

# CS-GY 9223 Cloud Computing and Big Data

## Spotflix - The music app

### TEAM MEMBERS

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# Motivation and Problem Statement

To create a cloud based web-application that allows you to play and listen to a wide variety of music. Upload your own music videos. The application also allows users to search and filter songs based on various criteria like Genre, artist name, lyrics etc.

Convenience: With the rise of music apps and a vast variety of songs, it is often challenging to listen to music. This application will be a one stop place to search for new songs, and keep yourself updated about the trending songs.

Personalization: Everyone has different tastes in music and this application can provide an opportunity for people to share and discover new music.

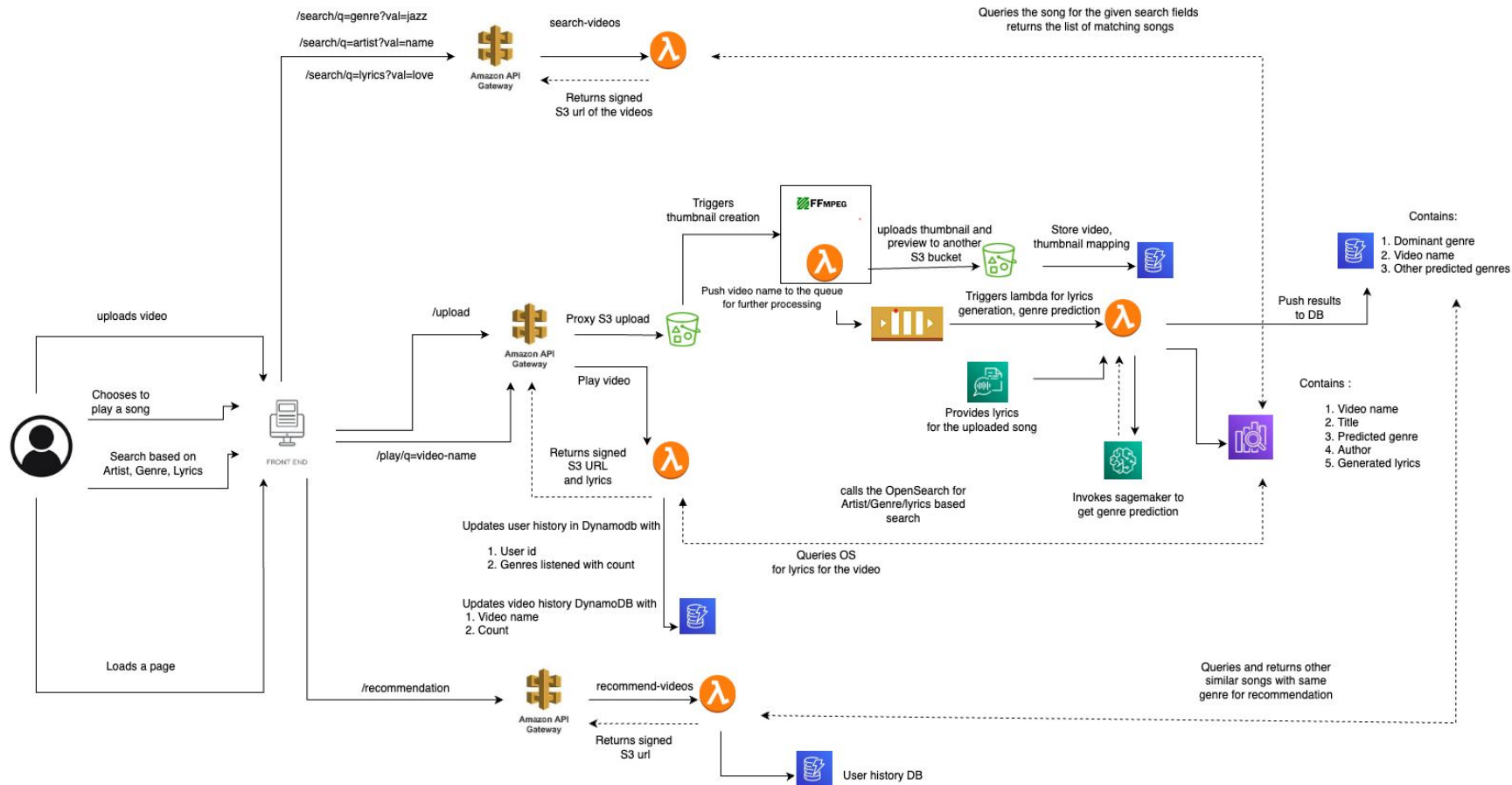
Business Opportunities: If this works out, we can make a lot of money through paid partnerships and a subscription-based model :)



# Implementation and Features

- Upload music videos
- Automatic ML based music analysis for genre tagging
- Automated generation of thumbnails
- Video processing to generate preview
- Transcribing video song lyrics
- Recommendation engine based on active playing song
- Search music based on artist, title, lyrics
- Autoplay feature
- View lyrics of active playing song

# Architecture





# Video processing

- FFmpeg is a free and open-source software project consisting of a suite of libraries and programs for handling video, audio, and other multimedia files and streams
- When the videos are uploaded in the S3 it triggers the lambda to process the preview and the thumbnail.
- Configurations like the duration for generating the preview and the frames to capture are provided.
- Generated preview and thumbnails are stored in a separate S3, used for rendering in the front-end





# ML engine working

- Convert audio file into mel spectrogram image(unlike normal spectrogram where the frequencies are in linear scale, in this case its in mel scale - which is the logarithmic transformation of a signal's frequency).
- This image is then sent to a CNN model(after experimenting with couple of different networks; CNN model was giving us 87% test accuracy and 89% val accuracy)
- It is a softmax layer in the last layer so you get confidence score for most of the labels
- Classes: { pop, metal, disco, blues, reggae, classical, rock, hiphop, country, jazz}
- This model is used to predict the genre of the mp4 file in s3 for giving recommendation based on user history.
  - So we rank the songs by picking the subset of songs filtering on the same dominant genre and recommend the next songs based on user history.



# Showstoppers and enhancements

- Lambda memory limit (128 MB) allowed us to generate the thumbnails and the previews for small videos only.
- Transcribe allowed us to process only a part of the video. However, it is easily extendable.
- Additional features like video live and comments sections can be incorporated into the application.
- We can use asynchronous inferences and batch inferences for larger and more complex models for better prediction of genres.
- Kafka stream, Kinesis firehose, etc. can be employed for additional features such as streaming, watch party, etc.
- CloudFront can be used for caching video streams and enabling seamless experience.
- WAF can be used for enhanced security.
- Store videos on different resolutions to handle different bandwidth



# AWS Services

- Sagemaker
- API Gateway
- Lambda
- OpenSearch
- DynamoDB
- S3
- Code Pipeline
- Transcribe
- SQS





# References

- <https://medium.com/analytics-vidhya/understanding-the-mel-spectrogram-fca2afa2ce53>
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- <https://opensource.com/article/17/6/ffmpeg-convert-media-file-formats>
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Thank you!

