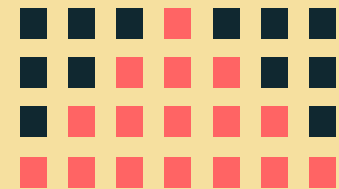
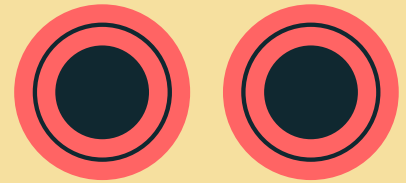
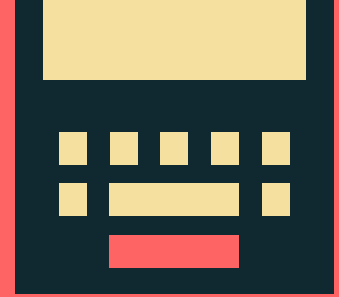
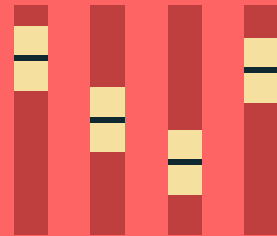
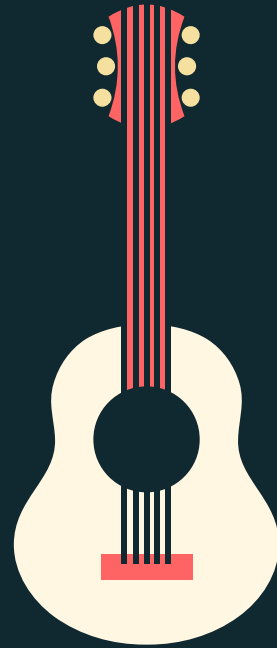




MovieMood

Movies from your Music, for your Mood

Will Dudek, Neil Prabhu, Josefina Ruggieri,
Sumedh Shah, and Neta Tartakovsky



★ Problem



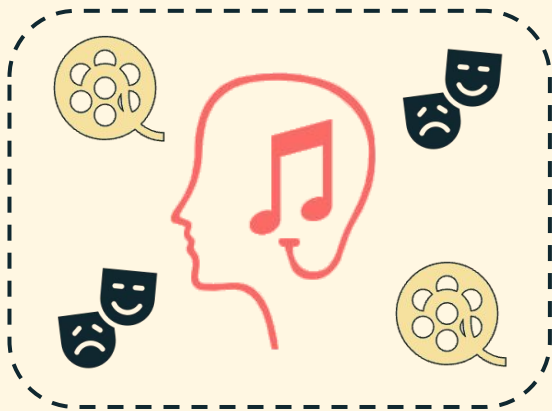
- Current recommendation engines use your **watching history** to make suggestions
- Multiple streaming platforms today result in **endless content** to choose from
- Average American spends **32+ hours/week listening to music**, and spend **hours curating playlists** for every mood

MovieMood uses **emotional experience** of listening to music to **recommend movies that match the mood** of your music playlist.



★ Impact & Market Opportunity

Music fanatics looking
for entertainment

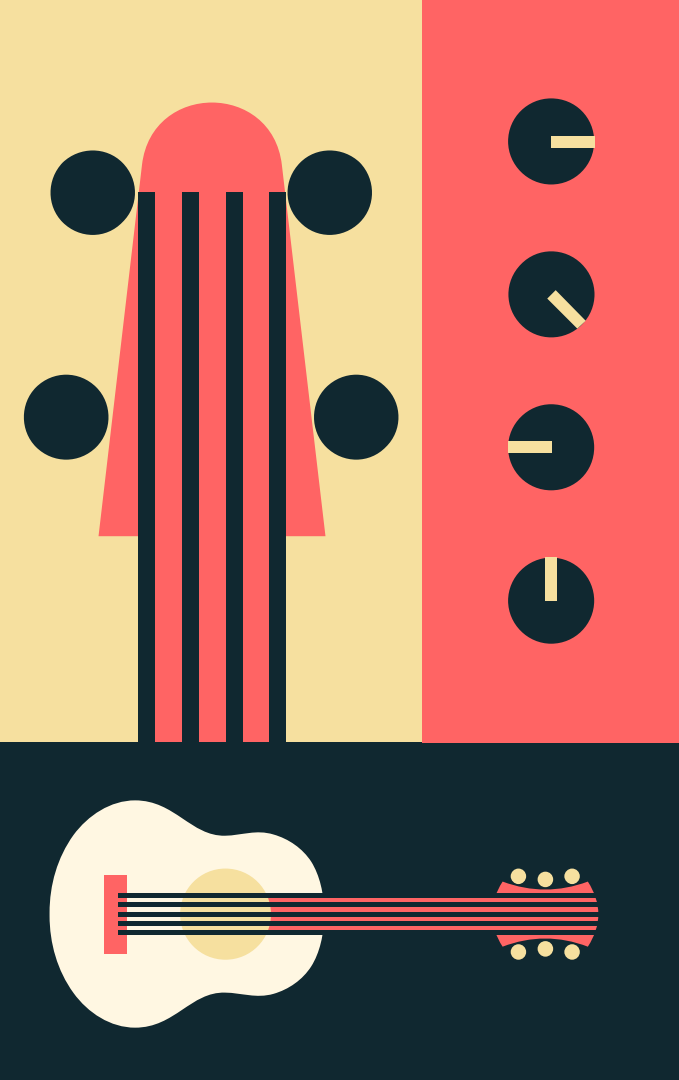


Unique emphasis
on mood



Competitors don't have
this level of specificity





MVP Demo

<https://moviemood.streamlit.app/>

★ Data Pipeline

Scraping Wikipedia

Oppenheimer (film)

FILM TITLE

Read View source View history Tools

Oppenheimer (/ˈɒppənhɑːmə/ *OP-ən-hy-mə*) is a 2023 epic^[a] biographical thriller film^[a] written and directed by Christopher Nolan.^[a] It stars Cillian Murphy as J. Robert Oppenheimer, the American theoretical physicist credited with being the "father of the atomic bomb" for his role in the Manhattan Project—the World War II undertaking that developed the first nuclear weapons. Based on the 2005 biography *American Prometheus* by Kai Bird and Martin J. Sherwin, the film chronicles the career of Oppenheimer, with the story predominantly focusing on his studies, his direction of the Manhattan Project during World War II, and his eventual fall from grace due to his 1954 security hearing. The film also stars Emily Blunt as Oppenheimer's wife "Kitty", Matt Damon as head of the Manhattan Project Leslie Groves, Robert Downey Jr. as U.S. Atomic Energy Commission member Lewis Strauss, and Florence Pugh as Oppenheimer's communist lover Jean Tatlock. The ensemble supporting cast includes Josh Hartnett, Casey Affleck, Rami Malek, and Kenneth Branagh.

The film was announced in September 2021 after Universal Pictures won a bidding war for Nolan's screenplay, following Nolan's conflict with longtime distributor Warner Bros. Murphy was the first cast member to sign on the following month, with the rest of the cast joining between November 2021 and April 2022. Pre-production was under way by January 2022, and filming took place from February to May.

Oppenheimer was filmed in a combination of IMAX 65 mm and 65 mm large-format film, including, for the first time, scenes in IMAX black-and-white film photography. Like his previous works, Nolan made extensive use of practical effects, with minimal computer-generated imagery used to perfect the former. Editing was handled by Jennifer Lame, and the score was composed by Ludwig Göransson. The film is Nolan's fourth to receive an R-rating in the United States, preceded by *Following* (1998), *Memento* (2000) and *Insomnia* (2002).

Oppenheimer premiered at Le Grand Rex in Paris on July 11, 2023, and was theatrically released in the United States and the United Kingdom on July 21 by Universal. Its simultaneous release with Warner Bros.' *Barbie* led to the *Barbenheimer* cultural phenomenon, which encouraged audiences to see both films as a double feature. The film received critical acclaim and grossed over \$953 million worldwide, becoming the third-highest-grossing film of 2023, the highest-grossing World War II-related film, the highest-grossing biographical film, and the second-highest-grossing R-rated film. The National Board of Review and the American Film Institute named *Oppenheimer* one of the top-ten films of 2023.^[a] Among its various accolades, the film received

PLOT SUMMARY

Plot

In 1926, 22-year-old doctoral student J. Robert Oppenheimer grapples with anxiety and homesickness while studying under experimental physicist Patrick Blackett at the Cavendish Laboratory in Cambridge. Upset with the demanding Blackett, Oppenheimer leaves film a poisoned apple but later retrieves it. Visiting scientist Niels Bohr recommends that Oppenheimer instead study theoretical physics at Göttingen.

He completes his PhD there and meets fellow scientist Isidor Isaac Rabi. They later meet theoretical physicist Werner Heisenberg in Switzerland. Wanting to expand quantum physics research in the United States, Oppenheimer begins teaching at the University of California, Berkeley, and the California Institute of



Theatrical release poster

Directed by
Screenplay by
Based on

DIRECTOR

Produced by

Starring

Cinematography

Edited by

Music by

Production companies

Distributed by

Release dates

Martin J. Sherwin

Emma Thomas

Charles River

Christopher Nolan

Cillian Murphy

Emily Blunt

Matt Damon

Robert Downey Jr.

Florence Pugh

Josh Hartnett

Casey Affleck

Rami Malek

Kenneth Branagh

Hoyle van Hoytema

Jennifer Lame

Ludwig Göransson

Warner Bros.

Universal

Data Sources



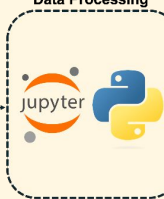
Data Ingestion



Data Labeling



Data Processing



CSV Files



Querying OMDb

Request:

```
https://www.omdbapi.com/{QUERY}
```

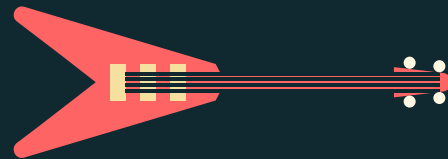
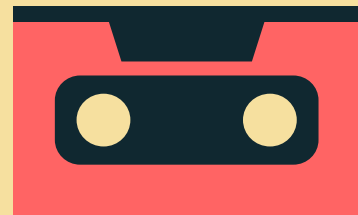
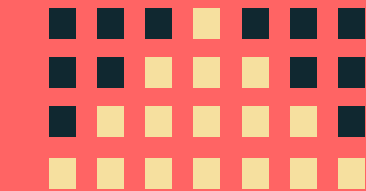
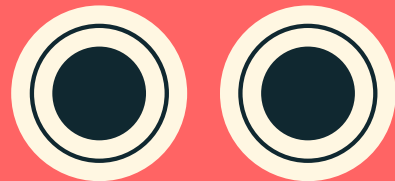
Result:

Title, Year, Rated, Released, Runtime, Genre, Director, Writer, Actors, Plot, Language, Country, Awards, Poster, Ratings, Metascore, imdbRating, imdbVotes, imdbID, Type, DVD, BoxOffice, Production, Website, Response

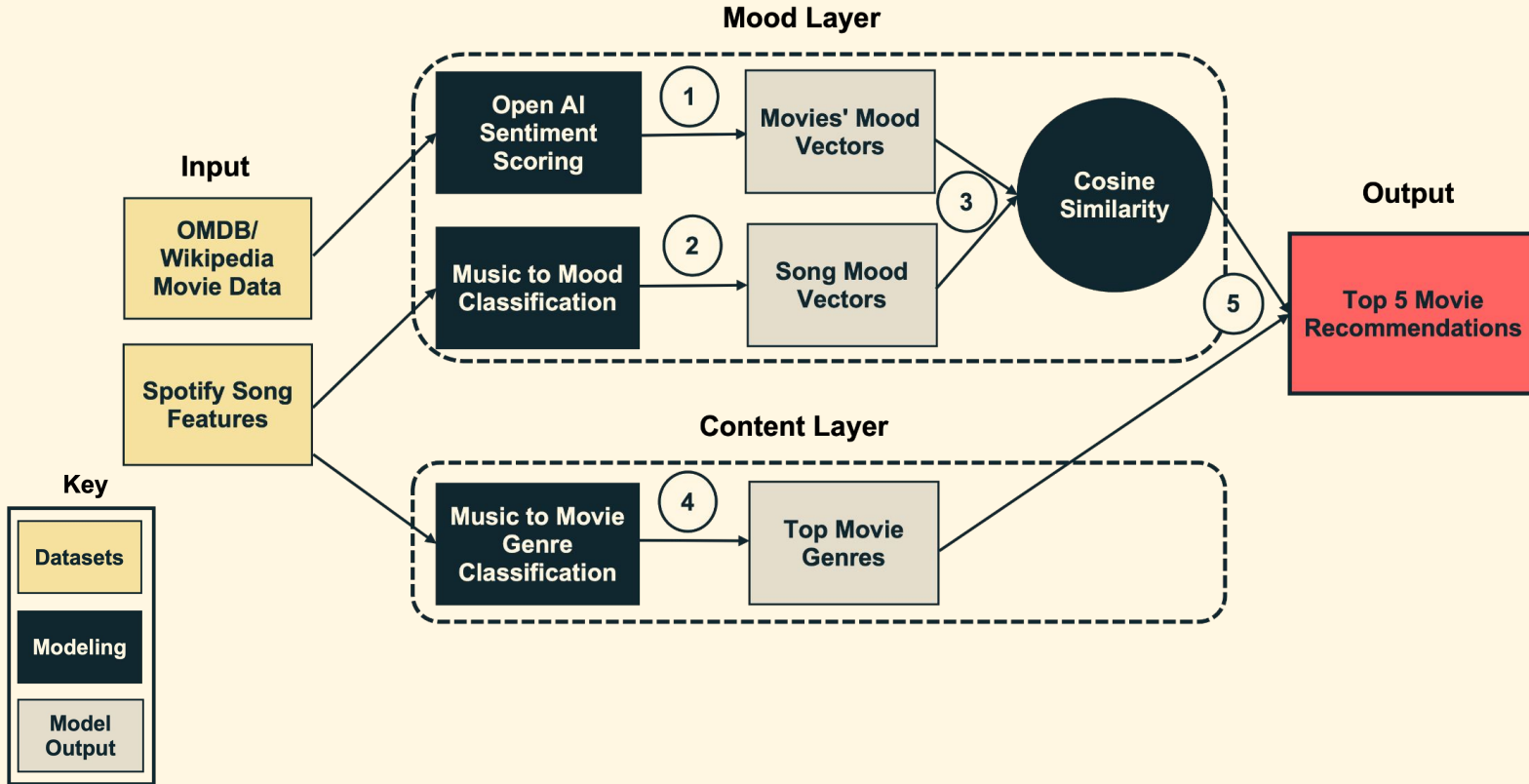




Modeling Approach



★ MovieMood Architecture



Movie Sentiment Scoring (Step 1)

Prompt

Based on this movie plot
"..." [and this genre "..."]
rank each mood happy,
sad, energetic, calm on a
scale from 0 to 1

Open AI
GPT 3.5

Input

OMDB/
Wikipedia
Movie Data

1

Open AI
Sentiment
Scoring

Mood Layer

Movies' Mood
Vectors

Output



To rank each mood (happy, sad, energetic, calm) on a scale from 0 to 1 based on the given movie plot, we need to analyze the emotions and atmosphere conveyed in the plot. Keep in mind that this is a subjective interpretation, and different individuals may assign different scores. Here's one possible ranking:

- **Happy:** 0.1
 - The plot does not have a predominant happy mood. There are elements of adventure and excitement, but they are overshadowed by darker themes.
- **Sad:** 0.6
 - The plot contains sad elements, such as the death of characters and the loss of the sea people's future. The overall mood leans towards melancholy.
- **Energetic:** 0.2
 - While there is some level of energy and action in the plot, especially during the conflicts and the search for pearls, the predominant mood is not highly energetic.
- **Calm:** 0.1
 - There are moments of calm, particularly during interactions with Syrene and the underwater scenes. However, the overall plot is not predominantly calm.

This ranking suggests that the plot has a somewhat sad and melancholic atmosphere with elements of action and adventure. The happy and calm moods are less prominent in this story. Please note that the emotional interpretation of a plot can vary from person to person, and these scores are based on one interpretation.

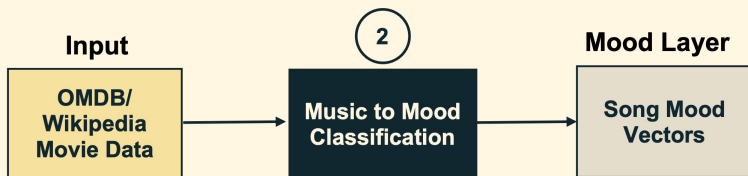
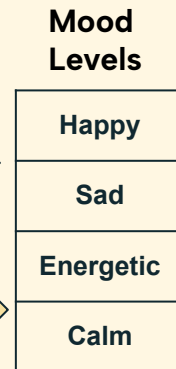
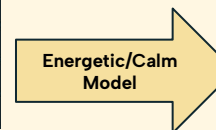
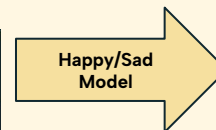
Regenerate



★ Music to Mood (Step 2)

Audio features from user's playlist

	Dance-ability	Acous-ticness	Energy	Instrumen-talness	Liveness	Valence	Loudness	Speech-iness	Tempo
Song 1	HIGH	HIGH	HIGH	LOW	LOW	HIGH	HIGH	LOW	HIGH
Song 2	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	LOW	LOW
Song 3	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	LOW	LOW
Song 4	HIGH	HIGH	LOW	LOW	LOW	HIGH	HIGH	LOW	LOW
Song n	LOW	HIGH	HIGH	LOW	LOW	LOW	HIGH	LOW	LOW



★ Music to Mood (Step 2)

Happy/Sad Model Results

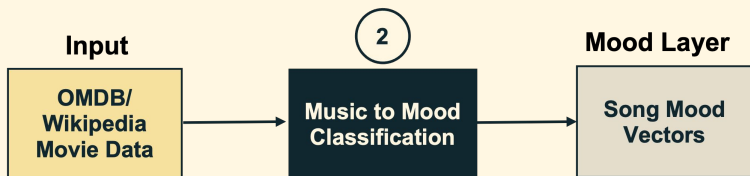
Model	F1 Score
Random Forest	0.824
Logistic Regression	0.803
GBM	0.780
SVM	0.780

Energetic/Calm Model Results

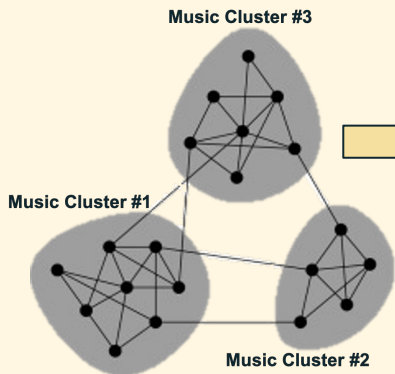
Model	F1 Score
Random Forest	0.994
Logistic Regression	0.978
GBM	0.989
SVM	0.989

Example Songs' Moods

Song	happy	sad	energetic	calm
Vampire - Olivia Rodrigo	MED	LOW	HIGH	LOW
Pink - Lizzo	HIGH	LOW	MED	LOW
WHATS POPPIN - Jack Harlow	MED	LOW	HIGH	LOW
Bad Blood - Taylor Swift	MED	LOW	MED	LOW
Daydreaming - Harry Styles	HIGH	LOW	HIGH	MED



★ Bridging Music and Movies (Step 3)



vampire - Olivia Rodrigo
Pink - Lizzo
WHATS POPPIN - Jack Harlow
Bad Blood - Taylor Swift
Daydreaming - Harry Styles



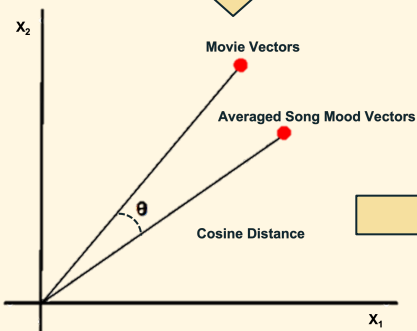
Mood Layer

Movies' Mood Vectors

3

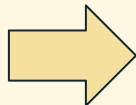
Song Mood Vectors

Cosine Similarity

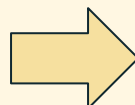


★ Music to Movie Genre (Step 4)

Gathered soundtracks from Spotify for 110 high grossing movies₂



Assign most prominent genre label to movie soundtrack songs



Assigned each song within movie soundtrack same genre label



Examples:

Star Wars Last Jedi:
Action/Sci-Fi → Sci-Fi

Magic Mike XXL:
Comedy/Drama → Comedy

Training Data

IMDB Genre Tag	# Songs
Action	606
Comedy	357
Drama	317
Horror	276
Romance	196
Sci-Fi	562

Input

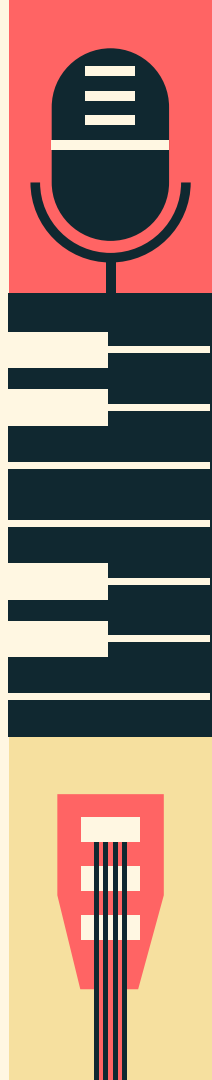
Spotify Song Features

4

Music to Movie Genre Classification

Content Layer

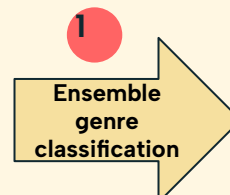
Top Movie Genres



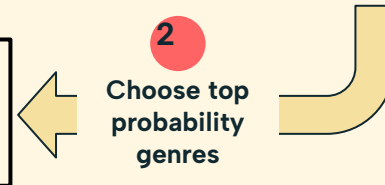
★ Music to Movie Genre (Step 4)

Audio features from user's playlist

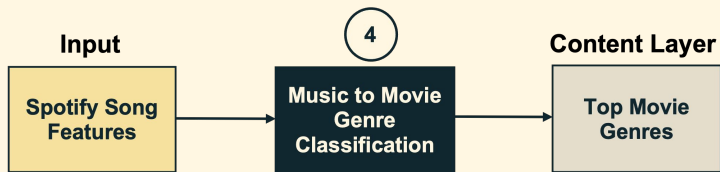
	Dance-ability	Acous-ticness	Energy	Instru-mentalness	Valence	Loudness	Tempo
Song 1	HIGH	HIGH	HIGH	LOW	HIGH	HIGH	HIGH
Song 2	LOW	HIGH	LOW	LOW	LOW	HIGH	LOW
Song 3	LOW	HIGH	LOW	LOW	LOW	HIGH	LOW
Song 4	HIGH	HIGH	LOW	LOW	HIGH	HIGH	LOW
Song n	LOW	HIGH	HIGH	LOW	LOW	HIGH	LOW



- Action
- Comedy
- Drama
- Horror
- Romance
- Sci-Fi



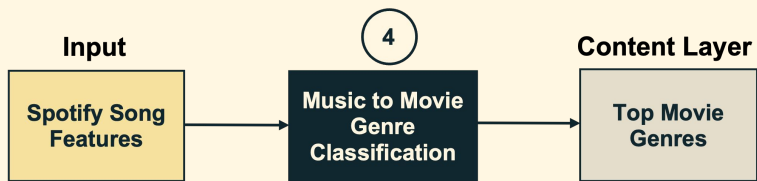
Filtered
genre
movies



★ Music to Movie Genre (Step 4)

Model Results (AUC Weighted Scores)

Model	Action	Comedy	Drama	Horror	Romance	Sci-Fi
Random Forest	0.604	0.668	0.649	0.663	0.723	0.653
Logistic Regression	0.621	0.690	0.590	0.596	0.693	0.653
Light GBM	0.636	0.732	0.673	0.669	0.777	0.683



Example Top Genre Distributions

Vampire (Olivia Rodrigo):

- Comedy (0.83)
- Romance (0.95)
- Drama (0.8)

Pink from Barbie (Lizzo)

- Comedy (0.99)

WHATS POPPING (Jack Harlow)

- Comedy (0.99)
- Drama (0.66)

Bad Blood (Taylor Swift):

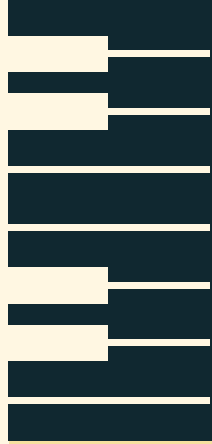
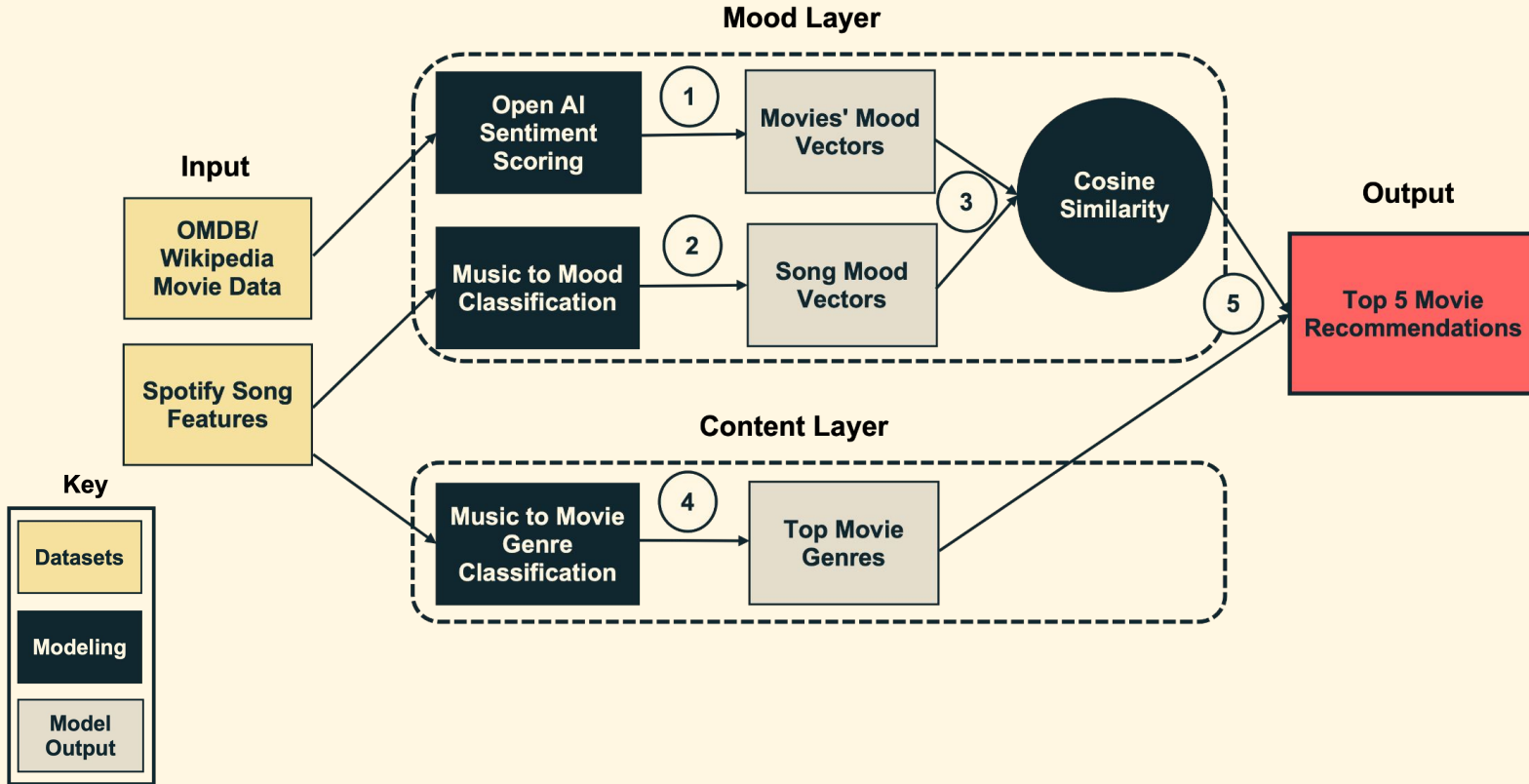
- Comedy (0.84)
- Romance (0.59)

Daydreaming (Harry Styles)

- Comedy (0.98)
- Drama (0.79)

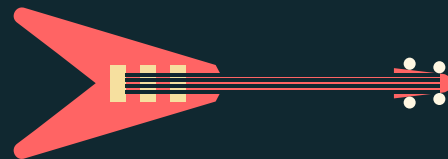
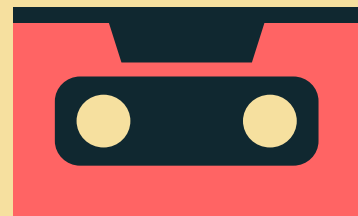
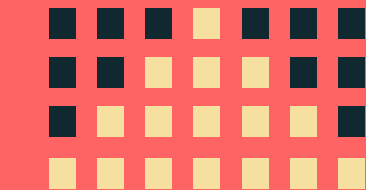
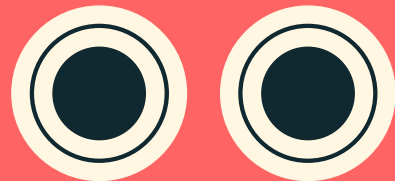


★ MovieMood Architecture Recap





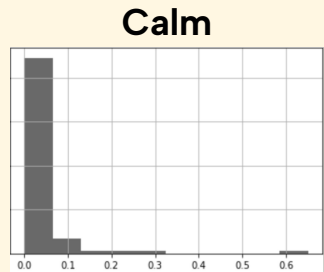
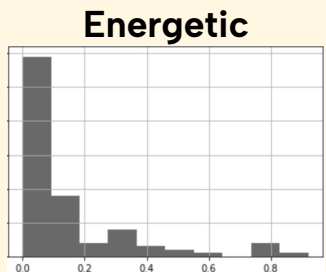
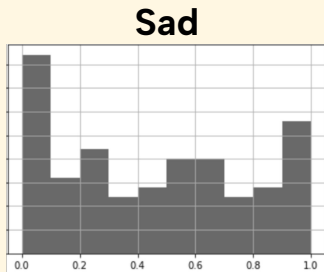
Model Validation



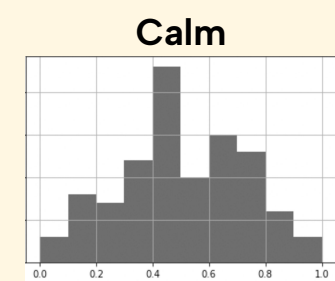
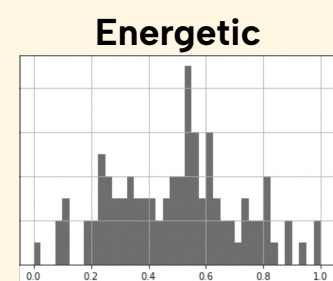
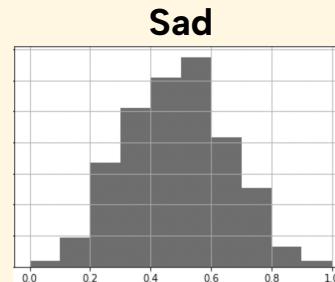
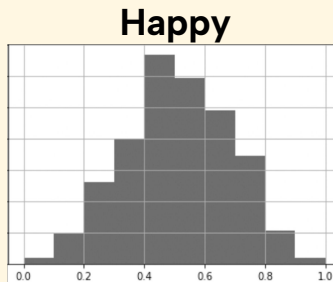
Model Validation (Technical)



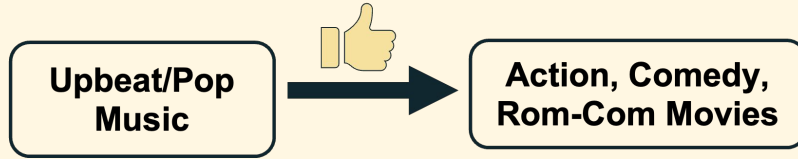
Initial Approach:
4-class Classifier



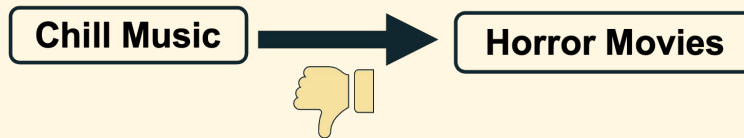
Improved Approach:
binary classifiers + regularization + scaling



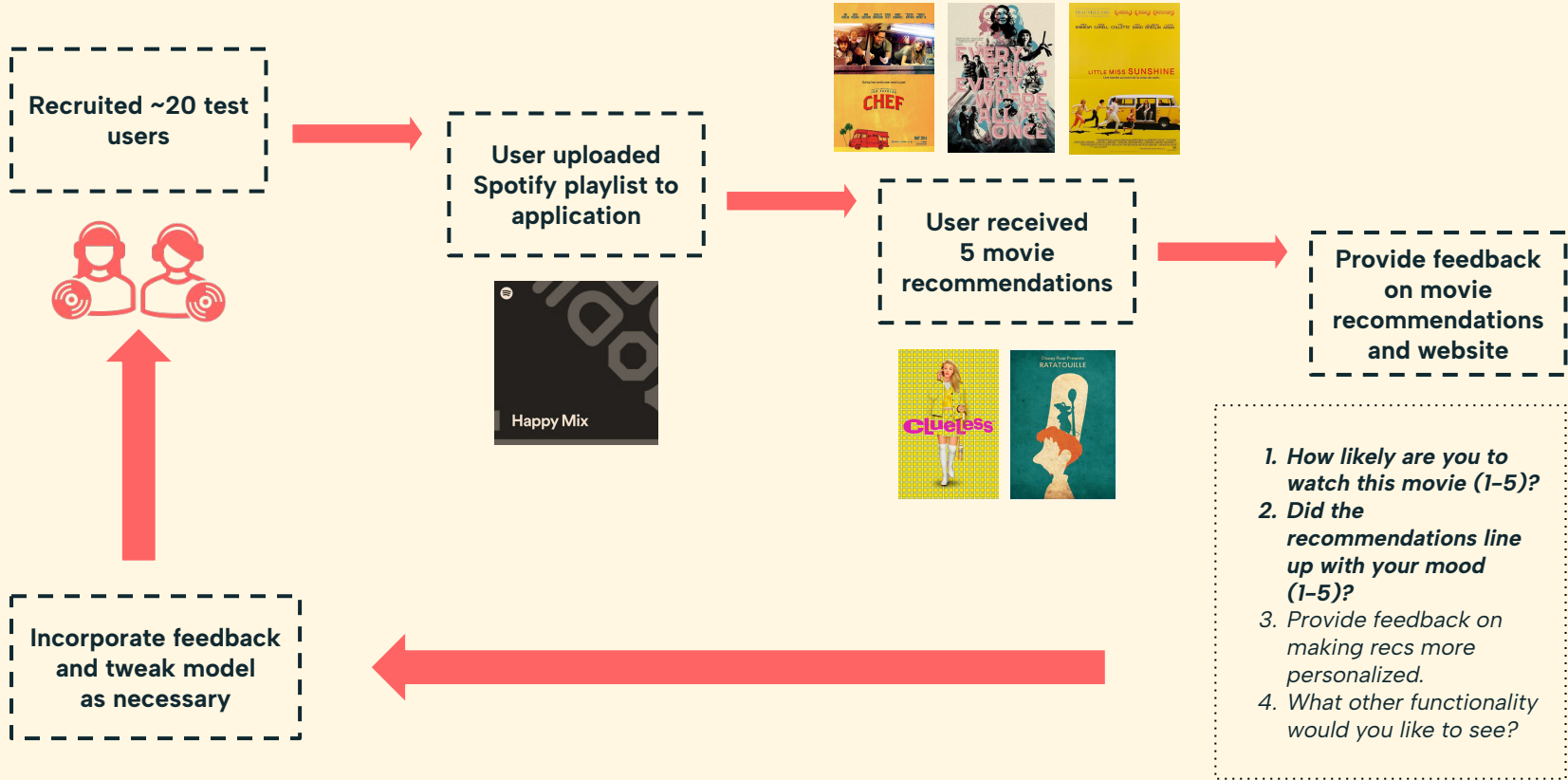
★ Model Validation (Qualitative)



Validated that recommended movies matched the moods of the music accurately



★ MovieMood Beta Test



1. How likely are you to watch this movie (1-5)?
2. Did the recommendations line up with your mood (1-5)?
3. Provide feedback on making recs more personalized.
4. What other functionality would you like to see?



★ Beta Test Results

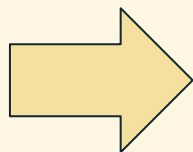
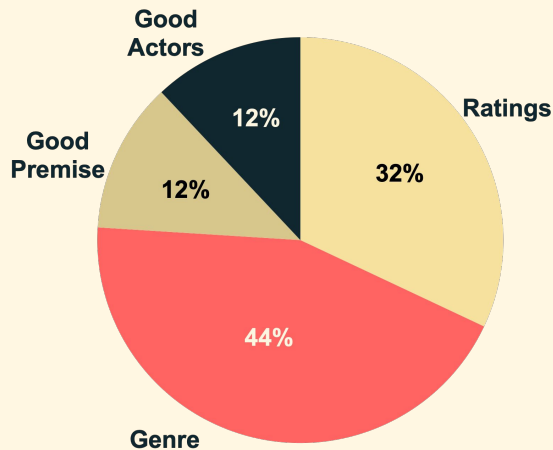
How likely are you to watch these movies? 3 / 5 → 4 / 5

How much did recommendations line up with mood? 3 / 5 → 4 / 5

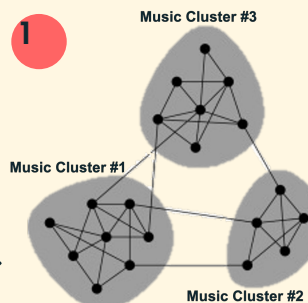
Version 1

Top User feedback:

1. Detect **variance** in my **playlists**
2. View movie **details without "googling"**
3. **Recommend** movies **closer to my mood**



Version 2



Optional Filtering Drop Down:

- Movie genres
- Movie ratings
- IMDb score

More details ^

Based on a true story. After graduating from Emory University, Christopher McCandless abandoned his possessions, gave his entire savings account to charity, and hitchhiked to Alaska to live in the wilderness. Along the way, Christopher encounters a series of characters who shape his life.

Runtime: 148 minutes

Rated: R

IMDb Score: 8.1

Genres: Adventure, Biography, Drama

Directed by: Sean Penn

Leading Actors: Emile Hirsch, Vince Vaughn, Catherine Keener

[Go to IMDb Page →](#)



★ MovieMood User Testimonials

*“These are all very popular movies that **I have either watched or thought about watching** and **match my mood wheel**”*

*“Felt **much more up my alley** in the types of movies I would watch **without looking at ratings**”*

*“My playlist is a bit diverse, so **I do see the recommendations aligning with most of my playlist.**”*

*“**The website is SUPER easy to use**, I love that you just drag and drop your file and it **automatically generates** the movie recs for you **without you having to navigate anywhere else** or even push a single button.*

*“Amazing enhancements – **The filters and regenerate are great additions.** I'd love to use it next time I am looking for a movie!”*



★ Challenges & Solutions

Challenges

Bridging between datasets with **no common features**

How to increase **dimensionality** for better **quality recommendations**?

How to **validate** E2E model with **no labelled dataset**?

Solutions



Mood Vectors

Multi-layered application



Test Cohort with Survey Data



★ Top Roadmap Items





Cross Music Platform Integration:
Include platforms like Amazon Music, Apple Music, Spotify, Pandora, SoundCloud, etc.




Theme Layer:

Theme / key-phrase mapping from song lyrics to similar plot summaries



User Feedback Incorporation:
User feedback to improve future recommendations





MovieMood

Movies from your Music, for your Mood

We strive to **bridge the gap between music and movies**, and enrich users' **emotional journeys**, to create a uniquely **personalized and curated multimedia experience**.

★ Acknowledgements

- Capstone Instructors, **Todd Holloway & Joyce Shen**
- NYU Professor & Netflix Prize Winner, **Chris Volinsky**
- MIDS Alum, **Max Eagle**



★ Appendix

1. <https://www.forbes.com/sites/hughmcintyre/2017/11/09/americans-are-spending-more-time-listening-to-music-than-ever-before/?sh=2e30e32f7f8f>
2. Moodify project
3. Ma B, Greer T, Knox D, Narayanan S (2021) A computational lens into how music characterizes genre in film. PLoS ONE 16(4): e0249957. <https://doi.org/10.1371/journal.pone.0249957>
4. Gillick, Jon & Bamman, David. (2018). Telling Stories with Soundtracks: An Empirical Analysis of Music in Film. 33-42. 10.18653/v1/W18-1504.

