

Project Miles Ahead

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By Christopher Shoe

Building off the TensorFlow
model magenta, we will attempt
to expand Deep Learning Jazz
Generation by enhancing the
recurrent neural network
“Lookback RNN”. Or in other
words...

Can computers
“swing”?

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Dependencies

Get your remote server on!

- TensorFlow
 - magenta - TensorFlow package
 - music21 - python package
 - matplotlib
 - A love for good music
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Process

1. Install required packages and libraries
- preferably on a remote server environment.
2. Run script to initiate database build and modified magenta model.
3. Sit back and enjoy a beverage or two with your favorite jazz album - it's gonna be a while.
4. Wake up, it's tomorrow and your model is done - maybe.
5. Run Script for midi output.
6. Listen to your computer's beautiful creation.

```
INFO:tensorflow:Global Step: 11240 - Learning Rate: 0.00569 - Loss: 0.001 - Perplexity: 1.001 - Accuracy: 99.987
INFO:tensorflow:Global Step: 11250 - Learning Rate: 0.00569 - Loss: 0.000 - Perplexity: 1.000 - Accuracy: 99.995
INFO:tensorflow:Global Step: 11260 - Learning Rate: 0.00569 - Loss: 0.000 - Perplexity: 1.000 - Accuracy: 99.982
INFO:tensorflow:Global Step: 11270 - Learning Rate: 0.00569 - Loss: 0.001 - Perplexity: 1.001 - Accuracy: 99.982
INFO:tensorflow:Global Step: 11280 - Learning Rate: 0.00569 - Loss: 0.000 - Perplexity: 1.000 - Accuracy: 99.997
INFO:tensorflow:Global Step: 11290 - Learning Rate: 0.00569 - Loss: 0.000 - Perplexity: 1.000 - Accuracy: 99.992
INFO:tensorflow:Global Step: 11300 - Learning Rate: 0.00569 - Loss: 0.000 - Perplexity: 1.000 - Accuracy: 99.992
INFO:tensorflow:Global Step: 11310 - Learning Rate: 0.00569 - Loss: 0.000 - Perplexity: 1.000 - Accuracy: 99.997
INFO:tensorflow:Global Step: 11320 - Learning Rate: 0.00569 - Loss: 0.000 - Perplexity: 1.000 - Accuracy: 99.997
INFO:tensorflow:Global Step: 11330 - Learning Rate: 0.00569 - Loss: 0.000 - Perplexity: 1.000 - Accuracy: 99.987
INFO:tensorflow:Global Step: 11340 - Learning Rate: 0.00569 - Loss: 0.000 - Perplexity: 1.000 - Accuracy: 99.987
INFO:tensorflow:Global Step: 11350 - Learning Rate: 0.00569 - Loss: 0.000 - Perplexity: 1.000 - Accuracy: 99.987
```

%CPU	%MEM	TIME+	COMMAND
99.9	34.4	1250:21	python
0.0	0.1	0:01.64	init
0.0	0.0	0:00.01	kthreadd

But is it human?

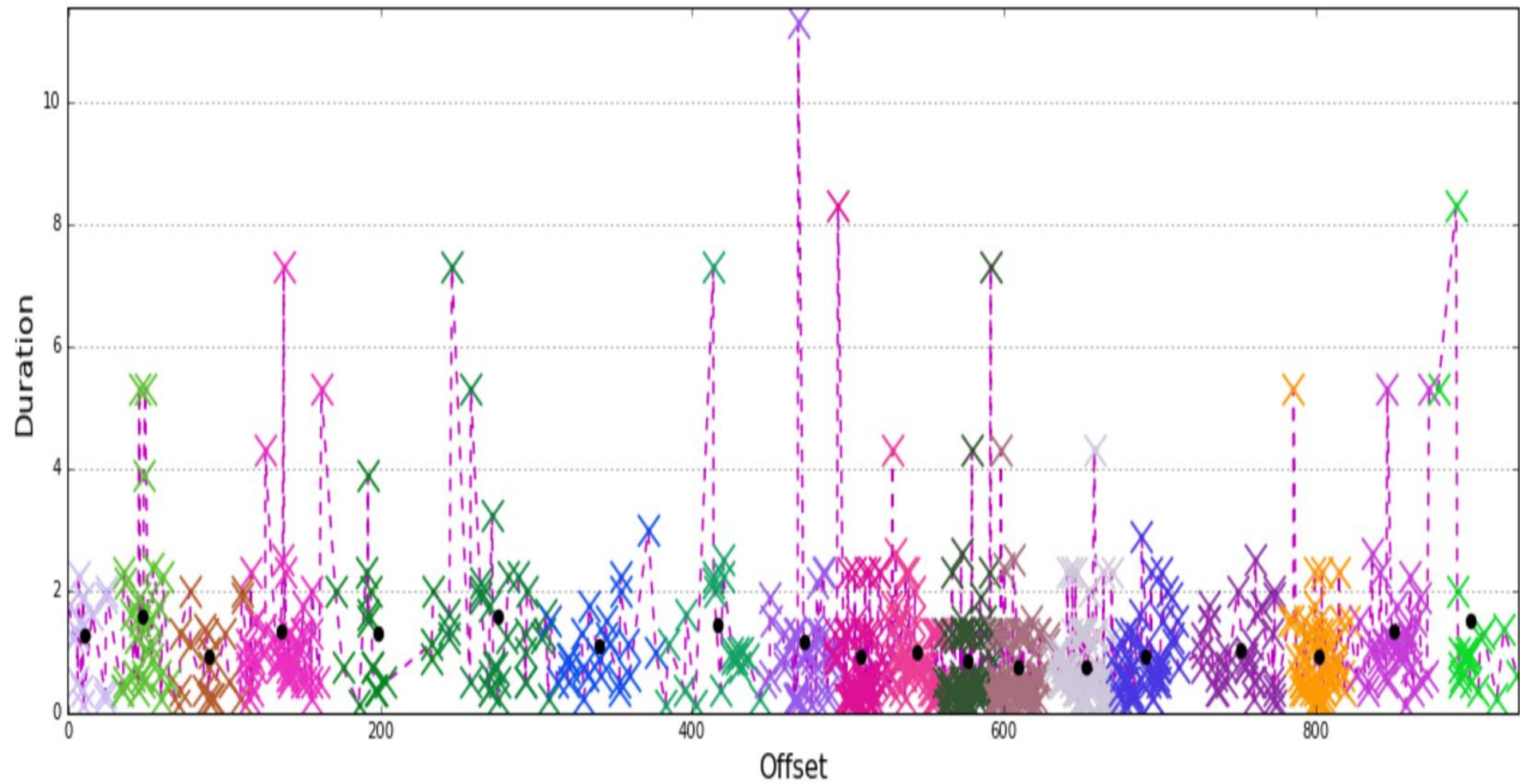
More robust analysis found at: <https://github.com/Mithers/Portfolio>
under the EDA section of Project Miles Ahead

K-means clustering

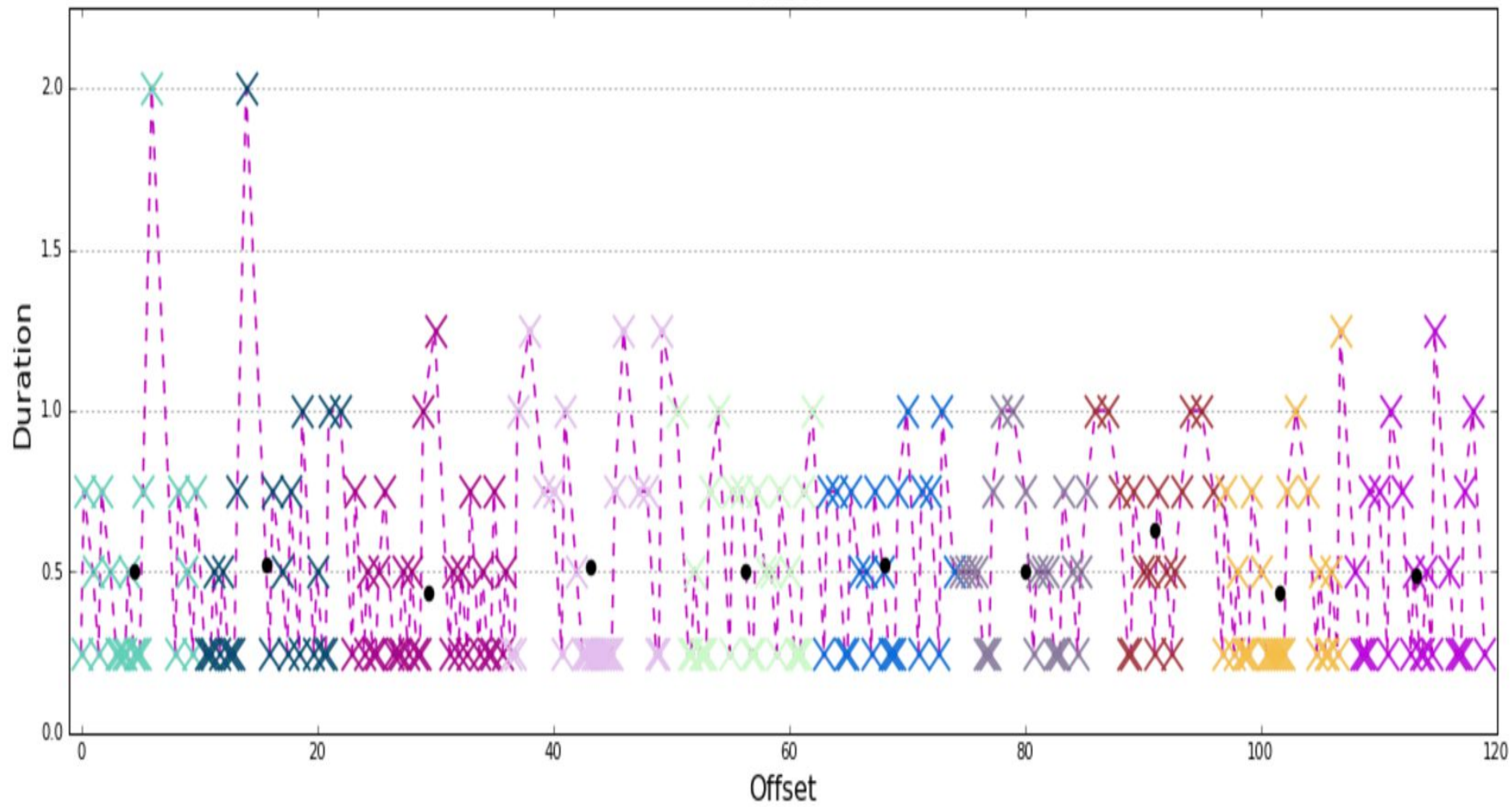
In statistics, **K-Means** is a clustering algorithm that assumes k clusters, and then computes these clusters based on the attributes of the available data. The algorithm takes your entire dataset, in this case debbie, and iterates over its attributes (note length) to determine clusters based around centers(offset), known as centroids.

Doing so with music, particularly with rhythms as we are here, shows us patterns in the player's execution - which will be useful in analyzing the music produced by Miles.

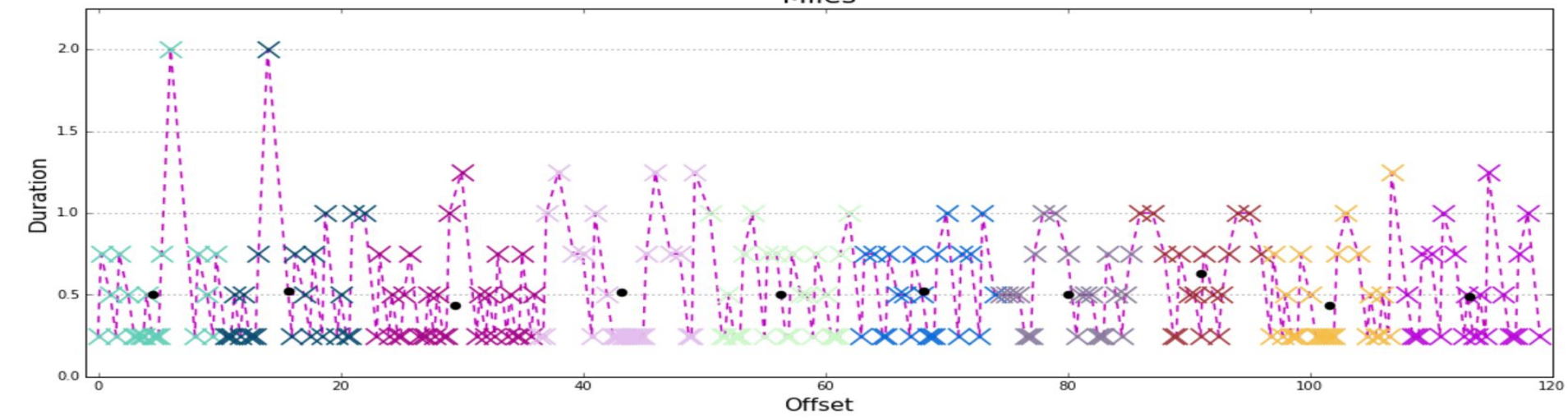
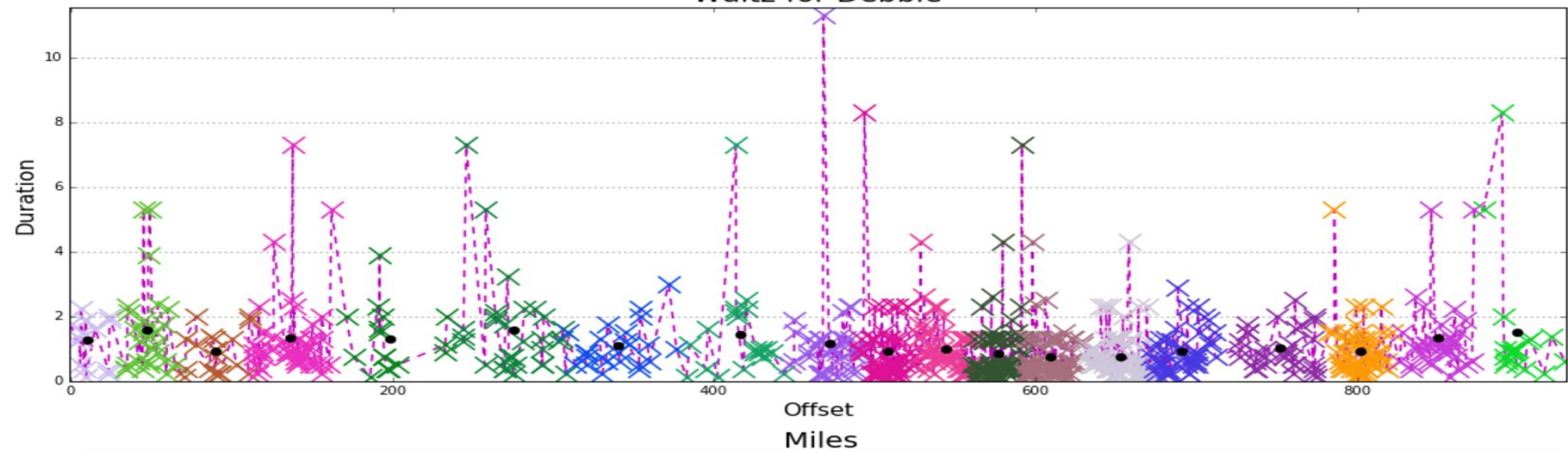
Waltz for Debbie



Miles



Waltz for Debbie



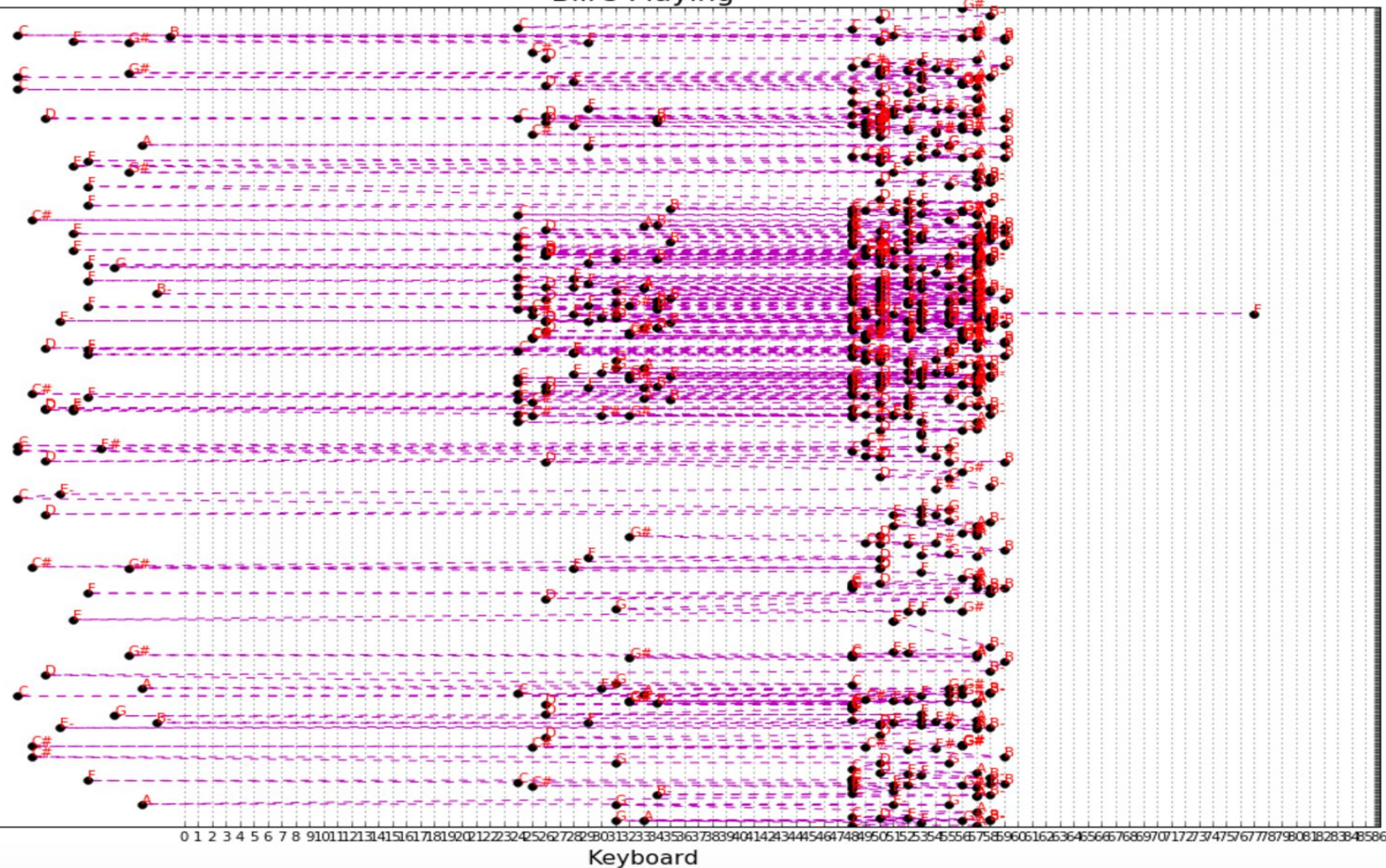
Visualizing Patterns on a Piano

Utilizing `music21` - a python library built for analyzing music - and `matplotlib` we can visualize note and execution patterns of the piece on a piano.

Doing this can bring some interesting insight into whether or not Miles is “thinking” like a real jazz player.

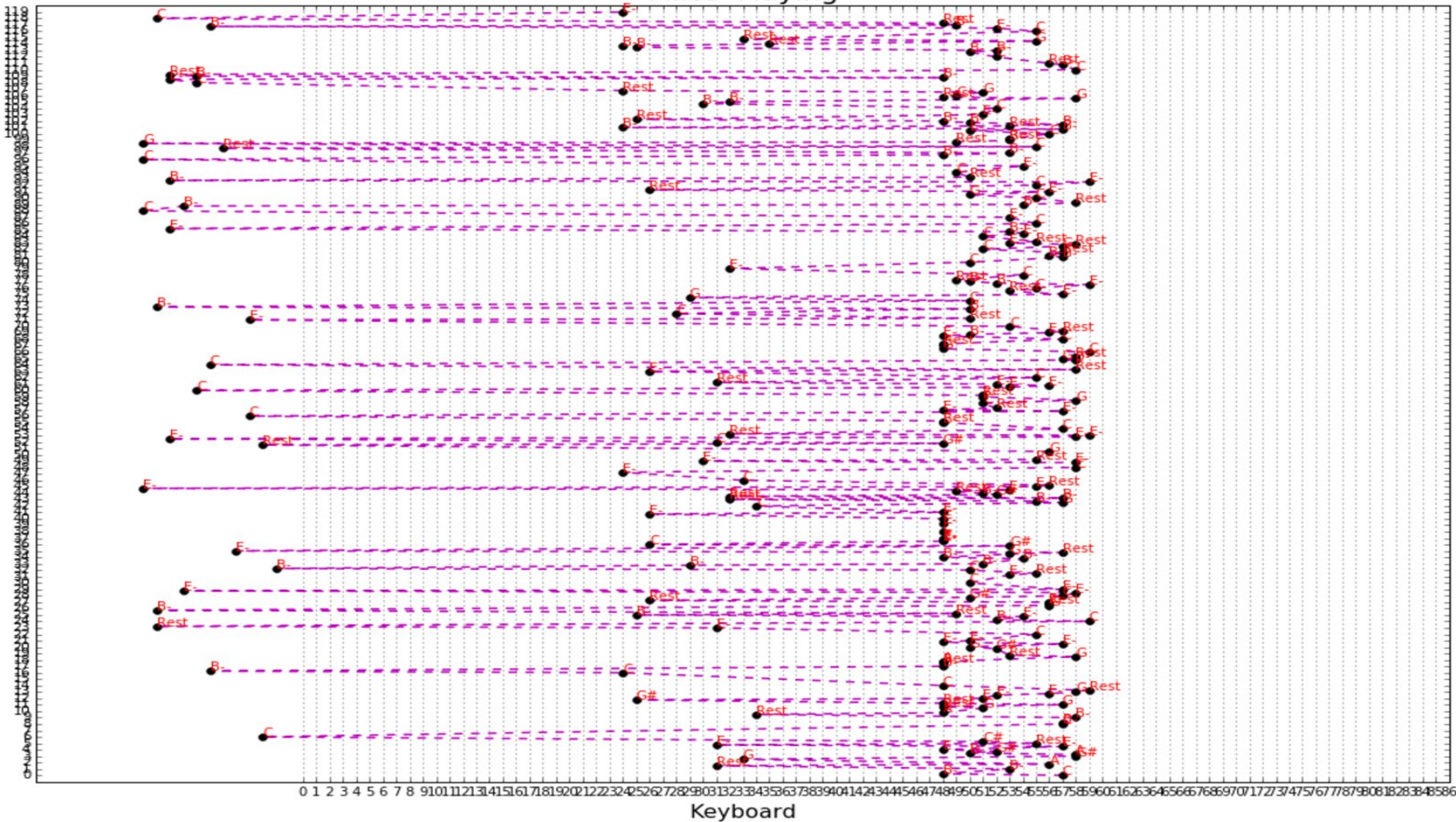
Bill's Playing

Offset



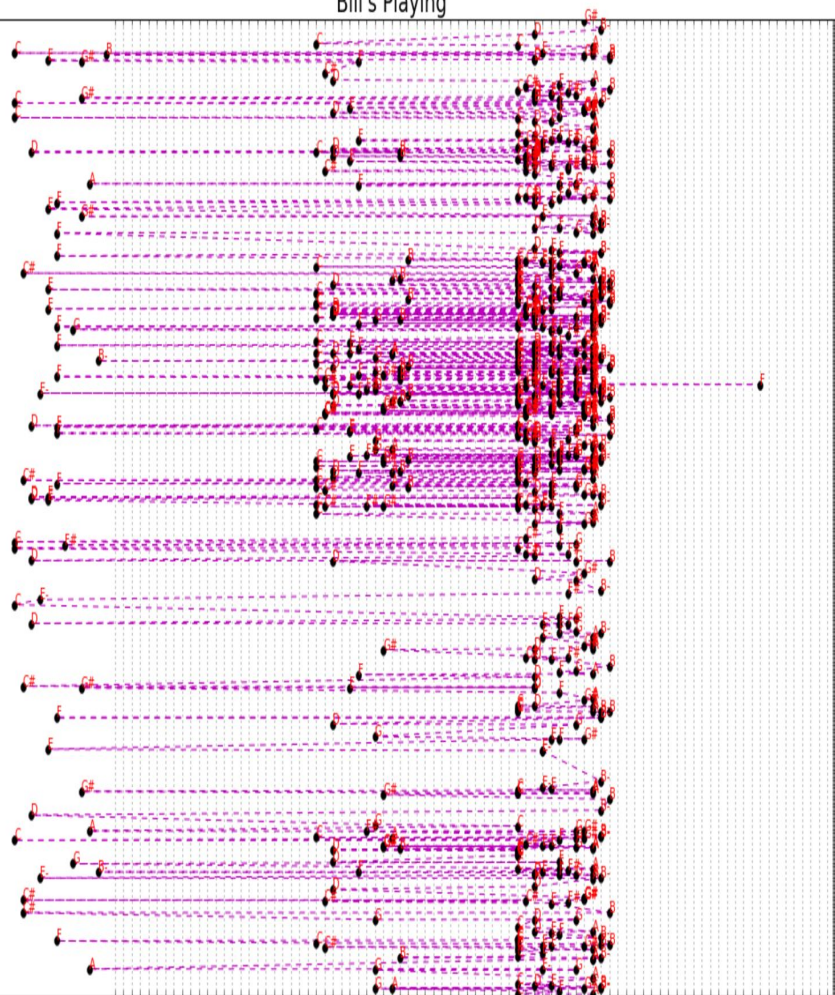
Miles' Playing

Offset



Bill's Playing

Offset

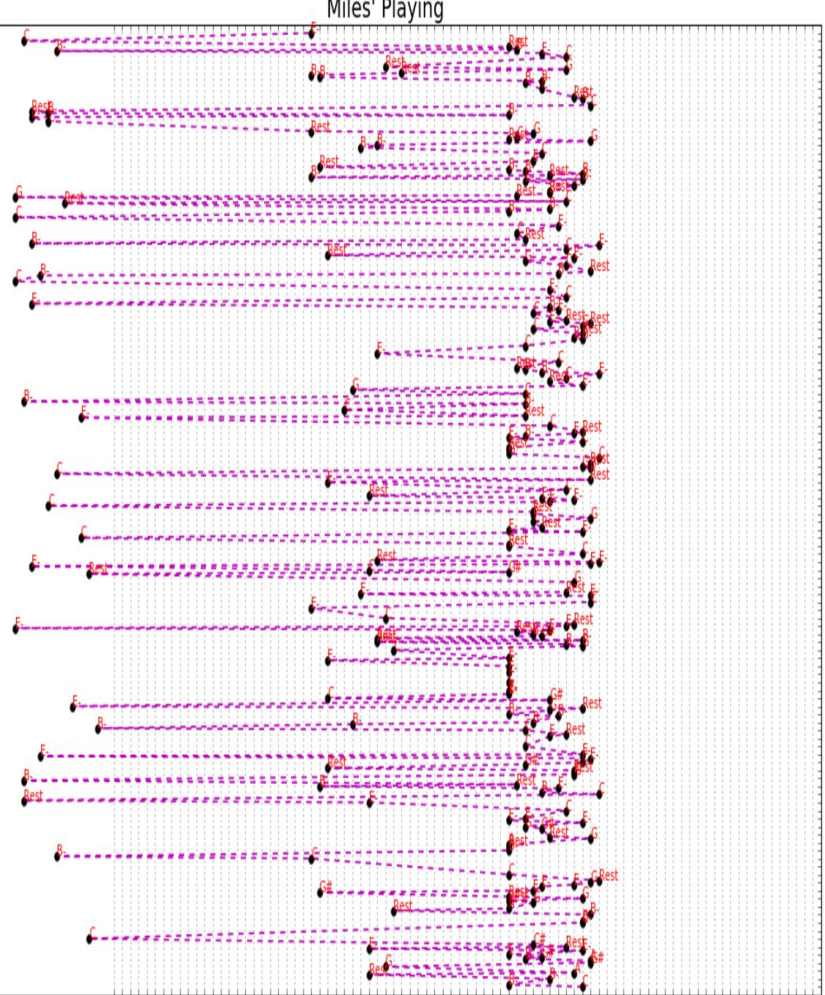


0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86

Keyboard

Miles' Playing

Offset



0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86

Keyboard

Conclusion

Similar rhythmic patterns, clustering, and note selection can be a valid argument for the “humanity” of Miles.

A significant amount more testing will need to be done in order to truly determine if this is the case.

Music, however, is an audible art form. So, perhaps, the only real question is...

Can Miles Can Swing?

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