Open Source Software Senior Design Project Proposal

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Gap Analysis

Problem Statement

Creating compelling highlight reels or summaries of sports plays involves time-consuming video editing and voiceover work, requiring manual selection of key moments, cutting the video, and adding narration. This process often demands extensive human effort, leading to inefficiencies, time constraints, and potential inconsistencies in the final output.

To streamline and expedite this process, there's a need for an AI-driven solution that automates the compilation of sports play highlights. The solution should incorporate advanced video analysis, automated video cutting, and intelligent voiceover capabilities to efficiently generate engaging highlight reels or summaries, reducing the manual effort and ensuring consistency and quality in the final output.

Solution Statement

Our solution is designed specifically to cater to the fast-paced demands of halftime sports analysis. By leveraging cutting-edge AI technologies, our platform enables instant creation of highlight reels during halftime breaks or live sports events.

Through real-time video analysis algorithms, our system swiftly identifies and extracts key moments from the ongoing game or match. These pivotal highlights are automatically compiled into engaging and concise reels within moments, ensuring timely availability for halftime analysis.

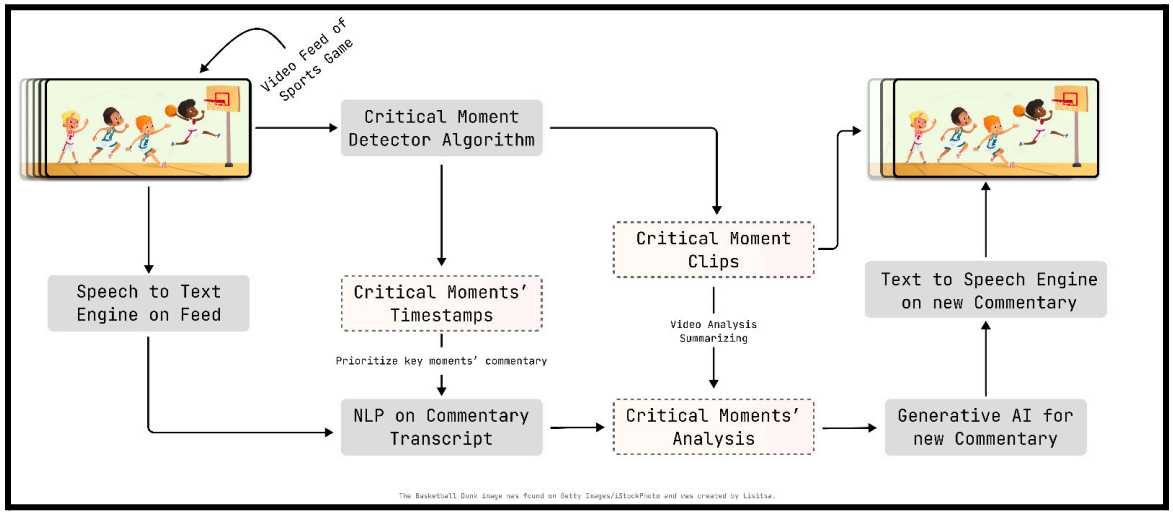
Furthermore, our AI-driven voiceover functionality provides instant narration or commentary, adding depth and context to the highlighted plays. This feature facilitates comprehensive analysis and enhances viewer engagement during the brief halftime window.

The user-friendly interface allows sports analysts or broadcasters to seamlessly access, customize, and present these highlight reels within minutes, enabling dynamic and informative halftime discussions. Our solution significantly reduces the time and effort

traditionally required for video editing and voiceover work, ensuring that valuable halftime moments are maximized for insightful analysis and audience engagement.

Our systems would be trained using full-length sports games, producing comprehensive highlight reels. Feedback from pre-existing shortened games, such as those found on NBA or NFL YouTube channels, refines our model's grasp of impactful moments. This data, coupled with user interactions like crowd noise, commentator tone/volume, and manual labeling, enhances our machine learning algorithms. This iterative process guarantees our system consistently delivers high-quality sports play highlights.

Solution Overview



How the system works:

1. The backend video analysis component analyzes the live video footage and detects key moments.
2. The highlight reel compilation component compiles the extracted key moments into engaging and concise highlight reels.
3. The AI-driven voiceover generation component generates voiceover narration for the highlight reels.
4. The highlight reels and voiceover narration are stored in the database.
5. The frontend user interface allows users to access, customize, and present the highlight reels.

Benefits of the AI-driven solution for sports play highlights:

- Speed and efficiency: The system can automatically generate highlight reels in real time, which is significantly faster than traditional video editing and voiceover workflows.

- Accuracy and consistency: The system uses machine learning algorithms to identify and extract key moments from the video footage, which ensures that the highlight reels are accurate and consistent.
- Scalability: The system can be scaled to handle large volumes of video footage and generate highlight reels for multiple games or events simultaneously.

Overall, the AI-driven solution for sports play highlights is a powerful tool that can help broadcasters, sports analysts, and other content creators to produce engaging and informative highlight reels more quickly and efficiently. For example, the speed and efficiency of this solution will allow for better quality content to be shown to users in a quick-turnaround time during halftime breaks during basketball matches.

We will be using a cloud based architecture to host our solution, primarily driven by AWS technologies. Below is a brief outline of some technologies we wish to leverage and what we will be using them for.

Backend:

- Real-time video analysis: This component uses AWS Rekognition to identify and track objects in the video footage, such as players, the ball, and other important objects. It also uses machine learning algorithms to analyze the video footage and detect key moments, such as goals, assists, and turnovers.
- Highlight reel compilation: This component compiles the extracted key moments into engaging and concise highlight reels. It uses a variety of techniques, such as video editing, music, and effects using FFmpeg, to create reels that are both informative and entertaining.
- AI-driven voiceover generation: This component uses GPT-4 Turbo to generate voiceover narration for the highlight reels. The voiceover is generated in real time, based on the detected key moments and other relevant information.

Frontend:

- User interface: This component provides a user interface that allows users to access, customize, and present the highlight reels. Users can select the highlight reels they want to view, trim them to their desired length, and add their own commentary.

API:

- API Gateway: This component manages the API requests and routes them to the appropriate backend components.
- API endpoints: The API provides a number of endpoints that allow developers to integrate the AI-driven solution into their own applications. For example, developers can use the API to submit video footage, retrieve highlight reels, and generate voiceover narration.

Database:

- AWS RDS: This component stores the video footage, highlight reels, and other relevant data, such as voiceover narration transcripts.

4. Go shopping for libraries (bias towards Open-source, but totally fine with some others). Think about the next step - need to acquire skills needed for jobs (eg. knowing how to train a model on AWS, using a specific programming language)

Shopping List

1. GPT-4 Turbo
2. Whisperv3 speech-to-text
3. Figma (Frontend)
4. AWS Rekognition (Pretrained CV models)
5. AWS RDS (Database)
6. AWS API Gateway (API Handling)
7. AWS Lambda (Backend)
8. GraphQL
9. FFmpeg (Video Processing)

Competitive Analysis

There is a definite interest in the field of AI-generated highlights, and the idea has proven to be meritorious. Tools such as WSC Sports, Magnifi, and Cognitive Mill are currently being utilized by sports leagues and organizations to generate highlights of the most significant moments of a game using AI. Additionally, there is a growing interest in generating highlight reels for various forms of content, with tools like ContentGroove, Valossa AI, and Pictory employing AI to generate highlights.

An example of real-world usage includes FOX Sports' "Catch Up with Highlights" feature, which utilized AWS Rekognition to create automated highlights for the games played during the most recent soccer World Cup.

However, the existing tools in the market lack one crucial element – AI-generated commentary integrated with the highlights. This idea remains largely unexplored, and we believe there is significant potential to develop a tool that can provide a competitive edge over existing solutions. AI-generated highlights with AI-synthesized commentary can greatly enhance the user experience by adding a storytelling aspect and providing instantaneous analysis. This can offer users insights that are not apparent with the highlights generated by currently available tools.