

# Timeline of AI papers

## BIRTH OF MUSIC NEURAL NETWORKS

**Lewis, 1988** – “Creation by Refinement: A creativity paradigm for gradient descent learning networks” in International Conference on Neural Networks.

**Todd, 1988** – “A sequential network design for musical applications” in Proceedings of the Connectionist Models Summer School.

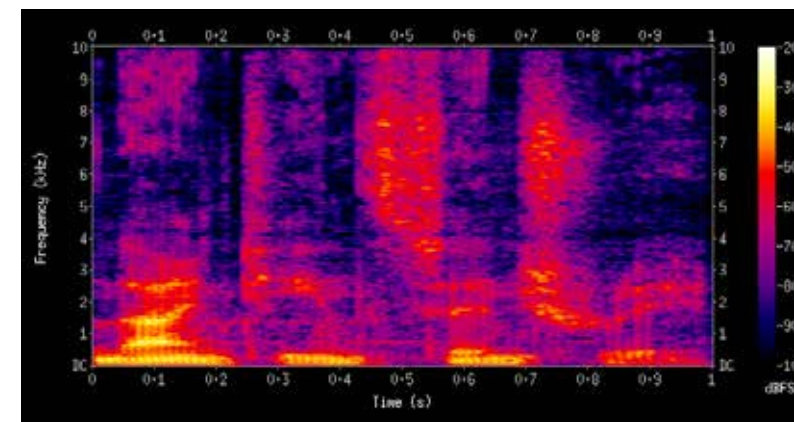


## Symbolic data: i.e. MIDI data or notes

## FIRST USE OF LSTM

- **Eck & Schmidhuber, 2002** – “Finding temporal structure in music: Blues improvisation with LSTM recurrent networks” in IEEE Workshop on Neural Networks for Signal Processing.

- **Marolt et al., 2002** – “Neural networks for note onset detection in piano music” in International Computer Music Conference (ICMC).



## USE OF IMAGES FOR DATA

## FIRST GENRE CLASSIFIER

**Hinton et al., 2006** – “A fast learning algorithm for deep belief nets” in Neural computation, 18(7), 1527–1554.

## CHORD RECOGNITION

**Humphrey & Bello, 2012** – “Rethinking automatic chord recognition with convolutional neural networks” in International Conference on Machine Learning and Applications (ICMLA).

**Humphrey et al., 2012** –  
“Moving beyond  
feature design:  
deep  
architectures  
and automatic  
feature learning  
in music  
informatics” in  
International  
Society for  
Music  
Information  
Retrieval  
Conference  
(ISMIR).

**Lee et al., 2009** – “Unsupervised feature learning for audio classification using convolutional deep belief networks” in Advances in Neural Information Processing Systems (NIPS).

## IMPROVING NETWORKS

**Choi et al., 2016** – “Automatic tagging using deep convolutional neural networks” in International Society for Music Information Retrieval Conference (ISMIR).

Engel et al., 2017 – “Neural audio synthesis of musical notes with Wavenet autoencoders” in International Conference on Machine Learning (ICML).

**Yang et al., 2017** – “MidiNet: A convolutional generative adversarial network for symbolic-domain music generation” in International Society for Music Information Retrieval Conference (ISMIR).

Dieleman et al., 2018 – “The challenge of realistic music generation: modelling raw audio at scale” in arXiv.

**Pons et al., 2018** – “End-to-end learning for music audio tagging at scale” in International Society for Music Information Retrieval Conference (ISMIR).

- **Roberts et al., 2018** – “A hierarchical latent vector model for learning long-term structure in music” in arXiv.

- Donahue et al., 2018 – “Synthesizing audio with Generative Adversarial Networks” in ICLR Workshops.

- Lee et al., 2017 – “Sample-level deep convolutional neural networks for music auto-tagging using raw waveforms” in International Sound and Music Computing Conference (SMC).

## MODERN GAN/VAEs

**Pons et al., 2016** – “Experimenting with musically motivated convolutional neural networks” in International Workshop on Content-Based Multimedia Indexing (CBMI).

- **Van Den Oord et al., 2016** – “WaveNet: A generative model for raw audio” in arXiv.

**Dieleman & Schrauwen, 2014** – “End-to-end learning for music audio” in IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).

## END-TO-END MUSIC CLASSIFIER

## Raw audio: waveforms

## Engineered features: i.e. Spectrograms and Chromagrams