Investor Pitch: 3 Neural Networks for Genre Classification

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How often do you want to rapidly classify music??

Increasing relevance of music classification.... such as Spotify, Apple Music, and Pandora music recommendation algorithms!

2-Genre MLP Classification

- Data: EchoNest Audio Features
- 8,000 data points total: 4,000 Rock and 4,000 Electronic
  - (Rock & Electronic most frequent in fma dataset)

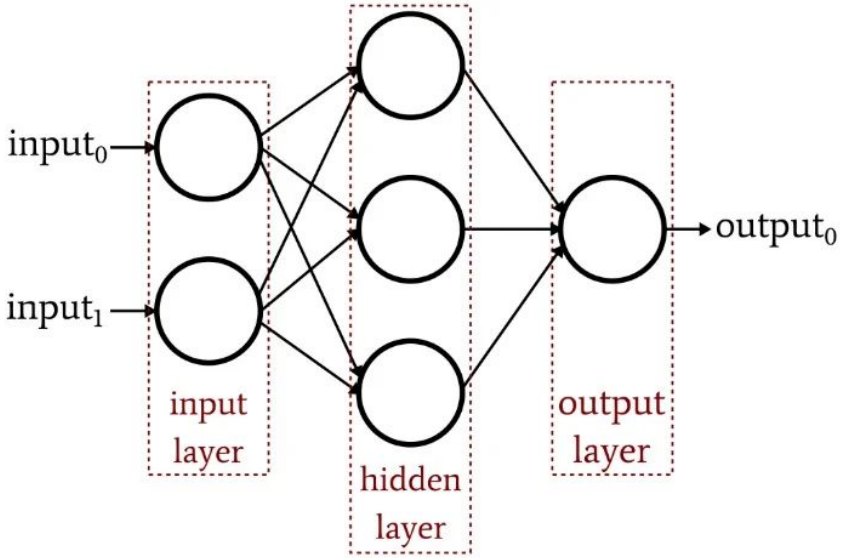
genre	acousticness	danceability	energy	instrumentalness	liveness	speechiness	tempo	valence
R	0.9883055496	0.2556609004	0.9797737929	0.9730057241	0.121342	0.0517397623	90.241	0.0340178672
R	0.9701348869	0.3529461312	0.0238515619	0.9571128852	0.1132607212	0.0321767642	53.758	0.035631561
R	0.9816573443	0.1422492483	0.9121220855	0.9672939775	0.3635095155	0.0875269884	91.912	0.0343252564
R	0.989141175	0.2259775281	0.7228348527	0.2630762793	0.0923705318	0.0534063523	94.322	0.0283472078
R	0.8866597102	0.2985183025	0.7443325625	0.9209504901	0.1395870184	0.0887810414	97.88	0.0735475474
R	0.6982777611	0.2858156458	0.2134937338	0.9556913003	0.0870359278	0.0640938189	125.645	0.1505991359
R	0.8155489042	0.1441250712	0.8927211866	0.9004301244	0.1047034668	0.1022936576	138.68	0.0349164186
R	0.8421128878	0.2852932287	0.5646886968	0.9516243456	0.1104813781	0.0406105474	166.552	0.254299214
R	0.3673926458	0.3296989706	0.8466394286	0.9091861794	0.1989439803	0.4626974726	70.887	0.0482427326

- 8-dimensional inputs, 1-dimensional output

2-Genre MLP Classification

- 8-dimensional inputs, 90-dimensional hidden neurons, 1 output neuron
- Dataset: 60% training, 20% validation, 20% testing
- Loss function: MSE

- **Final testing accuracy: 76% with 0.01 learning rate and 20 epochs**



8-Genre Classification RNN

Model Summary:

```
Model: "sequential_3"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 lstm_6 (LSTM)               (None, 20, 64)            347136

 lstm_7 (LSTM)               (None, 64)                33024

 dense_6 (Dense)             (None, 64)                4160

 dropout_3 (Dropout)         (None, 64)                0

 dense_7 (Dense)             (None, 8)                 520

=================================================================
Total params: 384,840
Trainable params: 384,840
Non-trainable params: 0
_________________________________________________________________
```

8-Genre Classification RNN

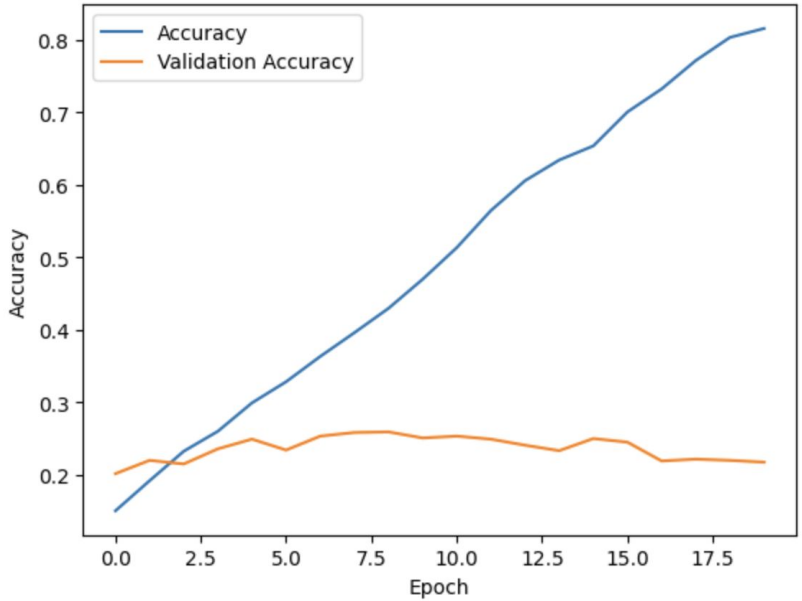
- Final classification accuracy: 28.66%
  - 20 epochs and a 0.001 learning rate
  - Better than random chance! (random chance = ⅛ = 12.5%)

- Accuracy of classifying the correct genre within the top 3 classifications: 60.75%

- *Next slides: Model performance*

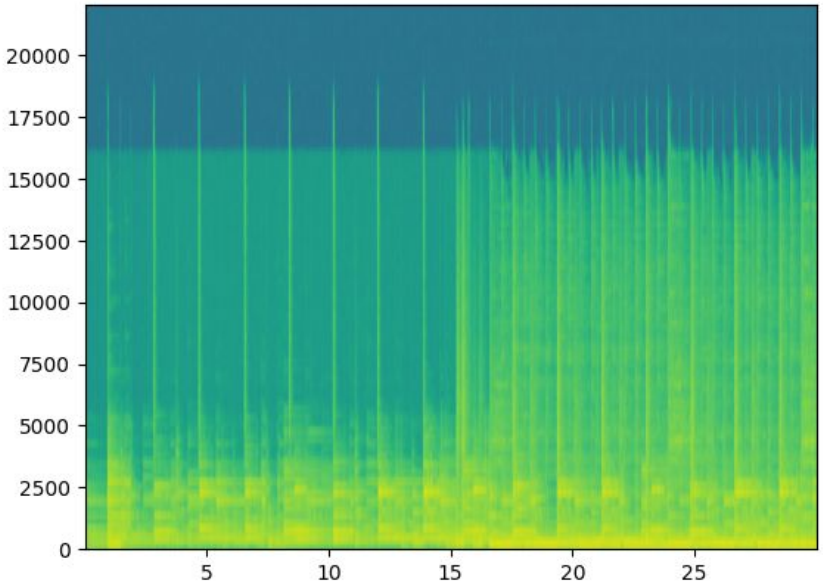
8-Genre Classification RNN

Figure 2. Validation Accuracy vs. Training Accuracy of the RNN Classification Model during Training



8-Genre Classification CNN

- Data: spectrograms converted from mp3 files



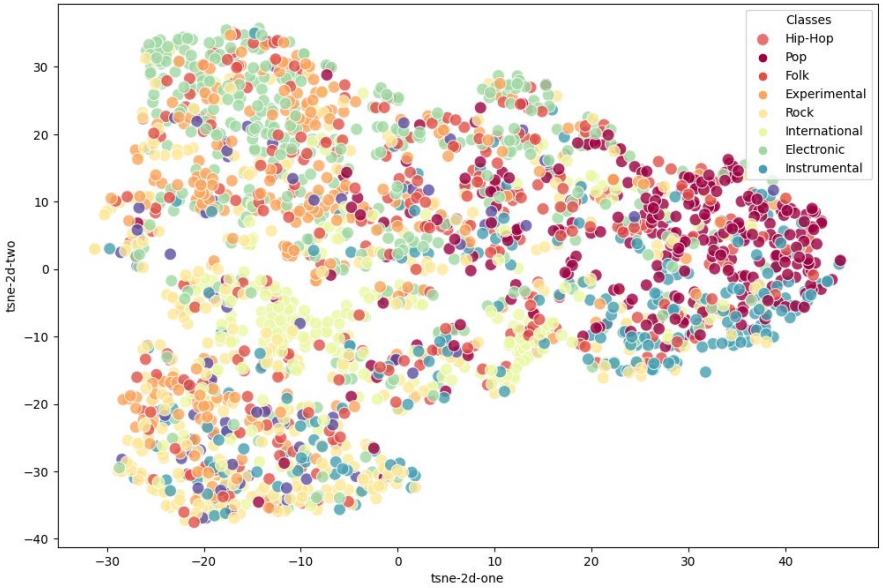
8-Genre Classification CNN

```
----------------------------------------------------------------
        Layer (type)               Output Shape         Param #
================================================================
            Conv2d-1         [-1, 8, 496, 369]             224
         MaxPool2d-2         [-1, 8, 248, 184]               0
            Conv2d-3        [-1, 32, 248, 184]           2,336
         MaxPool2d-4         [-1, 32, 124, 92]               0
            Linear-5                [-1, 128]      46,727,296
            Linear-6                  [-1, 8]           1,032
================================================================
Total params: 46,730,888
Trainable params: 46,730,888
Non-trainable params: 0
----------------------------------------------------------------
Input size (MB): 2.09
Forward/backward pass size (MB): 27.88
Params size (MB): 178.26
Estimated Total Size (MB): 208.24
----------------------------------------------------------------
```

8-Genre Classification CNN

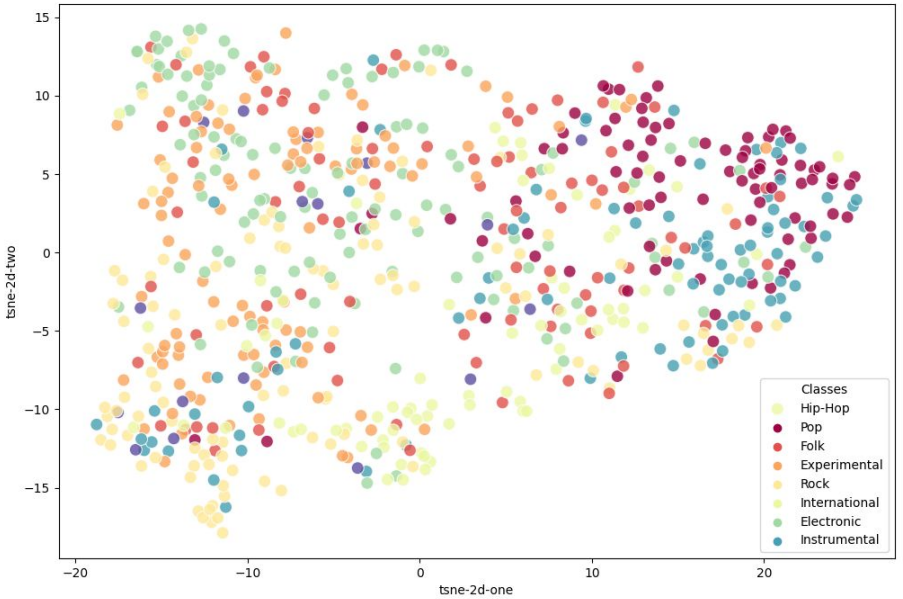
On Training Dataset:

Accuracy: 32.24%



On Testing Dataset:

Accuracy: 37.23%



Our Plans for the Future

- Improving the accuracy of each of these models
- Combining these models to achieve a better model which covers the complexity of the music songs
- Testing on more genres of music!!