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**Environment untuk Multimedia**

Tugas Ke: **Worksheet 1: Setup Python**

Mata Kuliah: **Sistem Teknologi Multimedia (IF25-40305)**

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## 1 Tujuan Pembelajaran

Setelah menyelesaikan worksheet ini, mahasiswa diharapkan mampu:

- Memahami pentingnya manajemen environment Python untuk pengembangan multimedia
- Menginstall dan mengkonfigurasi Python environment menggunakan conda, venv, atau uv
- Menginstall library-library Python yang diperlukan untuk multimedia processing
- Memverifikasi instalasi dengan mengimpor dan menguji library multimedia
- Mendokumentasikan proses konfigurasi dan hasil pengujian dalam format  $\text{\LaTeX}$

## 2 Latar Belakang

Python telah menjadi bahasa pemrograman yang sangat populer untuk multimedia processing karena memiliki ekosistem library yang sangat kaya. Namun, untuk dapat bekerja dengan multimedia secara efektif, kita perlu mengatur environment Python dengan benar dan menginstall library-library yang tepat.

Manajemen environment Python sangat penting untuk:

- Menghindari konflik antar library (dependency conflict)
- Memastikan reproducibility dari project
- Memudahkan kolaborasi antar developer
- Memisahkan project yang berbeda dengan requirement yang berbeda

## 3 Instruksi Tugas

### 3.1 Persiapan

Sebelum memulai, pastikan Anda telah:

- Menginstall Python 3.8 atau lebih baru di sistem Anda
- Memilih salah satu tool manajemen environment: **conda**, **venv**, atau **uv**
- Membuka terminal/command prompt
- Menyiapkan dokumen  $\text{\LaTeX}$  ini untuk dokumentasi

## 3.2 Bagian 1: Membuat Environment Python

Pilih **SALAH SATU** dari tiga opsi berikut dan ikuti langkah-langkahnya.

### 3.2.1 Opsi 1: Menggunakan Conda (Direkomendasikan untuk pemula)

Jalankan perintah berikut di terminal:

```
1 # Membuat environment baru dengan nama 'multimedia'
2 conda create -n multimedia python=3.11
3
4 # Mengaktifkan environment
5 conda activate multimedia
6
7 # Verifikasi environment aktif
8 conda info --envs
```

Kode 1: Membuat environment dengan Conda

### 3.2.2 Opsi 2: Menggunakan venv (Built-in Python)

```
1 # Membuat environment baru
2 python3 -m venv multimedia-env
3
4 # Mengaktifkan environment (Linux/Mac)
5 source multimedia-env/bin/activate
6
7 # Mengaktifkan environment (Windows)
8 # multimedia-env\Scripts\activate
9
10 # Verifikasi environment aktif
11 which python
```

Kode 2: Membuat environment dengan venv

### 3.2.3 Opsi 3: Menggunakan uv (Modern dan cepat)

```
1 # Install uv terlebih dahulu jika belum ada
2 # pip install uv
3
4 # Membuat environment baru
5 uv venv multimedia-uv
6
7 # Mengaktifkan environment (Linux/Mac)
8 source multimedia-uv/bin/activate
9
10 # Mengaktifkan environment (Windows)
11 # multimedia-uv\Scripts\activate
12
13 # Verifikasi environment aktif
14 which python
```

Kode 3: Membuat environment dengan uv

#### Dokumentasi:

- Tool manajemen environment yang saya pilih: **uv**
- Screenshot atau copy-paste output dari perintah verifikasi environment

```
[nashwalaisya@192 ~ % python3 -m pip install uv
Requirement already satisfied: uv in /Library/Frameworks/Python.framework/Versions/3.13/lib/python3.13/site-packages (0.8.13)
[nashwalaisya@192 ~ % uv venv multimedia-uv
Using CPython 3.13.7 interpreter at: /Library/Frameworks/Python.framework/Versions/3.13/bin/python3
Creating virtual environment at: multimedia-uv
Activate with: source multimedia-uv/bin/activate
[nashwalaisya@192 ~ % source multimedia-uv/bin/activate
(multimedia-uv) nashwalaisya@192 ~ % which python3
/Users/nashwalaisya/multimedia-uv/bin/python3
(multimedia-uv) nashwalaisya@192 ~ % which python
/Users/nashwalaisya/multimedia-uv/bin/python
(multimedia-uv) nashwalaisya@192 ~ % █
```

Gambar 1: Screenshot pembuatan environment uv

### 3.3 Bagian 2: Instalasi Library Multimedia

Setelah environment aktif, install library-library berikut:

#### 3.3.1 Library Audio Processing

```
1 # Untuk conda:
2 conda install -c conda-forge librosa soundfile scipy
3
4 # Untuk pip (venv/uv):
5 pip install librosa soundfile scipy
```

Kode 4: Instalasi library audio

#### 3.3.2 Library Image Processing

```
1 # Untuk conda:
2 conda install -c conda-forge opencv pillow scikit-image matplotlib
3
4 # Untuk pip (venv/uv):
5 pip install opencv-python pillow scikit-image matplotlib
```

Kode 5: Instalasi library image

#### 3.3.3 Library Video Processing

```
1 # Untuk conda:
2 conda install -c conda-forge ffmpeg
3 pip install moviepy
4
5 # Untuk pip (venv/uv):
6 pip install moviepy
```

Kode 6: Instalasi library video

#### 3.3.4 Library General Purpose

```
1 # Untuk conda:
2 conda install numpy pandas jupyter
3
4 # Untuk pip (venv/uv):
5 pip install numpy pandas jupyter
```

Kode 7: Instalasi library umum

## Dokumentasi Instalasi Library Audio Processing:

- Perintah instalasi yang saya gunakan

```
1 python -m pip install librosa soundfile scipy
```

Kode 8: Perintah instalasi library audio processing yang digunakan

- Screenshot proses instalasi atau output sukses

```
[multimedia-uv] nashwalaisya@192 ~ % python -m pip install librosa soundfile scipy
Collecting librosa
  Downloading librosa-0.11.0-py3-none-any.whl.metadata (8.7 kB)
Collecting soundfile
  Downloading soundfile-0.13.1-py2.py3-none-macosx_11_0_arm64.whl.metadata (16 kB)
Collecting scipy
  Downloading scipy-1.16.1-cp313-cp313-macosx_14_0_arm64.whl.metadata (61 kB)
Collecting audioread-3.0.1-py3-none-any.whl.metadata (8.4 kB)
Collecting numba-0.51.0 (from librosa)
  Downloading numba-0.61.2-cp313-cp313-macosx_11_0_arm64.whl.metadata (2.7 kB)
Collecting numpy-1.22.3 (from librosa)
  Downloading numpy-2.3.2-cp313-cp313-macosx_14_0_arm64.whl.metadata (62 kB)
Collecting scikit-learn-1.1.0 (from librosa)
  Downloading scikit_learn-1.7.1-cp313-cp313-macosx_12_0_arm64.whl.metadata (11 kB)
Collecting joblib-1.0 (from librosa)
  Downloading joblib-1.5.2-py3-none-any.whl.metadata (5.6 kB)
Collecting decorator-4.3.0 (from librosa)
  Downloading decorator-5.2.2-py3-none-any.whl.metadata (3.9 kB)
Collecting pooch-1.1 (from librosa)
  Downloading pooch-1.8.2-py3-none-any.whl.metadata (10 kB)
Collecting soxr-0.5.0.post1-cp312-cp312-macosx_11_0_arm64.whl.metadata (5.6 kB)
Collecting typing_extensions-4.1.1 (from librosa)
  Downloading typing_extensions-4.15.0-py3-none-any.whl.metadata (3.3 kB)
Collecting lazy_loader-0.1 (from librosa)
  Downloading lazy_loader-0.4-py3-none-any.whl.metadata (7.6 kB)
Collecting msgpack-1.0 (from librosa)
  Downloading msgpack-1.1.1-cp313-cp313-macosx_11_0_arm64.whl.metadata (8.4 kB)
Collecting standard_aifc-3.13.0-py3-none-any.whl.metadata (969 bytes)
Collecting standard_sunau-3.13.0-py3-none-any.whl.metadata (914 bytes)
Collecting cffi-1.17.1-cp313-cp313-macosx_11_0_arm64.whl.metadata (1.5 kB)
Collecting pycparser (from cffi>=1.0->soundfile)
  Downloading pycparser-2.22-py3-none-any.whl.metadata (943 bytes)
Collecting packaging (from lazy_loader>=0.1->librosa)
  Downloading packaging-25.0-py3-none-any.whl.metadata (3.3 kB)
Collecting llvmlite-0.45.0 (from numba>=0.51.0->librosa)
  Downloading llvmlite-0.44.0-cp313-cp313-macosx_11_0_arm64.whl.metadata (4.8 kB)
Collecting numpy-1.22.3 (from librosa)
  Downloading numpy-2.2.6-cp313-cp313-macosx_14_0_arm64.whl.metadata (62 kB)
Collecting platformdirs-2.5.0 (from pooch>=1.1->librosa)
  Downloading platformdirs-4.4.0-py3-none-any.whl.metadata (12 kB)
Collecting requests-2.19.0 (from pooch>=1.1->librosa)
  Downloading requests-2.32.5-py3-none-any.whl.metadata (4.9 kB)
Collecting charset_normalizer-3.4.3 (from requests>=2.19.0->pooch>=1.1->librosa)
  Downloading charset_normalizer-3.4.3-cp313-cp313-macosx_10_13_universal2.whl.metadata (36 kB)
Collecting idna-3.10 (from requests>=2.19.0->pooch>=1.1->librosa)
  Downloading idna-3.10-py3-none-any.whl.metadata (10 kB)
Collecting urllib3-2.5.0 (from requests>=2.19.0->pooch>=1.1->librosa)
  Downloading urllib3-2.5.0-py3-none-any.whl.metadata (6.5 kB)
Collecting certifi-2025.4.17 (from requests>=2.19.0->pooch>=1.1->librosa)
  Downloading certifi-2025.8.3-py3-none-any.whl.metadata (2.4 kB)
Using cached certifi-2025.8.3-py3-none-any.whl.metadata (2.4 kB)
Collecting threadpoolctl-3.6.0 (from scikit-learn>=1.1.0->librosa)
  Downloading threadpoolctl-3.6.0-py3-none-any.whl.metadata (13 kB)
Collecting standard_chunk-3.13.0-py3-none-any.whl.metadata (860 bytes)
Collecting audiopool-its (from standard_aifc->librosa)
  Downloading audiopool-its-0.2.2-cp313-cp313-macosx_11_0_arm64.whl.metadata (2.0 kB)
Download librosa-0.11.0-py3-none-any.whl (260 kB)
Download soundfile-0.13.1-py2.py3-none-macosx_11_0_arm64.whl (1.1 MB)
----- 1.1/1.1 MB 2.0 MB/s 0:00:00
Download scipy-1.16.1-cp313-cp313-macosx_14_0_arm64.whl (20.8 MB)
----- 20.8/20.8 MB 3.5 MB/s 0:00:06
Download audioread-3.0.1-py3-none-any.whl (23 kB)
Download cffi-1.17.1-cp313-cp313-macosx_11_0_arm64.whl (178 kB)
Download decorator-5.2.1-py3-none-any.whl (9.2 kB)
Download joblib-1.5.2-py3-none-any.whl (308 kB)
Download lazy_loader-0.4-py3-none-any.whl (12 kB)
Download msgpack-1.1.1-cp313-cp313-macosx_11_0_arm64.whl (78 kB)
Download numba-0.61.2-cp313-cp313-macosx_11_0_arm64.whl (2.0 MB)
----- 2.0/2.0 MB 3.6 MB/s 0:00:00
Download llvmlite-0.44.0-cp313-cp313-macosx_11_0_arm64.whl (26.2 MB)
----- 26.2/26.2 MB 3.7 MB/s 0:00:06
Download numpy-2.2.6-cp313-cp313-macosx_14_0_arm64.whl (5.1 MB)
----- 5.1/5.1 MB 3.6 MB/s 0:00:01
Download pooch-1.8.2-py3-none-any.whl (64 kB)
Download packaging-25.0-py3-none-any.whl (66 kB)
Download platformdirs-4.4.0-py3-none-any.whl (18 kB)
Download requests-2.32.5-py3-none-any.whl (64 kB)
Download charset_normalizer-3.4.3-cp313-cp313-macosx_10_13_universal2.whl (205 kB)
Download idna-3.10-py3-none-any.whl (70 kB)
Download urllib3-2.5.0-py3-none-any.whl (129 kB)
Using cached certifi-2025.8.3-py3-none-any.whl (161 kB)
Download scikit_learn-1.7.1-cp313-cp313-macosx_12_0_arm64.whl (8.6 MB)
----- 8.6/8.6 MB 3.6 MB/s 0:00:02
Download soxr-0.5.0.post1-cp312-cp312-macosx_11_0_arm64.whl (156 kB)
Download threadpoolctl-3.6.0-py3-none-any.whl (18 kB)
Download typing_extensions-4.15.0-py3-none-any.whl (44 kB)
Download pycparser-2.22-py3-none-any.whl (117 kB)
Download standard_aifc-3.13.0-py3-none-any.whl (10 kB)
Download standard_sunau-3.13.0-py3-none-any.whl (26 kB)
Download standard_chunk-3.13.0-py3-none-any.whl (4.9 kB)
Download audiopool-its-0.2.2-cp313-cp313-macosx_11_0_arm64.whl (26 kB)
Download standard_chunk-3.13.0-py3-none-any.whl (7.4 kB)
Installing collected packages: standard_chunk, urllib3, typing_extensions, threadpoolctl, pycparser
Successfully installed audiopool-its-0.2.2 audioread-3.0.1 certifi-2025.8.3 cffi-1.17.1 charset_normalizer-3.4.3 idna-3.10 llvmlite-0.44.0 librosa-0.11.0 msgpack-1.1.1 numpy-2.2.6 platformdirs-4.4.0 pooch-1.8.2 requests-2.32.5 scikit_learn-1.7.1 soundfile-0.13.1 standard_aifc-3.13.0 standard_sunau-3.13.0 threadpoolctl-3.6.0 typing_extensions-4.15.0
[multimedia-uv] nashwalaisya@192 ~ %
```

Gambar 2: Screenshot instalasi library audio processing

- Daftar library yang berhasil diinstall dengan versinya

```
Installing collected packages: standard-chunk, urllib3, typing_extensions, threadpoolctl, pycparser, platformdirs, packaging, numpy, msgpack, llvmlite, joblib, idna, decorator, charset_normalizer, certifi, audioread, audioop-lts, standard-sunau, standard-aifc, soxr, scipy, requests, numba, lazy_loader, cffi, soundfile, scikit-learn, pooch, librosa
Successfully installed audioread-3.0.1 certifi-2025.8.3 cffi-1.17.1 charset_normalizer-3.4.3 decorator-5.2.1 idna-3.10 joblib-1.5.2 lazy_loader-0.4 librosa-0.11.0 llvmlite-0.44.0 msgpack-1.1.1 numba-0.61.2 numpy-2.2.6 packaging-25.0 platformdirs-4.4.0 pooch-1.8.2 pycparser-2.22 requests-2.32.5 scikit-learn-1.7.1 scipy-1.16.1 soundfile-0.13.1 soxr-0.5.0.post1 standard-aifc-3.13.0 standard-chunk-3.13.0 standard-sunau-3.13.0 threadpoolctl-3.6.0 typing_extensions-4.15.0 urllib3-2.5.0
```

Gambar 3: Library audio processing yang berhasil diinstall

## Dokumentasi Instalasi Library Image Processing:

- Perintah instalasi yang saya gunakan

```
1 python -m pip install opencv-python pillow scikit-image matplotlib
```

Kode 9: Perintah instalasi library image processing yang digunakan

- Screenshot proses instalasi atau output sukses

```
[(multimedia-uv) nashwalaisya@192 ~ % python -m pip install opencv-python pillow scikit-image matplotlib]
Collecting opencv-python
  Downloading opencv_python-4.12.0.88-cp37-abi3-macosx_13_0_arm64.whl.metadata (19 kB)
Collecting pillow
  Downloading pillow-11.3.0-cp313-cp313-macosx_11_0_arm64.whl.metadata (9.0 kB)
Collecting scikit-image
  Downloading scikit_image-0.25.2-cp313-cp313-macosx_12_0_arm64.whl.metadata (14 kB)
Collecting matplotlib
  Downloading matplotlib-3.10.5-cp313-cp313-macosx_11_0_arm64.whl.metadata (11 kB)
Requirement already satisfied: numpy<2.3.0, >=2 in ./multimedia-uv/lib/python3.13/site-packages (from opencv-python) (2.2.6)
Requirement already satisfied: scipy>=1.11.4 in ./multimedia-uv/lib/python3.13/site-packages (from scikit-image) (1.16.1)
Collecting networkx>=3.0 (from scikit-image)
  Downloading networkx-3.5-py3-none-any.whl.metadata (6.3 kB)
Collecting imageio!=2.35.0, >=2.33 (from scikit-image)
  Downloading imageio-2.37.0-py3-none-any.whl.metadata (5.2 kB)
Collecting tifffile>=2022.8.12 (from scikit-image)
  Downloading tifffile-2025.8.28-py3-none-any.whl.metadata (32 kB)
Requirement already satisfied: packaging>=21 in ./multimedia-uv/lib/python3.13/site-packages (from scikit-image) (25.0)
Requirement already satisfied: lazy-loader>=0.4 in ./multimedia-uv/lib/python3.13/site-packages (from scikit-image) (0.4)
Collecting contourpy>=1.0.1 (from matplotlib)
  Downloading contourpy-1.3.3-cp313-cp313-macosx_11_0_arm64.whl.metadata (5.5 kB)
Collecting cycler>=0.10 (from matplotlib)
  Using cached cycler-0.12.1-py3-none-any.whl.metadata (3.8 kB)
Collecting fonttools>=4.22.0 (from matplotlib)
  Downloading fonttools-4.59.2-cp313-cp313-macosx_10_13_universal2.whl.metadata (109 kB)
Collecting kiwisolver>=1.3.1 (from matplotlib)
  Downloading kiwisolver-1.4.9-cp313-cp313-macosx_11_0_arm64.whl.metadata (6.3 kB)
Collecting pyparsing>=2.3.1 (from matplotlib)
  Downloading pyparsing-3.2.3-py3-none-any.whl.metadata (5.0 kB)
Collecting python-dateutil>=2.7 (from matplotlib)
  Using cached python_dateutil-2.9.0.post0-py2.py3-none-any.whl.metadata (8.4 kB)
Collecting six>=1.5 (from python-dateutil>=2.7->matplotlib)
  Downloading six-1.17.0-py2.py3-none-any.whl.metadata (1.7 kB)
Downloaded opencv_python-4.12.0.88-cp37-abi3-macosx_13_0_arm64.whl (37.9 MB)
  37.9/37.9 MB 4.2 MB/s 0:00:09
Downloaded pillow-11.3.0-cp313-cp313-macosx_11_0_arm64.whl (4.7 MB)
  4.7/4.7 MB 4.2 MB/s 0:00:01
Downloaded scikit_image-0.25.2-cp313-cp313-macosx_12_0_arm64.whl (13.2 MB)
  13.2/13.2 MB 2.6 MB/s 0:00:05
Downloaded matplotlib-3.10.5-cp313-cp313-macosx_11_0_arm64.whl (8.1 MB)
  8.1/8.1 MB 3.6 MB/s 0:00:02
Downloaded contourpy-1.3.3-cp313-cp313-macosx_11_0_arm64.whl (274 kB)
Using cached cycler-0.12.1-py3-none-any.whl (8.3 kB)
Downloaded fonttools-4.59.2-cp313-cp313-macosx_10_13_universal2.whl (208 MB)
  2.8/2.8 MB 3.5 MB/s 0:00:00
Downloaded imageio-2.37.0-py3-none-any.whl (315 kB)
Downloaded kiwisolver-1.4.9-cp313-cp313-macosx_11_0_arm64.whl (64 kB)
Downloaded networkx-3.5-py3-none-any.whl (2.0 MB)
  2.0/2.0 MB 3.2 MB/s 0:00:00
Downloaded pyparsing-3.2.3-py3-none-any.whl (111 kB)
Using cached python_dateutil-2.9.0.post0-py2.py3-none-any.whl (229 kB)
Downloaded six-1.17.0-py2.py3-none-any.whl (11 kB)
Downloaded tifffile-2025.8.28-py3-none-any.whl (231 kB)
Installing collected packages: tifffile, six, pyparsing, pillow, opencv-python, networkx, kiwisolver, fonttools, cycler, con
Successfully installed contourpy-1.3.3 cycler-0.12.1 fonttools-4.59.2 imageio-2.37.0 kiwisolver-1.4.9 matplotlib-3.10.5 netw
.0.post0 scikit-image-0.25.2 six-1.17.0 tifffile-2025.8.28
(multimedia-uv) nashwalaisya@192 ~ %
```

Gambar 4: Screenshot instalasi library image processing

- Daftar library yang berhasil diinstall dengan versinya

```
Installing collected packages: tiffle, six, pyparsing, pillow, opencv-python, networkx, kiwisolver, fonttools, cycler, contourpy, python-dateutil, imageio, scikit-image, matplotlib
Successfully installed contourpy-1.3.3 cycler-0.12.1 fonttools-4.59.2 imageio-2.37.0 kiwisolver-1.4.9 matplotlib-3.10.5 networkx-3.5 opencv-python-4.12.0.88 pillow-11.3.0 pyparsing-3.2.3 python-dateutil-2.9
.0.post0 scikit-image-0.25.2 six-1.17.0 tiffle-2025.8.28
(multimedia-uv) nashwalaisya@192 ~ % python -m pip install moviepy
```

Gambar 5: Library image processing yang berhasil diinstal

## Dokumentasi Instalasi Library Video Processing:

- Perintah instalasi yang saya gunakan

```
1 python -m pip install moviepy
```

Kode 10: Perintah instalasi library video processing yang digunakan

- Screenshot proses instalasi atau output sukses

```
(multimedia-uv) nashwalaisya@192 ~ % python -m pip install moviepy
Collecting moviepy
  Downloading moviepy-2.2.1-py3-none-any.whl.metadata (6.9 kB)
Requirement already satisfied: decorator<6.0,>=4.0.2 in ./multimedia-uv/lib/python3.13/site-packages (from moviepy) (5.2.1)
Requirement already satisfied: imageio<3.0,>=2.5 in ./multimedia-uv/lib/python3.13/site-packages (from moviepy) (2.37.0)
Collecting imageio_ffmpeg<0.2.0 (from moviepy)
  Downloading imageio_ffmpeg-0.6.0-py3-none-macosx_11_0_arm64.whl.metadata (1.5 kB)
Requirement already satisfied: numpy>=1.25.0 in ./multimedia-uv/lib/python3.13/site-packages (from moviepy) (2.2.6)
Collecting proglog<=1.0.0 (from moviepy)
  Downloading proglog-0.1.12-py3-none-any.whl.metadata (794 bytes)
Collecting python-dotenv>=0.10 (from moviepy)
  Downloading python_dotenv-1.1.1-py3-none-any.whl.metadata (24 kB)
Requirement already satisfied: pillow<12.0,>=9.2.0 in ./multimedia-uv/lib/python3.13/site-packages (from moviepy) (11.3.0)
Collecting tqdm (from proglog<=1.0.0->moviepy)
  Downloading tqdm-4.67.1-py3-none-any.whl.metadata (57 kB)
Download moviepy-2.2.1-py3-none-any.whl (129 kB)
Download proglog-0.1.12-py3-none-any.whl (6.3 kB)
Download imageio_ffmpeg-0.6.0-py3-none-macosx_11_0_arm64.whl (21.1 MB)
21.1/21.1 MB 4.5 MB/s 0:00:04
Download python_dotenv-1.1.1-py3-none-any.whl (20 kB)
Download tqdm-4.67.1-py3-none-any.whl (78 kB)
Installing collected packages: tqdm, python-dotenv, imageio_ffmpeg, proglog, moviepy
Successfully installed imageio_ffmpeg-0.6.0 moviepy-2.2.1 proglog-0.1.12 python-dotenv-1.1.1 tqdm-4.67.1
(multimedia-uv) nashwalaisya@192 ~ %
```

Gambar 6: Screenshot instalasi library video processing

- Daftar library yang berhasil diinstall dengan versinya

```
Installing collected packages: tqdm, python-dotenv, imageio_ffmpeg, proglog, moviepy
Successfully installed imageio_ffmpeg-0.6.0 moviepy-2.2.1 proglog-0.1.12 python-dotenv-1.1.1 tqdm-4.67.1
(multimedia-uv) nashwalaisya@192 ~ % python -m pip install numpy pandas jupyter
```

Gambar 7: Library video processing yang berhasil diinstal

## Dokumentasi Instalasi Library General Purpose:

- Perintah instalasi yang saya gunakan

```
1 python -m pip install numpy pandas jupyter
```

Kode 11: Perintah instalasi library general purpose yang digunakan

- Screenshot proses instalasi atau output sukses

```
(multimedia-uv) nashwalaisya@192 ~ % python -m pip install numpy pandas jupyter
Requirement already satisfied: numpy in ./multimedia-uv/lib/python3.13/site-packages (2.2.6)
Collecting pandas
  Downloading pandas-2.3.2-cp313-cp313-macosx_11_0_arm64.whl.metadata (91 kB)
Collecting jupyter
  Downloading jupyter-1.1.1-py2.py3-none-any.whl.metadata (2.0 kB)
Requirement already satisfied: python-dateutil>=2.8.2 in ./multimedia-uv/lib/python3.13/site-
Collecting pytz>=2020.1 (from pandas)
  Downloading pytz-2025.2-py2.py3-none-any.whl.metadata (22 kB)
Collecting tzdata>=2022.7 (from pandas)
  Downloading tzdata-2025.2-py2.py3-none-any.whl.metadata (1.4 kB)
Collecting notebook (from jupyter)
  Downloading notebook-7.4.5-py3-none-any.whl.metadata (10 kB)
Collecting jupyter-console (from jupyter)
  Downloading jupyter_console-6.6.3-py3-none-any.whl.metadata (5.8 kB)
Collecting nbconvert (from jupyter)
  Downloading nbconvert-7.16.6-py3-none-any.whl.metadata (8.5 kB)
Collecting ipykernel (from jupyter)
  Downloading ipykernel-6.30.1-py3-none-any.whl.metadata (6.2 kB)
Collecting ipywidgets (from jupyter)
  Downloading ipywidgets-8.1.7-py3-none-any.whl.metadata (2.4 kB)
Collecting jupyterlab (from jupyter)
  Downloading jupyterlab-4.4.6-py3-none-any.whl.metadata (16 kB)
Requirement already satisfied: six>=1.5 in ./multimedia-uv/lib/python3.13/site-packages (from
Collecting appnope>=0.1.2 (from ipykernel->jupyter)
  Downloading appnope-0.1.4-py2.py3-none-any.whl.metadata (988 bytes)
Collecting comm>=0.1.1 (from ipykernel->jupyter)
  Downloading comm-0.2.3-py3-none-any.whl.metadata (3.7 kB)
Collecting debugpy>=1.6.5 (from ipykernel->jupyter)
  Downloading debugpy-1.8.16-cp313-cp313-macosx_14_0_universal2.whl.metadata (1.3 kB)
Collecting ipython>=7.23.1 (from ipykernel->jupyter)
  Downloading ipython-9.4.0-py3-none-any.whl.metadata (4.4 kB)
Collecting jupyter-client>=8.0.0 (from ipykernel->jupyter)
  Downloading jupyter_client-8.6.3-py3-none-any.whl.metadata (8.3 kB)
Collecting jupyter-core<=5.0.*,>=4.12 (from ipykernel->jupyter)
  Downloading jupyter_core-5.8.1-py3-none-any.whl.metadata (1.6 kB)
Collecting matplotlib-inline>=0.1 (from ipykernel->jupyter)
  Downloading matplotlib-inline-0.1.7-py3-none-any.whl.metadata (3.9 kB)
Collecting nest-asyncio>=1.4 (from ipykernel->jupyter)
  Downloading nest_asyncio-1.6.0-py3-none-any.whl.metadata (2.8 kB)
Requirement already satisfied: packaging>=22 in ./multimedia-uv/lib/python3.13/site-packages
Collecting psutil>=5.7 (from ipykernel->jupyter)
  Downloading psutil-7.0.8-cp312-abis-macosx_11_0_arm64.whl.metadata (22 kB)
Collecting pyzmq>=25 (from ipykernel->jupyter)
  Downloading pyzmq-27.0.2-cp312-abis-macosx_10_15_universal2.whl.metadata (6.0 kB)
Collecting tornado>=6.2 (from ipykernel->jupyter)
  Downloading tornado-6.5.2-cp39-abis-macosx_10_9_universal2.whl.metadata (2.8 kB)
Collecting traitlets>=5.4.0 (from ipykernel->jupyter)
  Downloading traitlets-5.14.3-py3-none-any.whl.metadata (10 kB)
Requirement already satisfied: decorator in ./multimedia-uv/lib/python3.13/site-packages (fro
Collecting ipython-pygments-lexers (from ipython>=7.23.1->ipykernel->jupyter)
  Downloading ipython_pygments_lexers-1.1.1-py3-none-any.whl.metadata (1.1 kB)
Collecting jedi>=0.16 (from ipython>=7.23.1->ipykernel->jupyter)
  Downloading jedi-0.19.2-py2.py3-none-any.whl.metadata (22 kB)
Collecting pexpect>4.3 (from ipython>=7.23.1->ipykernel->jupyter)
  Downloading pexpect-4.9.0-py2.py3-none-any.whl.metadata (2.5 kB)
Collecting prompt_toolkit<3.1.0,>=3.0.41 (from ipython>=7.23.1->ipykernel->jupyter)
  Downloading prompt_toolkit-3.0.52-py3-none-any.whl.metadata (6.4 kB)
Collecting pygments>=2.4.0 (from ipython>=7.23.1->ipykernel->jupyter)
  Downloading pygments-2.19.2-py3-none-any.whl.metadata (2.5 kB)
Collecting stack_data (from ipython>=7.23.1->ipykernel->jupyter)
  Downloading stack_data-0.6.3-py3-none-any.whl.metadata (18 kB)
Collecting wcwidth (from ipython>=7.23.1->ipykernel->jupyter)
  Downloading wcwidth-0.2.13-py2.py3-none-any.whl.metadata (14 kB)
Collecting parso<0.9.0,>=0.8.4 (from jedi>=0.16->ipython>=7.23.1->ipykernel->jupyter)
  Downloading parso-0.8.5-py2.py3-none-any.whl.metadata (8.3 kB)
Requirement already satisfied: platformdirs>=2.5 in ./multimedia-uv/lib/python3.13/site-packa
Collecting ptyprocess>=0.5 (from pexpect>4.3->ipython>=7.23.1->ipykernel->jupyter)
  Downloading ptyprocess-0.7.0-py2.py3-none-any.whl.metadata (1.3 kB)
Collecting widgetsnbextension<=4.0.14 (from ipywidgets->jupyter)
```

Gambar 8: Screenshot instalasi library general purpose

- Daftar library yang berhasil diinstall dengan versinya

```
Installing collected packages: webencodings, wcwidth, pytz, pure-eval, ptyprocess, fastjsonschema, widgetsnbextension, websocket-client, webcolors, uri-template, tzdata, types-python-dateutil, traitlets, to
rno, tinycss2, soupsieve, sniffio, send2trash, rdpd-py, rfc3986-validator, rfc3339-validator, pyzmq, pyyaml, python-json-logger, pygments, psutil, prompt_toolkit, prometheus-client, pexpect, parso, pandoc
filters, nest-asyncio, mistune, MarkupSafe, lark, jupyterlab_widgets, jupyterlab-pygments, jsonpointer, json5, h11, fqn, executing, defusedxml, debugpy, comm, bleach, babel, attrs, async-lru, asttokens, ap
pnope, terminado, stack_data, rfc3987-syntax, referencing, pandas, matplotlib-inline, jupyter-core, Jinja2, jedi, ipython-pygments-lexers, httpcore, beautifulsoup4, arrow, argon2-cffi-bindings, anyio, juyt
er-server-terminals, jupyter-client, jsonschema-specifications, isoduration, ipython, httpx, argon2-cffi, jsonschema, ipywidgets, ipykernel, nbformat, jupyter-console, nbclient, jupyter-events, nbconvert, j
upyter-server, notebook-shim, jupyterlab-server, jupyter-lsp, jupyterlab, notebook, jupyter
Successfully installed MarkupSafe-3.0.2 anyio-4.10.0 appnope-0.1.4 argon2-cffi-25.1.0 argon2-cffi-bindings-25.1.0 arrow-1.3.0 asttokens-3.0.0 async-lru-2.0.5 attrs-25.3.0 babel-2.17.0 beautifulsoup4-4.13.5
bleach-6.2.0 comm-0.2.3 debugpy-1.8.16 defusedxml-0.7.1 executing-2.2.0 fastjsonschema-2.21.2 fqn-1.5.1 h11-0.16.0 httpcore-1.0.9 httpx-0.28.1 ipykernel-6.30.1 ipython-9.4.0 ipython-pygments-lexers-1.1.1 i
pywidgets-8.1.7 isoduration-20.11.0 jedi-0.19.2 Jinja2-3.1.6 json5-0.12.1 jsonpointer-3.0.0 jsonschema-4.25.1 jsonschema-specifications-2025.4.1 jupyter-1.1.1 jupyter-client-8.6.3 jupyter-console-6.6.3 jupy
ter-core-6.8.1 jupyter-events-0.12.0 jupyter-lsp-2.3.0 jupyter-server-2.17.0 jupyter-server-terminals-0.5.3 jupyterlab-4.4.6 jupyterlab-pygments-0.3.0 jupyterlab-server-2.27.3 jupyterlab_widgets-3.0.15 lark
-1.2.2 matplotlib-inline-0.1.7 mistune-3.1.3 nbclient-0.10.2 nbconvert-7.16.6 nbformat-5.10.4 nest-asyncio-1.6.0 notebook-7.4.5 notebook-shim-0.2.4 pandas-2.3.2 pandocfilters-1.5.1 parso-0.8.5 pexpect-4.9.0
prometheus-client-0.22.1 prompt_toolkit-3.0.52 psutil-7.0.8 ptyprocess-0.7.0 pure-eval-0.2.3 pygments-2.19.2 python-json-logger-3.3.0 pytz-2025.2 pyyaml-6.0.2 pyzmq-27.0.2 referencing-0.36.2 rfc3339-valida
tor-0.1.4 rfc3986-validator-0.1.1 rfc3987-syntax-1.1.0 rdpd-py-0.27.1 send2trash-1.8.3 sniffio-1.3.1 soupsieve-2.8 stack_data-0.6.3 terminado-0.18.1 tinycss2-1.4.0 tornado-6.5.2 traitlets-5.14.3 types-pytho
n-dateutil-2.9.0.20250822 tzdata-2025.2 uri-template-1.3.0 wcwidth-0.2.13 webcolors-24.11.1 webencodings-0.5.1 websocket-client-1.8.0 widgetsnbextension-4.0.14
(multimedia-uv) nashwalaisya@192 ~ %
```

Gambar 9: Library general processing yang berhasil diinstall

### 3.4 Bagian 3: Verifikasi Instalasi

Buat file Python sederhana untuk menguji semua library yang telah diinstall  
Jalankan script dan dokumentasikan hasilnya

### 3.5 Bagian 4: Simple Test dengan Sample Code

Buat dan jalankan contoh sederhana untuk setiap kategori multimedia:

#### 3.5.1 Test Audio Processing

```
1 import numpy as np
2 import matplotlib.pyplot as plt
3
4 # Generate simple sine wave
```



```

5 duration = 2 # seconds
6 sample_rate = 44100
7 frequency = 440 # A4 note
8
9 t = np.linspace(0, duration, int(sample_rate * duration))
10 audio_signal = np.sin(2 * np.pi * frequency * t)
11
12 # Plot waveform
13 plt.figure(figsize=(10, 4))
14 plt.plot(t[:1000], audio_signal[:1000]) # Plot first 1000 samples
15 plt.title('Sine Wave (440 Hz)')
16 plt.xlabel('Time (s)')
17 plt.ylabel('Amplitude')
18 plt.grid(True)
19 plt.savefig('sine_wave_test.png', dpi=150, bbox_inches='tight')
20 plt.show()
21
22 print(f"Generated {duration}s sine wave at {frequency}Hz")
23 print(f"Sample rate: {sample_rate}Hz")
24 print(f"Total samples: {len(audio_signal)}")

```

Kode 12: Test audio processing sederhana

### 3.5.2 Test Image Processing

```

1 import numpy as np
2 import matplotlib.pyplot as plt
3 from PIL import Image
4
5 # Create a simple test image
6 width, height = 400, 300
7 image = np.zeros((height, width, 3), dtype=np.uint8)
8
9 # Add some patterns
10 image[:, :width//3, 0] = 255 # Red section
11 image[:, width//3:2*width//3, 1] = 255 # Green section
12 image[:, 2*width//3:, 2] = 255 # Blue section
13
14 # Add a white circle in the center
15 center_x, center_y = width//2, height//2
16 radius = 50
17 Y, X = np.ogrid[:height, :width]
18 mask = (X - center_x)**2 + (Y - center_y)**2 <= radius**2
19 image[mask] = [255, 255, 255]
20
21 # Display and save
22 plt.figure(figsize=(8, 6))
23 plt.imshow(image)
24 plt.title('Test Image with RGB Stripes and White Circle')
25 plt.axis('off')
26 plt.savefig('test_image.png', dpi=150, bbox_inches='tight')
27 plt.show()
28
29 print(f"Created test image: {width}x{height} pixels")
30 print(f"Image shape: {image.shape}")
31 print(f"Image dtype: {image.dtype}")

```

Kode 13: Test image processing sederhana

Dokumentasikan hasil eksekusi:

- Screenshot output dari kedua script di atas



- Gambar yang dihasilkan
- Error message jika ada dan cara mengatasinya

## 4 Bagian Laporan

### 4.1 Output Verifikasi Instalasi

Perintah yang digunakan:

```
1 try:
2     import librosa
3     print("librosa: Success")
4 except Exception as e:
5     print("librosa: ERROR ->", e)
6
7 try:
8     import soundfile
9     print("soundfile: Success")
10 except Exception as e:
11     print("soundfile: ERROR ->", e)
12
13 try:
14     import scipy
15     print("scipy: Success")
16 except Exception as e:
17     print("scipy: ERROR ->", e)
18
19 try:
20     import cv2
21     print("opencv (cv2): Success")
22 except Exception as e:
23     print("opencv: ERROR ->", e)
24
25 try:
26     from PIL import Image
27     print("Pillow (PIL): Success")
28 except Exception as e:
29     print("Pillow: ERROR ->", e)
30
31 try:
32     import skimage
33     print("scikit-image: Success")
34 except Exception as e:
35     print("scikit-image: ERROR ->", e)
36
37 try:
38     import matplotlib
39     print("matplotlib: Success")
40 except Exception as e:
41     print("matplotlib: ERROR ->", e)
42
43 try:
44     import moviepy
45     print("moviepy: Success")
46 except Exception as e:
47     print("moviepy: ERROR ->", e)
48
49 try:
50     import numpy
51     print("numpy: Success")
```

```

52 except Exception as e:
53     print("numpy: ERROR ->", e)
54
55 try:
56     import pandas
57     print("pandas: Success")
58 except Exception as e:
59     print("pandas: ERROR ->", e)

```

Kode 14: Perintah untuk verifikasi instalasi

### Output

```

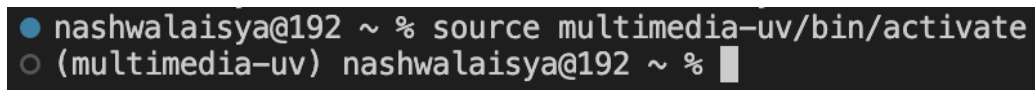
1 (multimedia-uv) nashwalaisya@192 ~ % python "/Users/nashwalaisya/Documents/Semester - 7/Sistem
   Teknologi Multimedia/Worksheet 1/verifikasi_instalasi.py"
2 librosa: Success
3 soundfile: Success
4 scipy: Success
5 opencv (cv2): Success
6 Pillow (PIL): Success
7 scikit-image: Success
8 matplotlib: Success
9 moviepy: Success
10 numpy: Success
11 pandas: Success

```

Kode 15: Output verifikasi instalasi

## 4.2 Screenshot Hasil Test

- Terminal/command prompt yang menunjukkan environment aktif



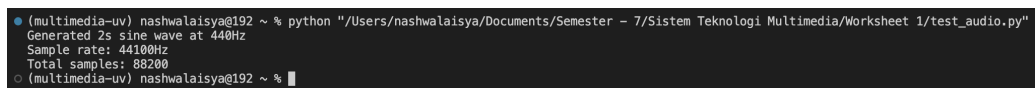
```

● nashwalaisya@192 ~ % source multimedia-uv/bin/activate
○ (multimedia-uv) nashwalaisya@192 ~ %

```

Gambar 10: Aktivasi environment

- Output dari script test audio (sine wave plot)

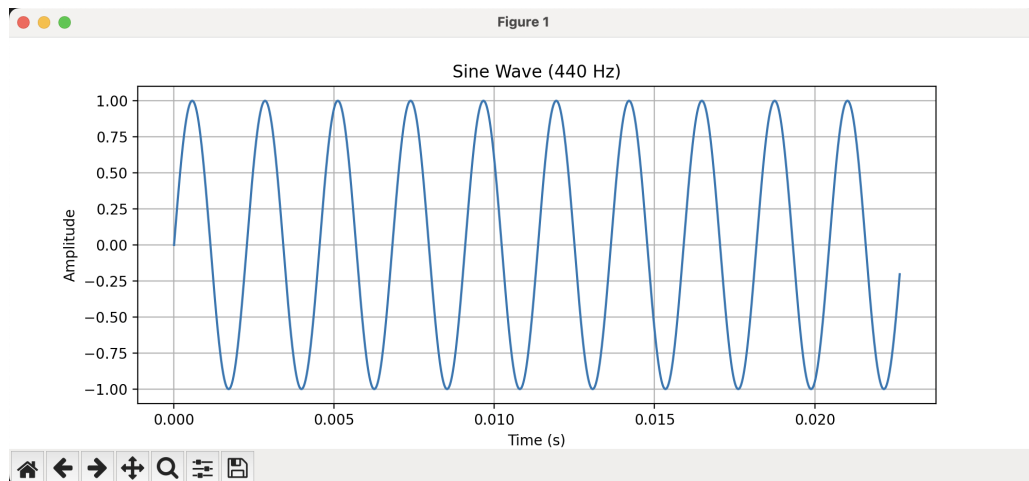


```

● (multimedia-uv) nashwalaisya@192 ~ % python "/Users/nashwalaisya/Documents/Semester - 7/Sistem Teknologi Multimedia/Worksheet 1/test_audio.py"
   Generated 2s sine wave at 440Hz
   Sample rate: 44100Hz
   Total samples: 88200
○ (multimedia-uv) nashwalaisya@192 ~ %

```

Gambar 11: Output script test audio pada terminal

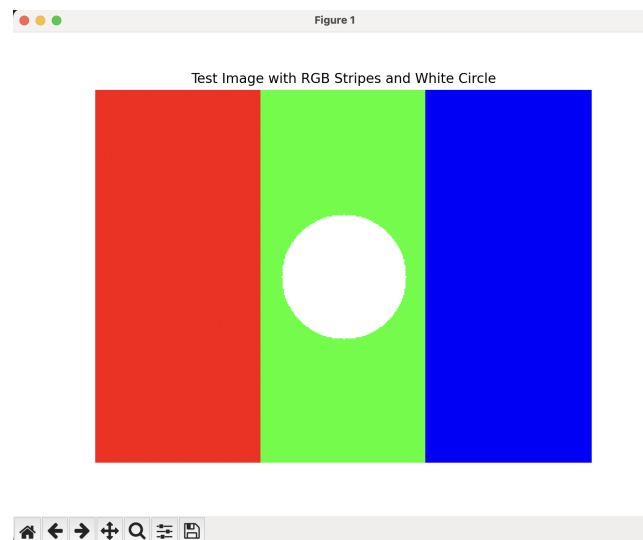


Gambar 12: Output script test audio

- Output dari script test image (RGB stripes dengan circle)

```
(multimedia-uv) nashwalaisya@192 ~ % python "/Users/nashwalaisya/Documents/Semester - 7/Sistem Teknologi Multimedia/Worksheet 1/test_image.py"
Created test image: 400x300 pixels
Image shape: (300, 400, 3)
Image dtype: uint8
```

Gambar 13: Output script test image pada terminal



Gambar 14: Output script test image

### 4.3 Analisis dan Refleksi

Jawab pertanyaan berikut:

1. Mengapa penting menggunakan environment terpisah untuk project multimedia?

Jawaban saya: Environment penting karena dapat memengaruhi kinerja teknis, pengujian, hingga pengalaman pengguna yang mana hal-hal tersebut sangat krusial untuk project multimedia.

2. Apa perbedaan utama antara conda, venv, dan uv? Mengapa Anda memilih tool yang Anda gunakan?

Jawaban saya: Perbedaan utama antara conda, venv, dan uv adalah:

- conda -> reliable tapi berat
- venv -> tidak terlalu berat tapi kecepatannya tergantung pip
- uv -> paling cepat di antara ketiga environment

Saya memilih uv karena tidak berat untuk laptop saya dan juga tidak perlu menunggu lama untuk menginstallnya.

### 3. Library mana yang paling sulit diinstall dan mengapa?

Jawaban saya: Selama penginstallan saya tidak menemukan kesulitan untuk menginstall library mana pun. Mungkin ada salah satu library yang memakan waktu lebih lama dari pada library-library lainnya. Library tersebut adalah Library General Purpose (numpy pandas jupyter). Proses penginstallan memang memakan waktu yang sedikit lebih lama tetapi tidak ada kesulitan dalam prosesnya.

### 4. Bagaimana cara mengatasi masalah dependency conflict jika terjadi?

Jawaban saya: Seandainya terjadi dependency conflict, biasanya masalah itu timbul karena lebih dari 1 package memerlukan versi yang tidak kompatibel dari dependency yang sama. Jadi lebih baik buat environment baru, lalu tetapkan versi secara eksplisit dan instal semuanya sekaligus kemudian verifikasi.

### 5. Jelaskan fungsi dari masing-masing library yang berhasil Anda install!

Jawaban saya:

- librosa -> untuk analisis musik dan audio: memuat file audio, menghitung spektrogram, mengekstrak fitur (tempo, pitch, MFCC), deteksi beat, dll.
- soundfile -> untuk membaca dan menulis file suara.
- scipy -> library komputasi ilmiah umum, dengan submodul scipy.signal untuk pemrosesan sinyal: penyaringan (filtering) audio, transformasi Fourier, interpolasi.
- opencv-python (cv2) -> library computer vision untuk pemrosesan gambar/video secara real-time: transformasi gambar, deteksi wajah, pelacakan objek, deteksi tepi.
- Pillow (PIL) -> untuk manipulasi gambar dasar: membuka, memotong, mengubah ukuran, memutar, mengonversi format (JPEG, PNG, dll.).
- scikit-image (skimage) -> toolkit pemrosesan gambar tingkat lanjut berbasis NumPy/SciPy: segmentasi, denoising, morfologi, ekstraksi fitur.
- matplotlib -> untuk plotting dan visualisasi: menampilkan gambar, membuat histogram, menggambar kurva data.
- moviepy -> pengeditan video di Python: memotong, menggabungkan, menambah efek, menambahkan audio, membuat GIF.
- ffmpeg (alat backend, tidak di-import langsung) -> program command-line yang kuat untuk mengonversi dan memproses video/audio.
- numpy -> library inti untuk komputasi numerik di Python: operasi cepat pada array/matriks, aljabar linear, FFT.
- pandas -> untuk analisis dan manipulasi data: membaca CSV/Excel, mengelola data tabular (baris kolom), grup, filter.
- jupyter -> menyediakan environment Jupyter Notebook: pemrograman interaktif, menjalankan Python per cell, menampilkan grafik langsung di notebook.

## 5 Export Environment untuk Reproduksi

Sebagai langkah terakhir, export environment Anda agar dapat direproduksi:

### 5.1 Untuk Conda

```
1 conda env export > environment.yml
```

Kode 16: Export conda environment

### 5.2 Untuk venv/uv

```
1 pip freeze > requirements.txt
```

Kode 17: Export pip requirements

Isi file requirements.txt:

```
1 anyio==4.10.0
2 appnope==0.1.4
3 argon2-cffi==25.1.0
4 argon2-cffi-bindings==25.1.0
5 arrow==1.3.0
6 asttokens==3.0.0
7 async-lru==2.0.5
8 attrs==25.3.0
9 audioop-lts==0.2.2
10 audioread==3.0.1
11 babel==2.17.0
12 beautifulsoup4==4.13.5
13 bleach==6.2.0
14 certifi==2025.8.3
15 cffi==1.17.1
16 charset-normalizer==3.4.3
17 comm==0.2.3
18 contourpy==1.3.3
19 cycler==0.12.1
20 debugpy==1.8.16
21 decorator==5.2.1
22 defusedxml==0.7.1
23 executing==2.2.0
24 fastjsonschema==2.21.2
25 fonttools==4.59.2
26 fqdn==1.5.1
27 h11==0.16.0
28 httpcore==1.0.9
29 httpx==0.28.1
30 idna==3.10
31 imageio==2.37.0
32 imageio-ffmpeg==0.6.0
33 ipykernel==6.30.1
34 ipython==9.4.0
35 ipython_pygments_lexers==1.1.1
36 ipywidgets==8.1.7
37 isoduration==20.11.0
38 jedi==0.19.2
39 Jinja2==3.1.6
40 joblib==1.5.2
41 json5==0.12.1
42 jsonpointer==3.0.0
43 jsonschema==4.25.1
```

```
44 jsonschema-specifications==2025.4.1
45 jupyter==1.1.1
46 jupyter-console==6.6.3
47 jupyter-events==0.12.0
48 jupyter-lsp==2.3.0
49 jupyter_client==8.6.3
50 jupyter_core==5.8.1
51 jupyter_server==2.17.0
52 jupyter_server_terminals==0.5.3
53 jupyterlab==4.4.6
54 jupyterlab_pygments==0.3.0
55 jupyterlab_server==2.27.3
56 jupyterlab_widgets==3.0.15
57 kiwisolver==1.4.9
58 lark==1.2.2
59 lazy_loader==0.4
60 librosa==0.11.0
61 llvmlite==0.44.0
62 MarkupSafe==3.0.2
63 matplotlib==3.10.5
64 matplotlib-inline==0.1.7
65 mistune==3.1.3
66 moviepy==2.2.1
67 msgpack==1.1.1
68 nbclient==0.10.2
69 nbconvert==7.16.6
70 nbformat==5.10.4
71 nest-asyncio==1.6.0
72 networkx==3.5
73 notebook==7.4.5
74 notebook_shim==0.2.4
75 numba==0.61.2
76 numpy==2.2.6
77 opencv-python==4.12.0.88
78 packaging==25.0
79 pandas==2.3.2
80 pandocfilters==1.5.1
81 parso==0.8.5
82 pexpect==4.9.0
83 pillow==11.3.0
84 platformdirs==4.4.0
85 pooch==1.8.2
86 proglog==0.1.12
87 prometheus_client==0.22.1
88 prompt_toolkit==3.0.52
89 psutil==7.0.0
90 ptyprocess==0.7.0
91 pure_eval==0.2.3
92 pycparser==2.22
93 Pygments==2.19.2
94 pyparsing==3.2.3
95 python-dateutil==2.9.0.post0
96 python-dotenv==1.1.1
97 python-json-logger==3.3.0
98 pytz==2025.2
99 PyYAML==6.0.2
100 pyzmq==27.0.2
101 referencing==0.36.2
102 requests==2.32.5
103 rfc3339-validator==0.1.4
104 rfc3986-validator==0.1.1
105 rfc3987-syntax==1.1.0
```

```

106 rpds-py==0.27.1
107 scikit-image==0.25.2
108 scikit-learn==1.7.1
109 scipy==1.16.1
110 Send2Trash==1.8.3
111 setuptools==80.9.0
112 six==1.17.0
113 sniffio==1.3.1
114 soundfile==0.13.1
115 soupsieve==2.8
116 soxr==0.5.0.post1
117 stack-data==0.6.3
118 standard-aifc==3.13.0
119 standard-chunk==3.13.0
120 standard-sunau==3.13.0
121 terminado==0.18.1
122 threadpoolctl==3.6.0
123 tifffile==2025.8.28
124 tinycss2==1.4.0
125 tornado==6.5.2
126 tqdm==4.67.1
127 traitlets==5.14.3
128 types-python-dateutil==2.9.0.20250822
129 typing_extensions==4.15.0
130 tzdata==2025.2
131 uri-template==1.3.0
132 urllib3==2.5.0
133 wcwidth==0.2.13
134 webcolors==24.11.1
135 webencodings==0.5.1
136 websocket-client==1.8.0
137 wheel==0.45.1
138 widgetsnbextension==4.0.14

```

Kode 18: Environment/Requirements file

## 6 Kesimpulan

Dari saya:

- Pengalaman setup Python environment untuk multimedia -> Awalnya saya kesulitan buat install environment karena saya belum terbiasa dengan command di macOS, tapi setelah tau command di macOS, saya jadi mudah untuk install environmentnya dan untuk commandnya kurang lebih sama seperti OS lainnya, hanya saja ada tambahan " python -m " sebelum menggunakan pip.
- Persiapan untuk project multimedia selanjutnya -> Mungkin saya akan coba untuk cari-cari gimana gambaran untuk audio, image, dan video processing. Setidaknya saya bisa tau workflownya.
- Saran untuk mahasiswa lain yang akan melakukan setup serupa -> Mungkin gunakan environment yang compatible dengan masing-masing device saja, jangan terlalu dipaksakan untuk pakai yang mungkin tidak memungkinkan untuk devicenya.

*Environment itu penting adanya untuk project multimedia. Kenapa? Karena dengan adanya environment, performance teknisnya jadi lebih smooth dan pengujian project juga jadi lebih baik dan sesuai*



## 7 Referensi

1. [Pertanyaan seputar environment - ChatGPT](#)
2. [Membuat file Python sederhana untuk verifikasi instalasi - ChatGPT](#)