Real-Time Chord Recognition

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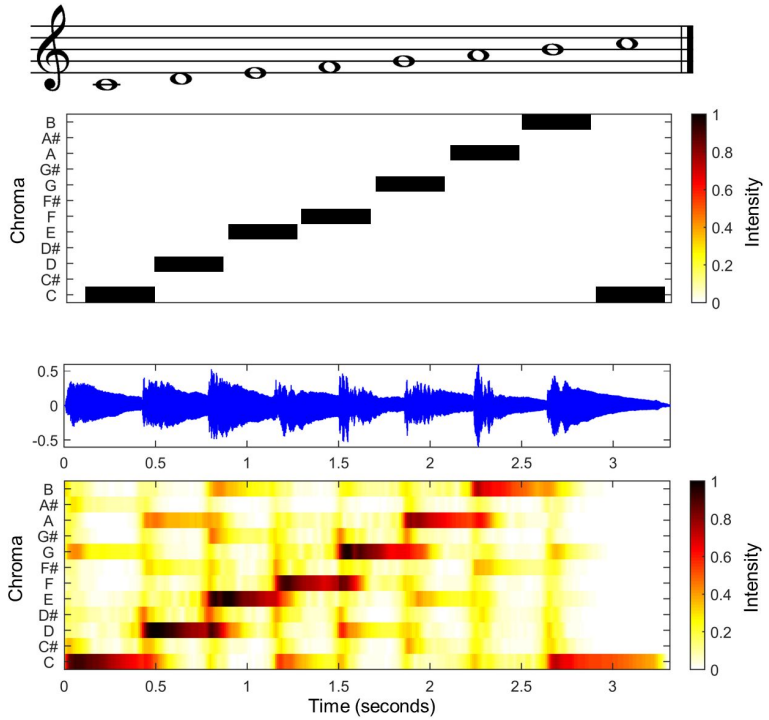
Introduction and Motivation

- Automatic chord recognition (ACR)
- Past research: chroma features and various algorithms
- Our project: **real-time** chroma features and a template-matching algorithm
- A composition tool for musicians



From https://en.wikipedia.org/wiki/Chroma_feature

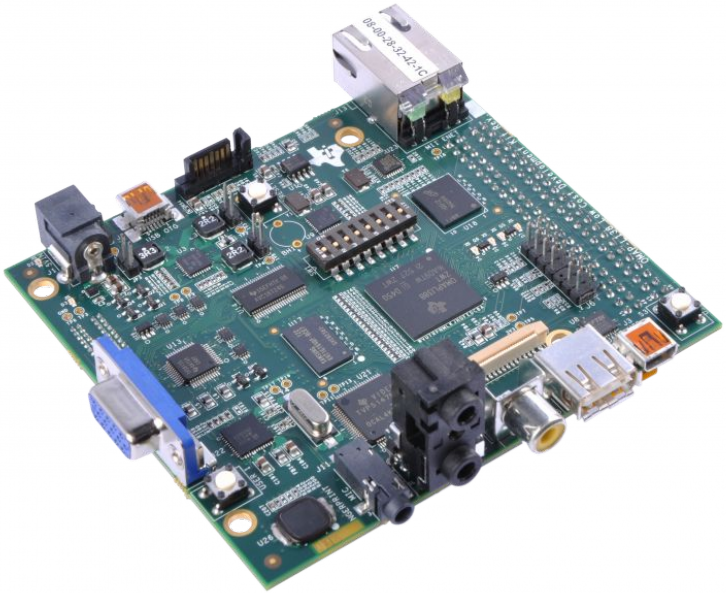
Software and Hardware

Software

- LibROSA (Python package)
- CCS (C libraries)

Hardware

- LCDK (CPU + DSP + Audio Codec)
- Microphone
- Digital Guitar Keyboard
- Speakers



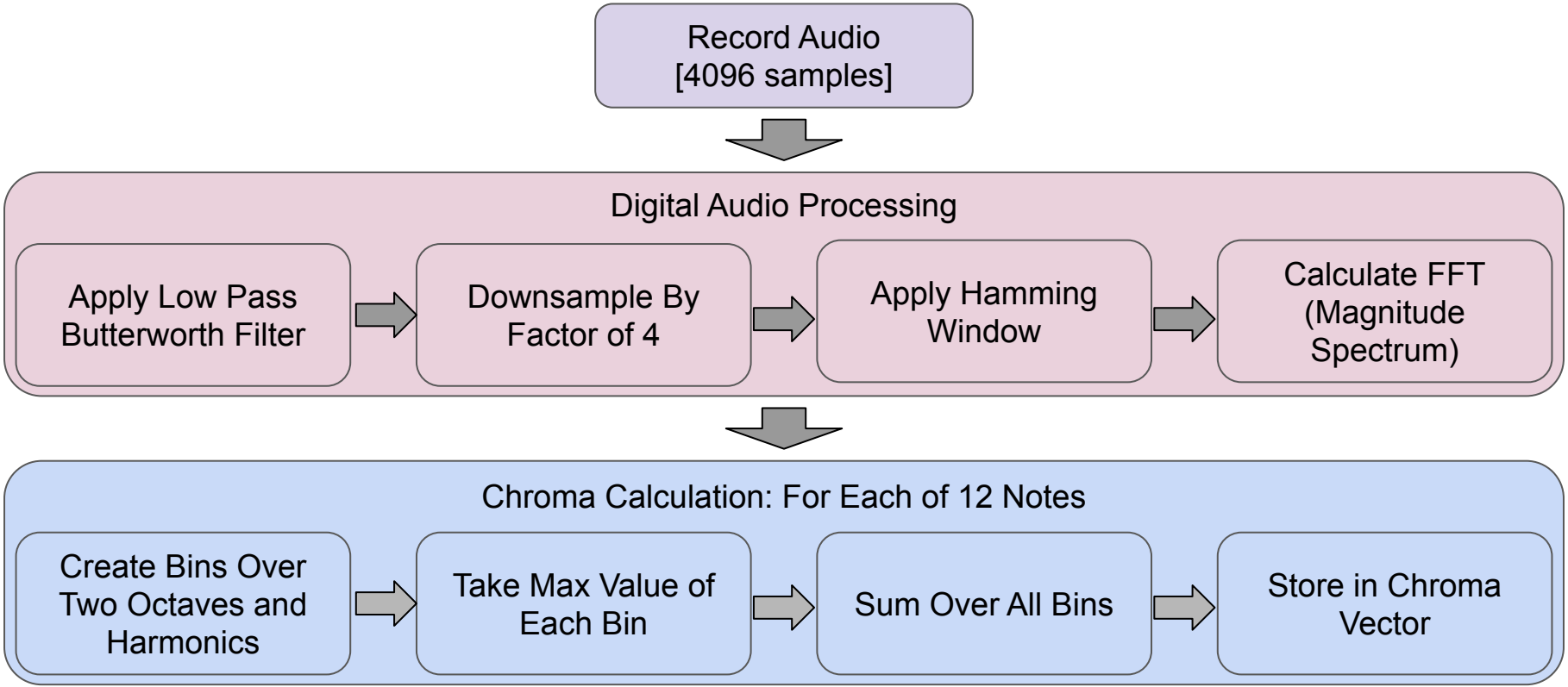
From http://www.ti.com/tool/TMDSLCDK138

Organization and Implementation

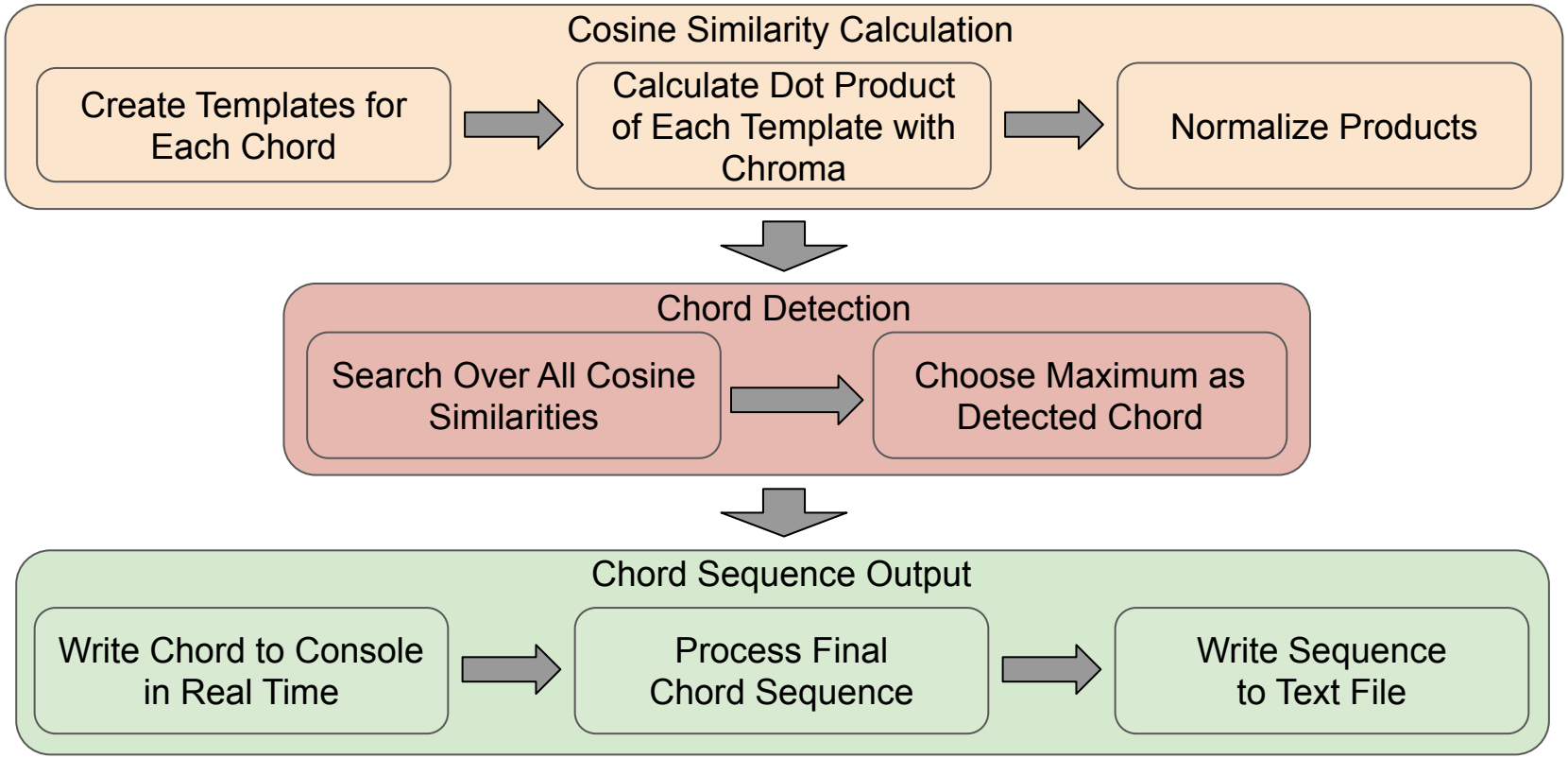
- One person handled software, one handled hardware

Weeks 1-2	Find and compile dataset
Weeks 3-4	Build prototype in Python
Weeks 5-7	Build LCDK program
Weeks 8-9	Test performance
Weeks 9-10	Write to output file

Chroma Feature Extraction

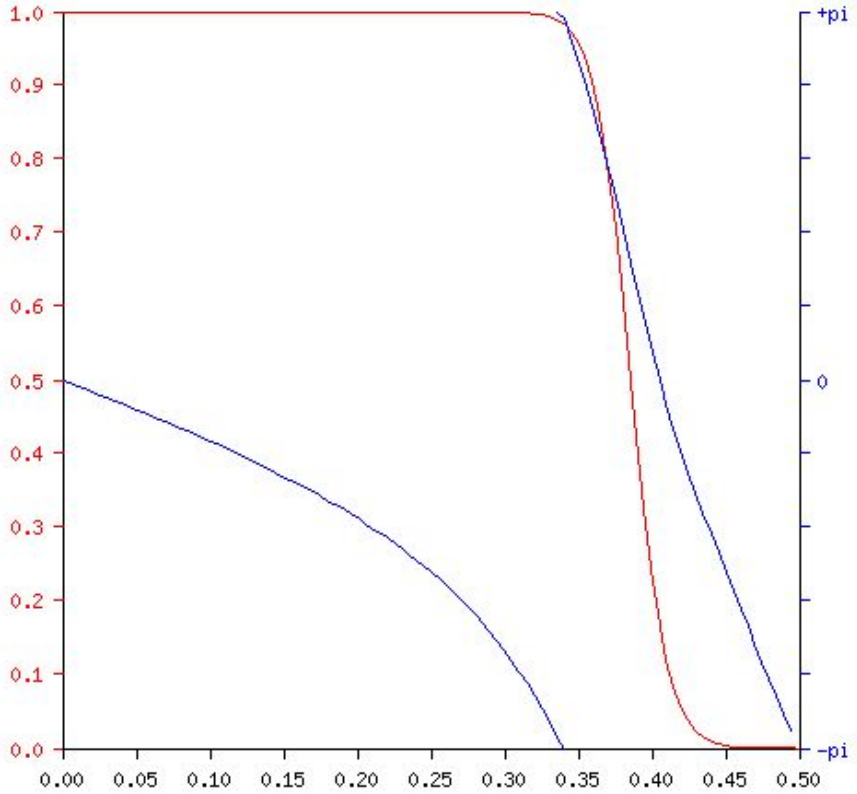


Chord Recognition and Output



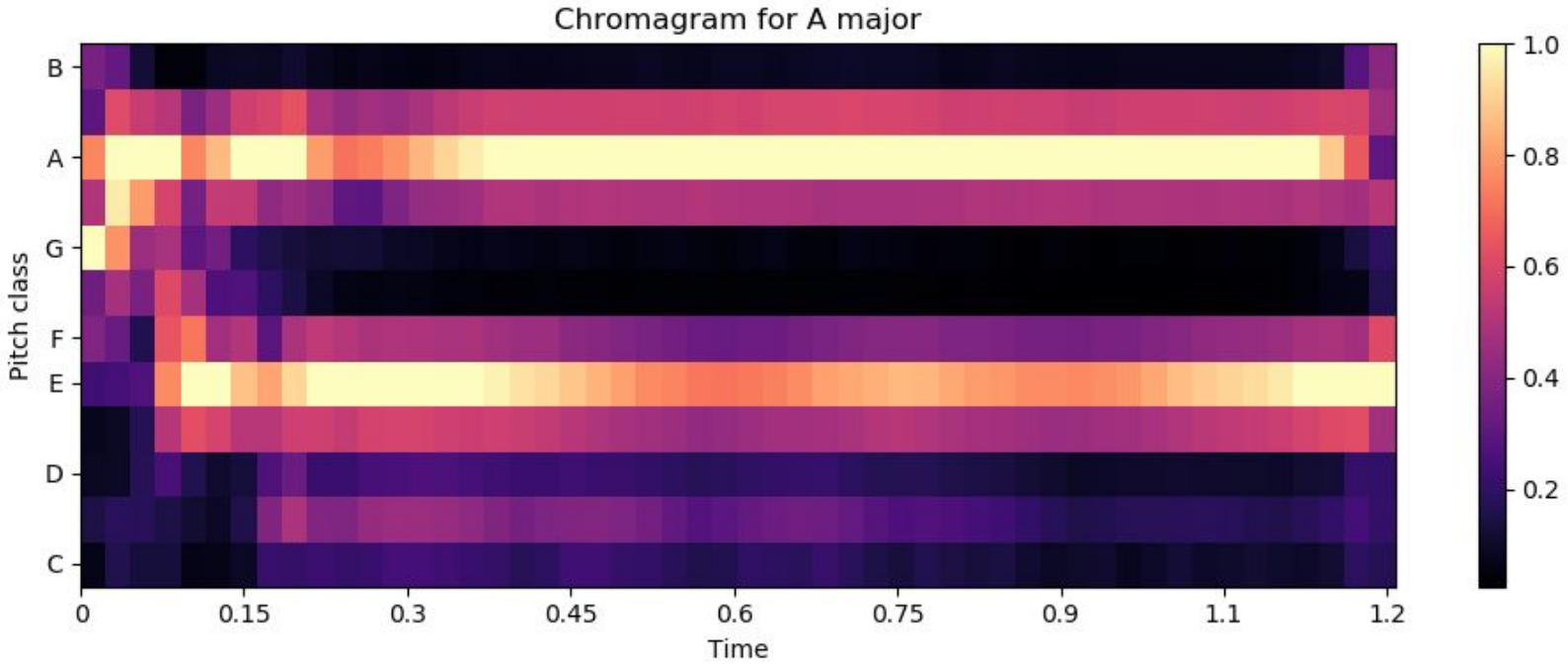
Filter Design

- Low-pass Butterworth
- Order 6
- Cutoff frequency = 6000 Hz

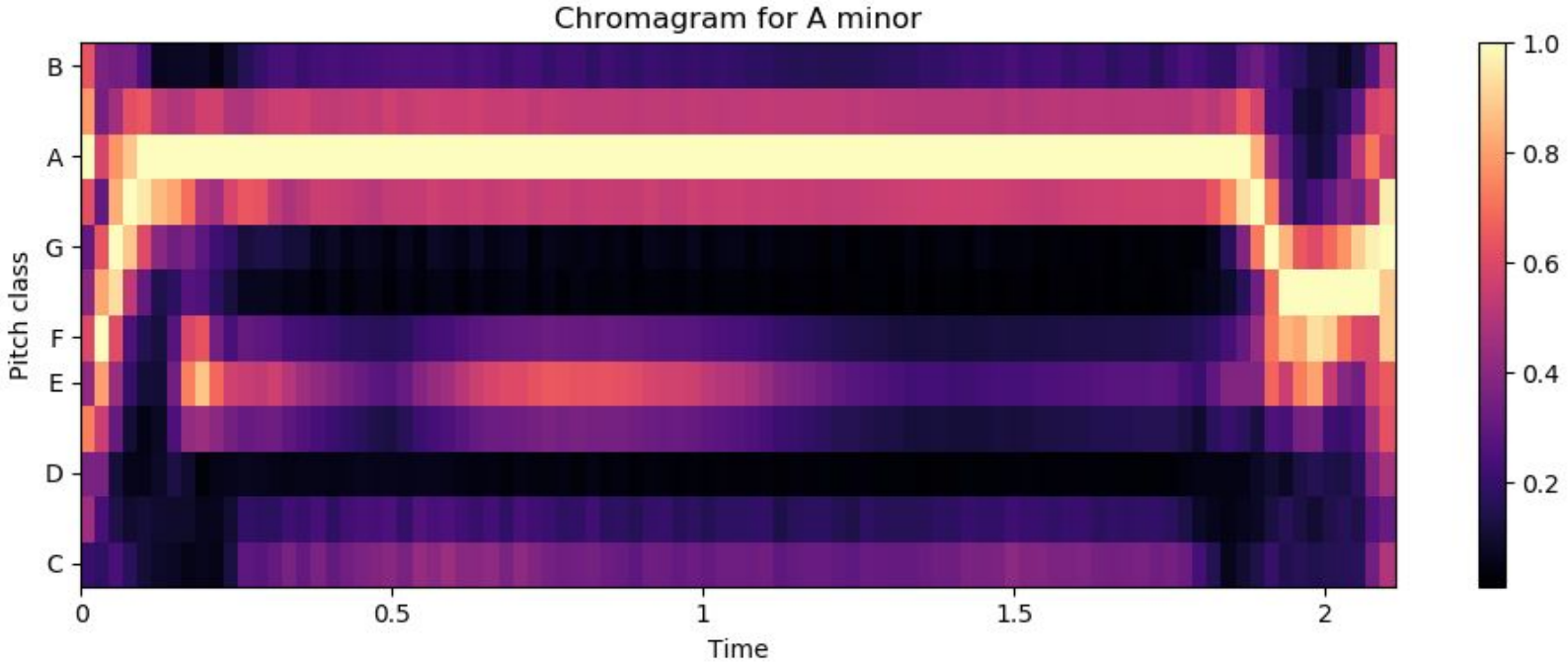


From https://www-users.cs.york.ac.uk/~fisher/mkfilter/

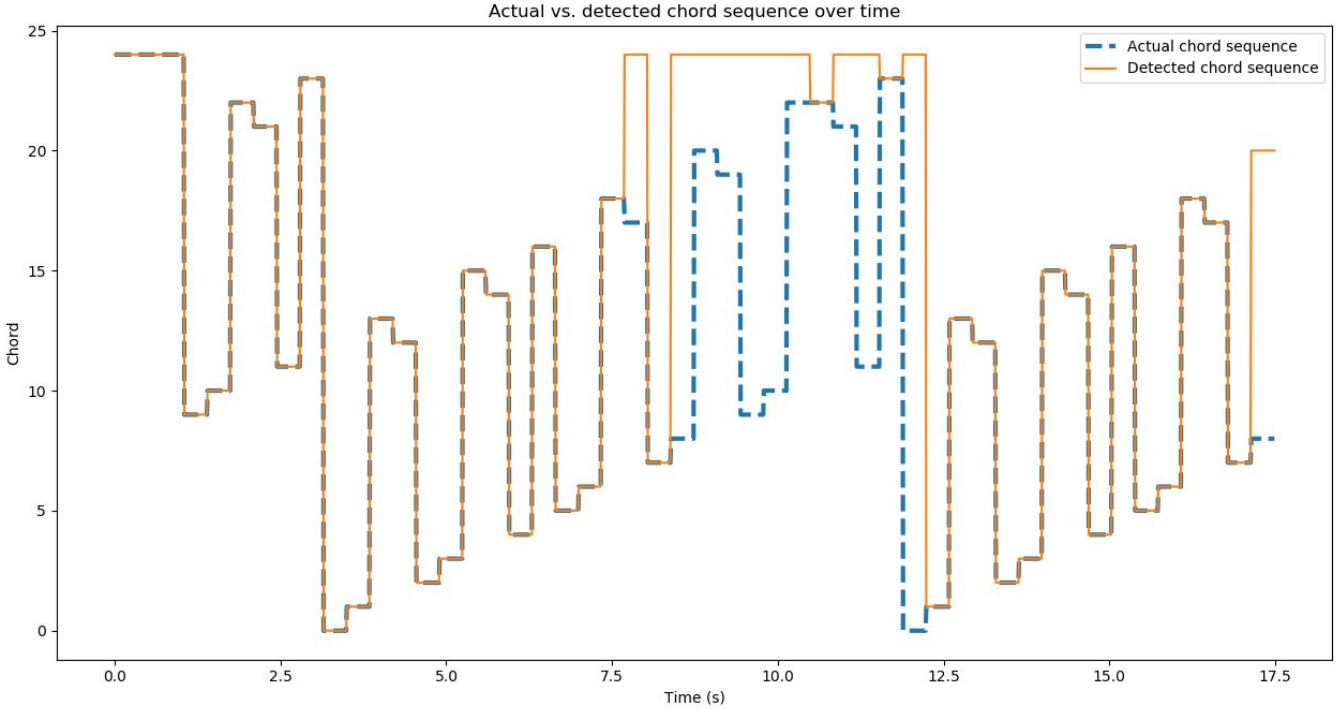
Chroma Features (A major)



Chroma Features (A minor)



Results


Actual vs. detected chord sequence over time
Actual chord sequence
Detected chord sequence
Chord
Time (s)
0
5
10
15
20
25
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5

Results (continued)