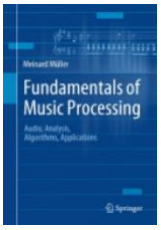
Multimedia Systems

Practical Class P1 FEUP

Task 1. Software Tools

Download and Install the following Software Tools.

1. FMP Jupyter Notebooks (Python)



You can check the full instructions to install Fundamentals of Music Processing (FMP) Python Notebooks at https://www.audiolabs-erlangen.de/resources/MIR/FMP/B/B_GetStarted.html

- **Download the FMP Notebooks (1.58GB)**

https://www.audiolabs-erlangen.de/resources/MIR/FMP/FMP_1.2.5.zip.
Unzip it to a place of your choice.

- **Install Conda**

  The fastest way to obtain conda is to install Miniconda, a mini version of Anaconda that includes only conda and its dependencies (**NOTE: this is the recommended version for our class**). If you prefer to have conda plus over 7,500 open-source packages, install Anaconda.
  We recommend you install conda for the local user, which does not require administrator permissions and is the most robust type of installation. You can also install Anaconda system wide, which does require administrator permissions. For further instructions:
  - Windows
  - MacOs
  - Linux

- **Create the Conda Environment**

  Open the Anaconda **Prompt** on Windows or your default **shell** on Linux/macOS. Then change to the directory that contains the file environment.yml. Create the environment with the following **shell** command:

```
conda env create -f environment.yml
```

- **After creating the FMP environment, you need to activate the environment using the following command:**

```
conda activate FMP
```

- **Change to the directory containing the FMP notebooks and start the Jupyter server by using the following command:**

```
jupyter notebook
```

  This should open a browser, displaying the folder structure of the FMP notebooks. You then can open the overview notebook by selecting the file C0/C0.ipynb. You can also directly open any FMP notebook by selecting a file in any subdirectory with the file extension .ipynb.
  NOTE: Within the Jupyter session you need to follow the **IPYNB links** to keep the code cells executable. Also note that within the Jupyter session, you can only access files that are contained in the directory you used for launching the Jupyter server or in any **subdirectory** (not in any parent folder).

- **Browse the contents and run some notebooks**

  To run a cell, select it and press ENTER. (Otherwise, use the toolbar).

2. Audacity (Optional)

https://www.audacityteam.org/download/

3. Sonic Visualiser (and VAMP Plugins)

https://www.sonicvisualiser.org/

Instructions

- **Download Sonic Visualiser (last version)**

https://www.sonicvisualiser.org/download.html

- **Download VAMP Plugins**

Go to http://vamp-plugins.org/download.html and download the following plugins:

- **Queen Mary plugin set** (Queen Mary, University of London)
- **MIR.EDU** (by Justin Salomon): if downloads are not available in the main page, follow the link to the Github page (https://github.com/MTG/miredu) and download the files for your OS from the directory *miredu/builds*.

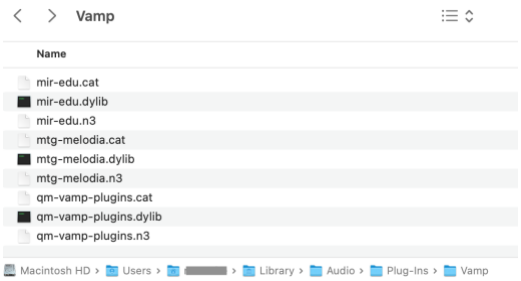
- **Install VAMP Plugins**

Follow the installation instructions here:
http://vamp-plugins.org/download.html#install

a. **To install a plugin set, copy the plugin's library file and any supplied category or RDF files into your system Vamp plugin location.**

Your operating system	File extension for plugins	Where to put the plugin files
macOS	.dylib	On a Mac: • Put plugins for all users to use in /Library/Audio/Plug-Ins/Vamp • Put plugins for only the current user in $HOME/Library/Audio/Plug-Ins/Vamp • The Library folders are hidden by default; see here for details of how to show them
64-bit Windows	.dll	When using a 64-bit version of Windows: • Put 32-bit plugins in C:\Program Files (x86)\Vamp Plugins • Put 64-bit plugins in C:\Program Files\Vamp Plugins • Both 32-bit and 64-bit plugins can be used, as long as you put them in the right places as above • If a plugin package is not described as 64-bit, then it is a 32-bit plugin. Some older plugins were only published in 32-bit form.

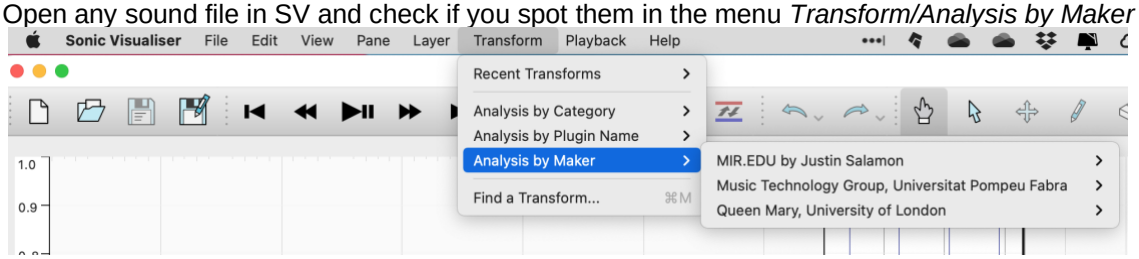
b. **in the end, your system Vamp plugin will be something like this (example from macOs) (Note: you only need the **.dylib* files but usually I copy all of them to the Vamp Plugins folder)**



c. **In the case of any OS warning about security issues, please accept and give the requested permissions (this libraries are trustworthy).**

- **Confirm the correct installation of VAMP Plugins**

Open any sound file in SV and check if you spot them in the menu *Transform/Analysis by Maker*



Task 2. Analysis of Sounds (Sonic Visualiser)

Goals
Learn the basics of Sonic Visualiser GUI
You may also check these video guides https://www.sonicvisualiser.org/videos.html.

HW1.1

Repeat the following loop for other sounds or any music you have on your computer:

- **Load a sound**
- **See waveform**
- **Obtain spectrum**
- **Obtain spectrogram**
- **Compute some audio descriptors (with MIR-EDU Vamp Plugin)**
- **Create new panes to visualise:**
  - different sonic representations (e.g. waveform, spectrum, spectrogram),
  - audio descriptors/low-level (e.g. spectral centroid, RMS);
  - music representations/mid-high-level ("Tempo and Beat Tracker: Beats", "MELODIA - Melody Extraction")

Experiment with other files, always trying to visually confirm all the "information" your ears perceive!

Task 3. Analysis of Sounds (FMP Notebooks)

Goals
Learn the basics of FMP Notebooks

HW1.2

Activate conda environment;

```
conda activate FMP
```

Change to the directory containing the FMP notebooks and start the Jupyter server:

```
jupyter notebook
```

Open the following Jupyter notebook and run it:

- Musical Notes and Pitches [Section 1.1.1]

➔ Execution of a Jupyter Notebook is sequential. You have to run cell 1, cell 2, etc. To run a cell you select it and press SHIFT+ENTER (or use the toolbar)
➔ Remember to always select **.ipynb*, while browsing the book

Musical Notes and Pitches	[Section 1.1.1] Note; pitch; pitch class; scale; enharmonic equivalence; twelve-tone equal-tempered scale; scientific pitch notation	[html]	[ipynb]

Try to:

- change the **duration** of the notes of the scale;
- change the **frequency** of some of the notes of the scale;
- Run the cells again and listen to the result.

Can you spot the difference? *You're ready to roll!*