



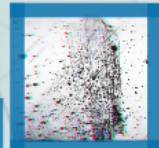
AALBORG UNIVERSITET



Artal *f*

DIEGO DICARLO

SMC8/MMP



IN PRACTICE

Given an unsorted categorical detection from the image, I extracted the objects and their bounding boxes from the audio-visual signal.

Using the audio-visual information, I extracted the objects and their bounding boxes from the image.

Using the audio-visual information, I extracted the objects and their bounding boxes from the image.

Using the audio-visual information, I extracted the objects and their bounding boxes from the image.



EXTRACTING DATA

Using the audio-visual information, I extracted the objects and their bounding boxes from the image.

Using the audio-visual information, I extracted the objects and their bounding boxes from the image.

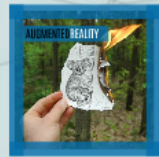
Using the audio-visual information, I extracted the objects and their bounding boxes from the image.



AR VISUAL MUSIC

Combining the audio-visual information, I extracted the objects and their bounding boxes from the image.

Using the audio-visual information, I extracted the objects and their bounding boxes from the image.



THANK YOU



Using the audio-visual information, I extracted the objects and their bounding boxes from the image.

Using the audio-visual information, I extracted the objects and their bounding boxes from the image.

ARVISUALMUSIC

*Combination of music and picture information retrieval and augmented reality for **real-time music visualization**.*

Using high and low level features extraction from audio/video multimedia, generate animated imagery in real-time on a real-world video content.

IN PRACTICE

- Colors and connected components detection from the image (computer vision in MATLAB®).
- High and low level audio feature extraction from the audio raw signal (MIRtoolbox in MATLAB®).
- add multimedia content to the real image: augmented reality (Vuforia UNITY®).
 - moving terrain heights* according to feature and patterns in the texture
- Audio/video synchronization and performance issues (multithreading).

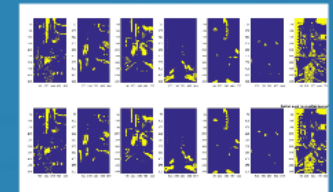
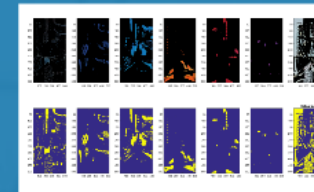
*Credits to **Alex Baldwin** (classmate, **friend**)



EXTRACTING DATA

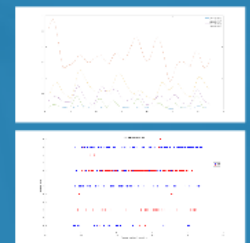
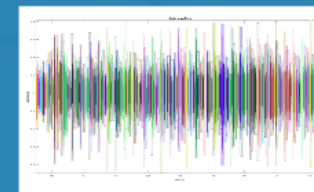
Computer Vision problem: image pattern recognition

- *Supervised training with manual color extraction on tuned RGB filters*
- *Removing small particles with size-base threshold*
- *Median Filter for smoothing and removing random noise*
- *Size-based clustering for connected components*

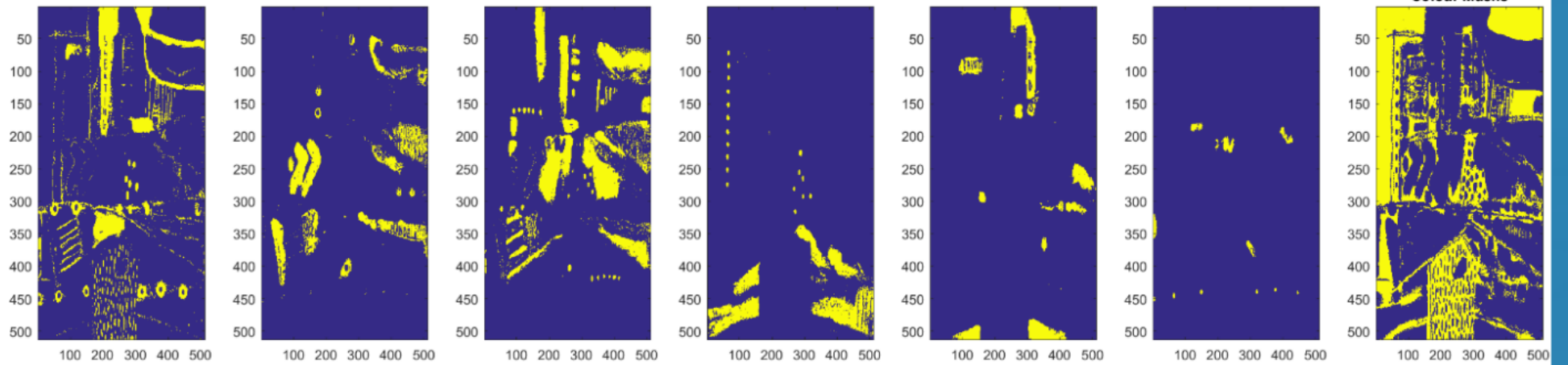
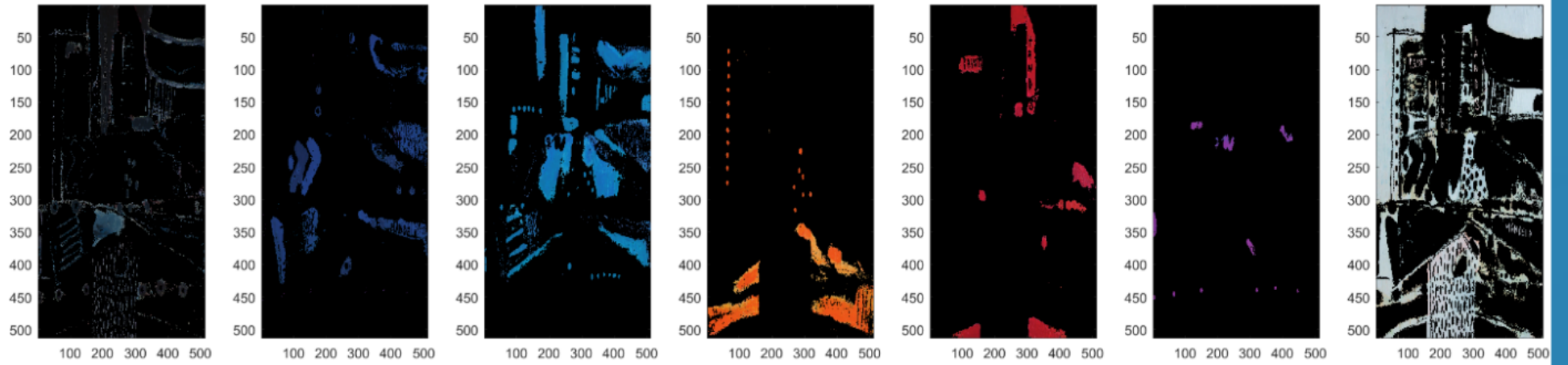


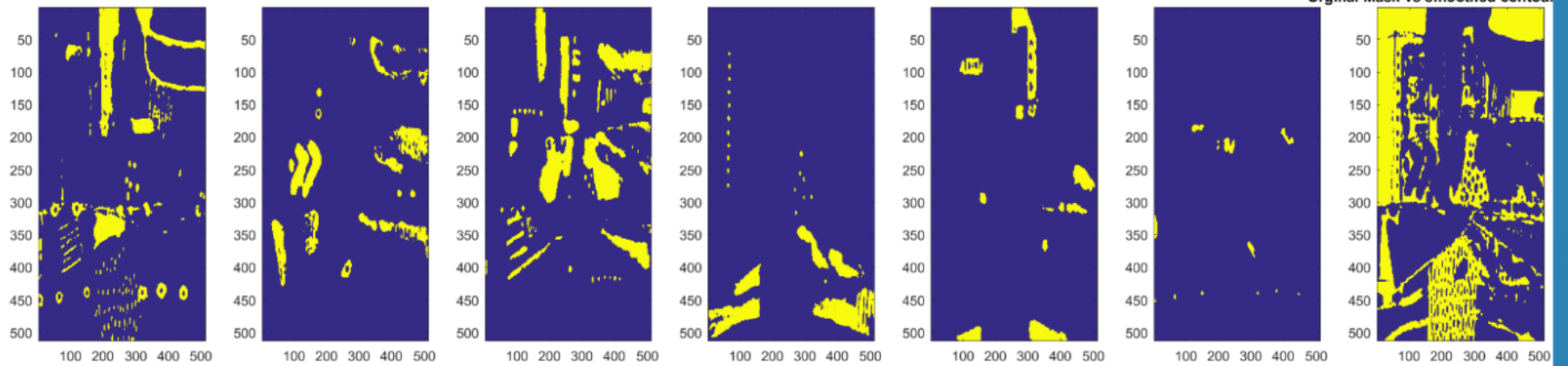
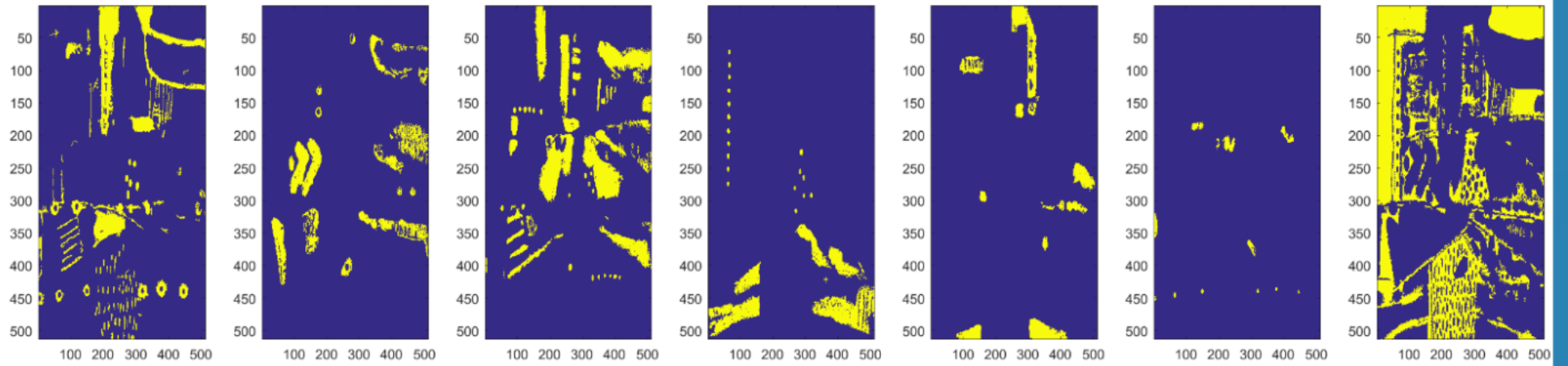
Music Information Retrieval problem: feature extraction

- *Energy of the output of a filterbank with 5 filters*
- *Pitch detection*
- *Mode* (Major vs Minor) and Key Clarity**
- *Roughness**

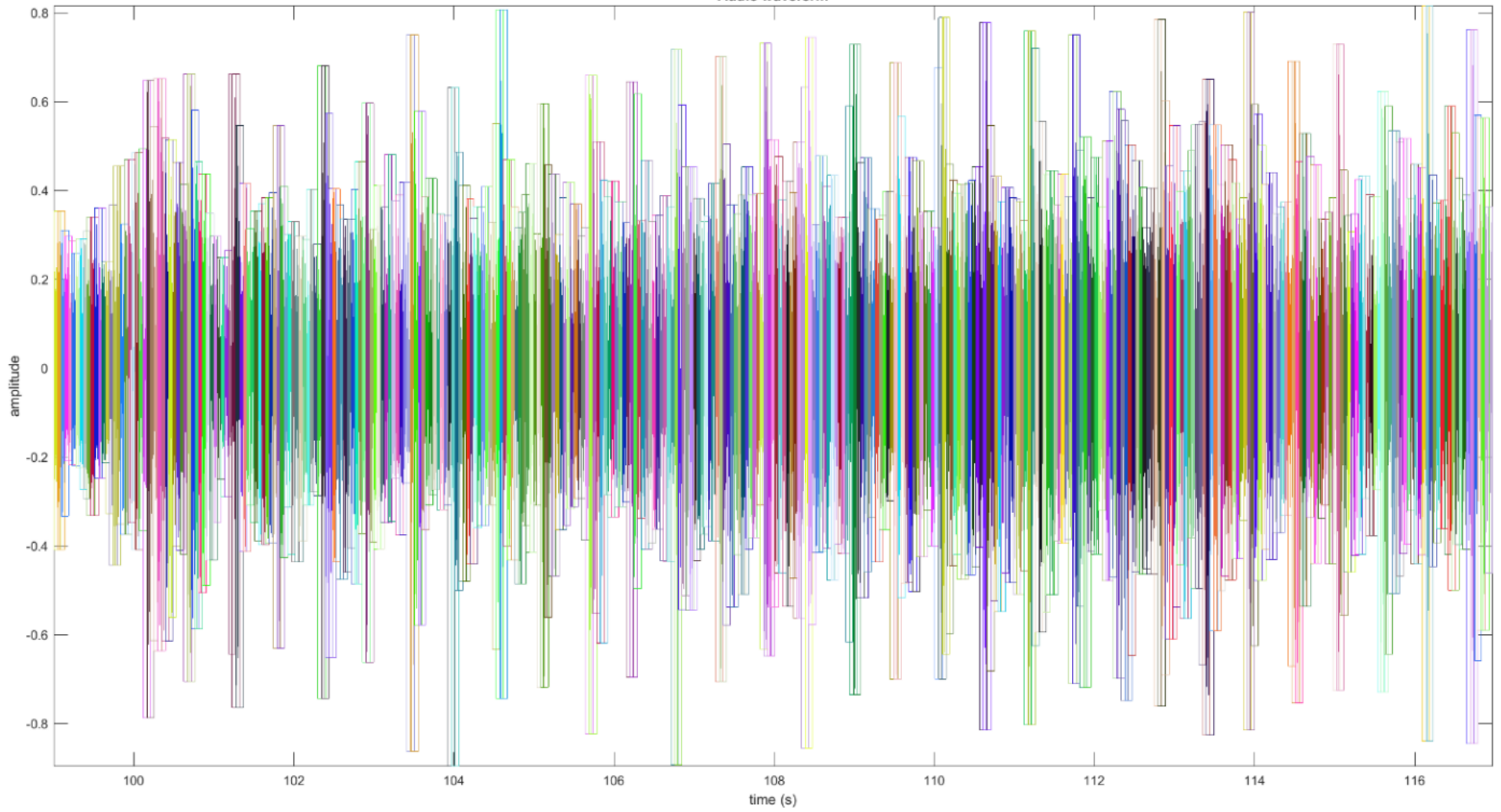


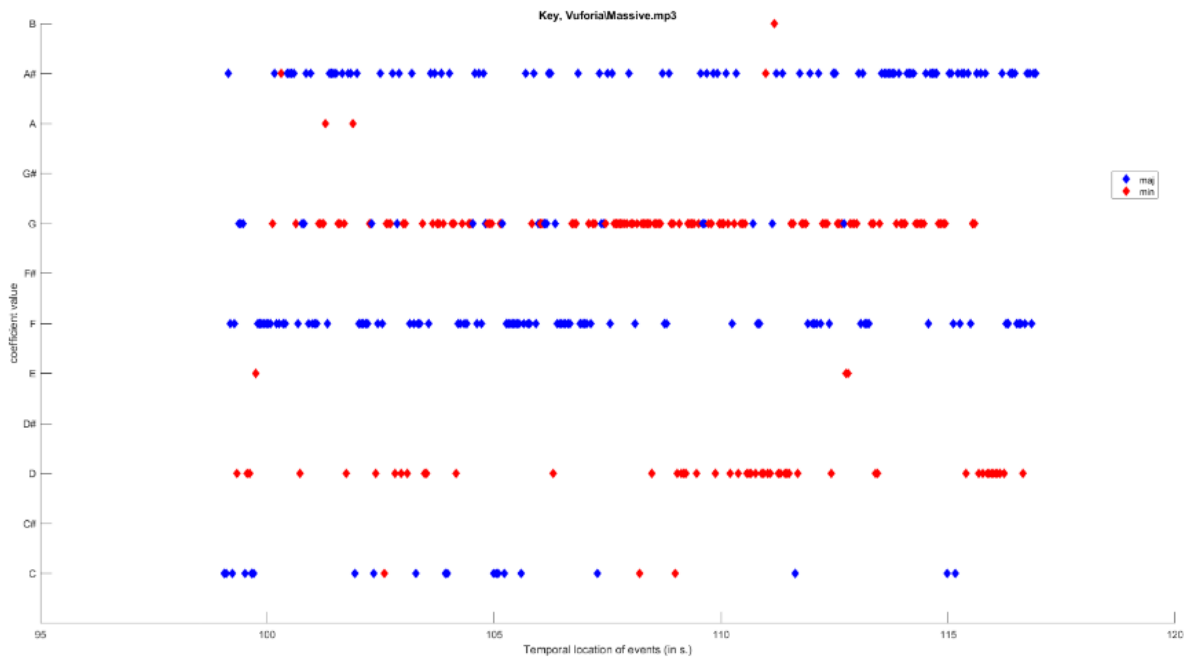
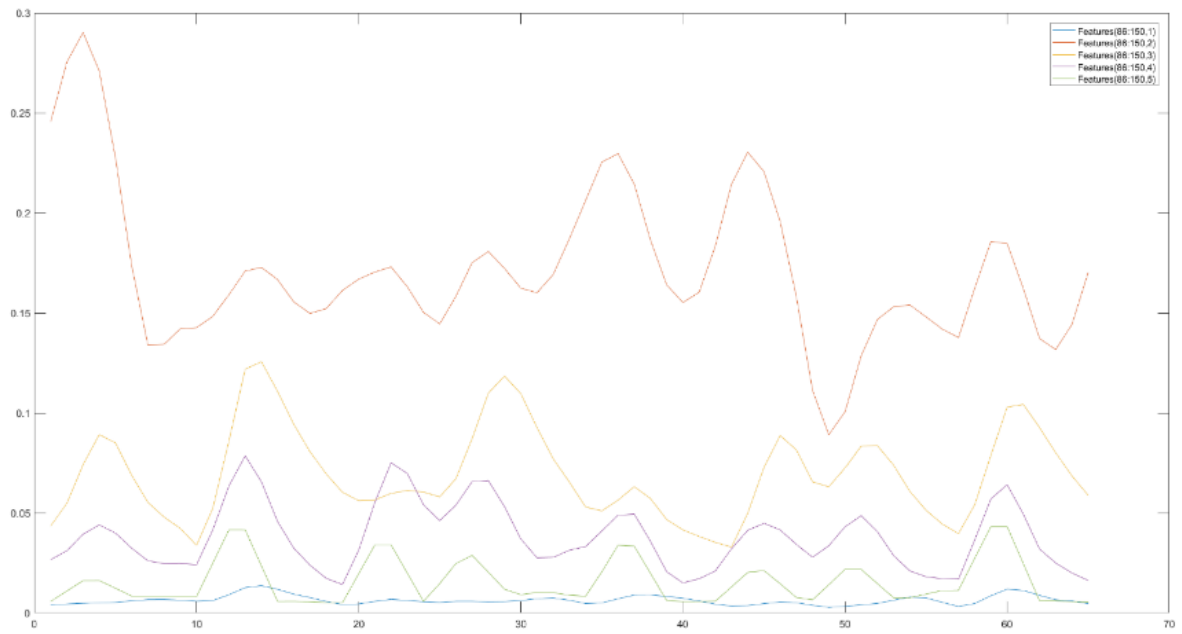
**(only in MATLAB)*





Audio waveform

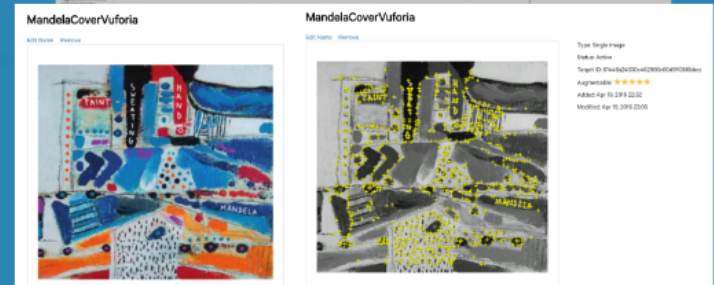
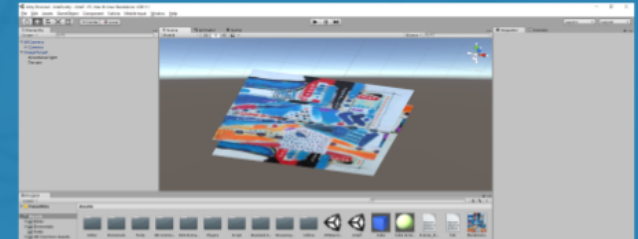




AUGMENTED REALITY



Augmented Reality in Vuforia



Multithreading

```
floatonTerrain();
// Launch terrain modification on a different thread
terrainModificationThread = new System.Threading.Thread(setHeight);
stopThread = false;

// Test and Debug //
Debug.Log("Heightmap resolution: " + mRes + ", " + iRes);
Debug.Log("Number of loaded assets: " + mAssets);
Debug.Log("Number of loaded features: " + FEATURES_FIELDNAME.Length + ", for " + nFrames + " copies");
Debug.Log("Terrain loaded: " + terrain.terrainData.name);
}

// ===== UPDATE ===== //
// ===== UPDATE ===== //

void update() {
// Spawn terrain motion with music, get the right frame index
isPlaying = audio.isPlaying;
if (isPlaying) {
int currFrameIndex = (int)Math.Floor(audio.time * Fs) / frameRate;
if (currFrameIndex > frameCounter)
frameCounter = currFrameIndex;
// Spawn top "coll" components: = (int)Math.Floor(audio.time*collFrameRate) + " with
}
```



YouTube

THANK YOU

FUT

FUTURE IMPROVEMENTS



- *Online Audio streaming*
 - *Soundcloud and BandCamp*
- *Online Computer Vision Algorithm*
 - *OpenCV (SimpleCV) C++*
- *Online Audio Feature Extraction*
 - *Essentia C++*
- *Online Content Acquisition*
 - *BandCamp information and content*
- *iOS/Android Implementation*

THANKYOU



Diego Di Carlo.

