USC CSCI 577a – Software Engineering

Spring 2025

Team Project: Assignment for Week 03

Team Information

• Team Name: Byte On
• Project Title: Doodle DJ
•Team Members and Roles:
- o Atharva Swami: Team Lead
- o Sneh Shah: Machine Learning Engineer
- o Ravneet Kaur: Backend Developer
- o Ishita Mehta: Backend Developer
- o Harsh Chheda: Front End Developer
- o Rishabh Budhia: Front End Developer
- o Anannya Patra: UI/UX Designer
- o Sai Varnitha Reddy: UI/UX Designer
- o Shalin Shah: Machine Learning Engineer

Project Overview

- Problem Statement:
    - o Many artists and creatives rely on music to enhance their focus and inspiration while drawing. However, manually curating playlists can be distracting and time-consuming. Existing solutions, such as standalone music streaming services and digital drawing applications, do not offer real-time, personalized music adaptation based on artwork.
    - o Solving this problem is valuable because it allows users to stay in their creative flow without interruptions. By seamlessly integrating music generation with visual art, we can enhance artistic expression, improve engagement, and provide a more immersive creative experience.

- Proposed Solution:
    - o Our solution is DoodleDJ, a web application that analyzes a user's drawing in real-time and generates a personalized music playlist based on color choices, stroke patterns, and overall artistic style. The music adapts dynamically as the artwork evolves, creating a seamless connection between sound and visual creativity.
    - o This approach is the best choice because it eliminates the need for manual music selection, allowing artists to stay focused. By leveraging AI and machine learning, DoodleDJ provides highly personalized recommendations that enhance creativity and emotional expression in ways that traditional static playlists cannot.

- Key Features:
    - o Real-Time Music Curation: Analyzes artwork elements like colors, strokes, and patterns to generate a playlist that evolves with the drawing.
    - o Mood-Based Adaptation: Detects emotional tones in the artwork and adjusts the playlist accordingly.
    - o AI-Driven Personalization: Uses machine learning to refine music recommendations based on user preferences and past interactions.
    - o Seamless Integration: Provides an intuitive and responsive interface that enhances the drawing experience without disrupting the workflow.
    - o Feedback Loop: Allows users to tweak their playlists, improving personalization over time.
    - o User Database & History: Saves artwork and music pairings to refine future recommendations and provide users with a creative archive.

Project Plan

• Development Methodology for this project: **Kanban**
• Reason for choosing Kanban:
We decided to use Kanban because it keeps our workflow organized and flexible. Since our project involves multiple teams working on different aspects—frontend, backend, machine learning, and UI/UX—it's important to have a system that helps us track progress in real time and adapt quickly to any changes. Kanban's visual board makes it easy to see what everyone is working on, identify bottlenecks, and ensure tasks move smoothly from start to finish.

Another reason we chose Kanban is that our team members have different schedules due to regular classes and on-campus jobs. This makes it difficult to have daily standups or fixed sprint cycles like in Scrum. Instead, Kanban allows us to work asynchronously while still staying aligned on progress. By continuously updating our task board and communicating through it, we can keep things moving without the need for frequent meetings. This approach helps us balance our academic and work commitments while ensuring steady progress on the project.

Milestones and Sprint Goals

Sprint	Start Date	End Date	Key Deliverables	Notes
Sprint 1	01/27/2025	02/09/2025	Project setup, repository creation, initial website design, risk analysis, and feasibility study	Establish foundational UI/UX and assess technical challenges
Sprint 2	02/10/2025	02/23/2025	Finalize architecture design, develop visual mockups, implement basic drawing canvas	Ensure smooth user interaction with the digital canvas
Sprint 3	02/24/2025	03/09/2025	Develop backend infrastructure, set up database, enable user data storage for artwork	Prepare for integrating real-time music features
Sprint 4	03/10/2025	03/23/2025	Implement real-time music curation based on artwork analysis, deliver the first feature prototype	Generate music dynamically based on strokes and colors
Sprint 5	03/24/2025	04/06/2025	Integrate mood-based music adaptation and AI-driven personalization	Detect emotional tone of artwork and refine music recommendation s
Sprint 6	04/07/2025	04/20/2025	MVP refinement and testing, implement feedback loop and cultural sensitivity features	Allow user input for playlist adjustments and optimize performance
Sprint 7	04/21/2025	05/04/2025	Final MVP and presentation prep, resolve bugs, optimize UI/UX	Ensure seamless performance, stability, and prepare for final deployment

Product Backlog

User Stories & Tasks
(**1 story point is half-day**, plan the story points in Fibonacci sequence including designing, developing and testing time)

ID	User Story	Priority	Status	Owner	Estimation (Story Points)
US01	As a user, I want to draw on a digital canvas so that I can create artwork within the app.	Medium	To Do	Harsh Chheda	8
US02	As a user, I want to select different brushes and colors so that I can customize my drawings.	Low	To Do	Harsh Chheda	13
US03	As a user, I want to have my artwork analyzed in real time so that I receive a personalized music playlist.	Low	To Do	Sai Varnitha Reddy	13
US04	As a developer, I want to implement real-time music generation so that users get instant feedback while drawing.	Medium	To Do	Anannya Patra	13
US05	As a developer, I want to set up a backend database so that user data and artwork can be securely stored.	High	To Do	Ravneet Kaur	13
US06	As a user, I want to save my artwork and	Low	To Do	Ishita Mehta	8

	playlists so that I can revisit them later.				
US07	As a user, I want to manually adjust my playlist so that I can refine the song selection.	Low	To Do	Sneh Shah	8
US08	As a developer, I want to integrate a machine learning model so that the app can detect the mood of the artwork.	High	To Do	Ravneet Kaur	21
US09	As a user, I want to get music recommendations based on my past interactions so that the app improves personalization over time.	Medium	To Do	Sneh Shah	21
US10	As a UI/UX designer, I want to create an intuitive and visually engaging interface so that users have a seamless experience.	High	In Progress	Anannya Patra Sai Varnitha Reddy	21
US11	As a user, I want to provide feedback on the playlist suggestions so that the system learns and improves recommendations.	Low	To Do	Shalin Shah	21
US12	As a user, I want to see visual effects that react to the music so that I have an immersive experience.	Low	To Do	Rishabh Budhia	21

US13	As a developer, I want to implement API integration so that the backend and frontend communicate smoothly.	High	In Progress	Ishita Mehta	13
US14	As a developer, I want to optimize the rendering performance so that the app runs smoothly without lag.	Low	To Do	Rishabh Budhia	13
US15	As a developer, I want to enable cultural and stylistic sensitivity in music selection so that users get music relevant to their artistic influences.	Low	To Do	Shalin Shah	13

Risk Analysis & Mitigation Plan

Risk	Impact	Likelihood	Mitigation Strategy
Technical Complexity (Real-time Synchronization)	High	High	Implement efficient algorithms, use caching mechanisms, conduct thorough performance testing, and set up monitoring systems
API Dependencies (Spotify Integration)	High	Medium	Maintain fallback mechanisms for critical functions, implement robust error handling, regular monitoring of API updates
ML Model Performance	High	Medium	Conduct extensive model training, implement performance benchmarks, set up continuous evaluation system, maintain fallback recommendation systems
Cross-Browser/Platform Compatibility	Medium	High	Implement responsive design principles, conduct regular cross-platform testing, use standardized web technologies
Data Privacy and Security	High	Medium	Implement strong encryption protocols, follow GDPR compliance, conduct regular security audits
Team Coordination (Multiple Specializations)	Medium	High	Hold regular sync meetings between ML, frontend, and backend teams, maintain clear API documentation, and establish standardized communication channels
Scope Creep	High	Medium	Document MVP features clearly, conduct regular backlog refinement, and implement a strict change control process
Performance Bottlenecks	High	Medium	Implement caching strategies, optimize database performance, conduct regular load testing
User Adoption	High	Medium	Conduct early user testing, implement iterative UI/UX improvements, and create a clear onboarding process
Integration Challenges	Medium	High	Maintain clear API documentation, implement regular integration testing, and use a staged deployment process

Sprint 1 Plan (Deliverable for Week 3)

Task	Owner	Due Date	Status
Setup GitHub repository	Atharva Swami	01/28/2025	Done
Create template for frontend and backend	Atharva Swami	01/29/2025	Done
Create a MongoDB database on Atlas	Atharva Swami	01/31/2025	Done
Create user stories and tasks for everyone	Atharva Swami	02/07/2025	In Progress
Explore API integration with Flask	Ishita Mehta	02/07/2025	In Progress
Set up project structure using React	Rishabh Budhia	02/03/2025	Done
Collaborate with UI/UX designers to finalize initial wireframes and user flows	Harsh Chheda	02/07/2025	To Do
Conduct feasibility study on frontend framework and library choices	Harsh Chheda	02/07/2025	In Progress
Identify potential risks in frontend development and propose mitigation strategies	Rishabh Budhia	02/07/2025	To Do
Research ML methods that can analyze the features based on the drawing, color schemes, stroke patterns, and overall	Sneh Shah	02/07/2025	In Progress

styles			
Research music recommendation methods and AL models	Shalin Shah	02/07/2025	In Progress
Generate music recommendations benchmark through proven AI models (e.g., ChatGPT, Claude AI)	Shalin Shah	02/03/2025	Done
Choose machine learning framework and libraries for image analysis	Sneh Shah	02/03/2025	Done
User Personas & Requirement Analysis	Anannya Patra	01/31/2025	Done
Low Fidelity Wireframes Design	Anannya Patra	01/31/2025	Done
Color Scheme Selection	Sai Varnitha Reddy	02/07/2025	In Progress
Design System Selection	Anannya Patra	01/31/2025	Done
Initial Landing Page Design	Sai Varnitha Reddy	01/31/2025	Done
User Feedback and Iterative Design Refinement	Anannya Patra	02/07/2025	In Progress
User Feedback and Iterative Design Refinement	Sai Varnitha Reddy	02/07/2025	In Progress
Explore approaches for integrating ML models with Flask	Ravneet Kaur	02/09/2025	In Progress
Conduct feasibility	Ravneet Kaur	02/06/2025	In Progress

study on the backend framework.			
Set up the backend using Flask.	Ravneet Kaur	02/10/2025	To Do

Tools & Technologies

- **Frontend**: ReactJS, HTML, CSS, JavaScript, Bootstrap, Styled Components
- **Backend**: Flask, Python, Fast API
- **Database**: MongoDB
- **Machine Learning:** Python, PyTorch, TensorFlow, Open Source LLM Models, Ollama, Librosa (for audio processing)
- **Additional Tools:** GitHub (version control), Figma (UI/UX design), Balsamiq Wireframe (prototyping), ClickUp (project management)

Note: The sentences in this document were reviewed and rewritten using ChatGPT to ensure they are clear, concise, and free of grammatical errors.