**Machine Learning Laboratory Setup: Tools and Installation Guide**

**1. Core Tools Required** install and configure the following tools/environments:

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| **Tool/Software** | **Purpose** |
| Python (Version 3.8+) | Main programming language for ML |
| Anaconda (Recommended) | Manages Python, packages, and environments |
| Jupyter Notebook / JupyterLab | Interactive coding environment for ML |
| Required Python Libraries | NumPy, Pandas, Matplotlib, Scikit-learn, etc. |
| (Optional) Integrated Development Environment (IDE) | VS Code, PyCharm, Spyder |
| (Optional) Git | Version control and code sharing |

**2. Step-by-Step Installation and Configuration**

**A. Installing Anaconda (Recommended for Beginners)**

*Anaconda simplifies handling Python, libraries, and environments. It includes Jupyter Notebook/ Lab.*

**Step 1: Download Anaconda Distribution**

* Go to: <https://www.anaconda.com/products/distribution>
* Click on “Download”.
* Choose your operating system (Windows/MacOS/Linux).
* Download the **Python 3.x (64-bit) Graphical Installer**.

**Step 2: Install Anaconda**

* **Windows**: Double-click the .exe installer. Click “Next” and follow setup instructions. Choose “Add Anaconda to my PATH environment variable” (optional but helpful).
* **MacOS/Linux**: Open Terminal, run:  
  bash <path-to-downloaded-file.sh>  
  Follow the prompts.
* Accept license, select destination folder, and finish installation.

**Step 3: Verify Installation**

* Open **Anaconda Navigator** (from Start Menu or search).
* Alternatively, open **Anaconda Prompt/Terminal** and type:  
  conda --version  
  You should see a version number.

**B. Setting Up a Python Environment**

(Prevents interfering with system Python and allows easy package management)

**Step 4: Create a New ML Environment**

* Open *Anaconda Prompt (Windows)* or *terminal (Mac/Linux)*.
* Run:  
  **conda create -n ml\_lab python=3.9**
* Confirm with “y” when asked.
* Activate your environment:  
  **conda activate ml\_lab**

**C. Installing Jupyter and Required Python Libraries**

**Step 5: Install Key Libraries**

* In the activated environment (ml\_lab), run the following:

**conda install jupyter pandas numpy matplotlib scikit-learn seaborn**

*(For deep learning or advanced ML: conda install tensorflow keras pytorch torchvision -c pytorch)*

**Step 6: Starting Jupyter Notebook / JupyterLab**

* Run:

jupyter notebook

(or, for JupyterLab: jupyter lab)

* A browser window will open. Create a new Notebook from the interface.

**D. (Optional) Installing Visual Studio Code (VS Code) – IDE**

**Step 7: Install VS Code**

* Go to: <https://code.visualstudio.com/>
* Download and run the installer for your OS.
* After installation, open VS Code.

**Step 8: Install Python Extension in VS Code**

* Open VS Code.
* Go to Extensions (left sidebar), search for “Python”, and click **Install** on the Microsoft Python extension.

**Step 9: Set Python Interpreter**

* Press Ctrl+Shift+P > “Python: Select Interpreter” > choose “ml\_lab” environment created earlier.

**E. (Optional) Installing Git for Version Control**

**Step 10: Install Git**

* Download: <https://git-scm.com/downloads>
* Install with default settings.
* Verify via terminal/cmd: git --version

**3. Testing the Setup**

**Step 11: Run a Test Notebook**

* In Jupyter, create a new notebook, type:

Python code given below:

import numpy as np

import pandas as pd

import matplotlib.pyplot as plt

from sklearn import datasets

print("All basic libraries are working!")

* Run the cell (Shift+Enter) – no error message means all is good.

**4. Troubleshooting Common Issues**

* **Jupyter Not Found**: Ensure you’ve activated the ml\_lab environment:  
  conda activate ml\_lab
* **Package Import Errors**: Ensure they are installed to the *activated* environment, not base.
* **Permission Issues**: On Mac/Linux, use sudo if needed, but prefer using conda in user space.

**5. Summary for Quick Setup**

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| --- | --- | --- |
| **Step** | **What to Do** | **Where to Download/Command** |
| 1 | Install Anaconda | anaconda.com/products/distribution |
| 2 | Create ML environment | conda create -n ml\_lab python=3.9 |
| 3 | Activate environment | conda activate ml\_lab |
| 4 | Install ML libraries | conda install jupyter pandas numpy matplotlib scikit-learn seaborn |
| 5 | Launch Jupyter | jupyter notebook or jupyter lab |
| 6 | (Optional) Install VS Code IDE | code.visualstudio.com |
| 7 | (Optional) Set interpreter in VS Code | Ctrl+Shift+P → Select interpreter |
| 8 | (Optional) Install Git | git-scm.com/downloads |

**6. Final Recommendations**

* **Always work inside your ml\_lab environment!**
* Save work often and back up via Git or cloud storage.
* Keep Anaconda and libraries updated:  
  conda update --all
* Don’t use system Python for experiments—always use your environment!

**7. References and Further Reading**

* [Anaconda Documentation](https://docs.anaconda.com/)
* [Jupyter Project](https://jupyter.org/)
* [Scikit-learn Documentation](https://scikit-learn.org/stable/)
* [Python for Beginners](https://www.python.org/about/gettingstarted/)