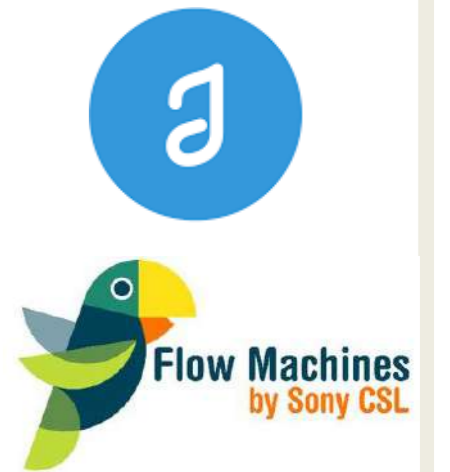


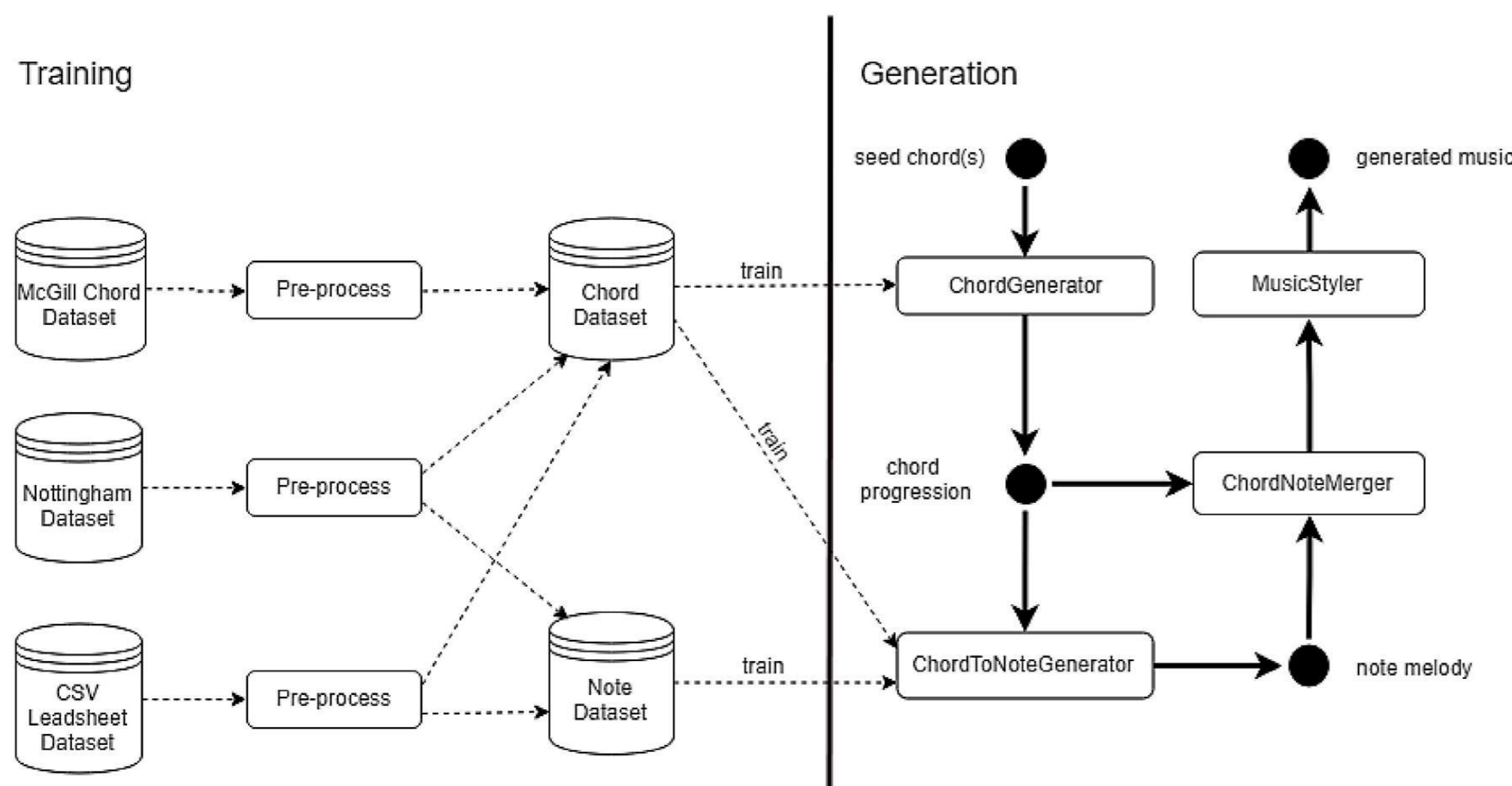
AI Music Composition using Deep Learning

Introduction

- **AI music composition** has emerged as one of the trending fields in **AI creativity research**.
- Participants in this field range from tech giants like **Google Magenta** and **Sony CSL**, to rising startups such as **Jukedeck** and **Amper**.
- Unlike a typical straightforward melody generation approach, here we showcase a **chord-based generation approach** that is capable to compose pleasant, harmonic music pieces.



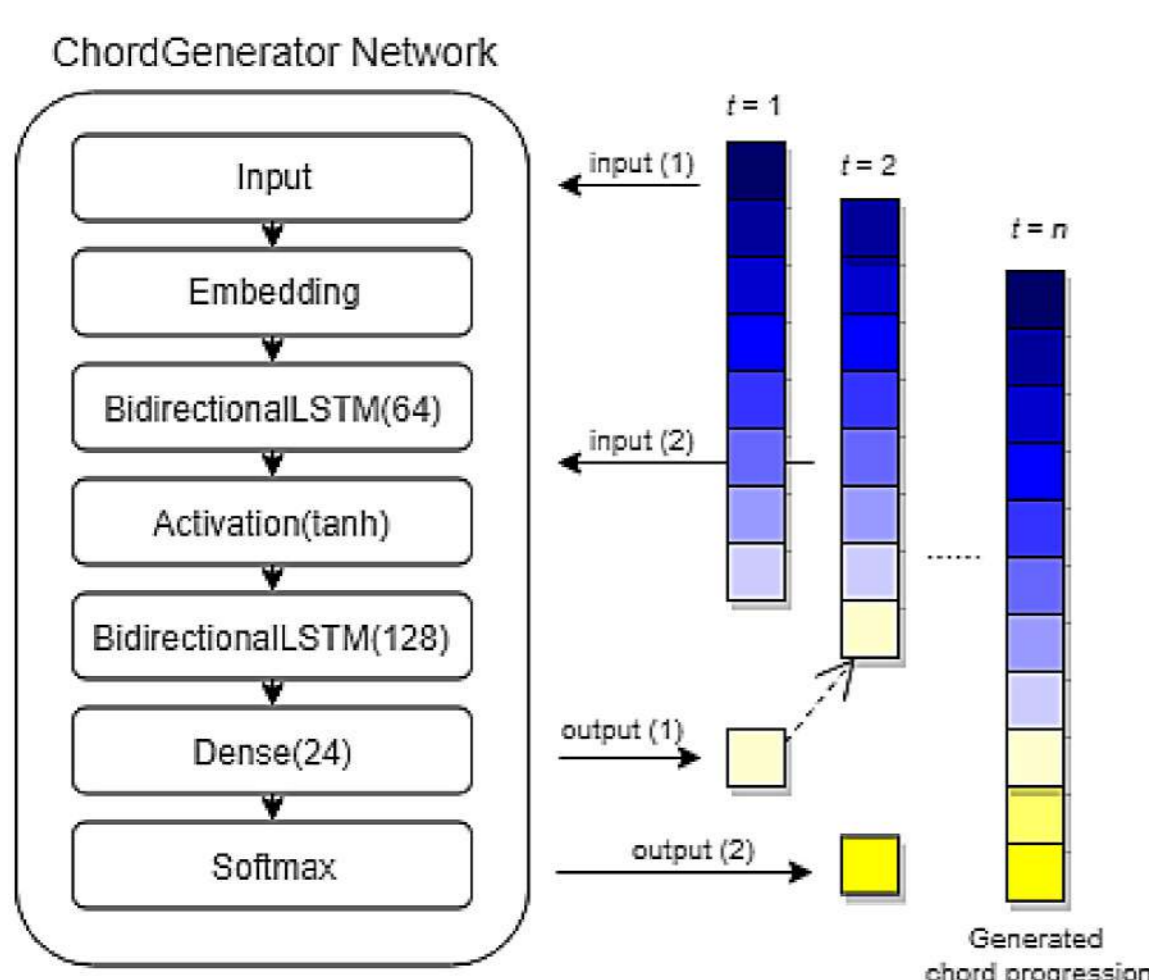
Chord-Based Generation Approach



Data

- **Nottingham dataset**
 - Contains over 1000 folk tunes, with both chords and melodies annotated.
 - The data is preprocessed and shifted to the same key (C major) for normalization.
- **McGill Billboard Chord dataset**
 - Contains 891 Billboard chart top hits songs, with the chord progressions annotated.
 - The key of each sample is shifted to the same key (C major) for normalization.

Model

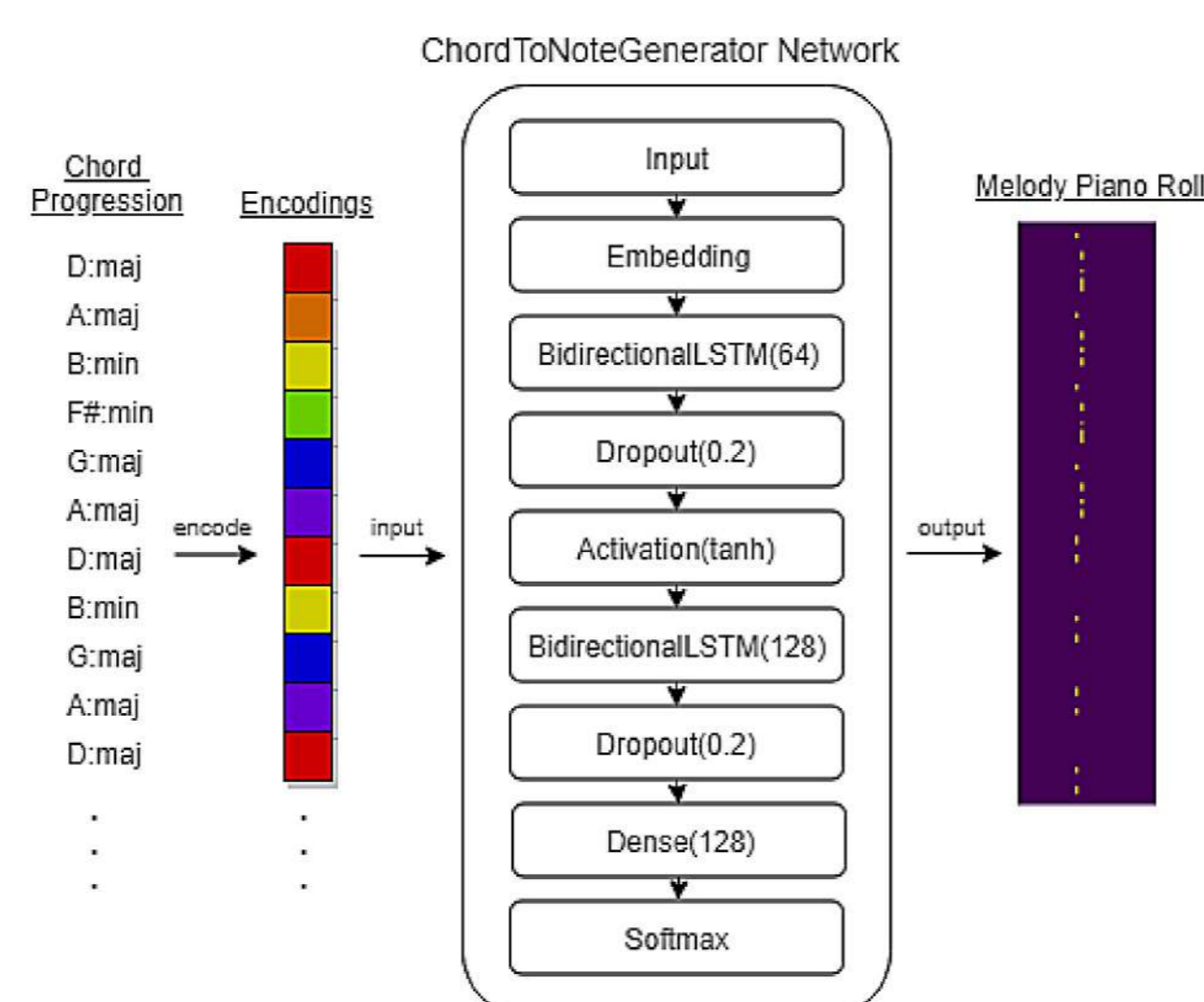


Chord Generator

- All chord samples are segmented into sequences of 9 chords.
- The first 8 chords are fed into the model to generate the next chord.
- The **generated chord** is combined with the first 7 chords as **input for the next time step** until we reach the number of chords needed.

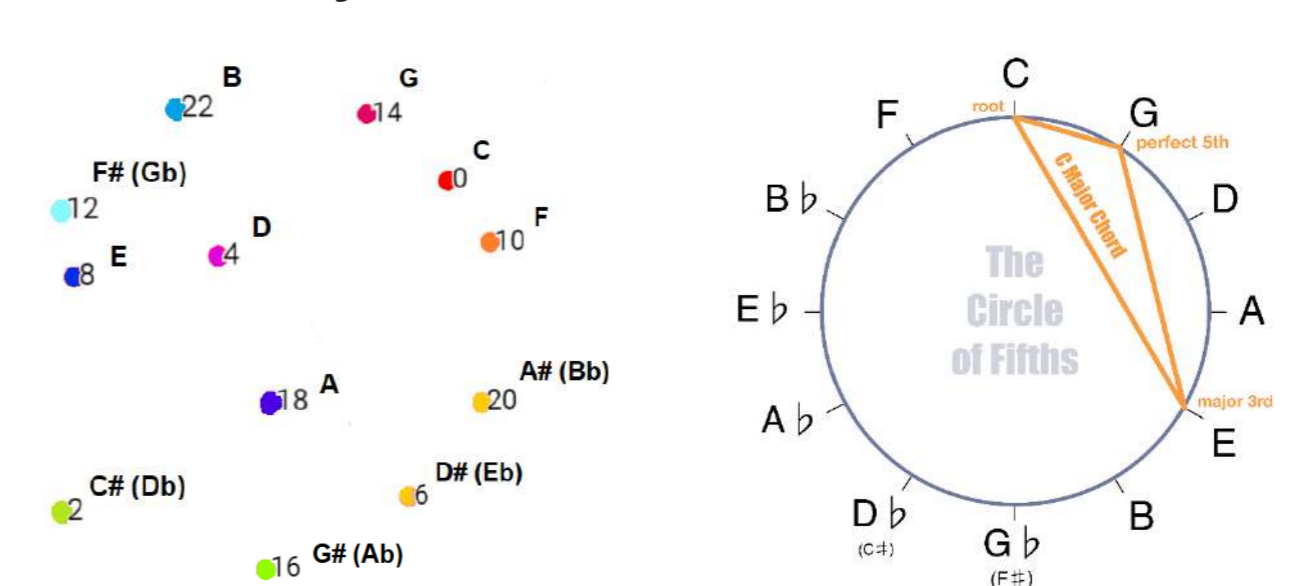
ChordToNoteGenerator

- We use a **seq2seq** model for chord-to-note generation.
- The chords are encoded into ids and fed into the note generator network
- The network outputs a tensor that shows the **probability of notes** at each time step.
- Taking the argmax of the probabilities at each time step yields a **melody piano roll**.



Results

- Surprisingly, the visualization of the chord embeddings learnt in Chord Generator, after dimensionality reduction using Principal Component Analysis (PCA), highly resembles the **major Circle of Fifths**.



- A two-tier evaluation is done as followed:
Tier 1 : Baseline - **Musical Turing Test**
Tier 2 : Comprehensive evaluation with metrics as below -

Objective Evaluation	Subjective Evaluation
Outlier chords / notes Excessive repeat of chords / notes Riemann's functional harmony	5-point Likert scale rating in terms of harmony, rhythm, musical structure, coherency and overall rating

Conclusion

- A **chord-based generation** method could ensure the melody generated to be more **pleasing** and **harmonic**.
- Our chord model is able to learn **meaningful representations** from the dataset that resembles with **music theory**, which aids the process of music composition.