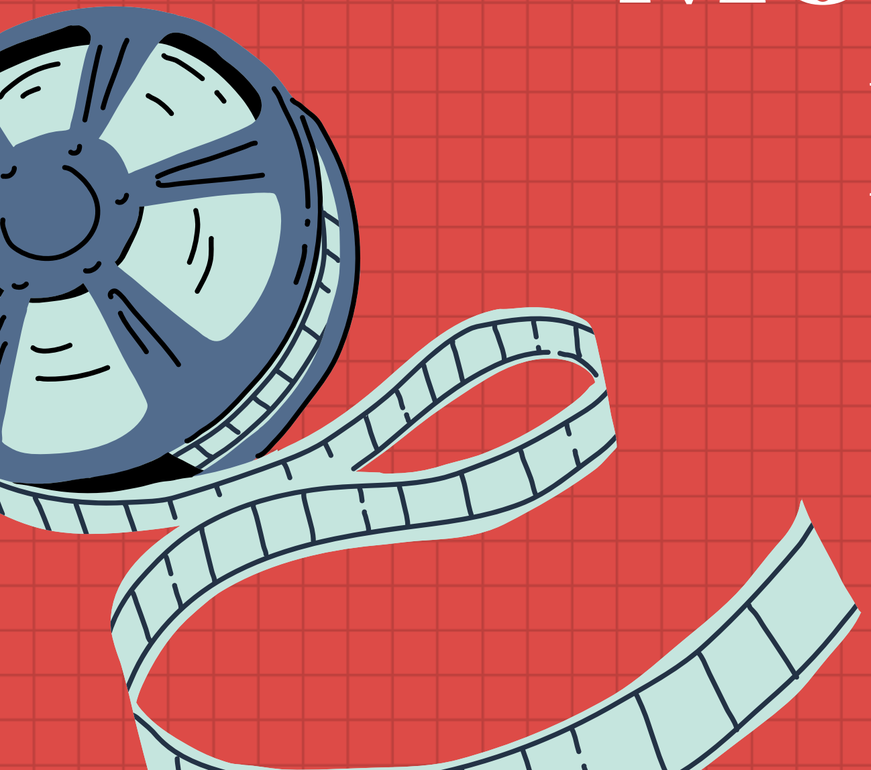
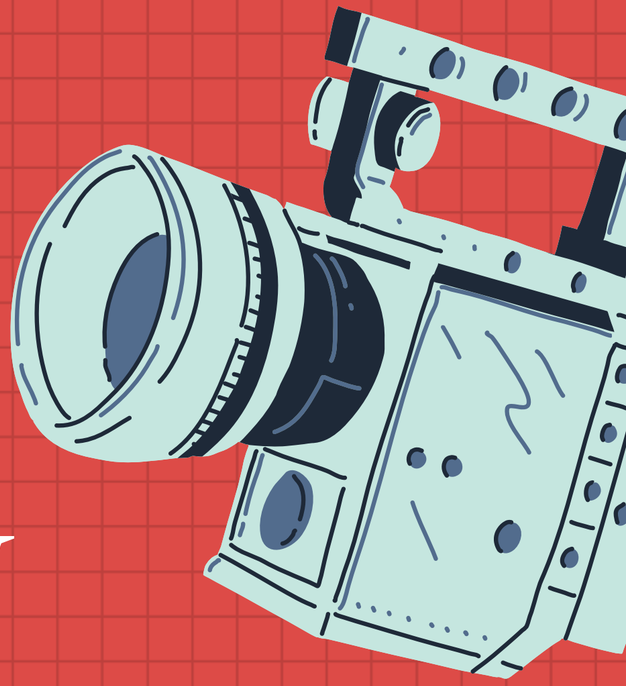
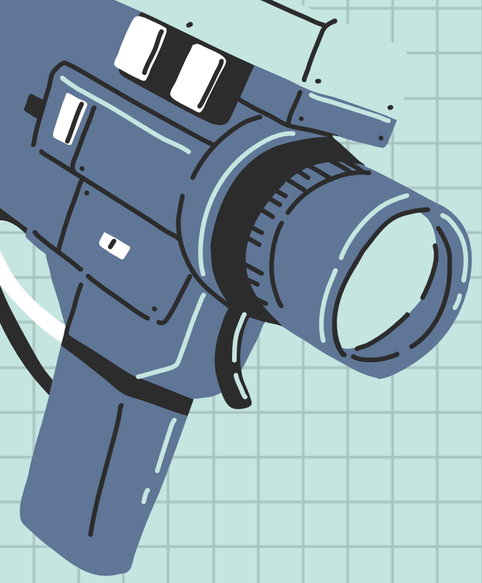
AOML

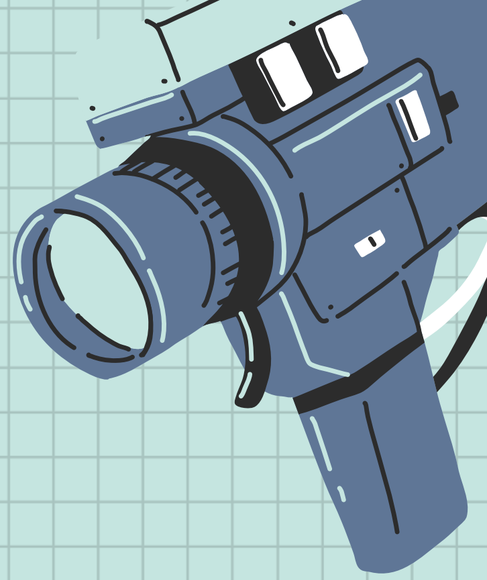
Movie Similarity Prediction

J013: Khushi Daga









Learning Goals

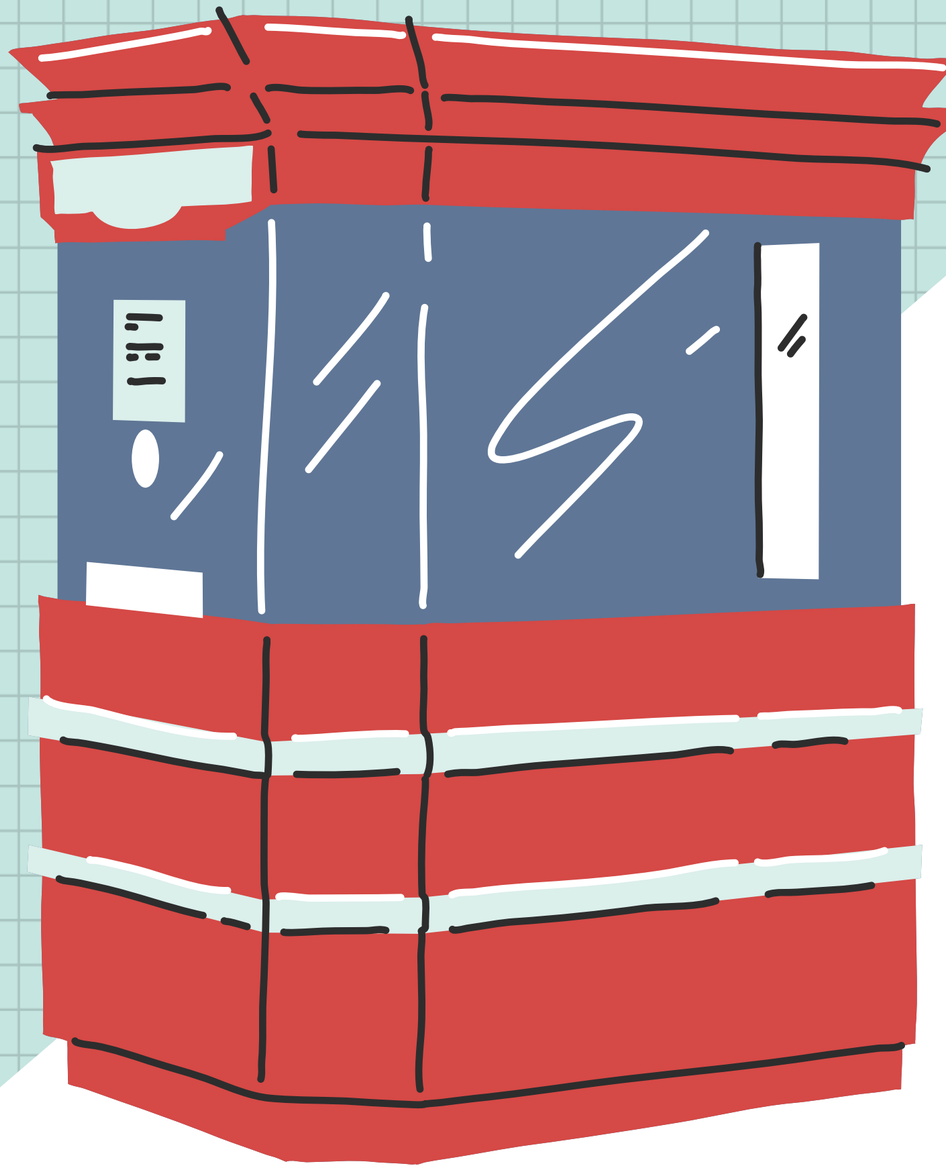
1

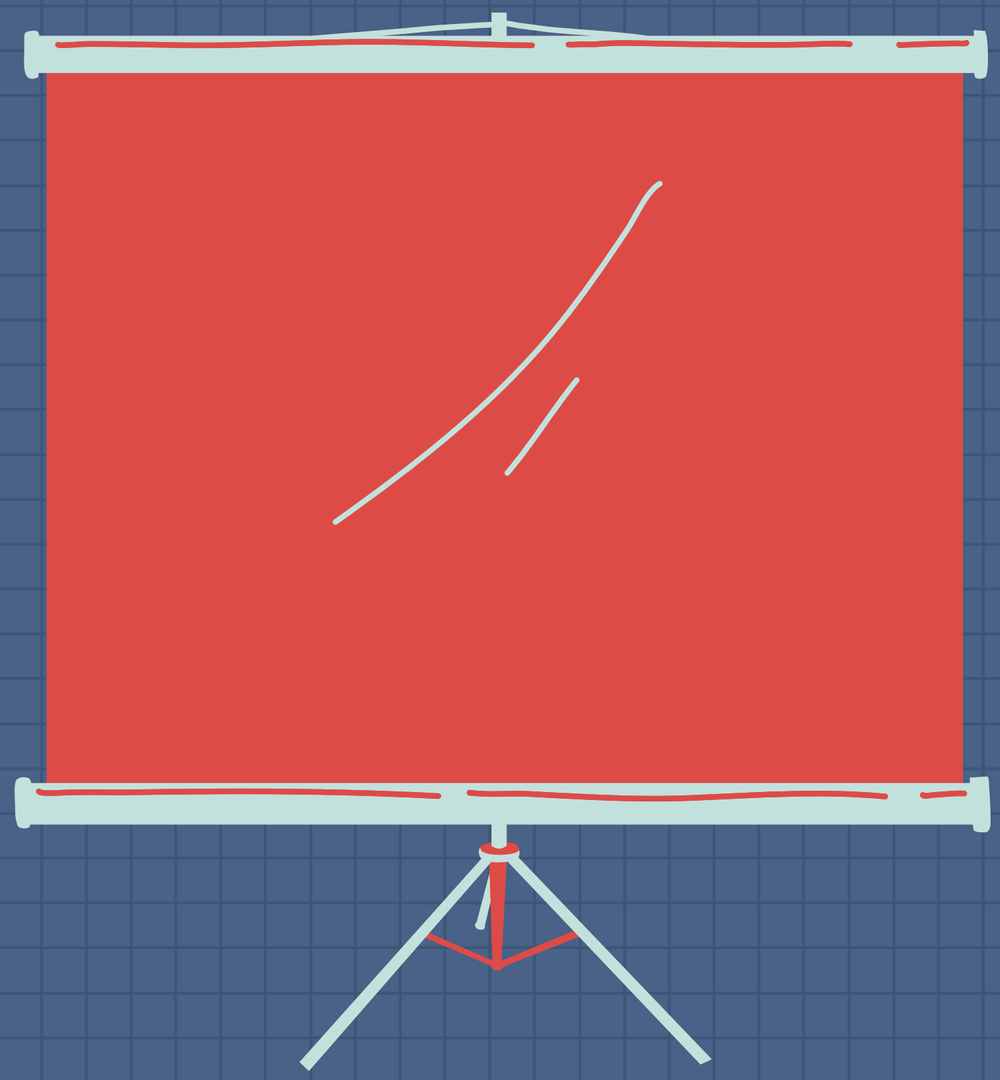
We will quantify the similarity of movies based on their plot summaries available on IMDb and Wikipedia.

2

We will then separate them into groups and we'll create a dendrogram to represent how closely the movies are related to each other.

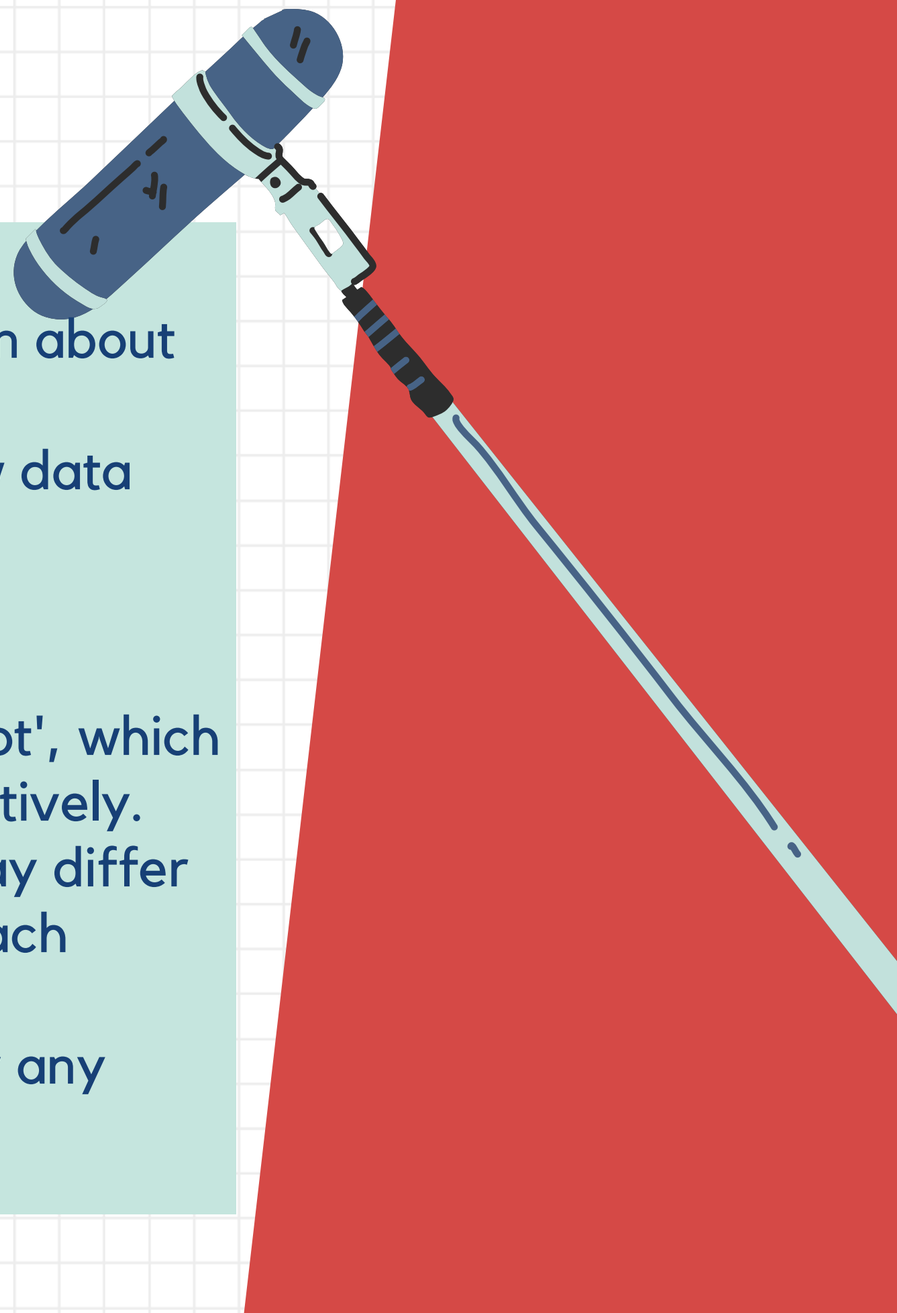
Contents





Import, Observe & Combine Dataset

Import and Observe



1. Importing the Dataset:

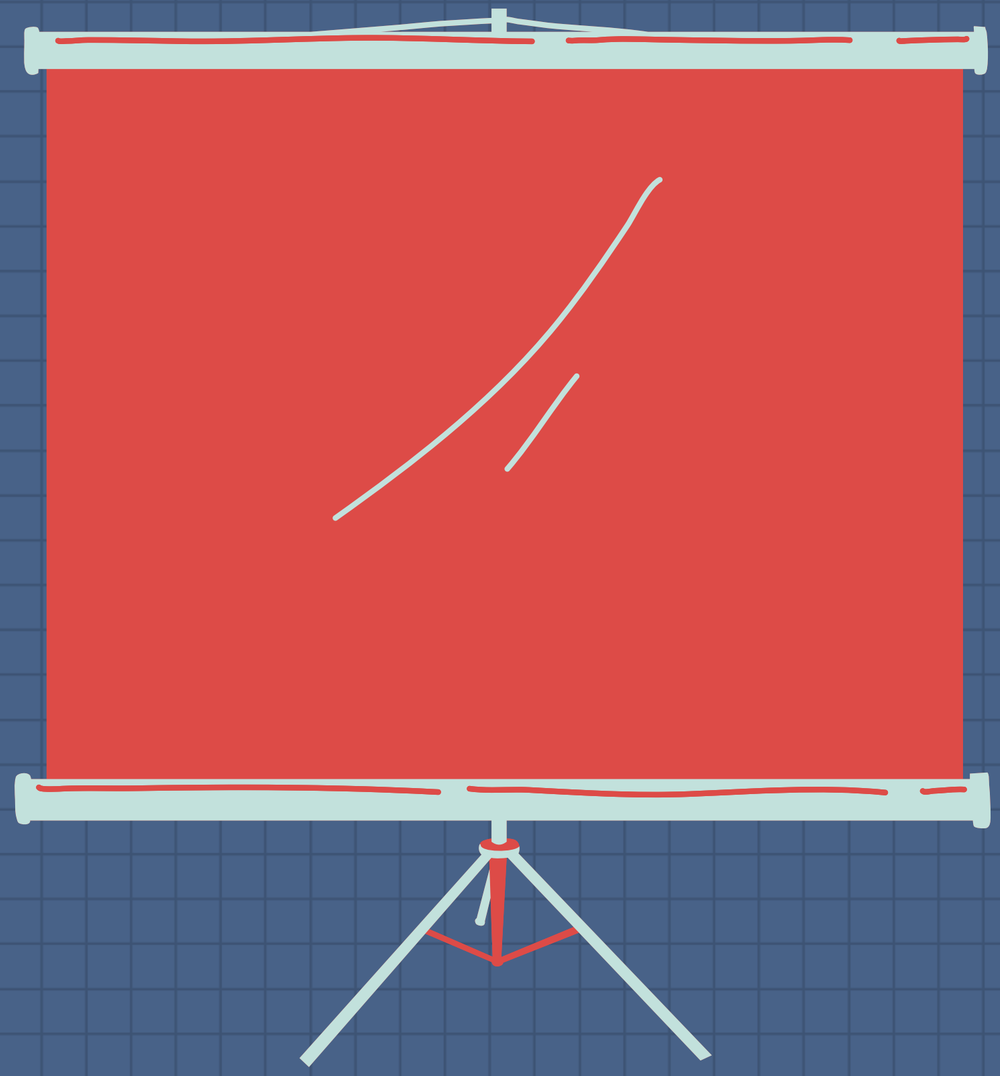
- We begin by importing the dataset that contains information about movie plot summaries from both IMDb and Wikipedia.
- This dataset is crucial for our analysis as it provides the raw data we'll be working with, it has data of 100 movies.

2. Observing the Data:

- The dataset contains two columns: 'wiki_plot' and 'imdb_plot', which represent plot summaries from Wikipedia and IMDb, respectively.
- Although these columns contain similar information, they may differ in tone and expression, providing unique perspectives on each movie's plot.
- Observing the data allows us to grasp its structure, identify any inconsistencies, & gain insights into potential patterns.

3. Combining Plot Summaries:

- To streamline our analysis and avoid redundancy, we'll combine the plot summaries from both 'wiki_plot' and 'imdb_plot' into a single column.
- This combined column, let's call it 'combined_plot', merges information from both sources, providing a comprehensive overview of each movie's plot.
- By consolidating the plot summaries, we eliminate the need to process extra columns, reducing computational overhead and simplifying our analysis process.
- The combined plot summaries serve as the basis for quantifying the similarity between movies and clustering them into groups based on their plot characteristics.



Tokenization

Definition and Steps

Tokenization is a crucial step in natural language processing that breaks down text into smaller units for analysis. It enables us to extract meaningful information from the text while considering additional filtration to remove irrelevant tokens.

Input Text

- Let's consider a small extract from "The Godfather".
- Example: "On the day of his only daughter's wedding, Vito Corleone"

Narrative Conventions

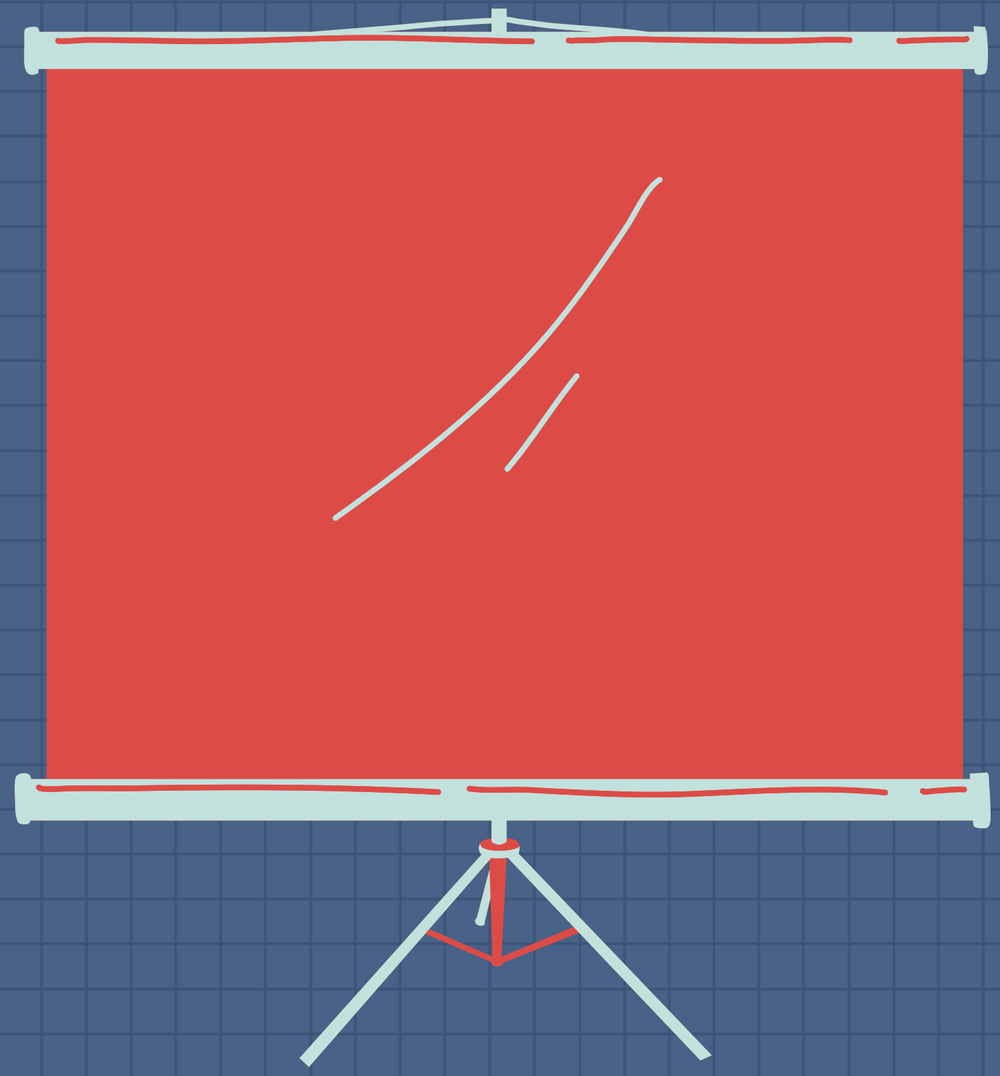
- Text can be tokenized into following words:
- "On", "the", "day", "of", "his", "only", "daughter's", "wedding", ",", "Vito", "Corleone"

Additional Filtration

- Additional filtration to remove tokens that are entirely numeric values or punctuation.

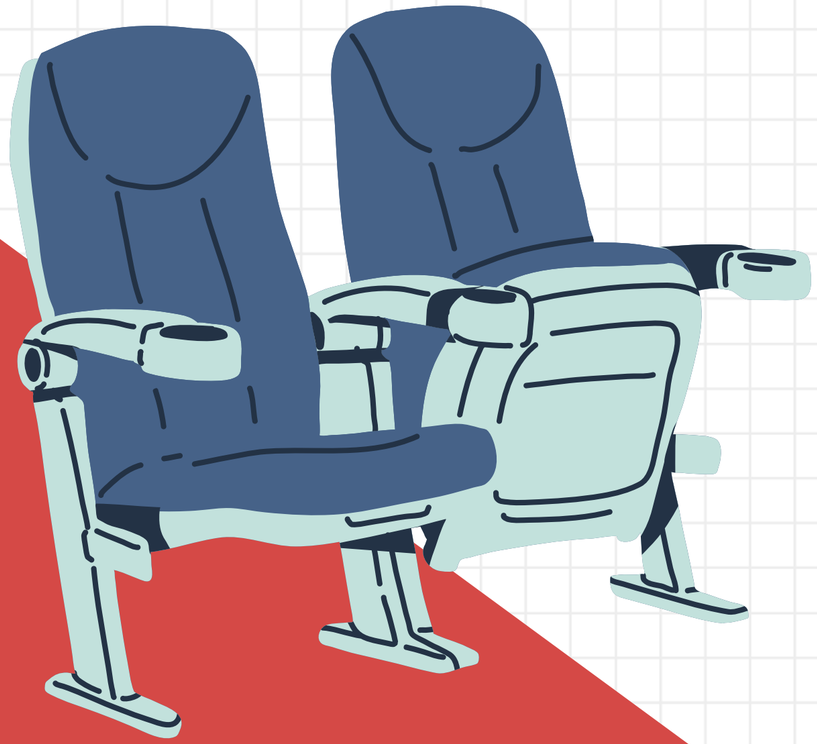
Context Buiding

- While tokenization breaks down the text into individual units, it may not always capture the context of the entire phrase or sentence.



Steamming

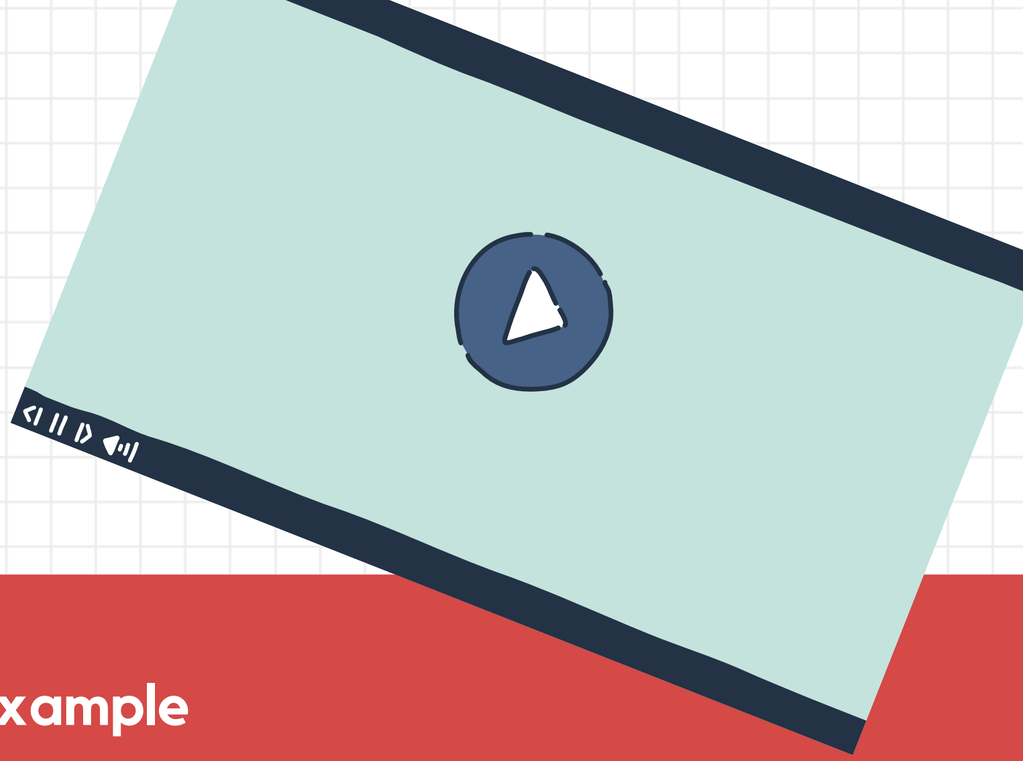
Definition



Stemming involves reducing words to their base or root form, disregarding variations like tense, plurality, or suffixes. For instance, words like 'fishing', 'fished', and 'fisher' all get stemmed to the word 'fish', simplifying the representation of these variations.

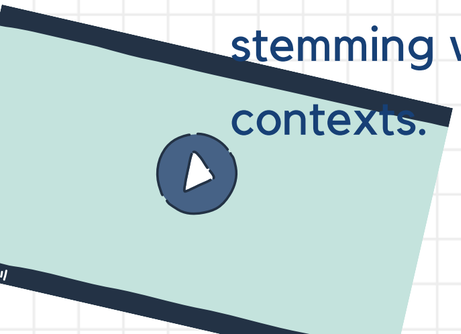
Process

- Instead of treating 'witnesses' and 'witness' as separate dictionary entries, stemming reduces them both to their root form, which is 'wit'.
- Stemming algorithms analyze the words and remove suffixes or prefixes to find the root form.
- In this case, both 'witnesses' and 'witness' would be stemmed to 'wit', simplifying the representation and enabling easier analysis.



Stemming Algorithm:

- The Snowball Stemmer, known for its versatility and language support, is chosen for its effectiveness in stemming words across different languages and contexts.

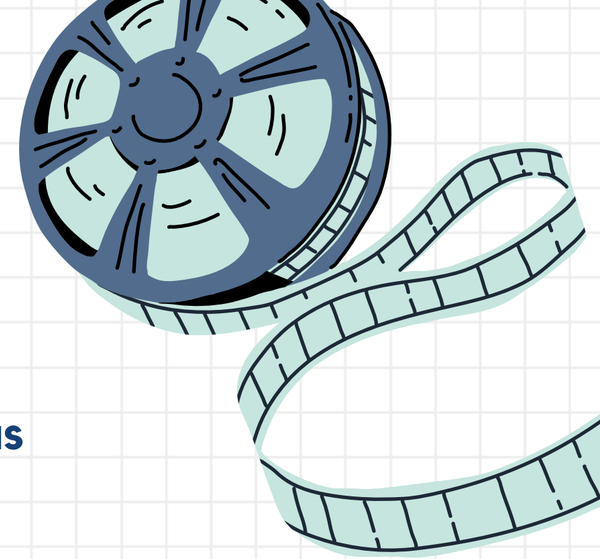


Example

- "Young William Wallace witnesses the treachery of Longshanks" ~ Gladiator
- "escapes to the city walls only to witness Cicero's death" ~ Braveheart

- In both sentences, the words 'witnesses' and 'witness' convey the same meaning, differing only in grammatical form.

Club together Tokenize & Stem



Wrapping tokenization and stemming into a single function and using it as the tokenizer argument in TF-IDF vectorization simplifies the preprocessing pipeline and enhances efficiency and consistency in text data processing tasks.

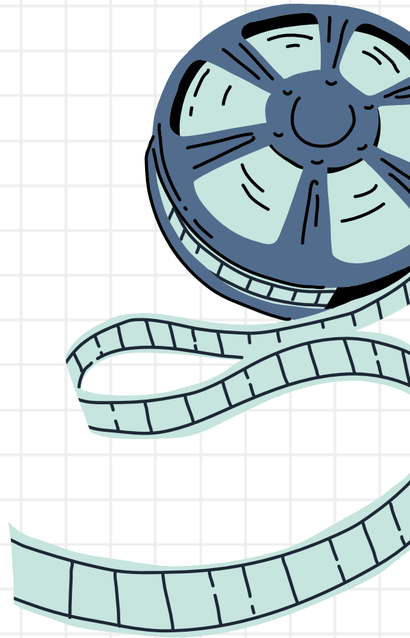
Consider the sentence from the plot of The Godfather: "Today (May 19, 2016) is his only daughter's wedding." If we do a 'tokenize-only' for this sentence, we have the following result:

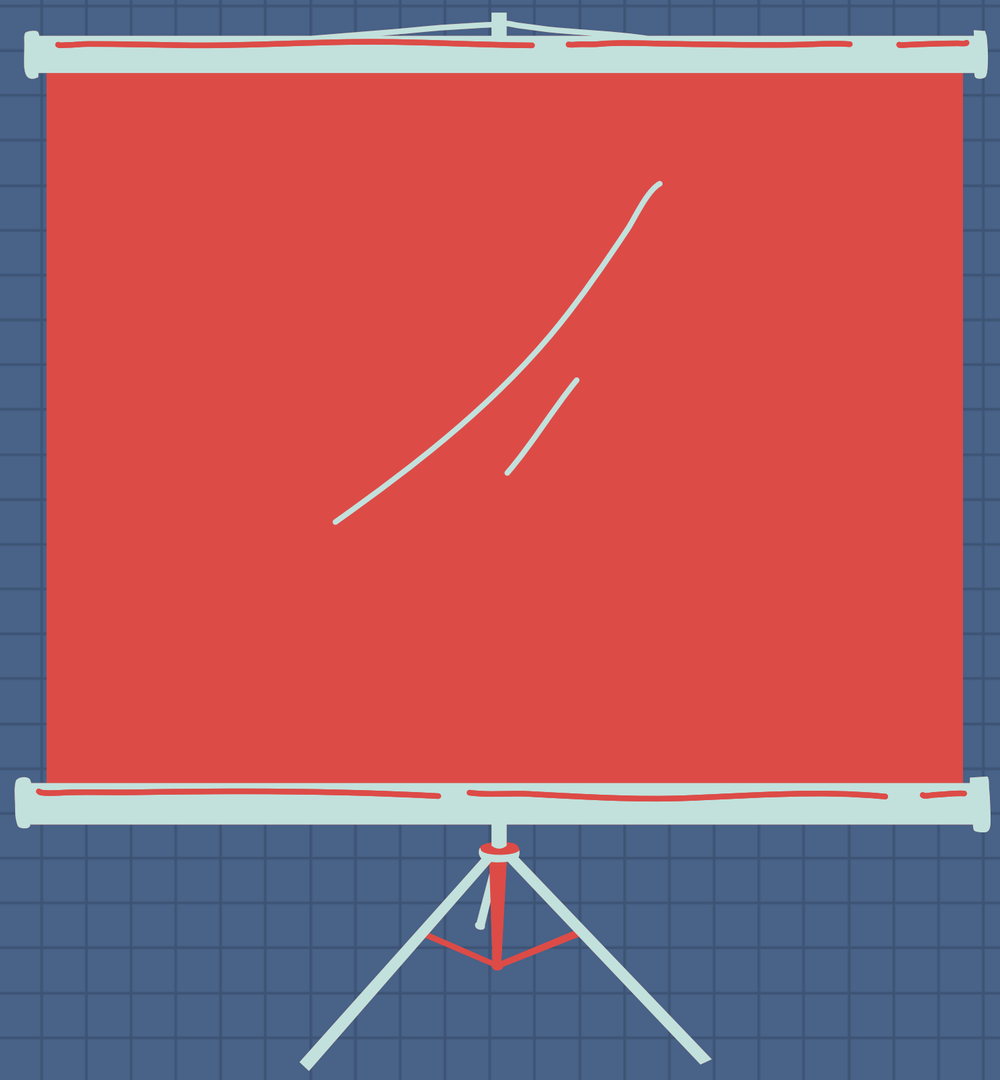
'today', 'may', 'is', 'his', 'only', 'daughter', "'s", 'wedding'

But when we do a 'tokenize-and-stem' operation we get:

'today', 'may', 'is', 'his', 'onli', 'daughter', "'s", 'wed'

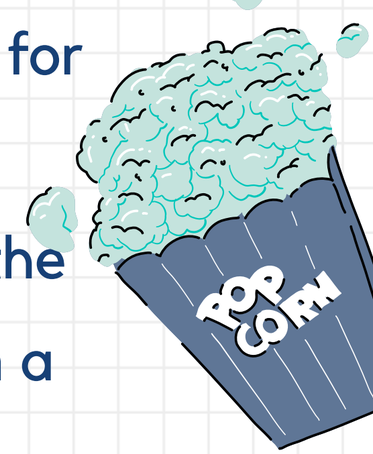
All the words are in their root form, which will lead to a better establishment of meaning as some of the non-root forms may not be present in the NLTK training corpus.

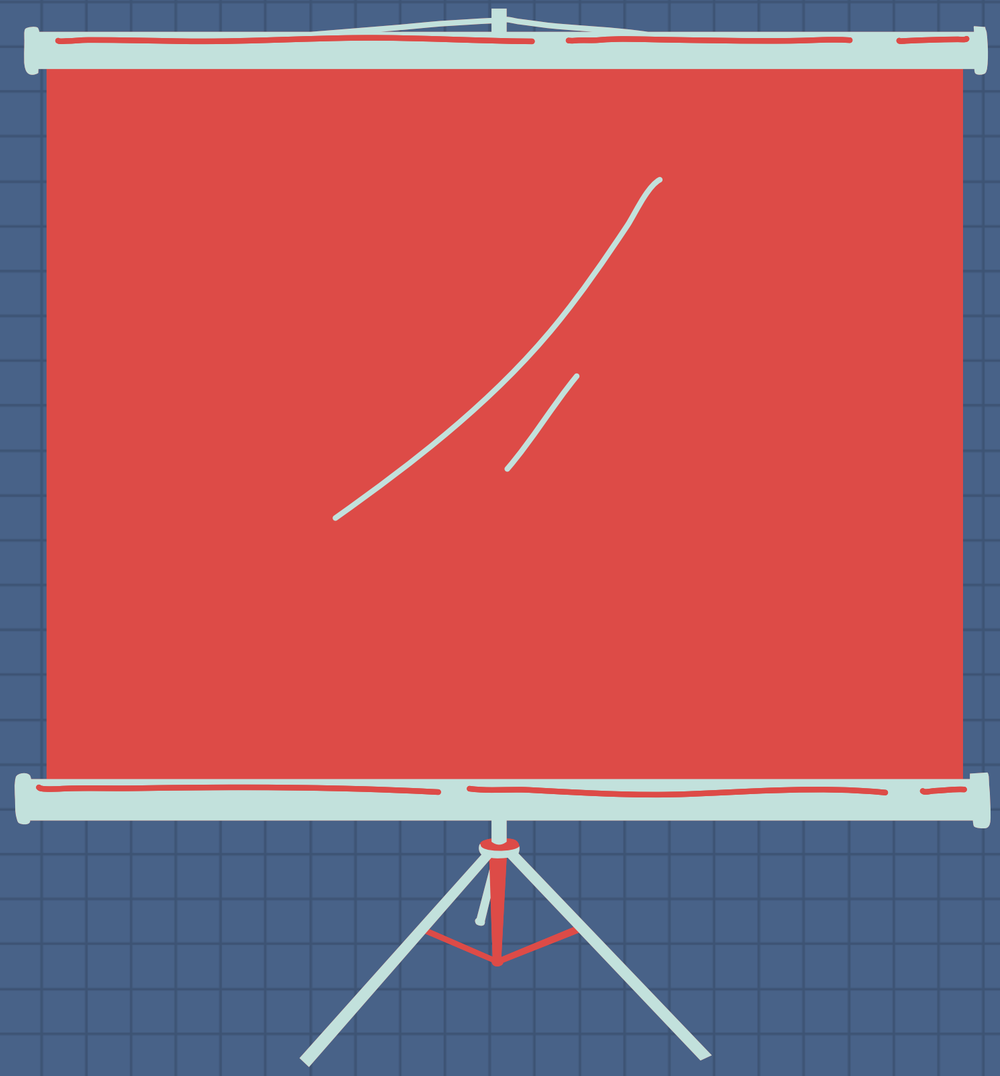




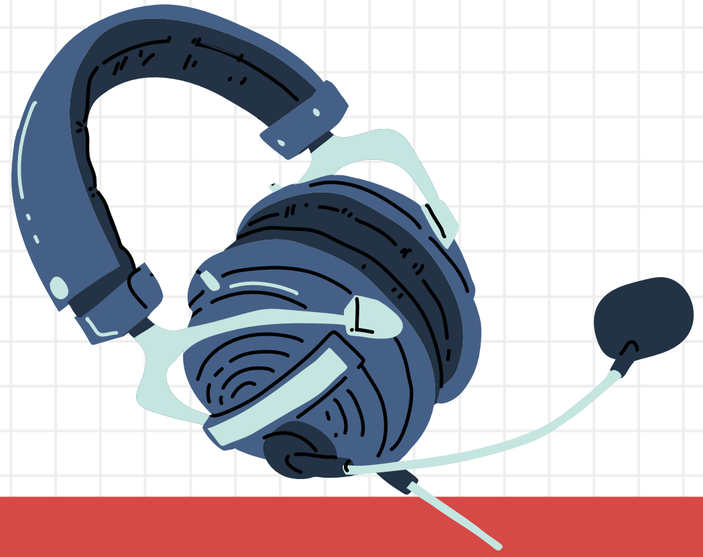
Create TfidfVectorizer

- Textual plot summaries need to be converted into numerical representations for computers to process effectively.
- One method to achieve this is by using the 'CountVectorizer', which counts the occurrences of each word in the entire vocabulary and returns the counts in a vector.
- However, 'CountVectorizer' has a limitation in that it treats all words equally, even common words that may not be important for understanding the plot's theme.
- To overcome this limitation, the Term Frequency-Inverse Document Frequency method is introduced.
- TF-IDF combines two metrics: Term Frequency measures how often a word appears in a document, while Inverse Document Frequency reduces the importance of words that appear frequently across multiple documents.
- TF-IDF recognizes words that are significant and distinctive within a particular document, making it a valuable tool for text analysis and information retrieval tasks.





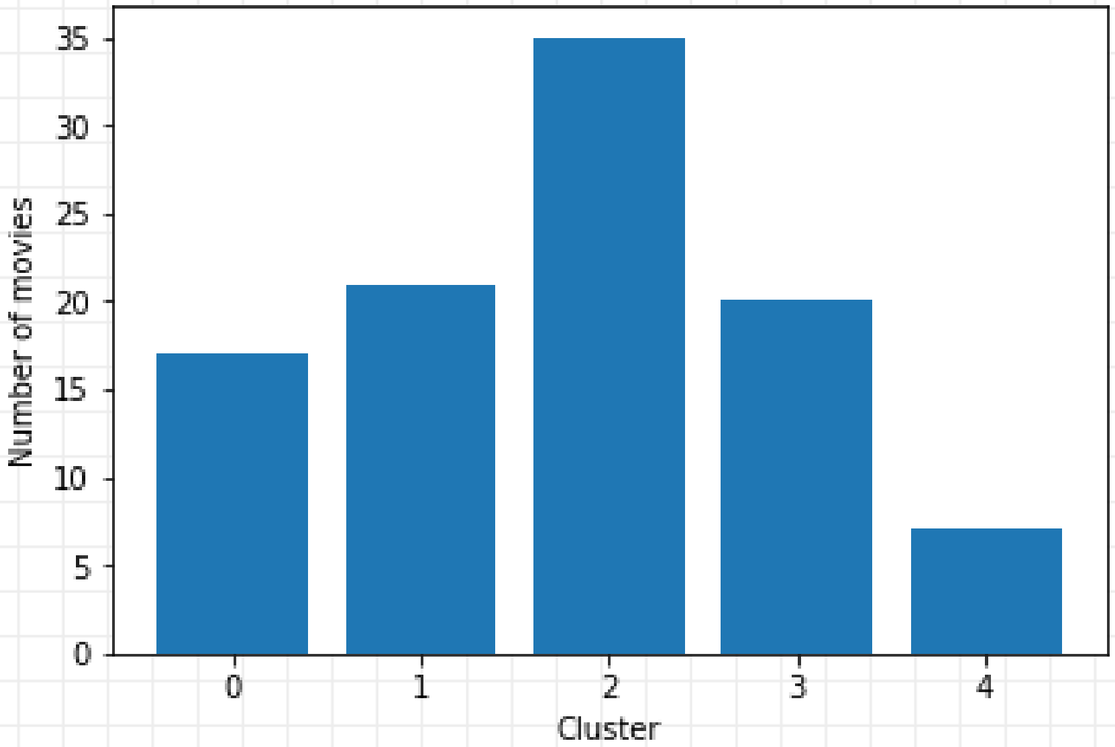
Create Clusters

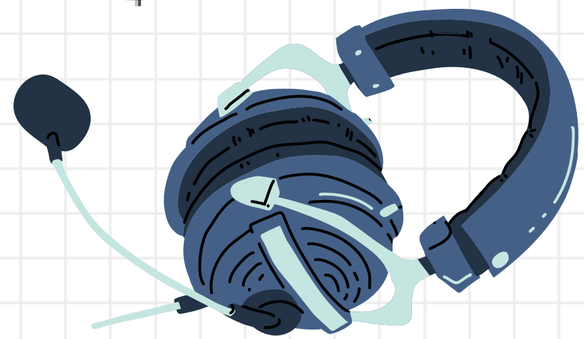


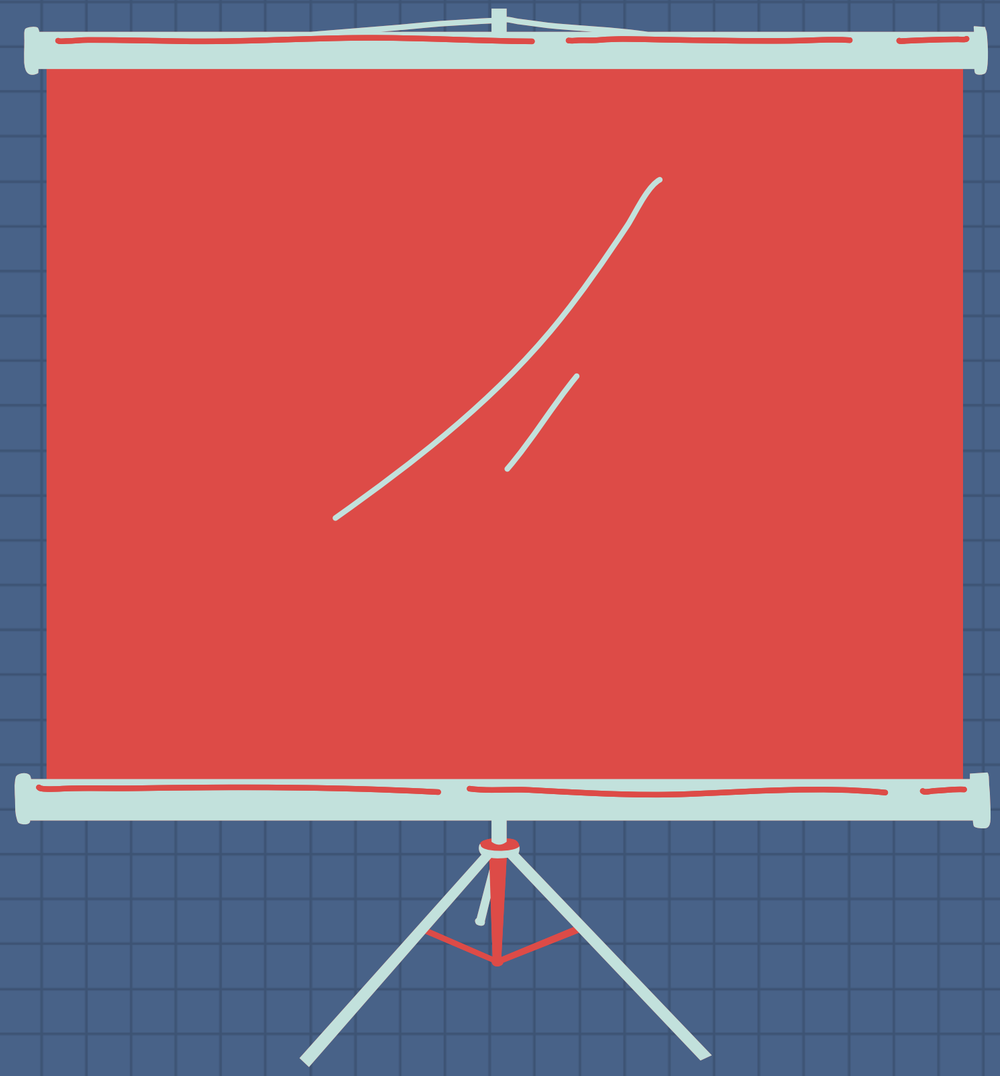
Defination:

Clustering is the method of grouping together a number of items such that they exhibit similar properties
K-means is an algorithm which helps us to implement clustering in Python.

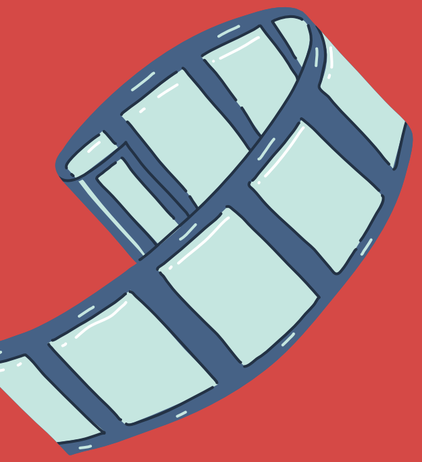
- The given sample is divided into K clusters where each cluster is denoted by the mean of all the items lying in that cluster.

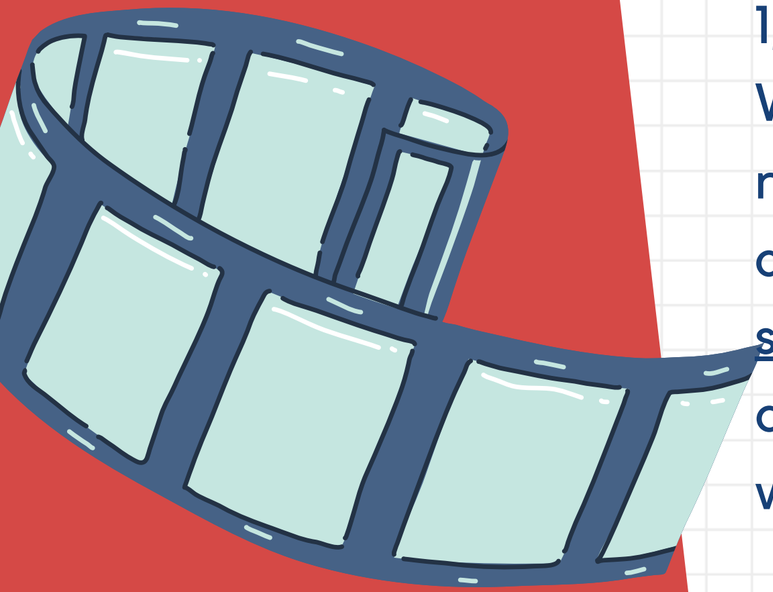


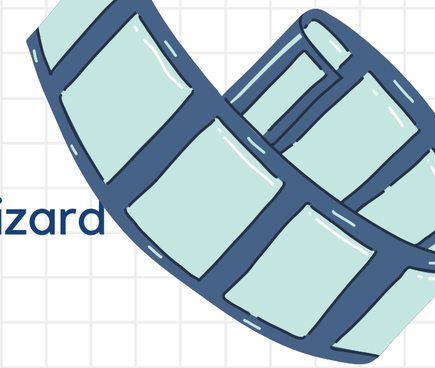




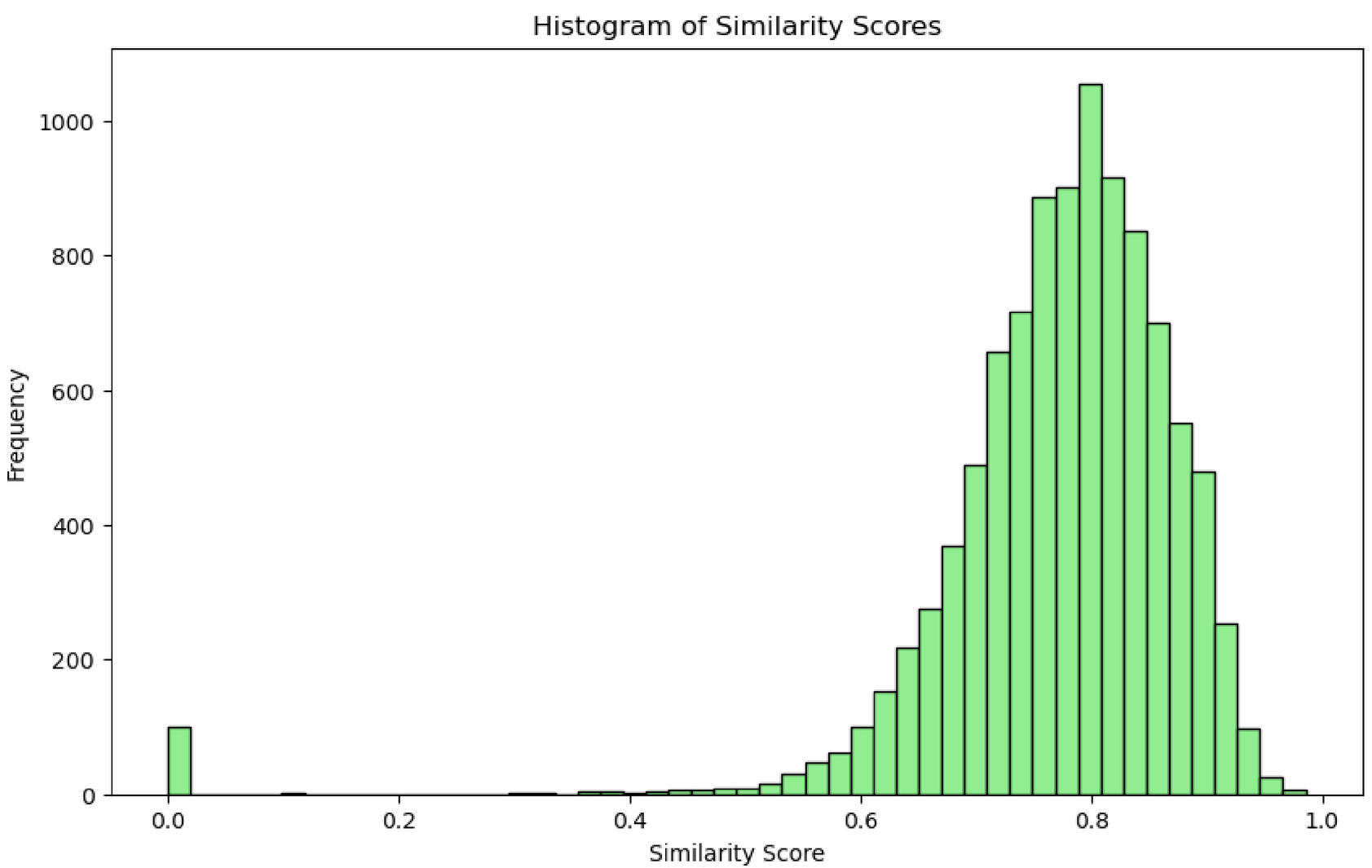
Calculate Similarity Distance

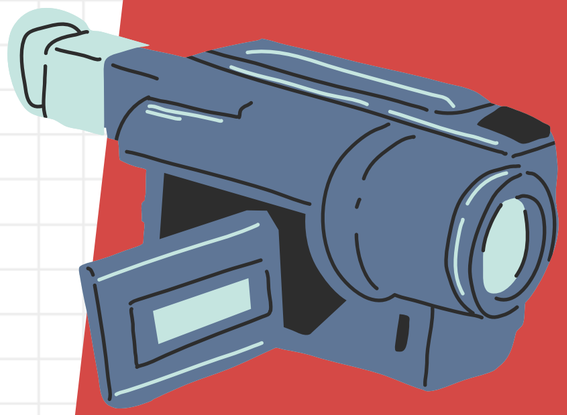


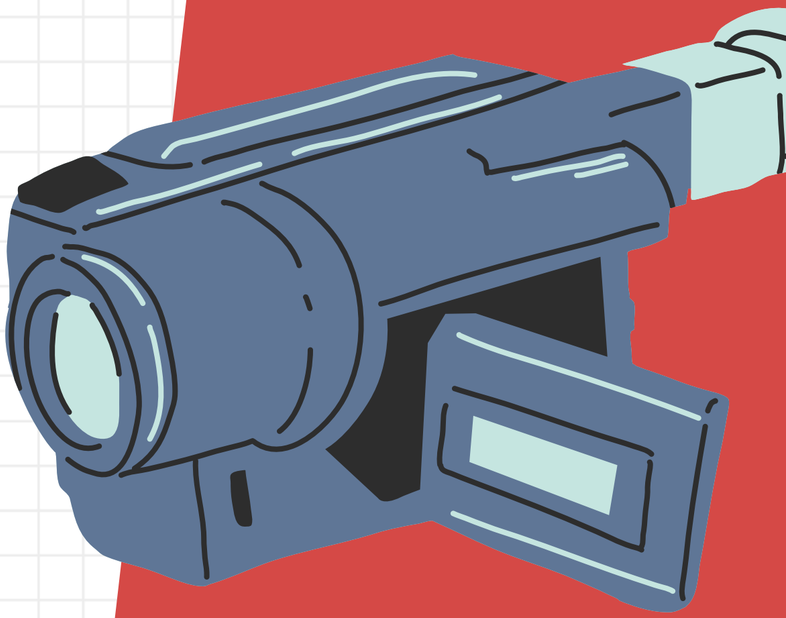


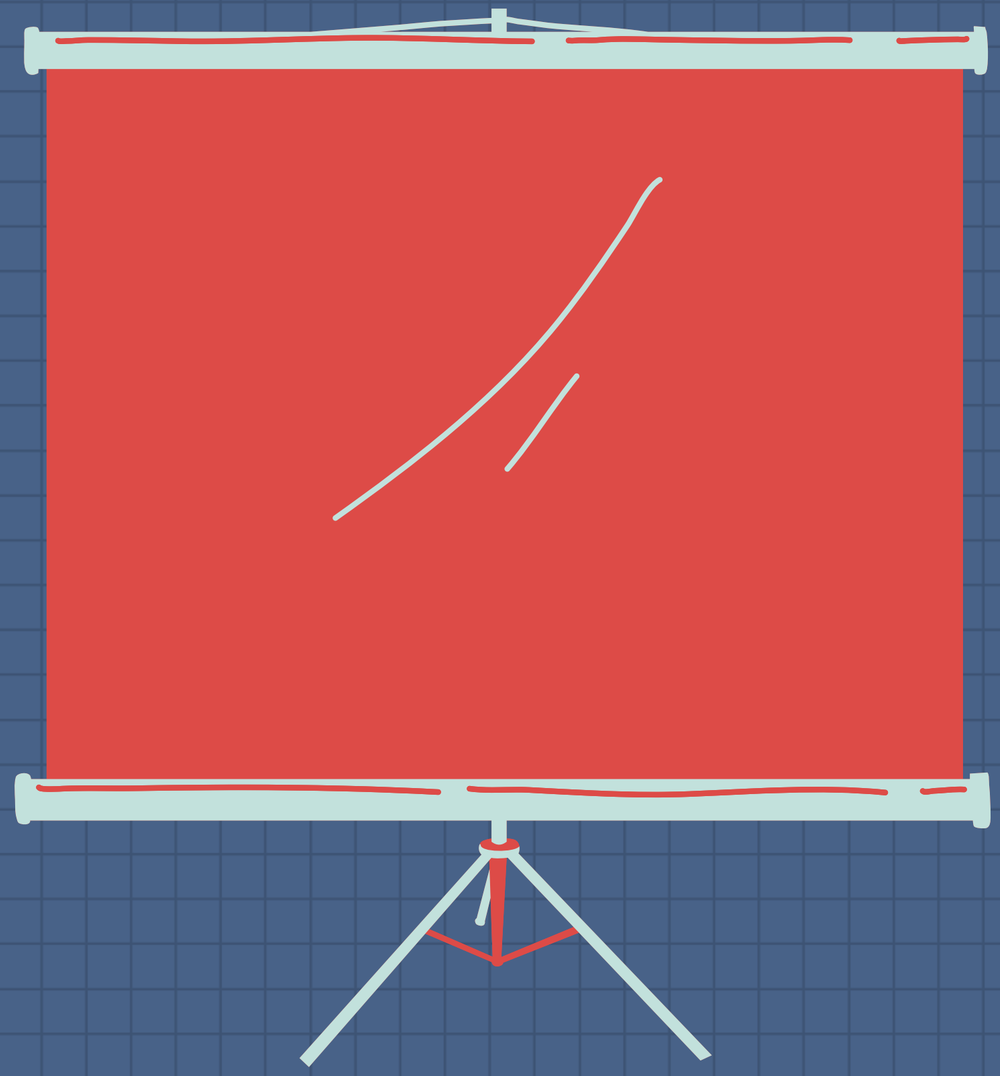


Consider the following two sentences from the movie The Wizard
"they find in the Emerald City"
"they finally reach the Emerald City"
If we put the above sentences in a CountVectorizer, the vocabulary produced would be "they, find, in, the, Emerald, City, finally, reach" and the vectors for each sentence would be as follows:
1, 1, 1, 1, 1, 1, 0, 0
1, 0, 0, 1, 1, 1, 1, 1
When we calculate the cosine angle formed between the vectors represented by the above, we get a score of 0.667. This means the above sentences are very closely related. Similarity distance is 1 - cosine similarity angle. This follows from that if the vectors are similar, the cosine of their angle would be 1 and hence, the distance between then would be 1 - 1 = 0.


Histogram of Similarity Scores
Frequency
Similarity Score
0
200
400
600
800
1000
0.0
0.2
0.4
0.6
0.8
1.0



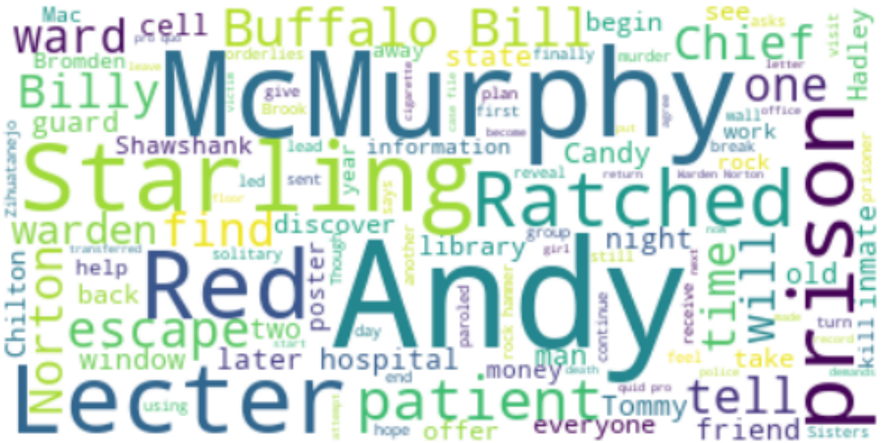




Visualizations

WordCloud from each Cluster

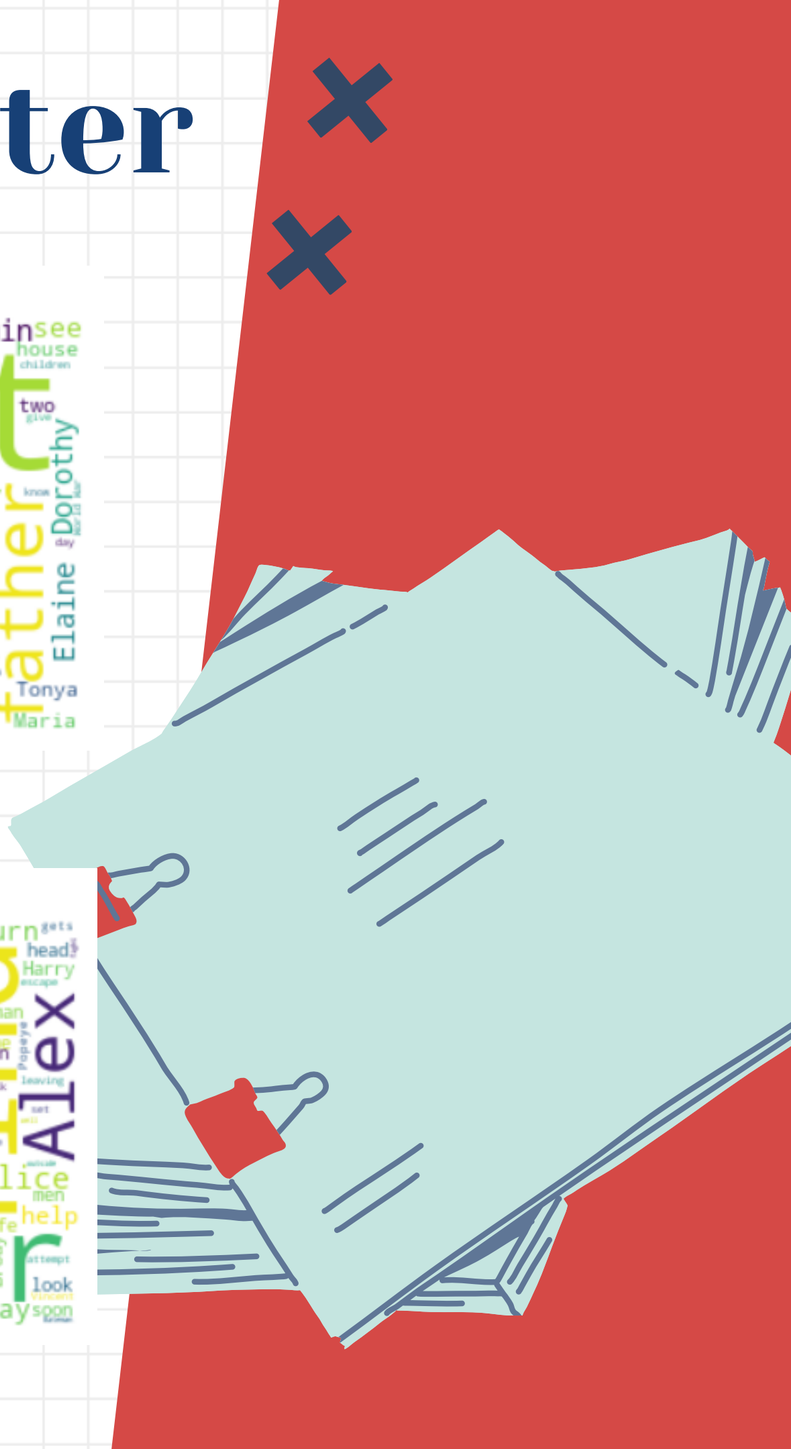
Cluster 0 Word Cloud



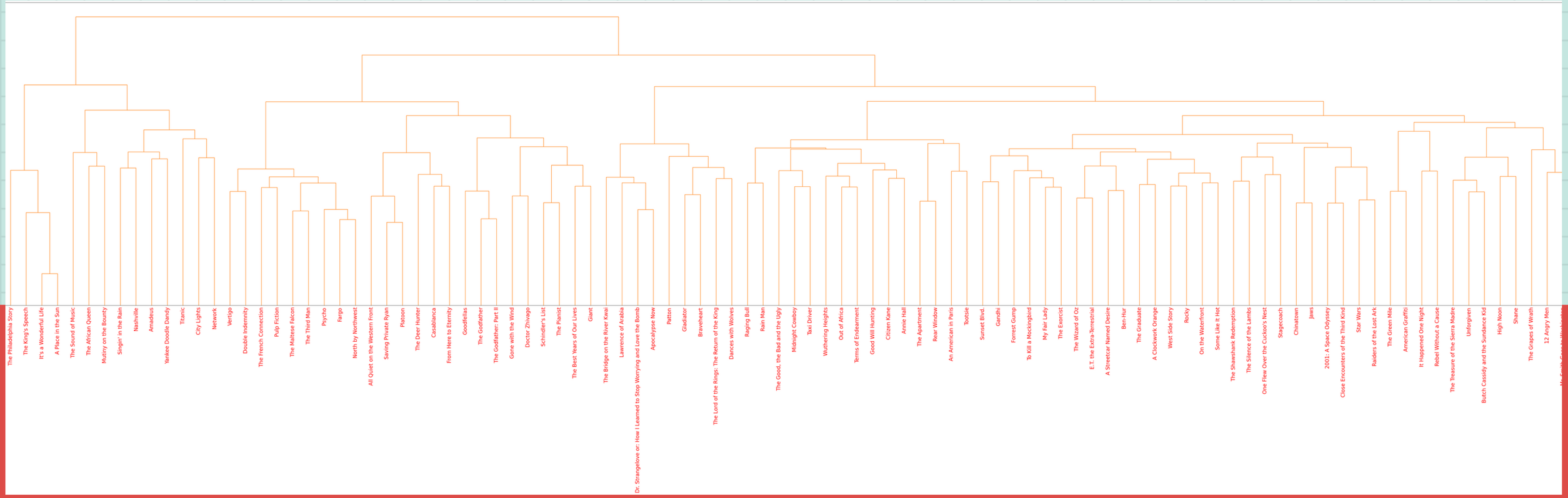
Cluster 4 Word Cloud

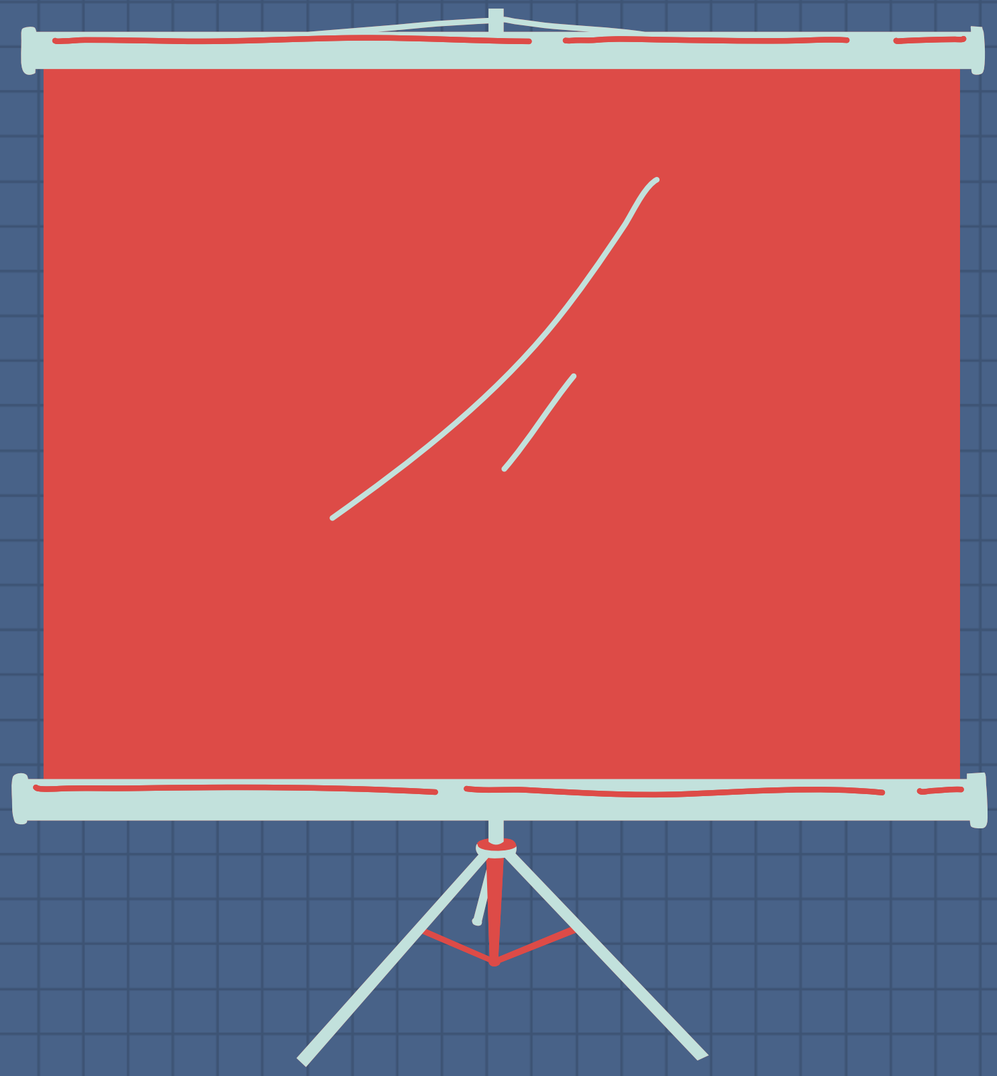
Cluster 2 Word Cloud

Cluster 1 Word Cloud



Dendrogram

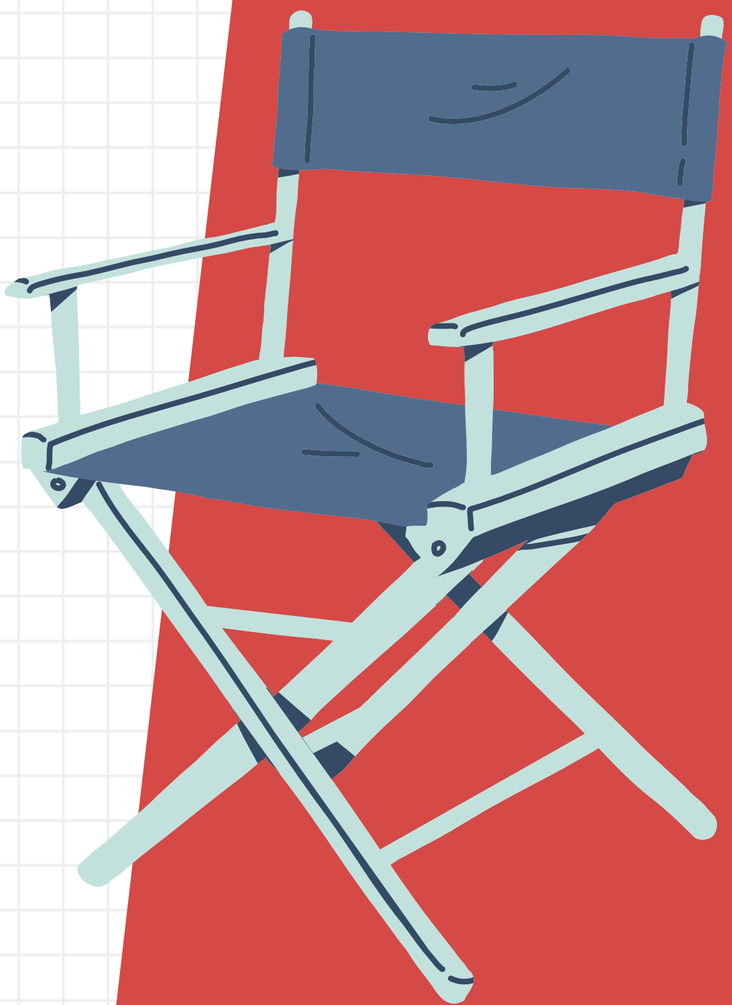

The Philadelphia Story
The King's Speech
It's a Wonderful Life
A Place in the Sun
The Sound of Music
The African Queen
Mutiny on the Bounty
Singin' in the Rain
Nashville
Amadeus
Yankee Doodle Dandy
Titanic
City Lights
Network
Vertigo
Double Indemnity
The French Connection
Pulp Fiction
The Maltese Falcon
The Third Man
Psycho
Fargo
North by Northwest
All Quiet on the Western Front
Saving Private Ryan
Platoon
The Deer Hunter
Casablanca
From Here to Eternity
Goodfellas
The Godfather
The Godfather: Part II
Gone with the Wind
Doctor Zhivago
Schindler's List
The Pianist
The Best Years of Our Lives
Giant
The Bridge on the River Kwai
Lawrence of Arabia
Dr. Strangelove or: How I Learned to Stop Worrying and Love the Bomb
Apocalypse Now
Patton
Gladiator
Braveheart
The Lord of the Rings: The Return of the King
Dances with Wolves
Raging Bull
Rain Man
The Good, the Bad and the Ugly
Midnight Cowboy
Taxi Driver
Wuthering Heights
Out of Africa
Terms of Endearment
Good Will Hunting
Citizen Kane
Annie Hall
The Apartment
Rear Window
An American in Paris
Tootsie
Sunset Blvd.
Gandhi
Forrest Gump
To Kill a Mockingbird
My Fair Lady
The Exorcist
The Wizard of Oz
E.T. the Extra-Terrestrial
A Streetcar Named Desire
Ben-Hur
The Graduate
A Clockwork Orange
West Side Story
Rocky
On the Waterfront
Some Like It Hot
The Shawshank Redemption
The Silence of the Lambs
One Flew Over the Cuckoo's Nest
Stagecoach
Chinatown
Jaws
2001: A Space Odyssey
Close Encounters of the Third Kind
Star Wars
Raiders of the Lost Ark
The Green Mile
American Graffiti
It Happened One Night
Rebel Without a Cause
The Treasure of the Sierra Madre
Unforgiven
Butch Cassidy and the Sundance Kid
High Noon
Shane
The Grapes of Wrath
12 Angry Men

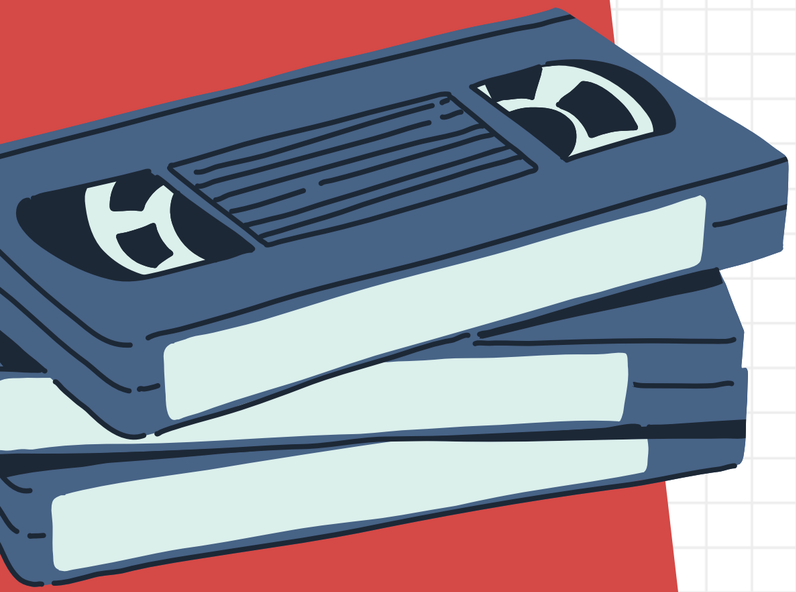


Some Conclusions

What is the average similarity score between movies in the same cluster?

- Average similarity score for cluster 0: 0.4732157414926383
- Average similarity score for cluster 1: 0.7159361615388798
- Average similarity score for cluster 2: 0.7353582797346853
- Average similarity score for cluster 3: 0.6578554341809363
- Average similarity score for cluster 4: 0.7246925351957314





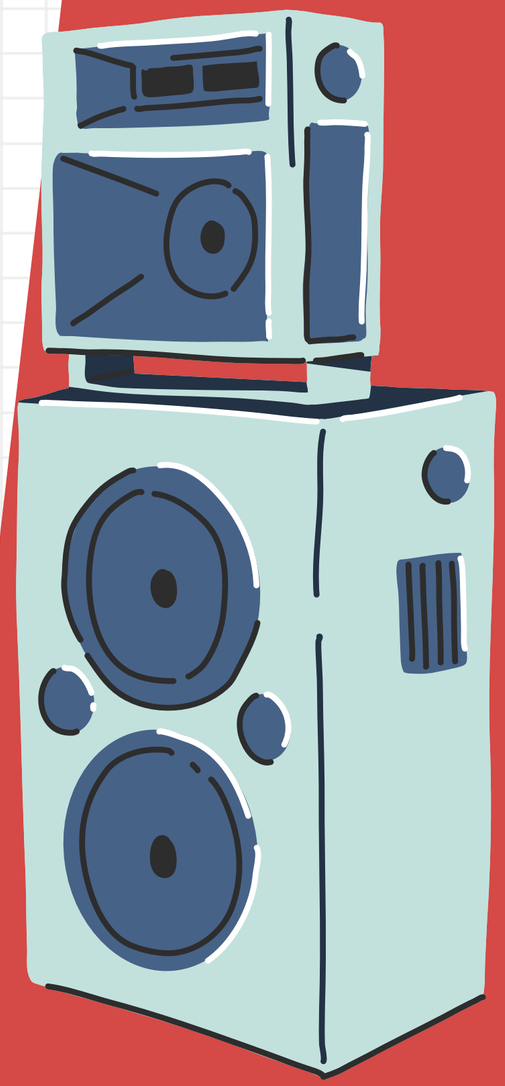
Which movies are most similar?

The movie most similar to Braveheart is: Gladiator

Which movies belong to the same cluster as "The Godfather"?

The movies in the same cluster as The Godfather are:

- 0 The Godfather
- 12 Psycho
- 13 Sunset Blvd.
- 14 Vertigo
- 18 West Side Story
- 20 E.T. the Extra-Terrestrial
- 21 2001: A Space Odyssey
- 23 Chinatown
- 32 Gandhi
- 37 Unforgiven
- 42 To Kill a Mockingbird
- 49 Jaws.....and so on



Thank You