

What is a chord?

- Several notes that sound simultaneously.
 - 2 notes: dyad
 - 3 notes: triad
 - 4 notes: tetrad
- What's a note?
 - A named pitch: A, B, C...
- What's a pitch?
 - A sound in a certain frequency: A=440 Hz, C=261 Hz

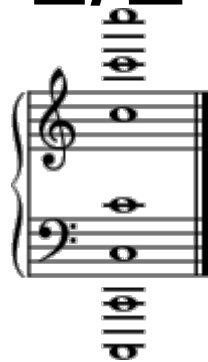
The image displays four musical staves, each illustrating a different type of triad. Each staff is divided into four sections: the first shows the full triad, the second shows the 'Root note', the third shows the 'Interval' (Major third, Minor third, Diminished fifth, or Augmented fifth), and the fourth shows the 'Fifth' note. The staves are labeled on the left as 'Major triad', 'Minor triad', 'Diminished triad', and 'Augmented triad'. The notes are written on a five-line staff with a treble clef. The Major triad consists of C4, E4, and G4. The Minor triad consists of C4, E♭4, and G4. The Diminished triad consists of C4, E♭4, and G♭4. The Augmented triad consists of C4, E4, and G♯4.

Triad Type	Root note	Interval	Fifth
Major triad	C4	Major third	G4
Minor triad	C4	Minor third	G4
Diminished triad	C4	Diminished fifth	G♭4
Augmented triad	C4	Augmented fifth	G♯4

Figure 5.5 from [Müller, FMP, Springer 2015]

What is a chroma? 1/2

- All pitches equally spaced in frequency domain, belongs to the same Pitch Class.
- A pitch can be separated in two components: *tone height* and *chroma*.
- A Chroma is a way to categorize pitches from the same Pitch Class.
 - C2 and C5 both have the same chroma value C



All C from C1 to C7

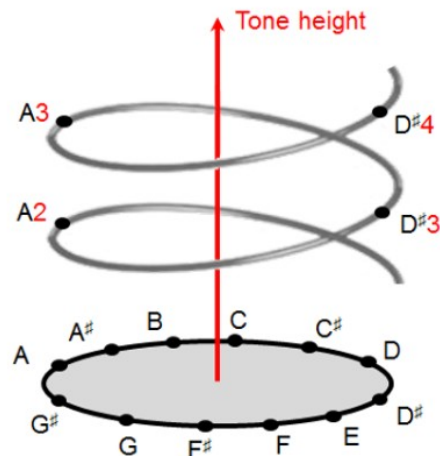
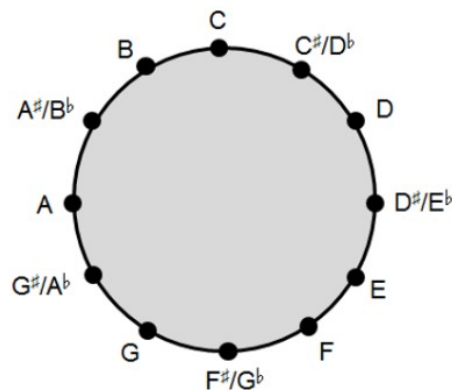
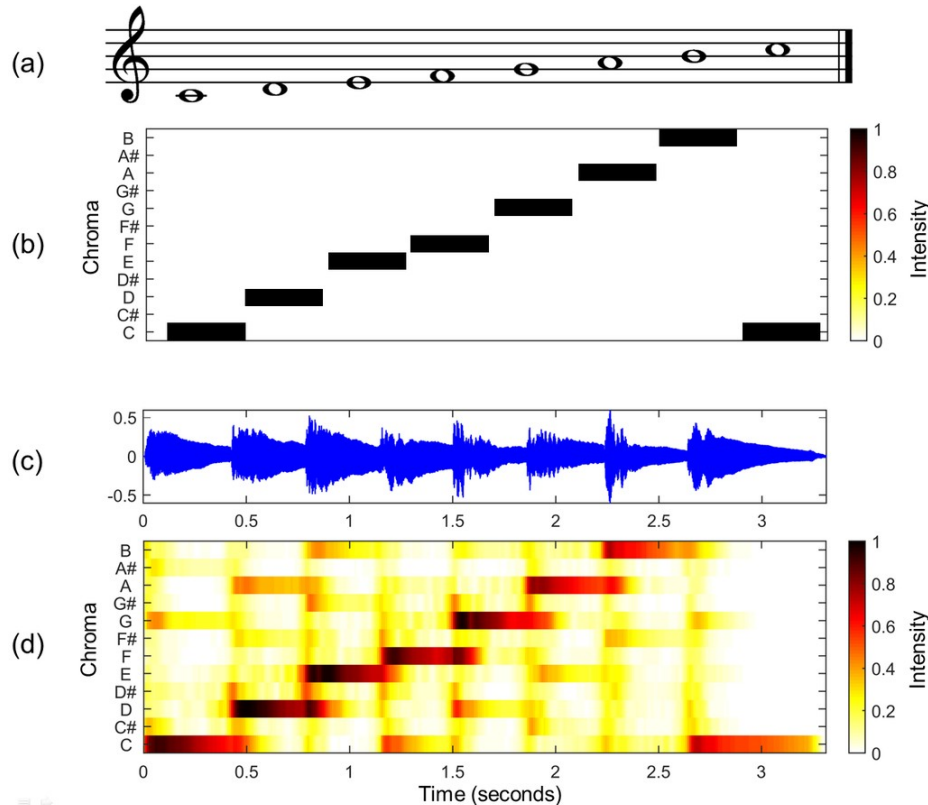


Figure 1.3 from [Müller, FMP, Springer 2015]

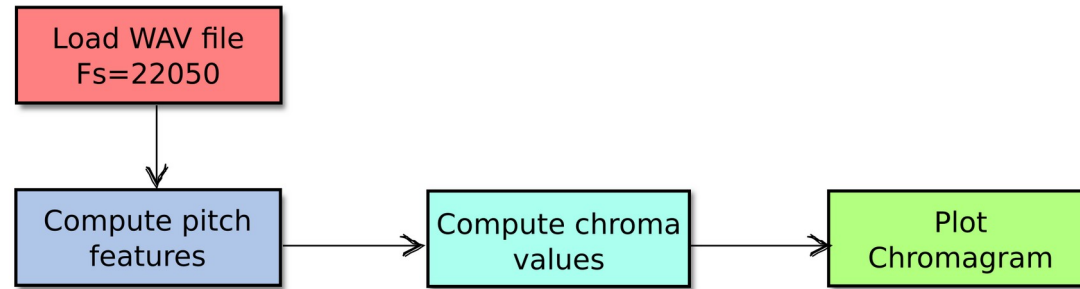
What is a chroma? 2/2



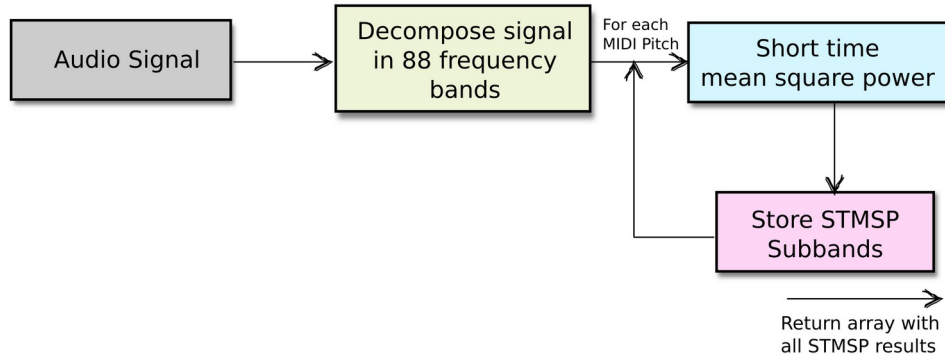
- A Chromagram shows the presence of all chromas in an audio signal for a given time window.

Objective

- For a given audio signal, compute and display the chroma values found.



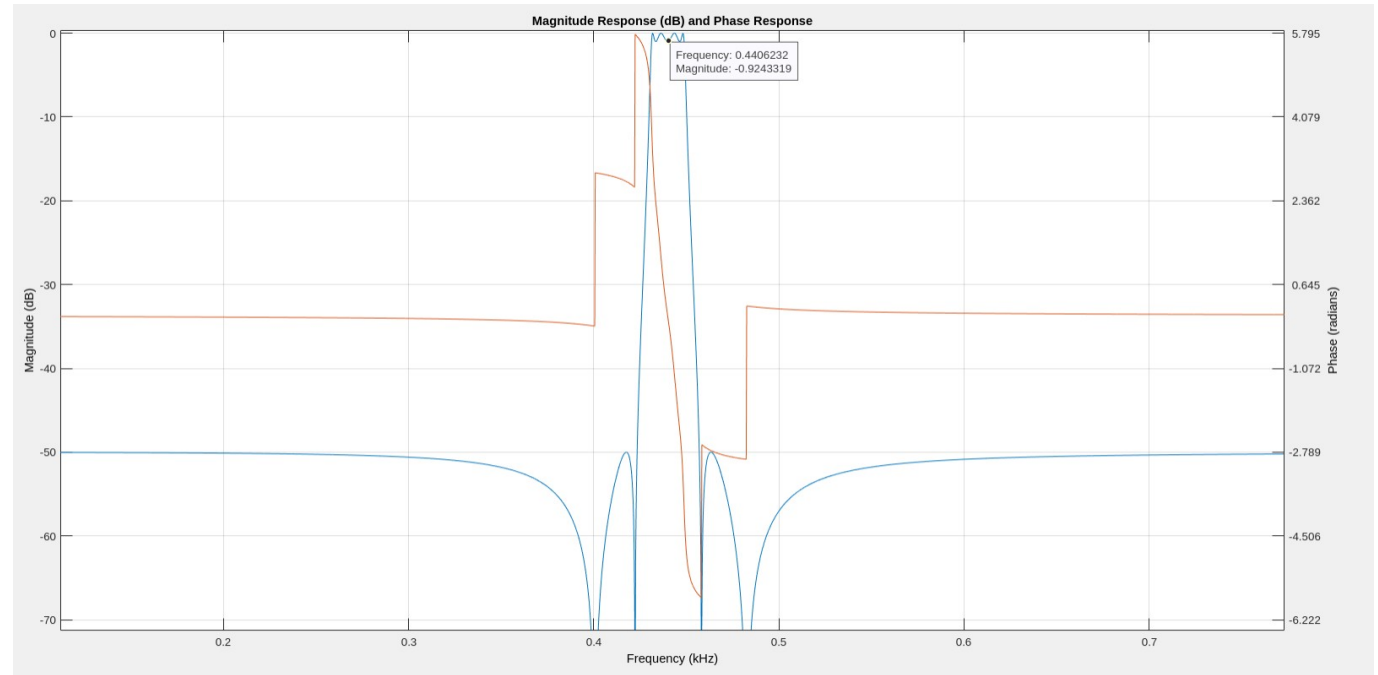
Compute pitch



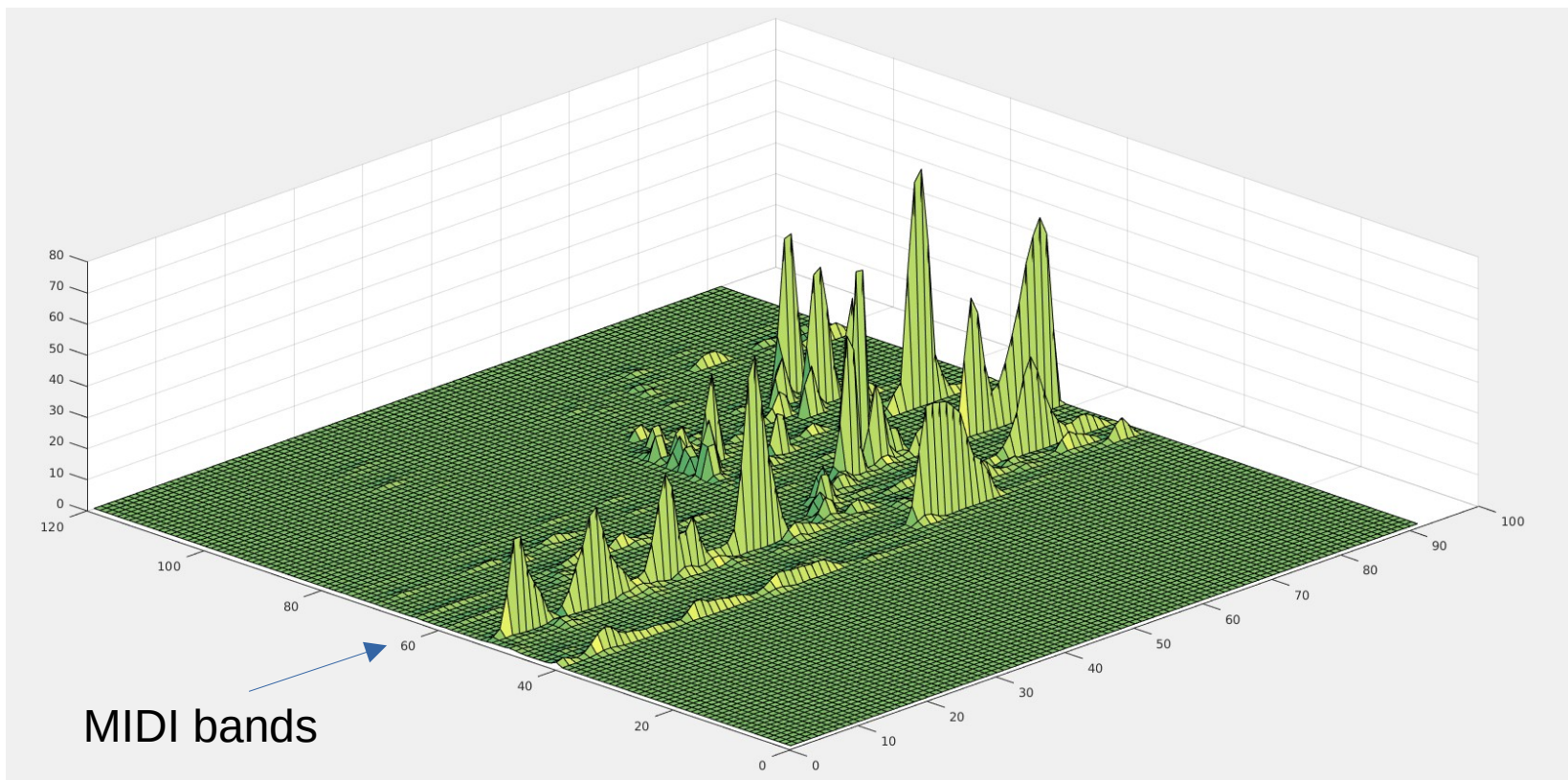
- Use a predefined filter bank to decompose signal in 88 sub-bands. (MIDI 21 to 108)
- On each MIDI pitch compute the STMSP
- Save the result in an array and return

Decomposing the signal

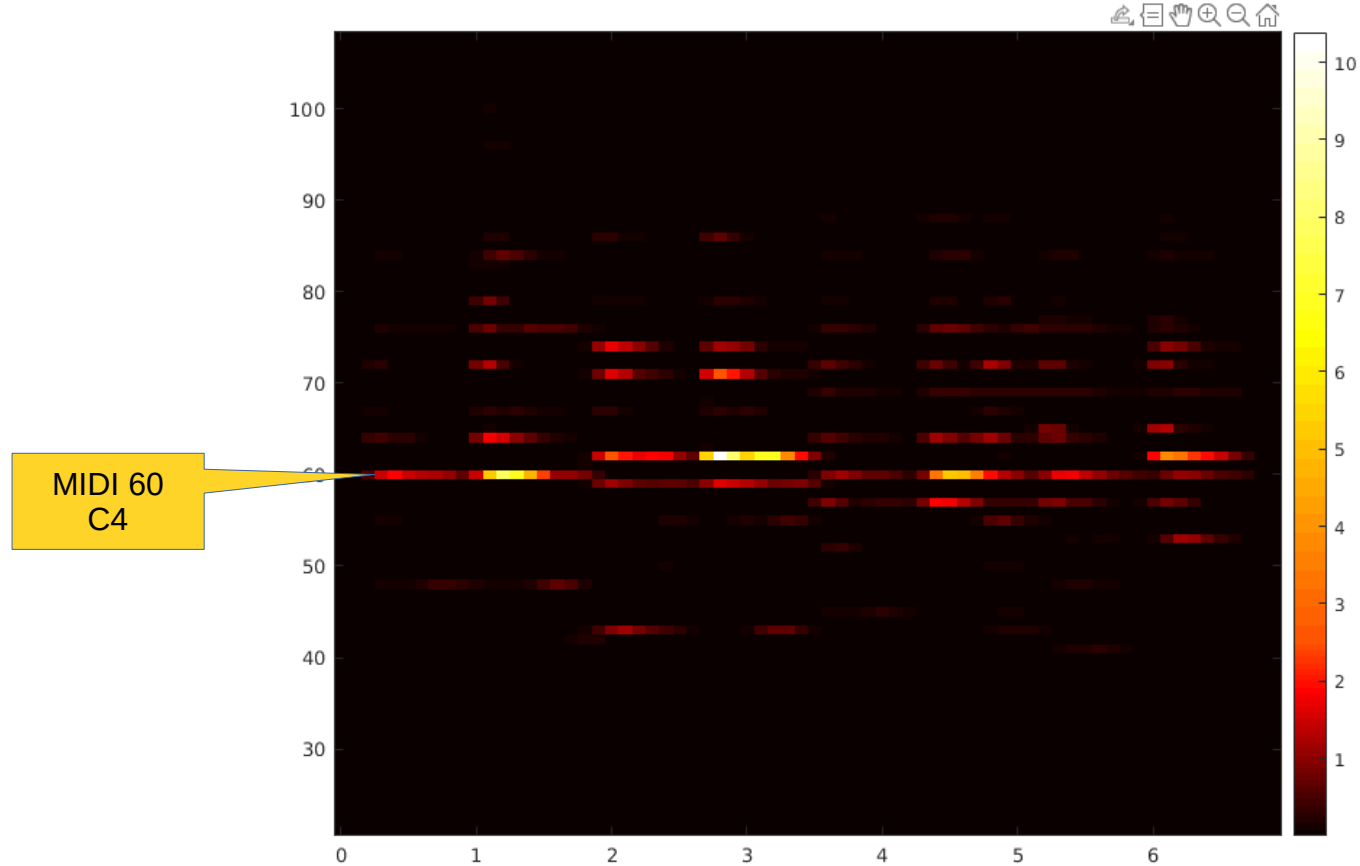
- Predefined filters created by paper's authors.
- Band pass filter for A4 = 440 Hz



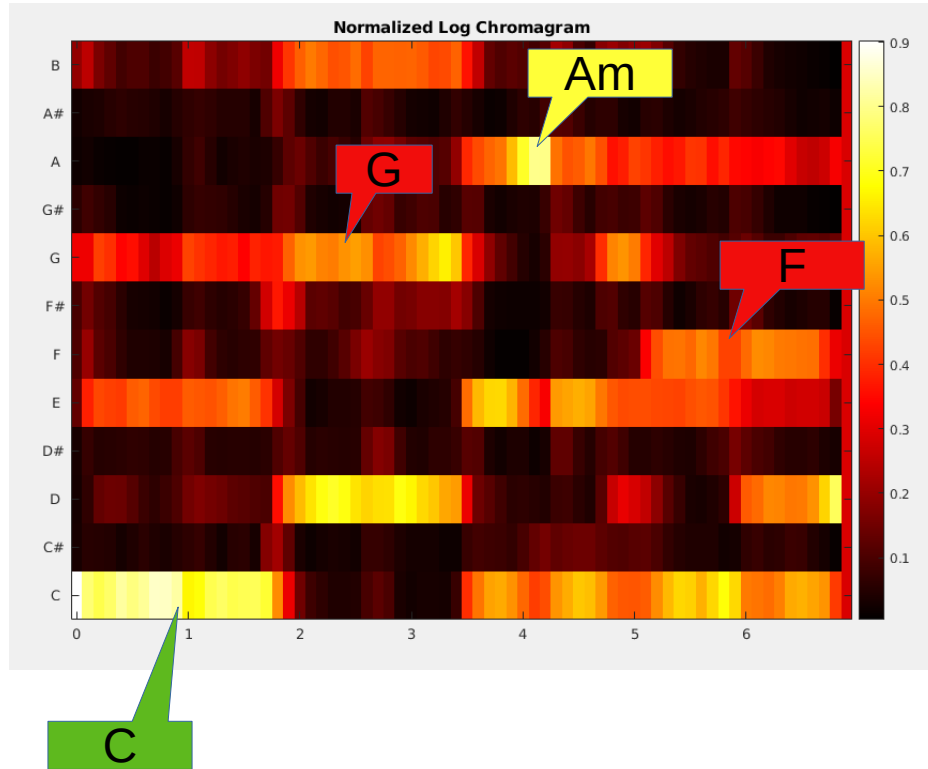
Pitches detected



Pitches colormap

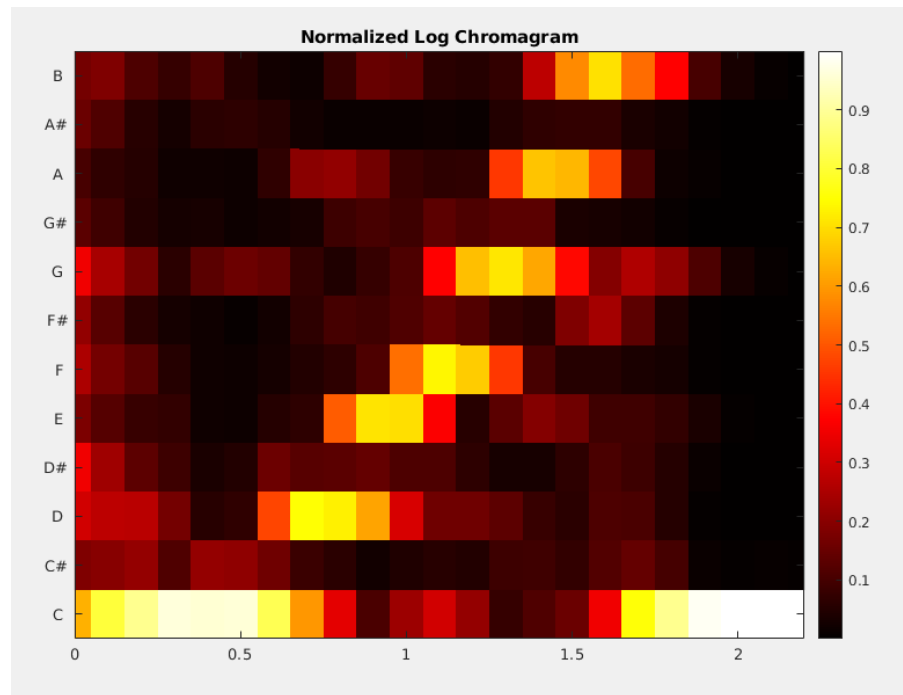
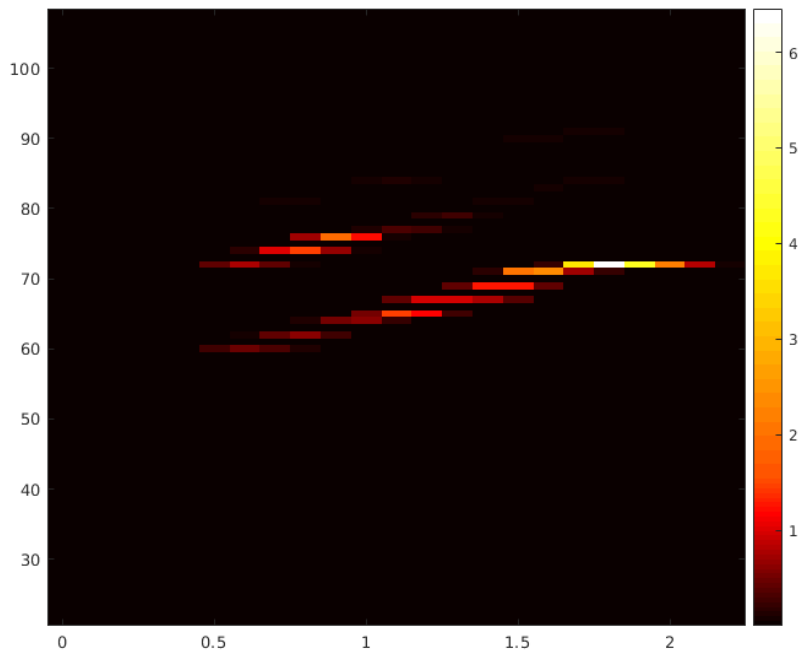


Chroma detection



- The first chord is identified correctly.
- The notes marked in red were wrong
- Am in yellow seems to be correct.

Trying sample audio



A scale C to B identified correctly