**Simulation and Resource Planning Using Synthea and Python**

**Objective:**

Analyze surgical procedure patterns, use Synthea to simulate synthetic patient data, and investigate its use in fair anesthesiologist scheduling in the face of demand unpredictability.

**Tools Used:**

* Synthea (Java-based synthetic patient generator)
* Python (Jupyter Notebook)
* Pandas, Matplotlib
* GitHub for version control

**Assumptions:**

* Massachusetts is the location of the simulated patients.
* To generate data for ten patients, the simulation employs -p 10.
* Just protocols.For this investigation, csv is utilized.
* Every row in the processes.A surgical or medical operation is represented by csv.

**Input Format:**

* File: data/procedures.csv
* Fields used: start (datetime of procedure), description (procedure name)

**Output Format:**

* Aggregated daily counts of procedures
* Bar chart: Procedures per day (saved as .png)
* Data structure: {date: count}

**Steps Followed:**

1. **Git Setup & Cloning**
   * Created a GitHub repo named synthea-equitable-scheduling
   * Cloned the repo locally and initialized it with README, .gitignore, and requirements.txt
2. **Synthea Execution**
   * Downloaded from: <https://github.com/synthetichealth/synthea>
   * Executed: run\_synthea.bat Massachusetts -p 10
   * Generated CSVs under output/csv/
   * Moved procedures.csv to data/
3. **Data Analysis**
   * Loaded CSV into a Jupyter notebook (notebooks/synthea\_analysis.ipynb)
   * Converted start column to date
   * Aggregated count of procedures per day
   * Plotted and saved chart to charts/procedure\_trend.png
4. **Visualization**
   * Used matplotlib to display frequency of procedures by date
   * Chart visually confirms distribution of simulated procedure loads
5. **Resource Planning Context**
   * These trends can be used to estimate **daily demand** for medical staff
   * Helps design equitable schedules using the method from [Sun et al., 2021]
   * Example: Use peak day data to assign fair shifts among anesthesiologists

**Code Comments:**

* All steps in the notebook are clearly commented
* Variable names follow intuitive naming: df, daily\_counts, etc.