Creating a data visualization dashboard for monitoring key metrics and performance indicators in a manufacturing plant

DS5110 Project: Iteration #02

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1 Project Kickoff

1.1 Clearly state your project goals

This project aims to design and implement an interactive data visualization dashboard that monitors key performance indicators (KPIs) in a manufacturing plant.

The dashboard will provide multi-dimensional insights into metrics such as production output, machine utilization, downtime, and defect rates. By presenting this data in a clear and accessible format, the system could support operational decision-making, improve efficiency, and enable early detection of issues on the production floor.

1.2 Define your project scope

The scope includes:

- Identifying and collecting relevant datasets that simulate or represent manufacturing KPIs
- Data preprocessing, cleaning, and structuring for visualization.
- Designing a dashboard interface with interactive charts and KPIs.
- Hosting the dashboard either locally or via a cloud service if available (maybe)

1.3 Outline expected deliverables and milestones

- **June 16**: Define metrics and find datasets.
- **June 30**: Complete data cleaning and preprocessing.
- **July 14**: Develop visualizations and dashboard wireframes.
- **July 28**: Final dashboard prototype with interactivity.
- **Aug 11**: Final submission with documentation and presentation.

1.4 Indicate timeline and dataset(s) selected

We plan to complete the project over a 10-week timeline. For the dataset, we are currently exploring options such as:

- The Kaggle dataset "Manufacturing Process Data" (public and downloadable).
  Production Plant Data for Condition Monitoring
  Industrial Safety and Health Analytics Database
- Simulated datasets generated to mimic sensor logs and machine outputs.

1.5 Reflect on whether your team is ready or has gaps in expertise

We are confident in our core programming and data analysis skills. However, we may need to deepen our knowledge of dashboard frameworks (e.g., Plotly Dash, Power BI, or Tableau) and cloud deployment for real-time interaction.

2 Team Discussions

2.1 List the core skills of each team member

Qingyuan Hu:

- Python, Java, SQL
- MongoDB, Express.js, React, and Node.js (MERN) Stack

Yunmu Shu:

- Java, React, Python
- Experience in REST APIs and frontend UI

2.2 Assign responsibilities based on strengths

Qingyuan will focus on:

- Datasets collection
- Data cleaning, preprocessing, and structuring
- Backend design

Yunmu will focus on:

- Dashboard integration and frontend design
- API setup and interactivity

2.3 Identify any skill gaps

We may need external guidance on:

- Professional domain knowledge of industrial data processing
- Deploying dashboards on cloud platforms (TBD)
- Real-time data streaming and live updates (e.g., WebSockets)

2.4 Mention selected programming languages and platforms

We will use:

- Python for data processing
- JS+CSS+HTML dashboard frontend
- GitHub for collaboration and version control

3 Skills and Tools Assessment

3.1 List tools and frameworks to be used

- **Python** – For data loading, cleaning, and analysis.
- **Pandas, NumPy** – Core libraries for data preprocessing.
- **JavaScript + HTML + CSS** – For customization of frontend components.
- **GitHub** – Version control and team collaboration.
- **(Optional)** Flask or Kafka – If we need a backend for dynamic data APIs.

3.2 Identify any external resources if any

- **Kaggle Datasets** – As data sources for realistic manufacturing metrics.
- **YouTube / Medium blogs** – For practical guides on dashboard deployment and design.
- **Technical documentation** – For understanding related syntax, libraries, and functions.
- **Open-source GitHub projects** – For reference dashboard architectures or UI ideas.
- **University course materials** – For guidance on best practices in data visualization and system design.

3.3 Clarify task assignment and role clarity

- **Qingyuan Hu**:
  - Responsible for dataset acquisition, preprocessing, and statistical summarization of KPIs.
  - Develops the backend logic and supports integration with visualization tools.
- **Yunmu Shu**:
  - Focuses on designing the dashboard interface and implementing interactive components.
  - Connects frontend with data sources and supports deployment planning.
- **Joint Tasks**:
  - Dashboard feature testing and feedback iteration.
  - Final documentation and project presentation.

4 Submission for This Iteration

4.1 List specific tasks completed in this phase

- Selected project topic.
- Formed a two-member team and defined individual roles and responsibilities.
- Clearly stated project goals and defined the scope of work.
- Identified initial datasets and relevant external resources.
- Outlined project timeline, deliverables, and major milestones.
- Assessed tools, frameworks, and team skills relevant to the project.

4.2 Document challenges, solutions, and any plan changes

- **Challenge:** Deciding between multiple topic options at the start.
- **Solution:** Choose the most feasible and practical option that matches our team's skill set and project timeline.
- **Challenge:** Limited experience with dashboard tools.
- **Solution:** Committed to learning through official documentation, tutorials, and sample projects.

4.3 If your data is hosted online, provide the data link

We are currently evaluating multiple datasets. The selected datasets under consideration are:

- Production Plant Data for Condition Monitoring
- Industrial Safety and Health Analytics Database

Final dataset selection and download will be completed by the next phase.

4.4 Confirm the Excel tracker is complete and included

Yes.