1. **Introduction**

I have not come into this project with a specific client in mind. My goal is to try and develop my knowledge and skills in the area of neural networks and to challenge what I already know. I’m always listening to music and commonly struggle to find exactly the style of music that I want to listen to at a certain time. This project combines both aforementioned aspects and create a starting point to automating this music finding process, Similar to the Spotify radio system which selects music from similar artists as the artist you are currently listening to.

1. **Business Case**
   1. **Business Need**

At the moment when I’m listening to music the radio will commonly pick similar artists’ songs. This causes for the mood of the music to not be consistent meaning that focus can be lost. By training a neural network to categorise music I will be able to take the first steps towards resolving the radio issue and providing a proof of concept that a neural network is able to categorise distinguishing features in music. Neural networks are also a field of work that I would be interested in working on after graduation, because of this practice and development of my knowledge in neural networks should prove useful.

* 1. **Business Objectives**

From this project the objectives that I would like to achieve are:

1. Develop a greater theoretical understanding of Deep Neural Networks
2. Develop a greater practical understanding of Deep Neural Networks
3. Improve my knowledge on Audio file types
4. **Project Objectives**

The objective is to produce a neural network that is trained so that it:

1. Can take in .WAV song formats and categorise into previously trained categories.
2. Efficiently categories said songs
3. Convert the .WAV files into Midi Files
4. Use a ‘Fast Fourier Transform’ to generate a spectrogram from the midi file.
5. Use the generated data points on the spectrogram to recognise patterns that can be used to classify the genres.

1. **Initial Scope**
2. The system should allow a user to input a .WAV song file and categorise this file into a specific genre.
3. The neural network should aim to categorise songs almost instantaneously.
4. The network would be trained on WAVs converted to Midi then to a spectrogram file using a fast fourier transform. This process could be done using parallel computation.
5. Training with the spectrograms can also be done using parallel computation
6. **Resources and Dependencies**

Parallel Computation Labs – BGB203

1. **Method of Approach**

The network will be designed incrementally, building up from the core elements. These core elements include but are not limited to; Multi-Layer Network, Test Data, .WAV selection.

Currently I am planning on using Keras for the neural network and Python for the data crunching/converting. For parallel computation I am looking at using the parallel computation lab in babbage, room 203. On these machines we can chose between two technologies for parallel computation, MPI and CUDA.

1. **Project Plan**

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| --- | --- | --- | --- |
| **7. Project plan** | | | |
| **Stage** | **Expected**  **Start**  **Date** | **Expected**  **Completion**  **Date** | **Products/Deliverables/Outcomes** |
| 1 Initial Research | 2 Jan | 11 Jan | Research previous papers attempted to complete similar or same task |
| 2 Initiation |  | 11 Jan | PID |
| 3 Investigation and outline requirements | Mon  29 Jan | Mon  5 Feb | Further research into existing papers, deciding on technologies and processes |
| 4 Initial high level design | Tuesday 6 Feb | Tues  13 Feb | Final design plan, network structure, parallel computation assignments, music file conversion program plan |
| 4 Increment1 | Weds  14 Feb | Thurs  1 Mar | Completed System for converting file types |
| 6 Increment2 | Fri  2 Mar | Weds  14 Mar | Created training program for neural network, running in parallel |
| 7 Increment3 | Thurs  15 Mar | Fri  23 Mar | Successfully running neural network with new untrained inputs. |
| ***Easter vacation*** | **Mon**  **26 Mar** | **Fri**  **13 Apr** |  |
| 8 System and user acceptance testing | Mon  16 Apr | Fri  20 Apr | Test results, final system; user training |
| 9 Assemble & complete final report[[1]](#footnote-1) | Mon  23 Apr | Fri  4 May | PRCO304 Report |

**7.2 Control plan**

The following PRINCE2 control techniques will be employed:

1. Highlight reports as dictated by the PRCO304 module

2. end-Stage reports

2. Review meetings with project supervisor as dictated by the PRCO304 module; additional ad-hoc meetings as are necessary

3. Risk management (see Section 8); communication plan (see Section 7.3); quality plan (see Section 9); exception reports[[2]](#footnote-2) and plans as necessary

**7.2 Control Plan**

In order to prevent myself from falling behind I will take the following steps to manage my project progress:

1. Highlight Reports
2. End of stage reports
3. Project supervisor meetings
4. Risk Management
5. Quality Control

**7.3 Communication Plan**

I will arrange meetings with my supervisor as the control plan dictates and when I need further support.

**8 Initial Risk List**

|  |  |
| --- | --- |
| **Risk** | **Management Strategy** |
| Schedule Overrun | Frequent meetings with my project supervisor should encourage me to keep on track of my work load, alongside clear planning documents. |
| Difficulty Learning / implementing new technologies | Additional research into using the new technologies should be carried out over the Christmas break. Test project will be created to develop an understanding in how to use the technologies |
| Technology failure | The university provides several PCs in the parallel computation lab in case any break. Files could be stored on one drive as a backup to reduce a full loss of data. |
| Unable to train network based on wav files | Input file would be changed out to a file type with more data points to compare if .WAVs converted through to spectrograms don’t provide enough. |

**9 Initial Quality Plan**

|  |  |
| --- | --- |
| **Quality Check** | **Strategy** |
| Requirements | Have the requirements initially set by myself been met? A cross check can be formed at each stage of the project or at the end. |
| Neural Network Training | Plotting the average error rate over each training iteration will provide me with a good insight in the training efficiency of the network. The lower the error rate over time the more accurate the training has made it. |
| Live test | Does a file with a predetermined genre get sorted correctly after training? |
| Parallel Computation | Does the parallel computation help, test the speed of the network in parallel vs the speed of the network in serial? |

**10 Legal, Ethical and/or professional Issues**

My project meets ethical and professional issues however could struggle to meet legal requirements given the licensing of music. To resolve this, I can use only copyright free and royalty free music in my project.

My project will not need an ethical approval application.

1. [↑](#footnote-ref-1)
2. [↑](#footnote-ref-2)