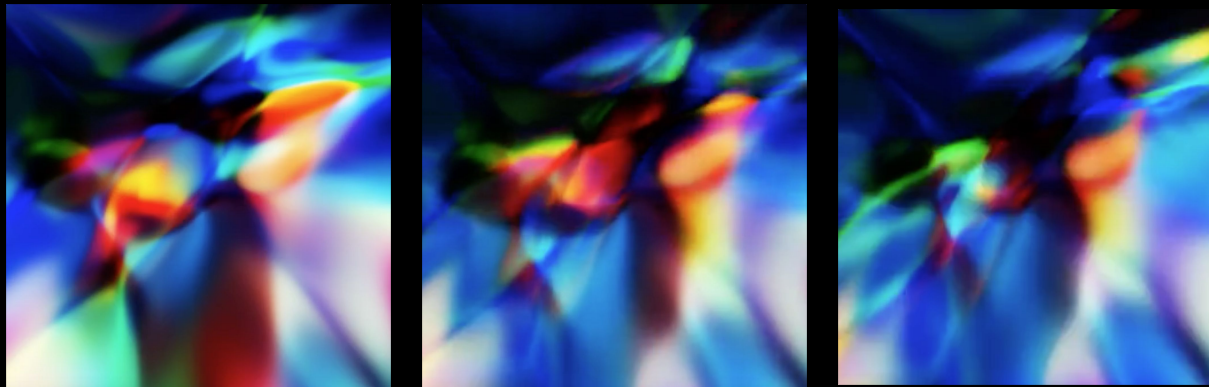


NeuroMV: A Neural Music Visualizer



Group 4: Kevin Chen, Maya Shen, Kayo Yin, Kenneth Zheng





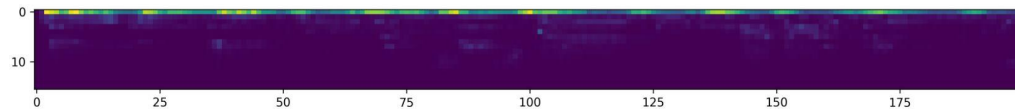
Zedd - Spectrum

Image: None (randomly initialized)

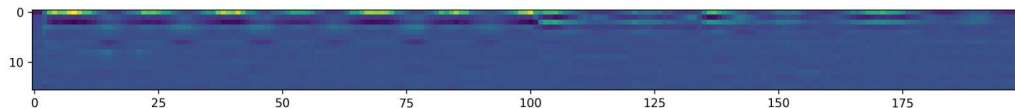
Features: Mel Spectrogram

Feature Extraction

- Mel Spectrogram



- Principal Component Analysis (PCA)

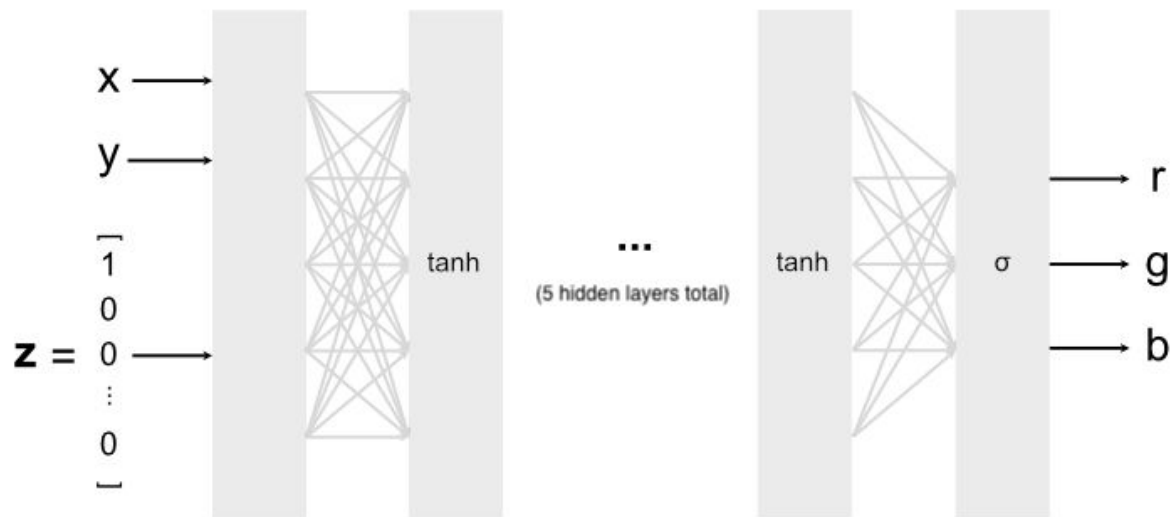


- Spleeter [9]
 - Pre-trained neural model to separate music into vocals+accompaniment



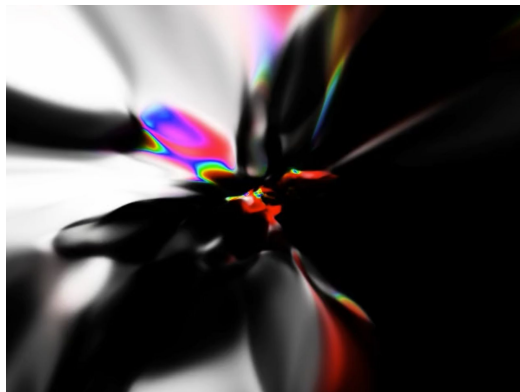
Model (CPPN)

- Compositional Pattern Producing Network
- Models an image as a function from (x,y) position to (r,g,b) values
- Simple feed-forward neural network with tanh activations
- Latent vector $\mathbf{z}$ changes the output based on a conditional input

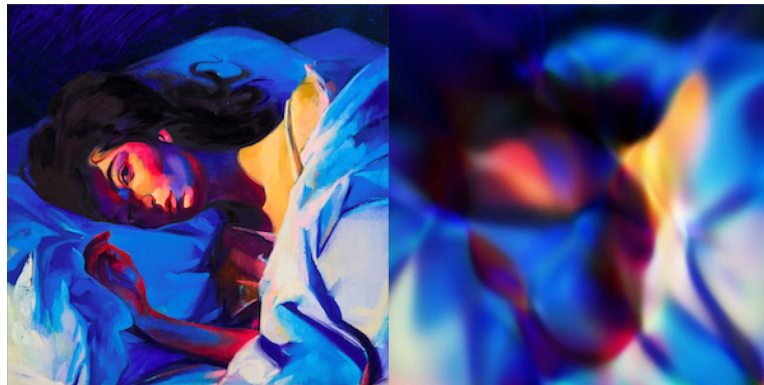


Training with images

- Can either randomly initialize weights, or train with a reference image as a pixel dataset
- Examples: album art, ML-generated images from lyrics, and manually selected images

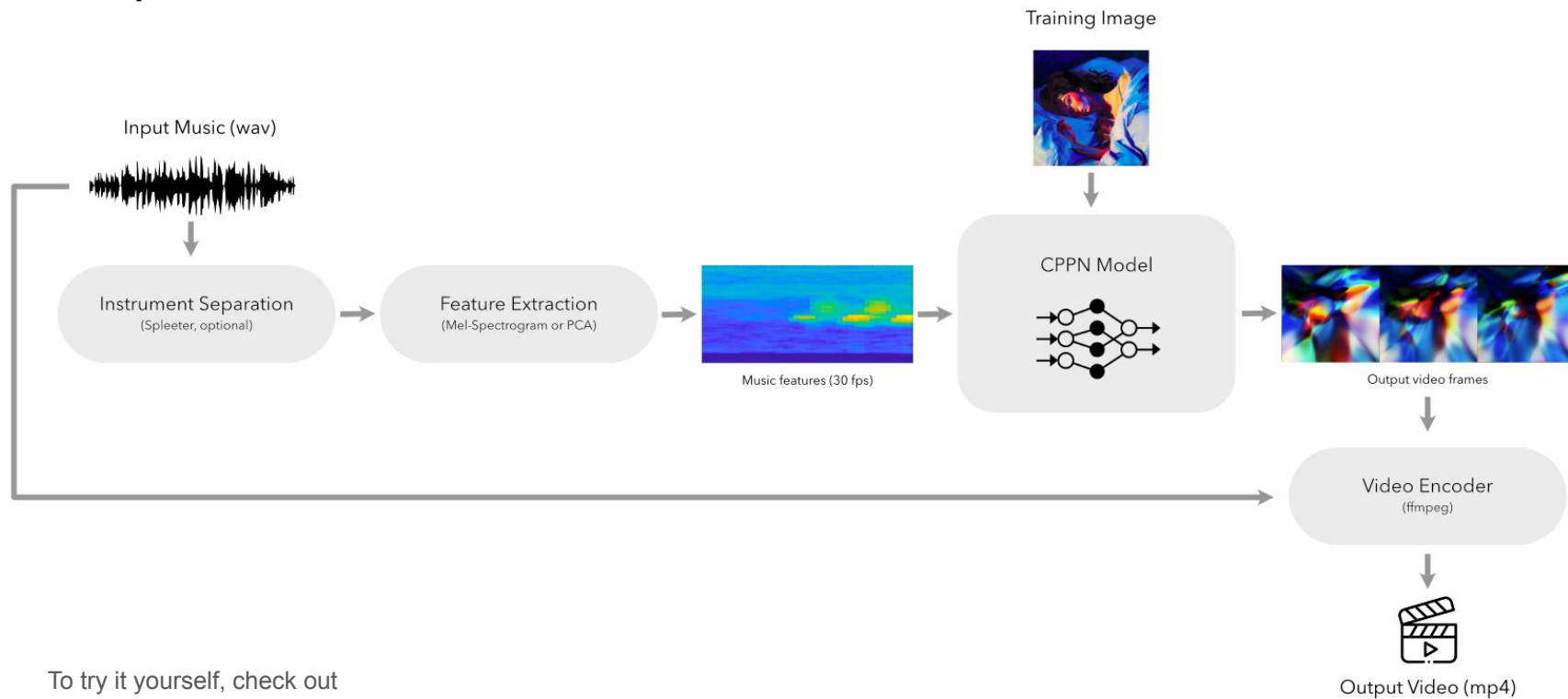


Randomly initialized weights
(from a standard Gaussian distribution)



Trained with image
(left = reference image, right = model output)

Full Pipeline



To try it yourself, check out
<https://github.com/kenzheng99/NeuroMV>

Evaluation/Reflection

- **Visual aesthetic quality**
 - overall visual style of the output frames, including color, shape, texture
- **Movement quality**
 - movement should be smooth, with enough variation to keep the viewer's interest and prevent static images
- **Syncing with music**
 - visualization seems to be in sync with the music
- **Emotional impact**
 - This is the least well-defined and hardest to measure, and is influenced by a combination of all the above metrics

Our results utilized album covers and other visual representations of their corresponding songs and made them move and pulse with the music. We hope such visualizations will allow people to see, feel, and touch the sound, allowing for a deeper appreciation of the music.

References

- [1] <https://blog.otoro.net/2016/03/25/generating-abstract-patterns-with-tensorflow/>
- [2] <https://github.com/hardmaru/cppn-tensorflow>
- [3] <https://kwj2104.github.io/2018/cppngan/>
- [4] <https://github.com/deepsing-ai/deepsing>
- [5] <https://github.com/saharmor/dalle-playground>
- [6] <https://github.com/tyiannak/pyAudioAnalysis>
- [7] <https://app.wombo.art/>
- [8] <https://www.textfixer.com/tools/remove-line-breaks.php>
- [9] <https://deezer.io/releasing-spleeter-deezer-r-d-source-separation-engine-2b88985e797e>