Northwestern | SCHOOL OF PROFESSIONAL STUDIES

PERSONALIZED MUSIC RECOMMENDATION SYSTEM

Week 5 Status Report
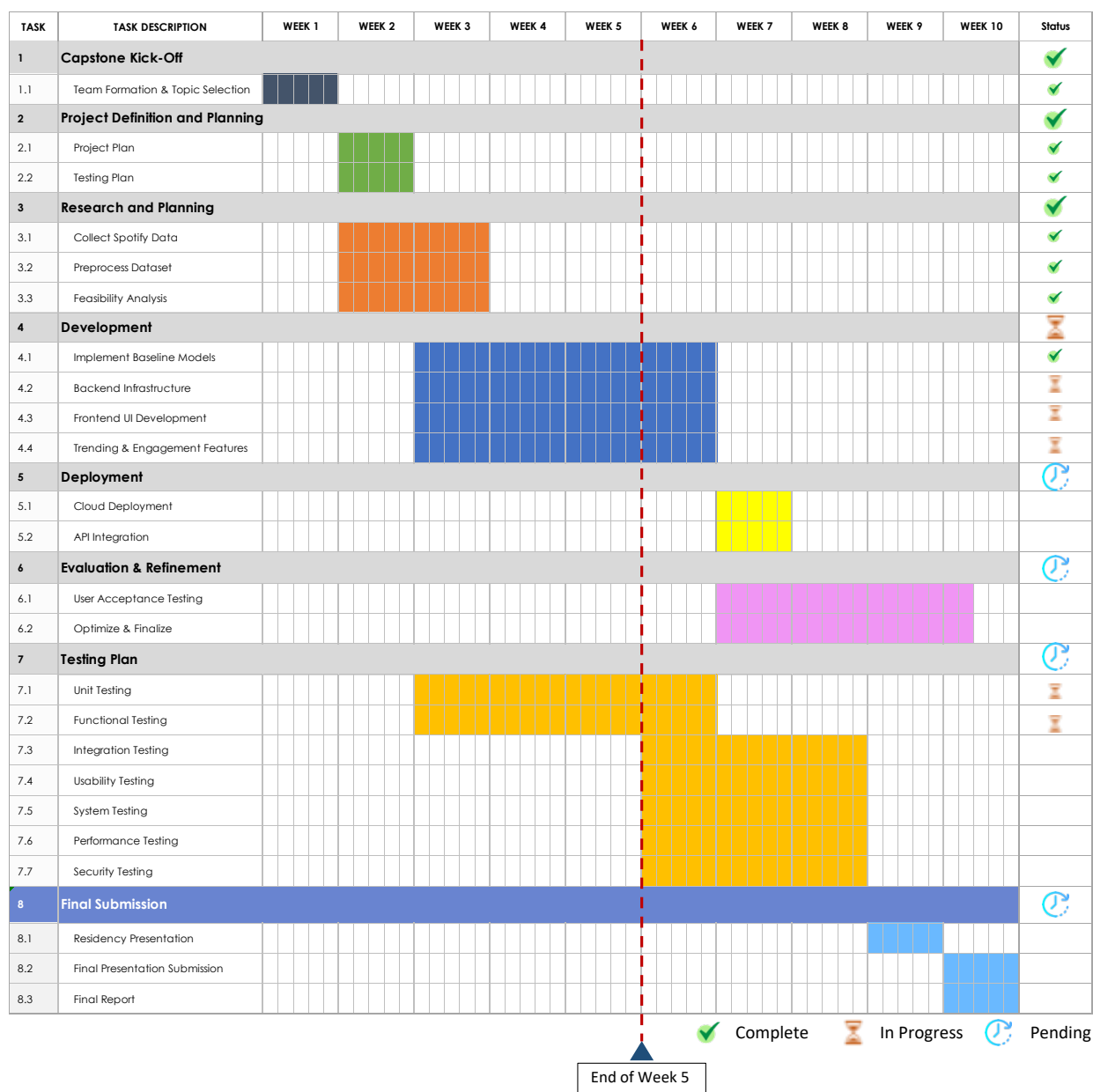
MSDSP 498 - Capstone

Abhigna Mallepally, Anishka Agarwal, Edwin Daniels, Sachin Sharma

February 11, 2025

Project Status Summary

Overall, the project is progressing well, with key milestones being achieved as planned.

The team has completed the data enrichment, basic frontend development, and database integration. This week we are working on integrating frontend and backend, app deployment, and analysing model performance.

TASK	TASK DESCRIPTION	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	Status
1	**Capstone Kick-Off**											✔
1.1	Team Formation & Topic Selection	■										✔
2	**Project Definition and Planning**											✔
2.1	Project Plan		■									✔
2.2	Testing Plan		■									✔
3	**Research and Planning**											✔
3.1	Collect Spotify Data		■	■								✔
3.2	Preprocess Dataset		■	■								✔
3.3	Feasibility Analysis		■	■								✔
4	**Development**											⌛
4.1	Implement Baseline Models			■	■	■	■					✔
4.2	Backend Infrastructure			■	■	■	■					⌛
4.3	Frontend UI Development			■	■	■	■					⌛
4.4	Trending & Engagement Features			■	■	■	■					⌛
5	**Deployment**											◔
5.1	Cloud Deployment							■				
5.2	API Integration							■				
6	**Evaluation & Refinement**											◔
6.1	User Acceptance Testing							■	■	■		
6.2	Optimize & Finalize							■	■	■		
7	**Testing Plan**											◔
7.1	Unit Testing			■	■	■	■					⌛
7.2	Functional Testing			■	■	■	■					⌛
7.3	Integration Testing						■	■	■			
7.4	Usability Testing						■	■	■			
7.5	System Testing						■	■	■			
7.6	Performance Testing						■	■	■			
7.7	Security Testing						■	■	■			
8	**Final Submission**											◔
8.1	Residency Presentation									■		
8.2	Final Presentation Submission										■	
8.3	Final Report										■	

✔ Complete   ⌛ In Progress   ◔ Pending

End of Week 5

Progress against Plan

Phase	Planned Tasks	Current Status	Next Steps	Comments
Data Collection	Collect users' last 50 songs dataset	✅ Completed	Train Models.	Successfully gathered user interaction data
Data Preprocessing	Clean and preprocess 1 million song dataset	✅ Completed	Add Locale using LLM.	Data ready for enrichment
Data Enrichment	Fill missing locale information for songs	✅ Completed	Review and refine locale data to ensure accuracy	Initial training dataset is completed.
Database Setup	Create SQL database for user login and preferences	✅ Completed	Develop functions for CRUD operations	All inputs and app data has been migrated to a database.
Frontend Development	Build React UI	🟡 In Progress	Interact with backend with HTTPS to populate data	Pages have been created for each feature
Backend Development	Implement recommendation engine	🟡 In Progress	Integrate API calls, model training and inference.	Developing APIs
Testing	Create Test cases.	🟡 In Progress	Start working on proposed test plan and user feedbacks.	Pending app deployment
Deployment	Deploy app to cloud.	🔴 Not Started	Cloud deployment	Testing and Bug fixes.

Risks, Issues & Mitigation Plans

Risk/Issue	Impact	Mitigation Plan	Status
Slow LLM Processing for Locale Data	Delays in completing data enrichment	Optimize batch size, explore parallel processing	✅ Completed
UI Development Complexity	Potential delays in frontend features	Prioritize core features first	✅ Completed
Cold-Start Problem for New Users	Reduced recommendation accuracy for new users	Use genre-based or trending song recommendations	🟡 In Progress
Chat Feature	Project delays	Development started	🟡 In Progress
Cloud Deployment	Project delays	Start immediately after beta app is created.	🔴 Not Started
Test Cases Creation	We will not be able to analyze	Start Parallelly after	🟡 In Progress

	the recommendation accuracy.	backend is completed.	
Data Quality	The data quality will impact the quality of recommendations	Leveraging lyrics APIs and '*langdetect*' package to improve the accuracy of locale information	🟡 In Progress

Next Week's Priorities

- **Backend Development**

Backend development is progressing as planned. Key APIs have been identified to support seamless frontend functionality, with active development and integration of third-party services like Ticketmaster to enhance user engagement. Exception handling is being implemented to ensure system stability, and overall development timelines remain on track.

- **Model Refinement**

The baseline performance of the MVP needs to be assessed to pinpoint areas for improvement. While current recommendations perform well on the dataset, discrepancies remain in aligning results with user preferences, listening history, and, in some cases, language. These inconsistencies will be analyzed to enhance model accuracy, as personalized recommendations are central to the app's functionality.

- **Integration & Deployment Progress Update**

Initiate the integration of the UI with backend services to ensure seamless API connectivity and data flow. This includes optimizing user interactions with music data. For deployment, we're evaluating cloud infrastructure options, setting up CI/CD pipelines for automated testing and deployment, and configuring security protocols to protect user data. The goal is to achieve a scalable and responsive application to ensure system stability and performance.

- **LLM Development**

We are advancing the LLM-based chat feature, focusing on refining prompts and enhancing context awareness for personalized music recommendations. Efforts include fine-tuning the model to generate relevant, engaging responses that align with user listening habits and preferences. This feature aims to boost user engagement through interactive, dynamic recommendations.

- **Performance Testing**

Initial load testing is underway to evaluate database performance under varying loads. This includes measuring query execution times, optimizing indexing strategies, and ensuring efficient handling of concurrent requests. The focus is on identifying bottlenecks early and enhancing system responsiveness to deliver a seamless user experience.