TonEd

Matthew Niemer, Christopher Pierce
EECS 352 WQ 2017, Prof. Bryan Pardo
Contact: mattniemer@u.northwestern.edu

NORTHWESTERN UNIVERSITY

Problem

- Young violin students struggle to play with a ***rich, full*** tone.
- TonEd aims to help students ***improve their tone*** by identifying different kinds of violin tone and diagnosing the underlying cause of poor tone quality.

Solution

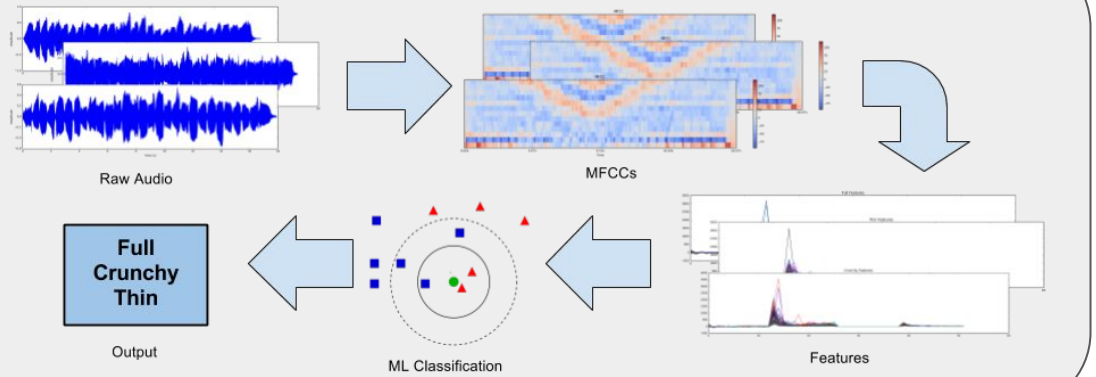
- Extract MFCCs from raw audio
- Window MFCCs into note-sized chunks and create feature vectors
- Train Nearest Neighbor classifier
- Run classifier on features extracted from student's raw audio
- Give feedback to user and recommend action based on classification

Results

- Nearest neighbor cross validation yields about **52%** precision
- Scale Classification successful **50%-66%** of the time

	Mean and Delta Mean Only	Var and Delta Var Only	All Features (Mean, Var, Delta Mean, Delta Var)
Decision Tree	0.511669865643	0.427562380038	0.515451055662
Nearest Neighbor	0.458733205374	0.495201535509	0.520153550864
Multi-layer Perceptron	0.430134357006	0.428848368522	0.512898272553
Support Vector Machine (w/ SDG)	0.47679462572	0.426429942418	0.471861804223

Flowchart



Data Set

- **6 proficient violinists** provided samples to create data set
- Each person recorded **3 scales** w/ full, crunchy, and thin tone
- Scales were 2 octave C Major scales at 100 BPM (no vibrato)
- 6 violinists x 3 scales each = **18 scales**
- Scales were split up into notes: 18 scales x 29 notes each = **522 data points** for training

Testing

- Used **10 fold cross validation** to test precision of machine learning algorithms
- Tested accuracy of scale classification against expected value
- Tried many different combinations of features & algorithms to identify optimal values