

ALGORITHMIC COMPOSITION

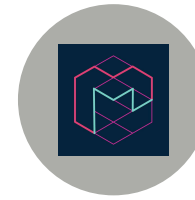
AIST2010 Lecture 11



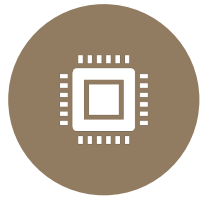
Algorithmic
Composition



Using Neural
Networks



TensorFlow and
Magenta



Functional
Programming



Euterpea

OUTLINE

THE COMPUTER AS A COMPOSER

Algorithmic composition — using algorithms to create music

- Mathematical models
- Knowledge based systems
- Grammars
- Evolutionary methods
- Systems which learn
- Hybrid systems

Read: <http://www.doc.gold.ac.uk/~mas02gw/papers/AISB99b.pdf>

MAIN CONCERN: WHAT IS THE NEXT NOTE?

Video from: <https://youtu.be/wM-x3pUcdeo>



There are any more “Pi Songs” on YouTube!

USING NEURAL NETWORKS

Should the computer attend a music theory class first?

Music by neural networks

- First trained music NN in 1989 by Peter Todd
 - A Connectionist Approach to Algorithmic Composition
 - <https://www.jstor.org/stable/3679551>

RNN/LSTM

- Learn patterns and rules from examples
- Estimate and imitate the style to decide:
 - What is the next note?
 - How long should it be?
 - What is the best chord to go together?
 - What instruments should be used?
 - Playing style? Emotion? ...

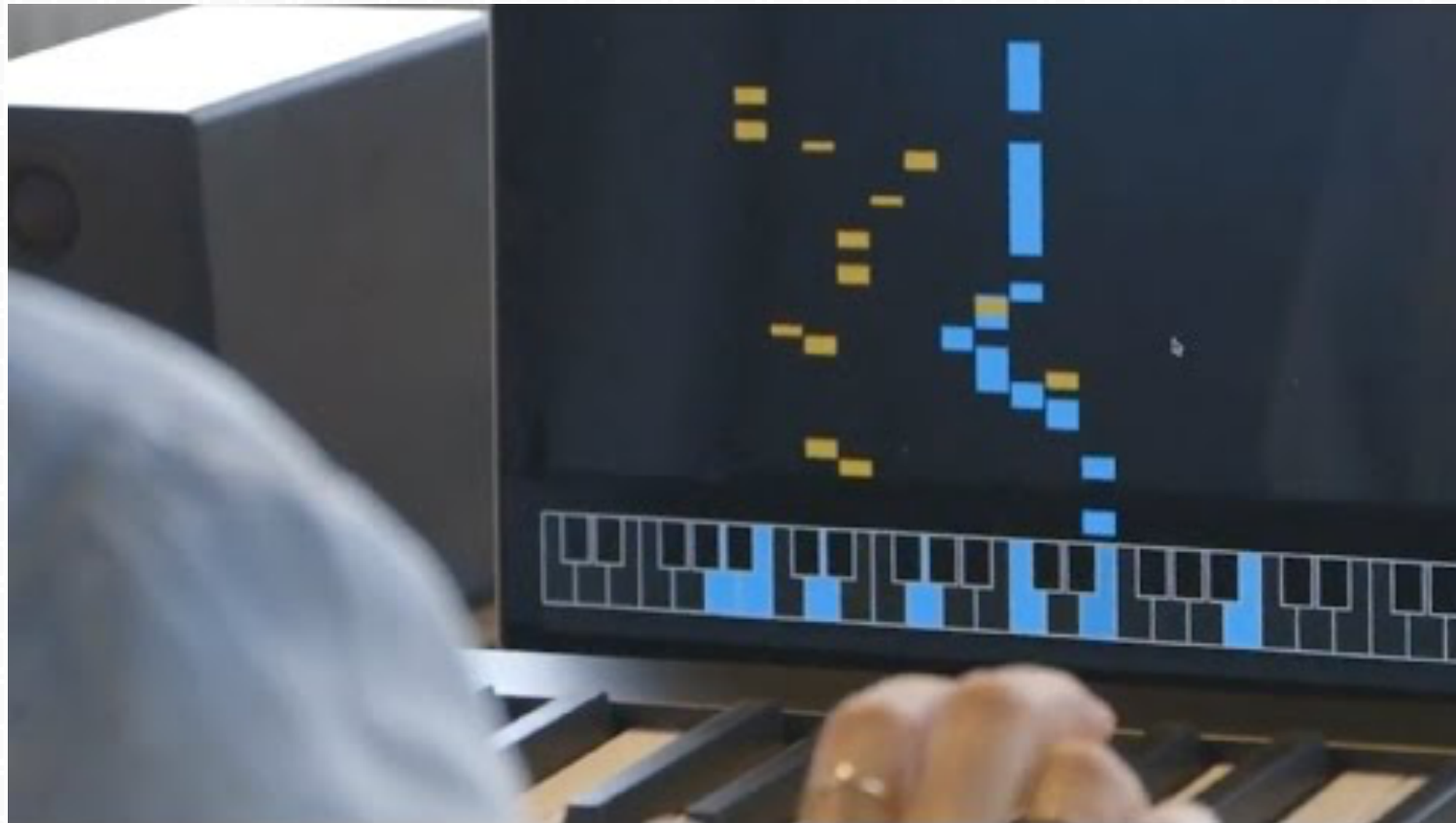
WHAT SHOULD IT LEARN FROM?

Input type	Note sequences	Raw audio
<i>Computational complexity</i>	Low (minutes – few hours)	High (few hours – days)
<i>Editable result</i>	Yes, can be imported in music production software	No, waveform itself has to be edited
<i>Musical complexity</i>	As complex as a single song from the corpus	As complex as the combination of the entire corpus

Read and listen: <https://www.asimovinstitute.org/analyzing-deep-learning-tools-music/>

MAGENTA: AI DUET

Video from: <https://youtu.be/OZE1bfPtvZo>



TENSORFLOW AND MAGENTA

TensorFlow

- Built by Google Brain since 2011
- Library and platform for building machine learning models
- Python based

Keras

- High-level NN API
- Running on top of TensorFlow

Magenta

- Python library powered by TensorFlow
- Open-source community with Google developers and others
- Training of models
- Symbolic creation and manipulation of music with **pre-trained models**
- *Also available as a JavaScript API!*

SHOWING AI MUSIC TO PEOPLE...

Video from: <https://youtu.be/XBfYPp6KF2g>



Try the doodle here: <https://www.google.com/doodles/celebrating-johann-sebastian-bach>