# Neural Computing Semester 2

## Introduction

For this second semester I have been asked to produce three different neural networks the first of these neural networks was a Probabilistic Neural Network, PNN, the second was a self-driving car based on the fuzzy logic neural network and the third was a genetic algorithm.

## Literature Review

This is a brief literature review of the findings that I made whilst doing some research on parts A, B and C. this review will be broken down into 3 sections as the later stages of this report have been.

Part A

Part B

In order to start building a neural network that can handle autonomous driving I need to define what autonomous driving is and as in an article be BMW AG (2019) The Path to Autonomous Driving they stated that there are 5 levels to autonomous driving the first three are mostly driver assistance and this is not full autonomy however level four and five. Level four of the article states that at Level 4 they considered this to be fully autonomous driving, although a human driver can still request control, and the car still has a cockpit. In level 4, the car can handle the majority of driving situations independently. The technology in level 4 is developed to the point that a car can handle highly complex urban driving situations, such as the sudden appearance of construction sites, without any driver intervention.

The driver, however, must remain fit to drive and capable of taking over control if needed, yet the driver would be able to sleep temporarily. If the driver ignores a warning alarm, the car has the authority to move into safe conditions, for example by pulling over. While level 4 still requires the presence of a driver, cars won’t need drivers at all in the next, final level of autonomous driving.

These statements are well above the threshold for automated driving and implementing something like this in MATLAB would be possible with fuzzy logic.

Level five of this article states they believe that unlike levels 3 and 4, the “Full Automation” of level 5 is where true autonomous driving becomes a reality: Drivers don’t need to be fit to drive and don’t even need to have a license. The car performs any and all driving tasks – there isn’t even a cockpit. Therefore, every person in the car becomes a passenger, opening up new mobility possibilities for people with disabilities, for example.

Cars at this level will clearly need to meet stringent safety demands and will only drive at relatively low speeds within populated areas. They are also able to drive on highways but initially, they will only be used in defined areas of city centres.

While this is full automation this sort of fuzzy logic network would take an extensive amount of time to implement and would be well out of the scope of such a small section of a semesters worth of assignment.

Part C

## Methods

### Part A

The PNN Network is used to automate the classification of data from a large data set the data that this network will be classifying will have many different data types in it from integer-based data through to text. The first step in creating this neural network was to look at the data and prepare it for input into the network as this would have a large impact on the initial building steps.

### Part B

During the design of this network the first thing that I did was to set some limits in order to keep this section within the scope of the assignment. These parameters have helped to stop this section getting

### Part C

The aim of part C was to from the minimum value of f for the value of x between 0 and 30 and to do this where f is defined as f= -(10+(-x^2/10) +3\*x) +50 +5\*sin(2\*x). The first thing to do was to learn how genetic algorithms were implemented in MATLAB and following this implement the algorithm that I needed.

## Conclusions

## References

BMW AG (2019). The Path to autonomous driving. <https://www.bmw.com/en/automotive-life/autonomous-driving.html>