

Lab 08: Neural Networks for Music Classification

In addition to the concepts in the [MNIST neural network demo](#) ([./demo_mnist_neural.ipynb](#)), in this lab, you will learn to:

- Load a file from a URL
- Extract simple features from audio samples for machine learning tasks such as speech recognition and classification
- Build a simple neural network for music classification using these features
- Use a callback to store the loss and accuracy history in the training process
- Optimize the learning rate of the neural network

To illustrate the basic concepts, we will look at a relatively simple music classification problem. Given a sample of music, we want to determine which instrument (e.g. trumpet, violin, piano) is playing. This dataset was generously supplied by [Prof. Juan Bello](#) (http://steinhardt.nyu.edu/faculty/Juan_Pablo_Bello) at NYU Steinhardt and his former PhD student Eric Humphrey (now at Spotify). They have a complete website dedicated to deep learning methods in music informatics:

<http://marl.smusic.nyu.edu/wordpress/projects/feature-learning-deep-architectures/deep-learning-python-tutorial/>
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You can also check out Juan's [course](http://www.nyu.edu/classes/bello/ACA.html) (<http://www.nyu.edu/classes/bello/ACA.html>).

Loading the PyTorch package

We begin by loading PyTorch and the other packages

```
In [1]: import numpy as np
import matplotlib
import matplotlib.pyplot as plt
%matplotlib inline
import torch
```

Audio Feature Extraction with Librosa

The key to accurate audio classification is to extract good features. In addition to torch, we will use the librosa package. The librosa package in python has a rich set of audio feature extraction methods for machine learning tasks such as speech recognition and sound classification.