BME 548 Lab Guide

Setting Up the Python Environment

This guide will help you create a Python environment using **Conda** or **Mamba**. This environment, named `bme548`, includes PyTorch and all necessary image processing and visualization libraries required for the lab.

Prerequisites

Ensure you have **Miniforge** (recommended) or **Anaconda** installed.

Note: We recommend using `mamba` commands for faster installation, but you can replace `mamba` with `conda` in all the commands below if necessary.

1 Option 1: Quick Setup (Command Line)

Follow these steps to build the environment interactively.

1. Create the Environment

Open your terminal (or Miniforge/Anaconda Prompt on Windows) and create a new environment with Python 3.12:

```
mamba create -n bme548 python=3.12 -y
```

2. Activate the Environment

```
mamba activate bme548
```

3. Install PyTorch

The installation command varies slightly depending on your operating system and hardware.

For most users (CPU or Apple Silicon M1/M2/M3/M4/M5):

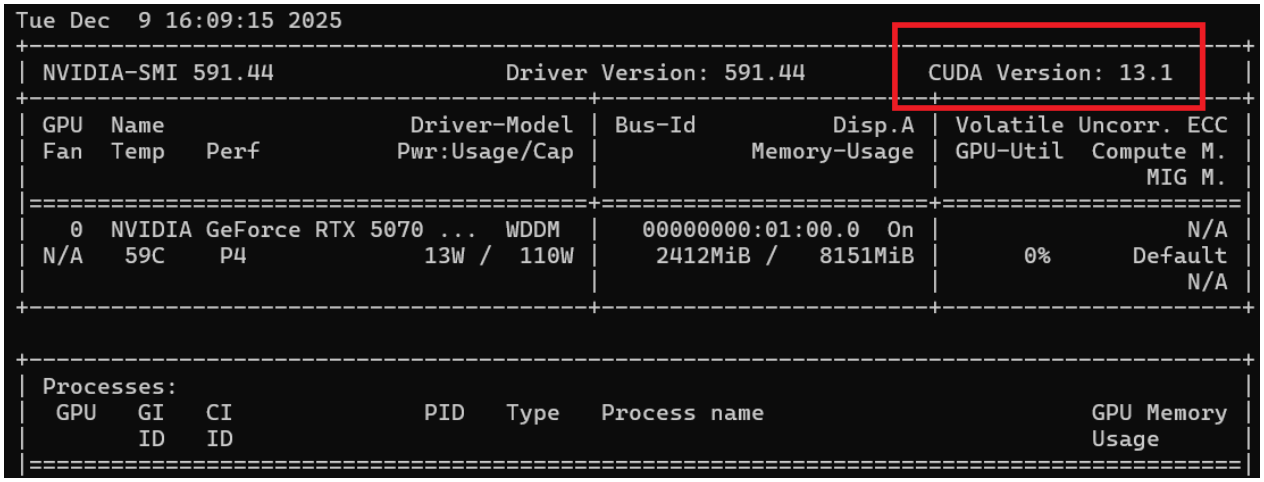
```
pip3 install torch torchvision
```

For users with NVIDIA GPUs (CUDA support):

To verify your installed CUDA version, you can use the following command in your terminal:

```
nvidia-smi
```

This will display information about your NVIDIA GPU and the installed CUDA driver version. You should see output like the following:



Note: The CUDA version shown in `nvidia-smi` is the driver-supported version, which may differ from the runtime used by PyTorch.

To ensure compatibility with PyTorch, refer to the official PyTorch website: `https://pytorch.org/get-started/locally/`

Select the appropriate command for your operating system. These commands install PyTorch with CUDA 13.0 support.

```
pip3 install torch torchvision --index-url https://download.pytorch.org/whl/cu130
```

4. Install Helper Packages

Install the remaining dependencies (`scikit-image`, `opencv`, `matplotlib`, `scipy`, etc.).

```
mamba install ipywidgets ipykernel scikit-image opencv matplotlib scipy -c conda-forge -y
```

5. Register the Kernel for Jupyter

To ensure this environment appears as an option in your Jupyter Notebooks:

```
python -m ipykernel install --user --name=bme548 --display-name "Python (bme548)"
```

2 Option 2: Reproducible Setup (Recommended)

1. Create the YAML file

Create a file named `environment.yml` in your project folder and paste the following content:

```
name: bme548
channels:
  - conda-forge
dependencies:
  - python=3.12.12
  - pytorch=2.9.1
  - torchvision=0.24.1
  - ipywidgets=8.1.8
  - ipykernel=7.1.0
  - scikit-image=0.25.2
  - opencv=4.12.0
  - matplotlib=3.10.8
  - scipy=1.16.3
```

2. Create the Environment from File

Run the following command in the same directory as your file:

```
mamba env create -f environment.yml -y
```

3. Activate and Register Kernel

```
mamba activate bme548
python -m ipykernel install --user --name=bme548 --display-name "
Python (bme548)"
```

3 Verification

To verify that your installation was successful, open a terminal, activate the environment, and run python:

```
mamba activate bme548
python
```

Run the following commands inside the Python shell:

```
import torch
import cv2
import scipy.signal
import matplotlib.pyplot as plt

print(f"PyTorch Version: {torch.__version__}")
print(f"CUDA Available: {torch.cuda.is_available()}")
print("All packages imported successfully.")
```

If no errors appear, you are ready for the lab.