

Ghulam Ishaq Khan Institute of Engineering Sciences and Technology
Department of Artificial Intelligence
AI201L – Programming for Artificial Intelligence Lab

Matplotlib Task

Lab Task

1. Overview

In this lab task, you will apply the Python library **Matplotlib** to visualize *real data that you collect yourself* over a period of seven consecutive days. The goal is to demonstrate that you can:

- record and structure real-world data,
- choose appropriate plot types and customizations in Matplotlib, and
- interpret the resulting visualizations in your own words.

2. Submission Instructions

- Submit **one Jupyter Notebook file**:

`Matplotlib_Task_<RegistrationNumber>_<Name>.ipynb`

- The notebook must contain:
 - all relevant code cells,
 - corresponding outputs (plots visible in the notebook), and
 - markdown explanations where requested.
- **Do not** submit PDF files or screenshots as the main submission. Only the `.ipynb` notebook will be evaluated.

3. Data Collection Requirements

Each student must collect data for **5 consecutive days** from *one* of the categories listed below. You may extend the variables within a category as long as the data remain realistic and measurable.

You must also include **at least one** photo or screenshot of your original data source (e.g., phone app, notebook page, spreadsheet) inside the notebook for authenticity.

3.1 Allowed Data Themes (Choose One)

- A. **Daily Time Usage** (choose at least 5 categories), e.g.

- sleep hours,
- time spent in classes,
- self-study time,
- social media / screen time,
- gaming or entertainment,
- exercise duration,
- commuting time,
- extracurricular or part-time work,
- “other” activities.

B. Digital Wellbeing / Phone Analytics

- total screen time per day,
- number of notifications,
- number of phone unlocks,
- time spent on top 3–5 apps,
- time on productivity vs. entertainment apps.

C. Physical and Health Metrics

- daily steps or distance walked,
- estimated calories burned,
- water intake (glasses or liters),
- sleep duration,
- resting heart rate (if available),
- number of meals,
- caffeine or soft drink consumption.

D. Academic and Learning Patterns

- hours studied per subject,
- quiz/assignment scores,
- pages or slides read,
- time spent on coding practice,
- number of problem sets solved,
- number of group study sessions.

E. Personal Finance Tracking (Simple)

- total daily spending,
- categorized expenses (food, transport, stationery, etc.),
- savings deposited or remaining balance,
- online purchase count.

F. Mood and Well-Being Tracking

- mood score (e.g., 1–10),
- stress level (e.g., 1–5),
- energy level (e.g., 1–5),
- hours spent outdoors,
- social interaction time,

- meditation or relaxation time.

G. Custom Theme (Optional)

- Must cover 5 consecutive days.
- Must include at least one numeric variable recorded each day.
- Must allow meaningful visualization using at least five different Matplotlib plot types.

4. Required Notebook Structure

Your notebook should be organized into the following sections (use markdown headings).

4.1 Section 1 Data Setup (5 marks)

- Enter your collected data into Python using an appropriate structure (e.g., lists, dictionaries, or a pandas DataFrame).
- Display the raw data clearly (print statement or DataFrame output).
- Add a short markdown explanation (3–5 sentences) describing:
 - what you measured,
 - how you collected the data,
 - why you chose this theme.
- Insert at least one screenshot or photo of the original data source.

4.2 Section 2 Visualizations Using Matplotlib (30 marks)

Using **Matplotlib**, create at least the following plots. You may use pandas for convenience, but the plotting should clearly involve Matplotlib functions (e.g., `plt.plot`, `plt.bar`, etc.).

Each plot must include an appropriate title, axis labels, and any relevant legends. At least one visual customization (color, marker style, line style, tick rotation, etc.) should be applied per plot.

1. **Line Plot** A line plot of one numeric variable across all 5 days (e.g., total study hours, steps, screen time). Include markers, grid, and a custom color.
2. **Bar Chart** A bar chart comparing at least three categories for one representative day (e.g., time spent on three different apps, spending in three categories).
3. **Stacked Bar Chart** A stacked bar plot showing the composition of one day-level total across at least two or three components (e.g., study + social media + other time for each day).
4. **Histogram** A histogram showing the distribution of a numeric variable over the 5 days (e.g., sleep hours, steps, daily spending). In a markdown cell, justify your choice of number of bins in 1–2 sentences.

5. **Scatter Plot** A scatter plot comparing two variables that might be related (e.g., sleep vs. screen time, study hours vs. quiz score). Add at least one point annotation (e.g., marking a quiz day, weekend, or any special event).
6. **Pie or Doughnut Chart** A pie chart or doughnut-style chart representing the proportion of categories for a single day (e.g., distribution of daily time or expense categories). Display percentages and include a legend.

4.3 Section 3 Personal Analysis and Interpretation (10 marks)

Write an **8–12 sentence** reflection in your own words, covering the following points:

- main patterns or trends observed in your plots,
- any unusual or outlier day and the real-life reason for it,
- any surprising insights discovered from the data,
- one realistic change you would like to make in your routine based on the visualizations.

The language should be simple and personal, generic or copied text will lose marks.

4.4 Section 4 Code Quality and Structure (5 marks)

- Use clear and meaningful variable names.
- Add brief comments where necessary to explain non-obvious code.
- Keep the notebook organized and readable (headings, spacing, order).
- Ensure that the notebook runs from top to bottom without errors using “Run All”.

5. Academic Integrity

- You may use online resources or tools to learn syntax or debug errors, but the **data must be your own**, collected by you.
- Reflections and explanations must be written in your own words.
- Artificial or “too perfect” datasets without natural variation may be questioned and can lead to deduction of marks.
- Cases of plagiarism, data fabrication, or identical notebooks will be dealt with according to university policy.

6. Marking Breakdown (Total: 50 marks)

Component	Marks
Section 1 – Data Setup	5
Section 2 – Visualizations (6 plots)	30
Section 3 – Analysis and Interpretation	10
Section 4 – Code Quality and Structure	5
Total	50