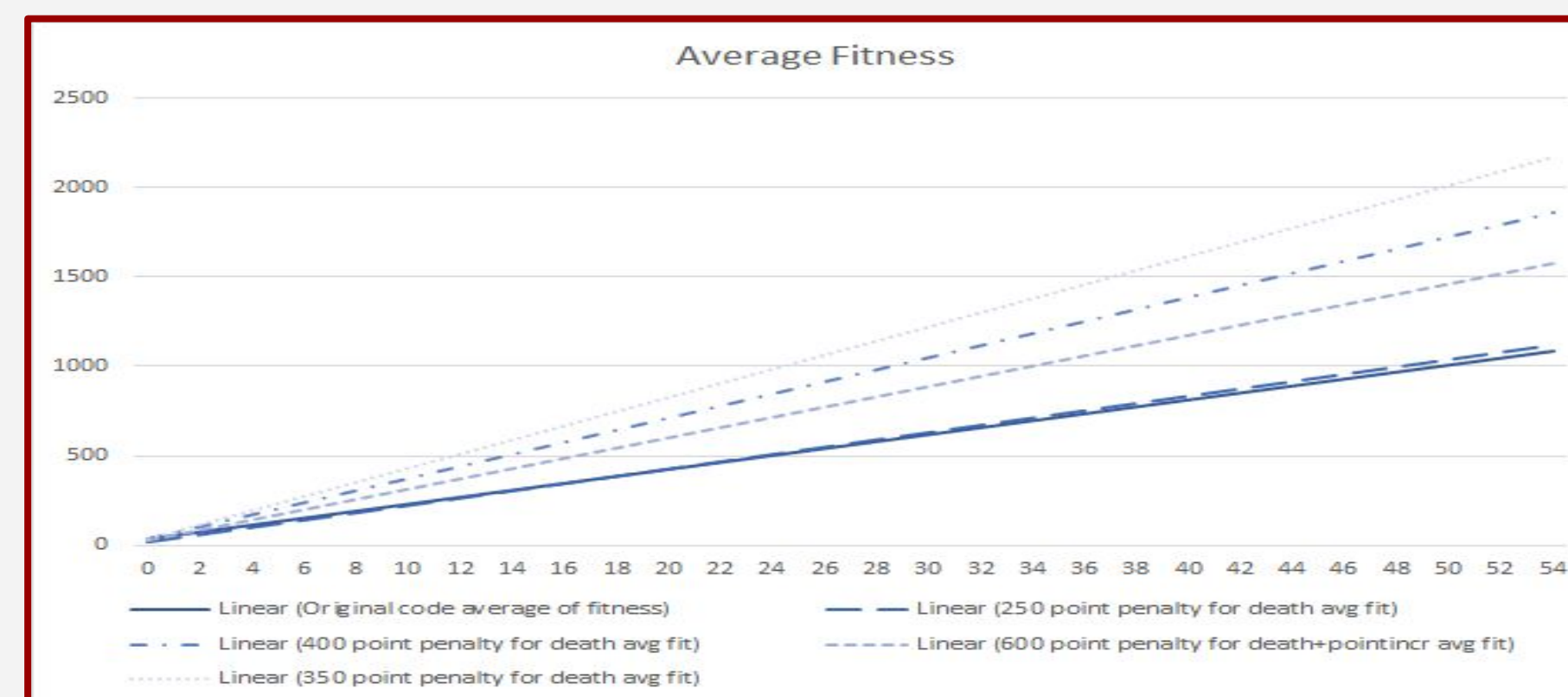
## Results



The above graph shows fitness for all the runs. As seen, the second pen-death had the highest average fitness. The second pen-death was when the AI agent was penalized 400 fitness points for dying



The above graph shows all data for all the graphs. It shows the max fitness as well as the average fitness. In both cases, the second pen-death is the one that is the highest.



The above graph shows the average fitnesses of all the runs in the form of trend lines (lines that show the slope). The higher the slope, the faster the rate of learning.

## Summary/Conclusion

The project was successful in attaining its goal of improving AI because first SethBling's code was run straight up with no changes, then several changes were made to the code and it was ran again. With these changes, better results were obtained as the AI learned to finish the level faster. And this was the goal.

## Discussion/Future steps

Some possible things that could be done in the future include: Getting the AI to complete other levels, changing the code so that fitness is determined by farmost\* not rightmost\* and having the AI play underground pipe levels. Further,aside from Marl/o, what has been learned from this project can applied to other games. It can be used to improve AI in games where there is an active adversary, an adversary that behaves in an unpredictable manner(Pac-Man)

\*Farmost = How far from the starting point the AI has got

\*Rightmost = How far right from the starting point the AI has got

## References/Acknowledgements

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