

# DEEP MUSICIAN

## AUTOMATIC MUSIC GENERATION USING DEEPLARNING

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## Music Generation

- Create a model that can automatically generate music
- Train the model on a large dataset of existing music
- Use the model to generate new, unheard music of arbitrary length

## Preprocessing - get the data in shape

- Use symbolic representation of music
  - Midi Files
  - **Piano roll**, that captures the notes played at each time step (2D-Array)

## Architecture

- Sequence aware **encoder-decoder** architecture
  - Each consist of a two-layered **GRU**

## Sequence 2 Sequence

- During **training** the model sees sequences and tries to predict the next note
  - After training the model is started with an empty step
- This triggers the model to incrementally **generate** a sequence of notes

# RESULTS

- The results measured by the loss function are very promising.
  - Yet the generated music is not very good and most of the time only an empty sequence is returned.
- The model is not able to generate a coherent melody, since the training data is very **imbalanced**: Most of the time the notes are not played at all.

## Preprocessing

- Endless possibilities to represent the underlying data
- There is not a single best representation: each have there own advantages and disadvantages
- Beside the piano roll representation, there are also symbolic representations that represent the music as a sequence of words.

## Evaluation

- Although the loss function is a good indicator for the performance of the model, it is not a good measure for the quality of the generated music.
  - Instead of a classical BCE-loss, I used a loss function that was initially developed for image recognition and object detection: **Focal Loss**.
- The main idea behind focal loss is to down-weight the contribution of easy examples in the training data and focus more on the hard examples