

Team Project - Sprint 1

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(My teammate and I decided to work on different topics, maybe related to some extent, but we are working separately.)

Define your project:

This project is to use Machine Learning to standardize such MIDI files and reduce the influence of musicians' live improvisation, ensuring that the notes land precisely on the beat where they belong. Thus it's easier to convert them into sheet music using notation editors.

(Background: The MIDI files recorded in real-time or transcribed by AI from audio files (e.g. recording of a piano performance) are often too "messy" to be directly opened with music notation software like Sibelius and Musescore, because of performers' live improvisation, notes deviate from their original positions in time, causing a "messy" display in the editing software.)



Figure 1 Sheet music generated from MIDI that is recorded from live performance



Figure 2 Sheet music after manual adjustment

The music score shown in Fig 2 was created from scratch by myself. The MIDI simply did not help. So I'm trying to make this project work for me – to simplify this process. Even if it looks a bit more organized, it's of great help.

Target Users:

- Music Producers (May use MIDI keyboards for note input)
- Those who are doing music transcription
- Music Software Developer

User story:

Users can specify an input MIDI file and receive a normalized MIDI file in return.

- As a music producer, I'd like to make a demo where all notes are exactly where they belong. I don't want to adjust every note manually.
- As someone who transcribes music, I may use AI models to generate MIDI files. I want these

MIDI files to be transformed into sheet music automatically. Small errors are acceptable. They can be corrected manually. This is much faster than editing sheet music from scratch.

- As a music software developer, I hope to integrate a feature into my software to automatically standardize MIDI, facilitating users in arranging music, creating sheet music, or producing standardized demos.

MVP:

Users can upload real-time recorded or AI-transcribed MIDI files through the software, and the system will apply a machine learning algorithm (using trained models) to standardize the notes, calculating the beats and adjusting note durations to reduce the influence of improvisation. The output should be also MIDI files, which allow further edition. It's expected to support only piano.

Resources for reference:

- [1] [Liu, Lele, et al. "Performance MIDI-to-score conversion by neural beat tracking." \(2022\).](#)
- [2] [Jamshidi, Fatemeh, et al. "Machine Learning Techniques in Automatic Music Transcription: A Systematic Survey." *arXiv preprint arXiv:2406.15249* \(2024\).](#)
- [3] [Tanprasert, Thitaree, et al. "Midi-sheet music alignment using bootleg score synthesis." *arXiv preprint arXiv:2004.10345* \(2020\).](#)
- [4] [A. Julian and V. Mukund, "Music to Score Conversion using Machine Learning," *2024 4th International Conference on Data Engineering and Communication Systems \(ICDECS\)*, Bangalore, India, 2024, pp. 1-5, doi: 10.1109/ICDECS59733.2023.10502423.](#)

Review:

Paper [1] focused on the specific challenge of rhythm quantization. This paper proposes an approach using CRNN to enhance the conversion of performance MIDI recordings into musical scores. This is quite helpful, because it literally solved the problem that improvisation may make notes not on the beat. It elaborates how CRNN worked to quantize rhythm and provides an open-source tool on github, which I'm planning to focus on during the next week.

Paper [3] is another method transforming MIDI to sheet music, introducing an alternative method to optical music recognition for aligning MIDI with sheet music images by projecting MIDI data into a 'bootleg score' format. It seems to operate on the graphic level.

Paper [2] and [4] are more about transcription, but they introduced multiple alternatives on onset detection, which is to be compared with Paper [1].

P.S.: I found few papers regarding the application of MIDI standardization. It seems that this topic is more of a technical issue.