AI-based Audio Analysis of Music and Soundscapes

Setting up & Using Python

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Python Basics
Outline

- Python in
  - Local machine
  - Jupyter Notebook
  - Google Colab

Python Basics
Python on local machine

- Install Python
  - https://www.python.org/downloads/
    - *Release Version Python 3.7.14*
  - *Run Installer*
- Install Miniconda
  - https://docs.conda.io/en/latest/miniconda.html
    - *Download 64-bit version for your operating system*

Python Basics
Python on local machine

- Start “Anaconda Prompt (Miniconda 3)”
  - This opens up a new terminal / command line window
- Download
  - https://github.com/machinelistening/machinelistening.github.io/raw/master/aiaa.yml (click on link, “File” > “Save Page As” …)
- Navigate to the folder, where the YML file was downloaded to (use “cd [sub directory name]” or “cd ..”)
- Run conda env create --file aiaa.yml to create a conda environment with all necessary Python packages
- Run conda activate aiaa to activate this environment
  - You should see “(aiaa) [your current path]” in the Terminal

Python Basics
Python on local machine

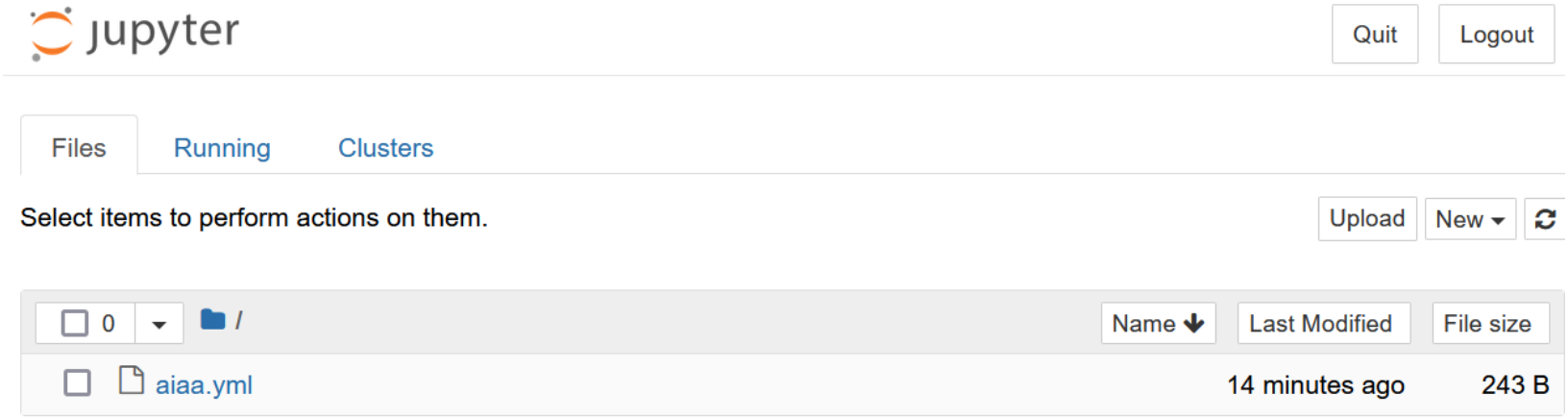
- Let's see if everything works
  - Run python to start the python console
  - Try to import our most relevant Python packages:
    - E.g. import matplotlib
    - Do the same for sklearn, numpy, librosa, tensorflow
  - Exit with exit()
- Now you're ready to use Python on your local machine ☺

Python Basics
Python on local machine

- Option 1: Local code development with Python editor
  - Write python code, save it as [name].py text files and run
    - python my_file.py (in the terminal) to execute the code
  - Recommended Python IDE (code editors)
    - https://atom.io/
    - https://www.jetbrains.com/pycharm/download/ (the "Community" version is free to use)

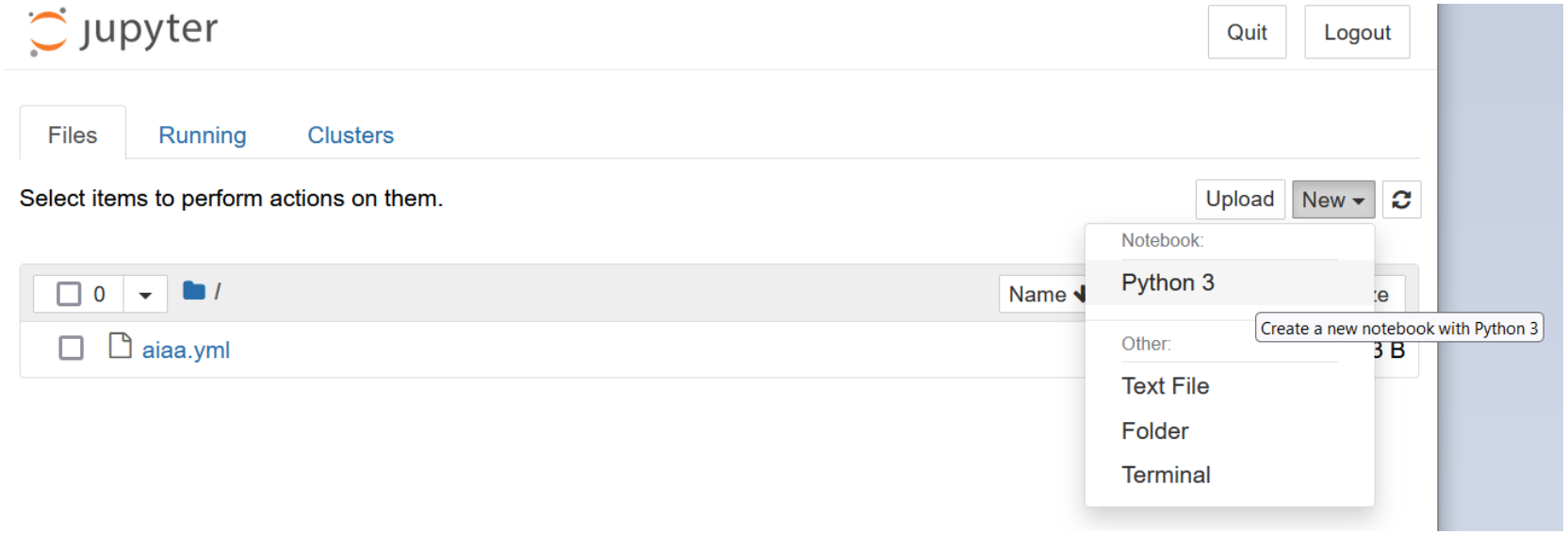
Python Basics
Python in Jupyter Notebook

- Option 2: Local code development with Jupyter notebook
  - Run jupyter notebook (within the activated aiaa conda environment)
    - This starts a local Python server and opens your browser



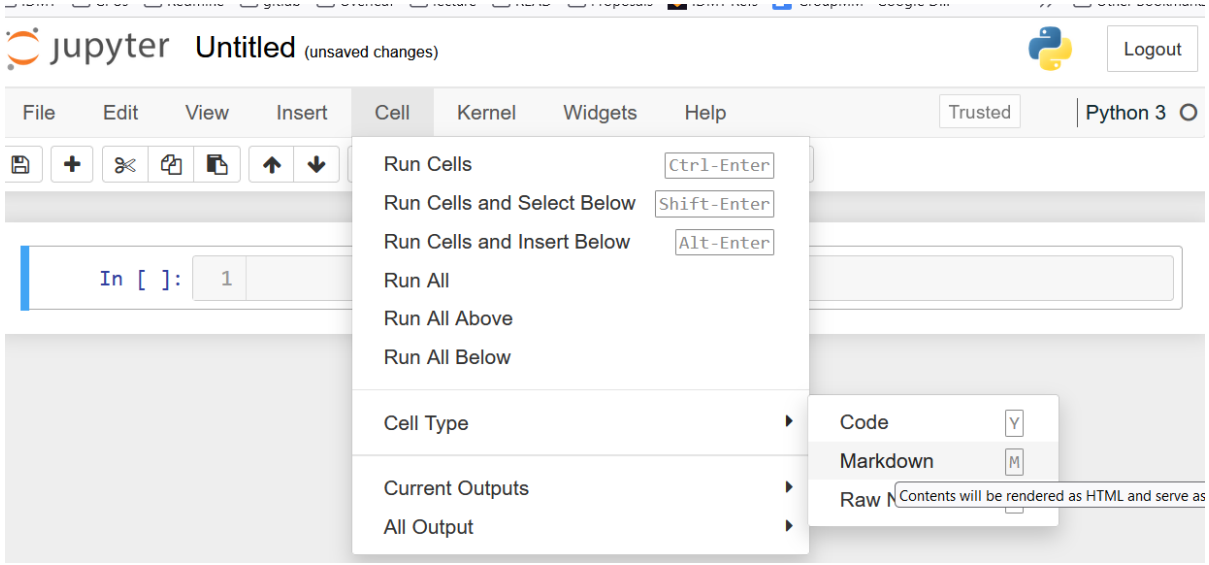
Python Basics
Python in Jupyter Notebook

- Create new notebook: New > Python 3



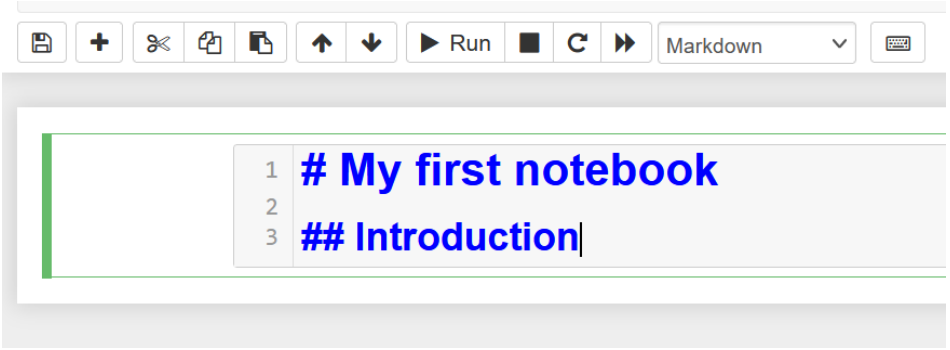
Python Basics
Python in Jupyter Notebook

- A Jupyter Notebook contains multiple “cells”, which can be
  - Python code
  - Formatted text (also images etc.) in “markdown” Syntax
- Let’s start with a text cell (change cell type to “Markdown”)

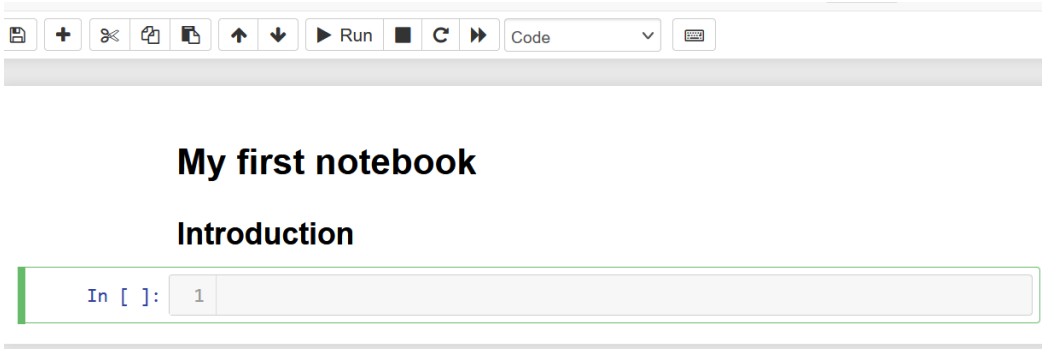


Python Basics
Python in Jupyter Notebook

- We'll add a header (using the # and ## formatting for level-1 and level-2 headers)

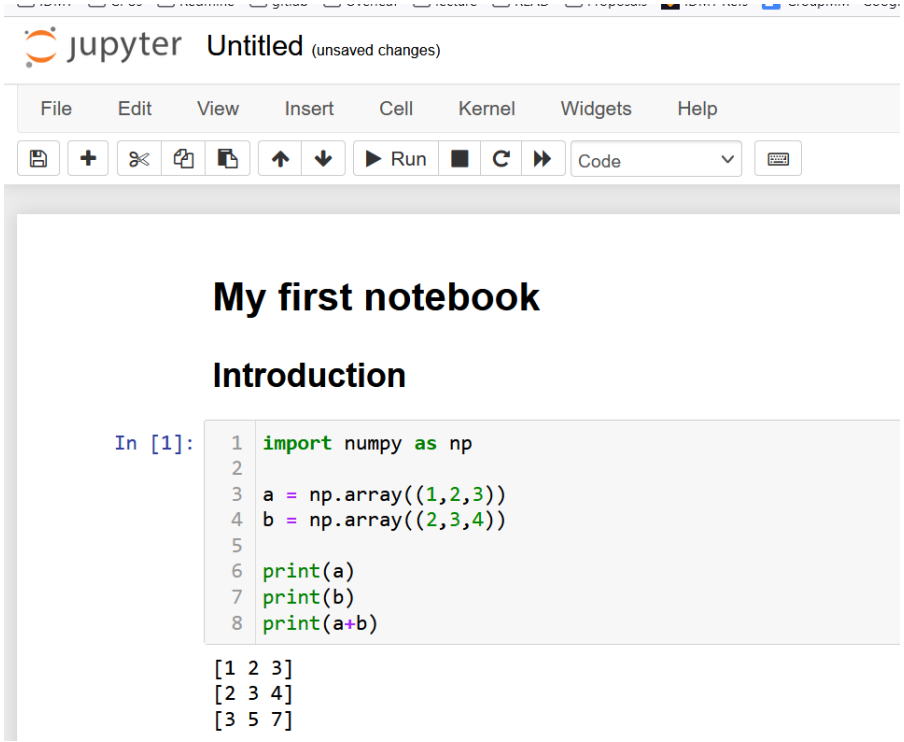


- Let's compile it (Shift + Enter)



Python Basics
Python in Jupyter Notebook

- In the next cell, we'll first import a python library and then run some code (again, compile with Shift + Enter)



Python Basics
Python in Jupyter Notebook

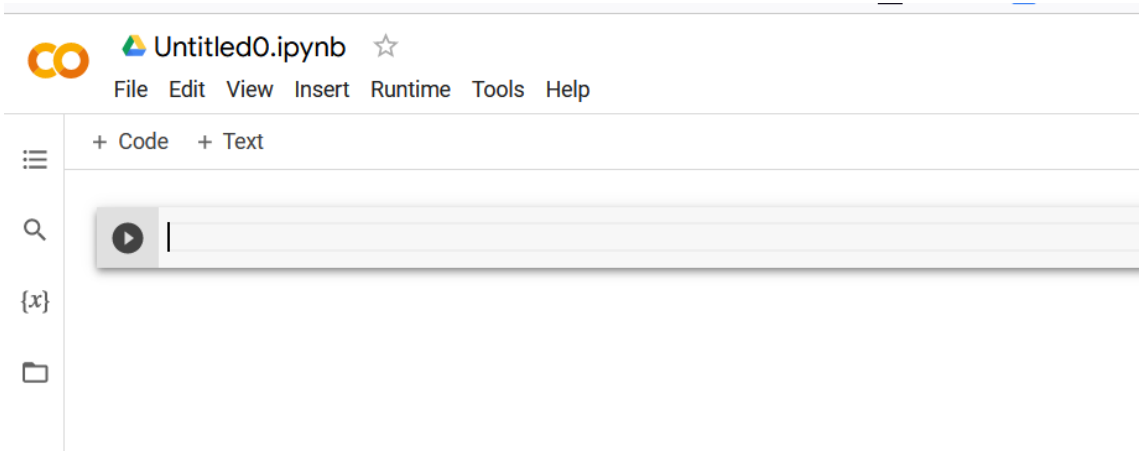
- Here are some more links on
  - Markdown formatting:
    - https://www.markdownguide.org/cheat-sheet/
  - Useful shortcuts in Jupyter:
    - https://www.audiolabs-erlangen.de/resources/MIR/FMP/B/B_Jupyter.html#Keyboard-Shortcuts

Python Basics
Python in Google Colab

- Advantages
  - Run Python code in the browser (no local Python installation necessary)
  - Access powerful hardware (GPU, TPU) for deep learning
  - Sharing of code to others
- Requirements
  - Google account

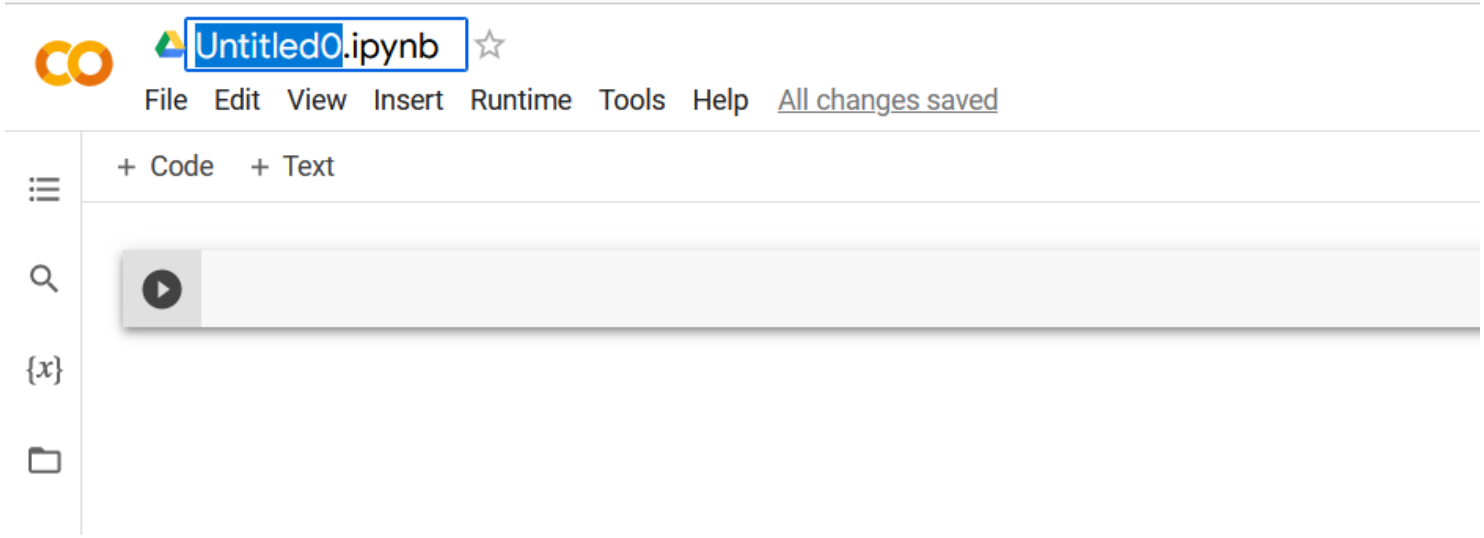
Python Basics
Python in Google Colab

- Setting it up
  - Go to https://colab.research.google.com/
  - Sign In (with your google account)
  - “New Notebook”



Python Basics
Python in Google Colab

- Change notebook name
  - Click on title



Python Basics
Python in Google Colab

- Add / fill cells
  - Just as in Jupyter, you can use code or markdown cells

- Run cells with Shift + Enter

Python Basics
Python in Google Colab

- Run lecture notebooks in Colab

Lecture Material (Slides / Jupyter Notebooks)

- AIAA 0 - Introduction
  - Slides (PDF)
- AIAA 1 - Python
  - Slides (PDF)
  - Jupyter Notebook (ipynb)
    - Open in Google Colab
- AIAA 2 - Audio Processing
  - Slides (PDF)
  - Jupyter Notebook (ipynb)
    - Open in Google Colab
  - Audio Examples
    - bird.wav
    - piano.wav

Python Basics
Python in Google Colab

- Run lecture notebooks in Colab

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