

**Title:** Supervised Learning: A study of Genetic Algorithm with a Feed-Forward Neural Network on real-time decision of a Tower Defense Game

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## **ABSTRACT**

Nowadays there are many researchers and game makers started using Evolutionary Algorithm to research and implement the Artificial Intelligence computer bot to various Real Time Strategy games, the computer bot will learn the players or opponent's behaviors and counter their strategy to enhance the gaming experience but those implemented RTS games are just a simulation. The proposed study intends to experiment if the Genetic Algorithm is capable in implementing Artificial Intelligence enemy bot to a Tower Defense game with the help of Feed-Forward Neural Network and by integrating a Supervised Learning for the approach of the AI-training. In this study, the role of the Genetic Algorithm is for the spawning of the enemies by using the genetic operators: Selection, Crossover, and Fitness Method. At each step, the GA selects two individuals from the current population of the enemies and uses them as parents to mate together through a crossover process and produces a child. After that, in fitness function, the weakest or the enemy with the lowest health point is eliminated from the population and added the new child. For the role of the FFNN, the neural network will help the genetic Algorithm for generating controllers. The FFFNN will decide on where the enemy will pass through the map. The process of FFNN will undergo a computation and the calculated output serves as baseline data for the training of the agent by using the back-propagation method of the supervised learning. In this method, it computes the error between the calculated output and the desired output and will taught the agent the path to go. These processes will be executed throughout the game. The algorithm was experimented through an Android device and with the results; it showed that the capabilities of Genetic Algorithm in implementing an Artificial Intelligence towards a Tower Defense game are possible and working accurately.

**Keywords:** Genetic Algorithm, Feed-Forward Neural Network, Fitness Function, Selection, Crossover, Mutation, Real-time Strategy games, Chromosomes, Artificial Intelligence, perceptron, Supervised Learning