Terms of Reference

Project title

Neural Networks with Python and TensorFlow

Stakeholders

Alexander James Johnson (Student),
Dr Stephen Lynch (Project supervisor).

Project Background

Artificial Intelligence (AI) still remains as one of the greatest challenges in scientific research to this date, but much progress in the field has been made using artificial neural networks. The design of artificial neural networks is loosely inspired by that of biological brains, and serves as an expansion of an earlier concept called the perceptron (Rosenblatt, 1958). By using multiple layers of these artificial neurons, we can form a highly connected system that is referred to as a neural network, these networks can then be trained on a large data set to predict the output with high accuracy.

The range applications for neural networks is wide: they can be used to classify data, predict future states of chaotic systems, apply stylisations to images, and control physical/physically-based system in real-time.

Aims

- Provide introductory information about neural networks and TensorFlow suitable for those without prior knowledge in the field.
- Produce a neural network model to reliably solve an advanced problem, potentially related to robotics.

Objectives

Listed here are a set of objectives, and a suggested date for their completion given as [year/month/day].

- Reproduce results previously obtained in MATLAB using Python. [2020/02/01]
- Terms of reference submission. [2020/02/01]
- Use TensorFlow to produce results, giving a brief overview of how the TensorFlow library works, and how to use it. [2020/02/15]
- Background of a more advanced subject that will be the main focus of the report. [2020/03/10]
- Precursory results from own research. [2020/03/20]
- Preliminary report submission. [2020/03/27]
- Obtain sufficient results for own research. [2020/04/15]
- Completed own research, ready to begin final tweaks. [2020/05/10]
- Oral and poster presentations. [2020/05/21]
- Project submission. [2020/05/26]

Project Deliverables

- A selection of programs that perform the calculations.
- A report, providing details of the mathematics and methodologies used.
- An interim report, which will act as a self contained sample of the full report.
- A poster presentation, highlighting key aspects of the project and displaying relevant results.
- An oral presentation, providing an in-depth overview of the report.
- A terms of reference document, describing the scope and purpose of the project (this document).

Required Resources

- Access to hardware capable of running Python and TensorFlow.
- Access to library and internet resources, for research purposes.
- An implementation of LaTeX, for report writing.

All of the above requirements are already satisfied by the University or otherwise.

Bibliography

Rosenblatt, Frank (1958). "The perceptron: a probabilistic model for information storage and organization in the brain." In: *Psychological review* 65.6, p. 386.