Detailed Requirements Document: Adapting Music to Dramatic Short Videos.

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1. Introduction

Project Overview: The project aims to develop a system that automatically adapts music to dramatic short videos, enhancing the emotional impact and storytelling.
This involves analyzing the video, understanding their dramatic elements, identifying a constant object, analyzing its movement or facial expressions, and matching them with suitable music tracks, or providing a detailed graph depicting the object's difference across the scene.

Objectives:

- Automate the adaptation of music to fit the mood and theme of the scenes\videos.
- Provide a user-friendly interface for filmmakers and people alike, to customize music suggestions.
- Leverage AI and machine learning for scene analysis and music matching.
- Provide a detailed graph for machine learning students, etc. to help with their studies.

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2. Identify Stakeholders:

The stakeholders for this project include:

1. **Filmmakers and Directors:** The primary end-users who want to enhance their movies' emotional impact through precise music adaptation.
2. **Composers and Music Producers:** Professionals who provide the music tracks used in the system.
3. **Cinema/Theatre Students:** Customers using this tool to help with their studies.
4. **Content Creators:** Enhance emotional impact, improve storytelling, and elevate their content's overall quality.
5. **Machine learning students**: Users that will take advantage of our platform to benefit them in video analysis studies and machine learning.

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3. Functional Requirements

Key Features

1. **Scene Analysis**
    - Analyze short videos for visual and auditory cues such as brightness, color grading, motion intensity, and dialogue tone.
    - Detect and classify the dramatic theme (e.g. suspense, romance, action, tragedy).
    - Find and Analyze movement or facial expressions of a certain object (or animal, actor, etc.)

2. **Music Matching and Adaptation**
    - Match analyzed scenes with suitable tracks from a pre-defined music library.
3. **Custom Music Suggestions**
    - Enable users to select a preferred track from the three recommendations provided by the system.
    - Offer alternative options upon request.
4. **Machine learning graph**
    - Provide a detailed graph describing the difference of movement (or change in facial expression) and concise description of the identified object that appears throughout the scene/short video.
5. **Editing and Exporting**
    - Allow users to fine-tune music parameters (e.g., volume, fade-in/out effects – optional)
    - Export the adapted music file and scene in a compatible format.

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4. Architectural Requirements

1. **System Architecture**
    - **Frontend:** User interface for uploading short videos, viewing analysis, receiving completed video results or graph analysis, and customizing music.
    - **Backend:** Modules for AI/ML-based scene analysis and music adaptation.
    - **Database:** Store music tracks and scene metadata. (possible on the cloud)
    - **Integration:** APIs for external music libraries and video editing tools.
2. **Performance Indicators**
    - Response time for analysis and adaptation: 15-30 seconds for small videos and up to 5 minutes for larger videos.
3. **Security**
    - Use secure protocols (e.g., HTTPS, TLS) for data transfer.

5. Technological Requirements

1. Programming Languages and Frameworks

- **Frontend:** React.js for a dynamic user interface.
- **Backend:** Node.js for server-side logic.

2. AI/ML Tools

- Use PyTorch for developing machine learning models.
- Pre-trained models for visual and audio feature extraction (e.g., OpenCV, LibROSA).

3. Database

- PostgreSQL for storing metadata and user data. (possible cloud)

4. APIs and Libraries

- Music and video processing: FFMPEG, LibROSA.
- External music libraries: Spotify API, YouTube Music API.
- Google cloud API/Azure Video Indexer usage for scene analysis and video output.

5. Hosting and Deployment

- Cloud platforms: AWS, Azure, or Google Cloud for scalability.
- CI/CD pipelines with GitHub Actions.

6. Compliance and Standards-

- Ensure compliance with GDPR and CCPA for handling user data and metadata securely and ethically.
- Adhere to standards like ISO/IEC 27001 for information security management and industry guidelines for AI transparency in machine learning models.
- Follow licensing requirements for external APIs (e.g., Spotify API, YouTube Music API) and music libraries.

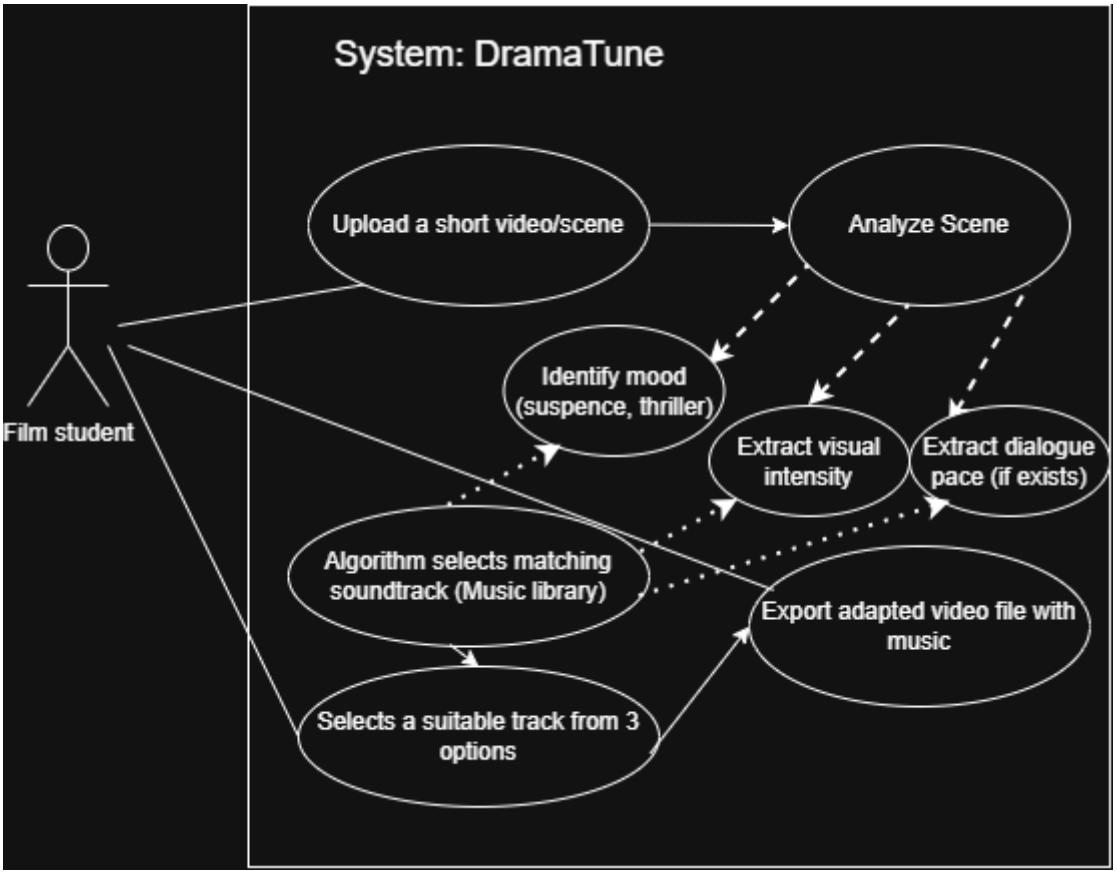
7. Testing and Quality Assurance

- Unit testing: Pytest, Jest.
- Performance testing: JMeter, Locust.
- Automated testing for critical workflows.

6. Example Use Case

Scenario: A film student uploads a 2-minute dramatic scene. The system analyzes the visual intensity and dialogue pace, identifies it as a suspenseful and tense scene, and selects a matching track from the music library.
The film student customizes the track by adjusting the tempo and exports the adapted file for integration.

Primary actor: film student/film maker/machine learning student



Expected Outcome:

- The film student receives a professionally adapted music video within minutes.

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7. Conclusion:

The system will bridge the gap between dramatic storytelling and music composition, enabling filmmakers (and students) to create compelling cinematic experiences effortlessly.
By combining advanced AI/ML technologies with intuitive user interactions, this project will revolutionize the way music is adapted to dramatic scenes, or create a simple platform for analyzing videos by a given object (or animal, person), and provide the user with a description and graph depicting the difference and change in the person's facial expressions or the object's movement along the short video/scene.