1. Download Python 3.7 and any IDE
2. Download PyCharm IDE here:<https://www.jetbrains.com/pycharm/download/#section=mac>
3. Open PyCharm, locate the terminal window on the bottom, type “pip install. pygame, neat-python”, press Enter to install the necessary packages.
4. Download the code from Github<https://github.com/Ramen2Spicy/Flappy_AI>
5. Read the README file on the Github Repository.
6. Change the configurations in the “config-feedforward” file as you please.
7. Run Flappy\_bird.py

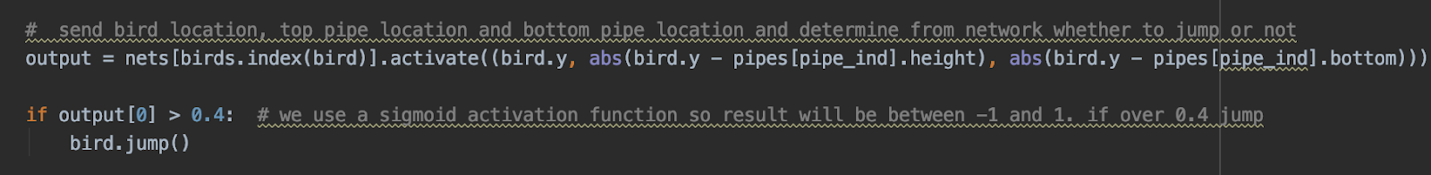
**Understanding Neural Evolution**

The learning ability of the AI-controlled birds in the game of Flappy Bird is inspired by

human neural networks, which use our own experiences to propagation our behavior. But in the perspective of training, the real world experience takes too long; flappy bird could take seconds or minutes to generate the result for a game; a game of chess or Monopoly will take even longer. To solve this problem, a technique called neural evolution is used, which is inspired by natural evolution. During the training process, the neural network creates a population of individual AI-controlled birds knowing as genomes. Similar to genomes in biology being sets of chromosomes that inherit genetic information, the neural network sees the birds as individuals that carry its own parameter values. As the game progresses, the genome that scored the highest points passes his parameter values to the next generation. Now the new generation of genomes will perform better by having better-fitting algorithms inherited from their ancestors and pass their successor’s genes to the next generation.

To achieve this evolution, we first need to provide a stable environment with universal rules that the genomes can adapt to just the way how real animals adapt to their habitats. In the world of Flappy Bird, the game ends when a bird collides with pipes. The game design code describes this environment as it functions independently without the presence of the AI. Next, we need to define what it means to be successful for the genomes. Fortunately, Flappy Bird is a simple game and the only goal is to survive as long as you can. We can condition the birds’ behavior by awarding a fitness score of 0.1 for each second a bird survives, a score of 2 when passing a pipe, and a score of -1 when colliding with a pipe.

The next step is to define what environmental factors should be taken into account when a bird decides to jump or not, in programming language terms, the inputs. There are 3 factors that should dictate the birds’ decision making process, which are the bird’s location, the bird’s distance to top pipe, and the bird’s distance to bottom pipe’s location, thus, three 3 inputs in the input layer of the neural network. The output, therefore, is a numerical value between 0 to 1. We are telling the AI to let the birds jump when the output is greater than 0.4. After defining the inputs and outputs, we begin building the structure of the neural network. The NEAT-Python package simplifies this process by allowing users to import a configuration file that includes each defined parameters. Here, we can specify the size of the population, mutation rates, type of activation, and etc. For example, we could change the fitness\_shreshold to 100, which tell the genomes to decline its learning rate after reaching a fitness score of 100. You could read more about what each of these settings do here: <https://neat-python.readthedocs.io/en/latest/>A screenshot of a cell phone

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