Generate Multi-track MIDI Files from Scratch Using Machine Learning

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1 Aims

There has been significant interest and development in the field of automated music generation over the last sixty years. With the recent advancements in AI and machine learning technology, the prospect of completely AI generated pieces of music is slowly becoming a feasible reality. Large scale organisation such as Google recognise the demand by the general public, hobbyists, professional musicians and organisations looking for good quality automated music. Googles Magenta project is a plugin for Ableton Live that lets users utilize machine learning to generate or augment pieces. Significant research and development has gone into the project.

The problem is that the best and most recent models still have issues such as creativity, style and structure and sentimental issues when generating musical ensembles (or multi track) from scratch.

The project will aim to try and create an machine learning architecture that can reliably output a score of multi track MIDI files that can maintain musical integrity between the different tracks whilst maintaining objectively good balance between creativity, style and structure and sentiment. Then embed this into a GUI for people wanting to use or edit these tracks in software such as Ableton Live.

I hope to explore how to use and combine machine learning techniques into effective architectures and achieve a use-able product that can be accessed in a simple user friendly environment.

2 Core Targets

- Conduct research of existing methods used to generate music and their pros and cons.
- Effectively create a machine learning architecture that employs a number of different methods or an ensemble of models to create well structured MIDI tracks with a main rhythm from scratch, and bass and percussion tracks conditionally from the rhythm track.
- Produce a model that can generate multitrack MIDI output that maintains integrity in the following areas: Long term length, local and global structure, natural endings.
- Embed the model in a user friendly GUI that can be used to download generated MIDI files for use in tools such as Ableton Live

3 Extended Targets

- Add elements to the model that can generate music with certain traits such as: Style, sentiment, mood.
- Extend the multi track to include more than the initial three tracks. Can include harmonic melodies, accompanying strings tracks etc.

4 Fallback Targets

- Create a model that can produce single track MIDI files rather than multi track.
- Create a very simple GUI for users to create and download MIDI tracks for their own purpose.

5 Relevance

- Machine learning has been a key focus for me since my introduction to the discipline during the course of my degree. This project should help me gain deeper understanding of machine learning techniques, how to combine previously researched methods into a larger architecture and how to employ them in real world project scenarios.
- Creating an application in a web development environment is something I have not encountered much yet. I hope to gain skills in technologies such as React to create an interface for people to play with my architecture.
- Integrating machine learning architectures into interactive user friendly environments is a key learning objective for me in this project.

6 Weekly Timetable

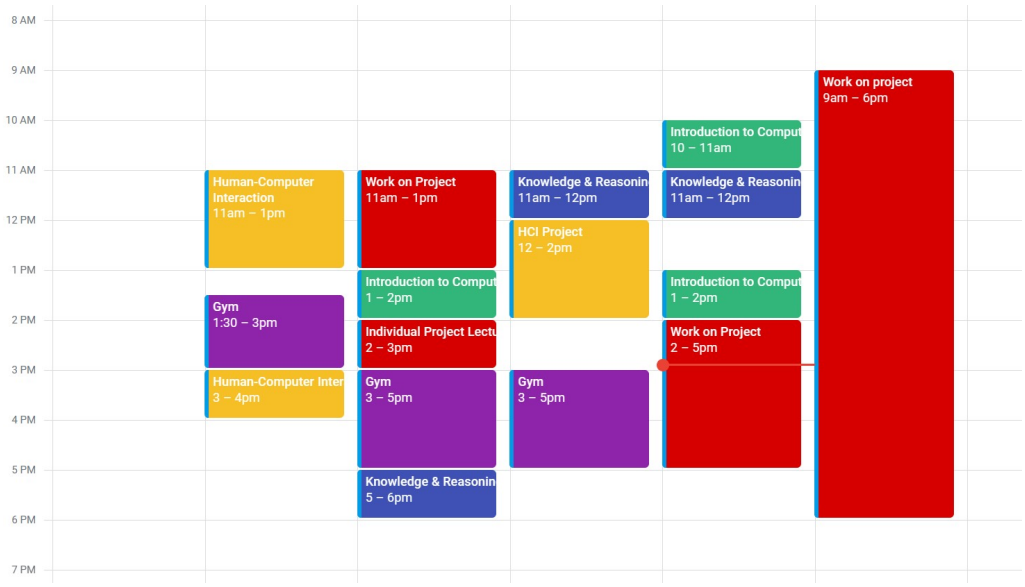

Figure 1: Weekly Timetable displaying available time to work on project

[2] [3] [4] [5] [1]

References

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[4] Shulei Ji, Xinyu Yang, and Jing Luo. A survey on deep learning for symbolic music generation: Representations, algorithms, evaluations, and challenges. *ACM Comput. Surv.*, 56(1), aug 2023.

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