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The Journey of Breaking Down Song Lyrics Using **NLP & Clustering**

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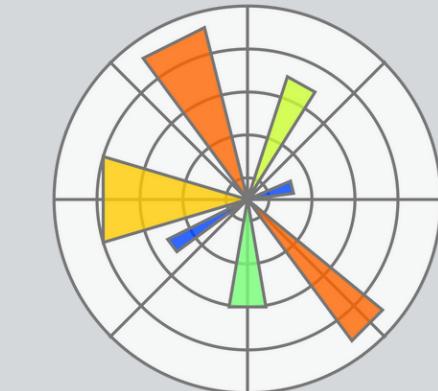
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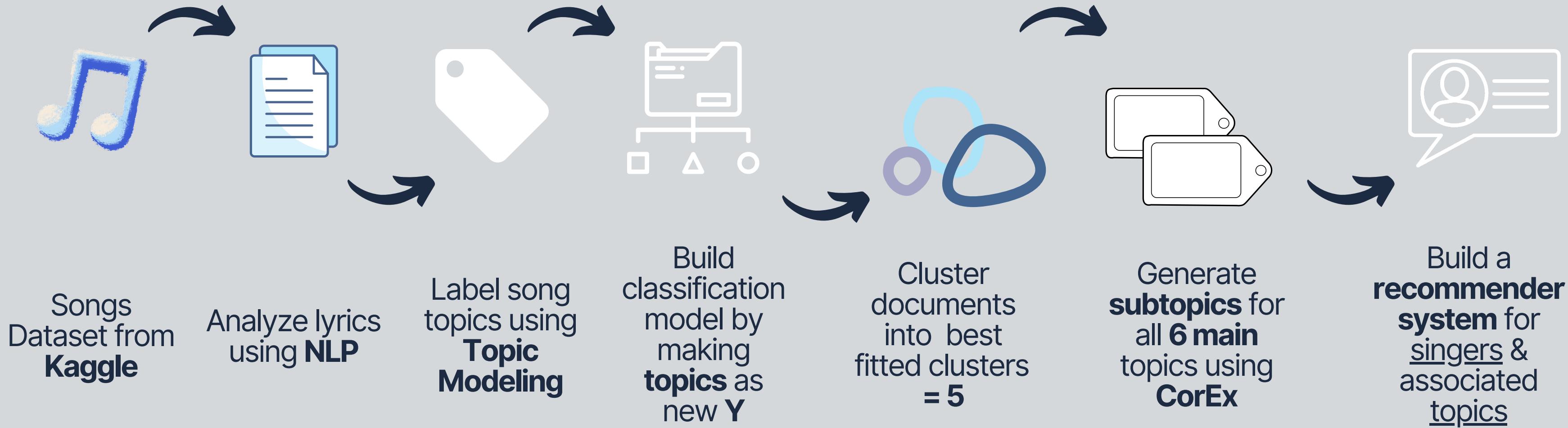
INTRODUCTION

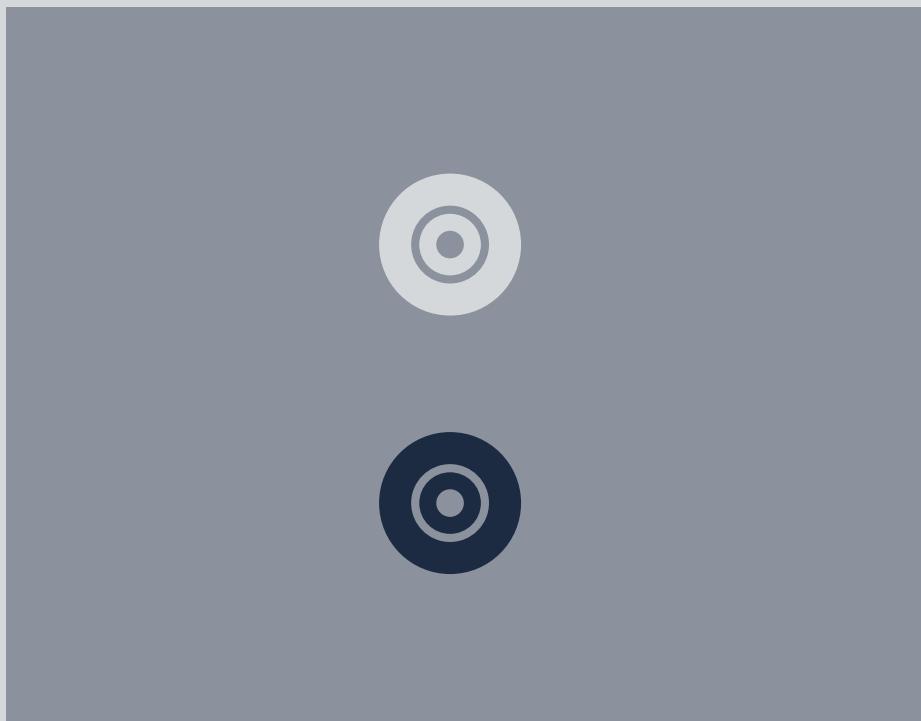
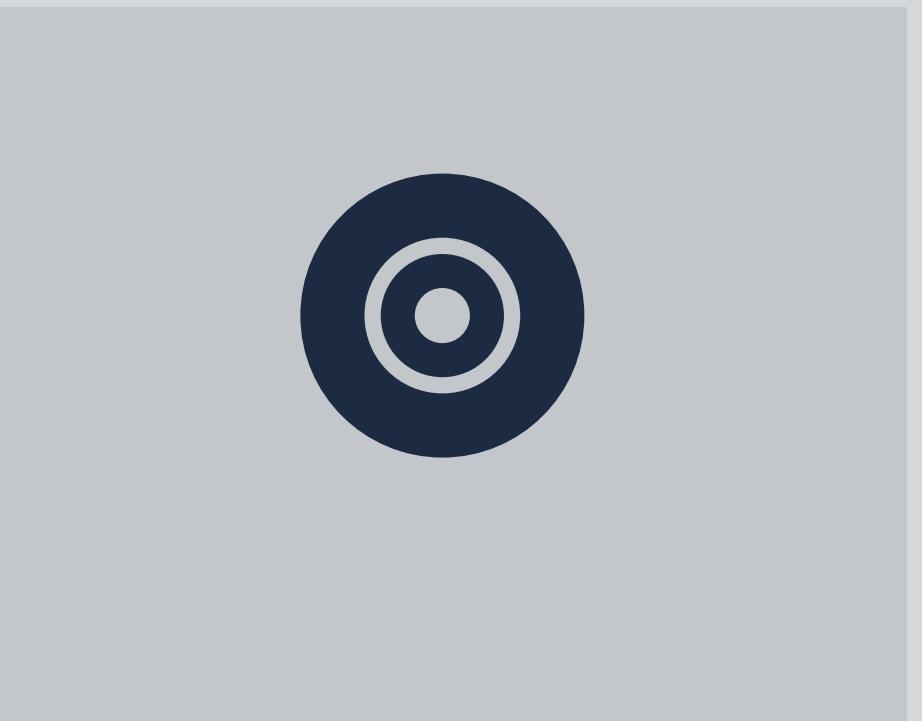
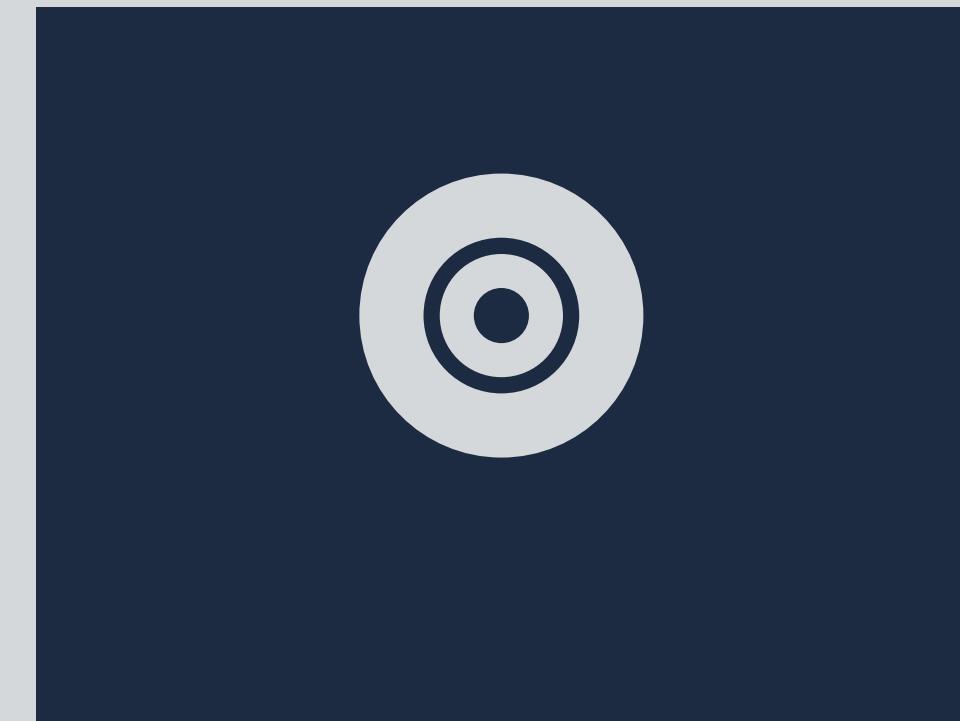
The main focus of this project is break down and analyze the under meaning of song lyrics using Natrual Langauge Processing and Clustering and to devide them into topics for further investigations.

TOOLS



WORK FLOW





About the Data

- Source: Kaggle
- Song Dataset:
200K rows 5 columns
- Artist Dataset
3K rows 6 columns

Chosen Sample

- 20,000 rows

Chosen Sample Criteria

- English songs
- Songs with 20 character



EXPLORATORY DATA ANALYSIS

Null Vlaues

Doesn't contain any nulls

New Column

Represents the length of the song

Duplicates (23101)

Removed all duplicates

Extra Columns

Removed unneeded columns like Song Link

NATURAL LANGUAGE PROCESSING

Text Cleaning

- Tokenization
- Vectorization
- Lemmatization
- Removed digits from texts.
- Made all text lowercase
- Got rid of all non-english characters
- Removed all punctuations



Extension of Stop Words

Added to the original English stop words common words said in songs.

- Like and Need
- humming and screams: oooh, ooo, ahh
- Explicit language



TOPIC MODELING



NMF

Topic 0
life, heart, world, eye, dream, light, live,
fall, end, die
Topic 1
baby, cry, hold, gone, shake, heart,
lord, lovin, maybe, kiss
Topic 2
man, little, rock, said, home, boy,
woman, roll, old, around
Topic 3
time, mind, last, mine, friend, find, wait,
every, gone, life
Topic 4
away, day, walk, far, run, stay, fade,
gone, today, turn
Topic 5
feel, give, think, believe, something,
nothing, always, everything, really,
much



LSA

Topic 0
time, baby, away, feel, day, life, heart,
world, think, eye
Topic 1
baby, little, rock, woman, said, man,
shake, roll, lord, lovin
Topic 2
rock, man, little, roll, boy, said, woman,
old, everybody, big
Topic 3
time, think, mind, feel, give, really,
much, believe, mine, last
Topic 4
away, time, day, gone, run, far, walk,
home, stay, christmas
Topic 5
away, feel, give, rock, something, think,
chorus, run, walk, roll



LDA

Topic 0
baby, man, little, time, said, home, rock,
around, ay, think
Topic 1
holiday, careless, boom, wah, satellite,
prisoner, ing, groovy, divide, messed
Topic 2
time, away, feel, life, heart, world, eyes,
us, day, find
Topic 3
worlds, heroes, waits, santa, jane,
collide, dancer, sale, woe, digging
Topic 4
johnny, bigger, hoo, hallelujah, glad,
lee, kissing, gravity, arpet, peter
Topic 5
wherever, rider, runaway, owe, honky,
ghosts, voodoo, sally, gal, dum

6 TOPICS

- Reality: Topic 0
- Heartbreak: Topic 1
- Coming of Age - Growing up: Topic 2
- Friendship: Topic 3
- Home: Topic 4
- Desire: Topic 5

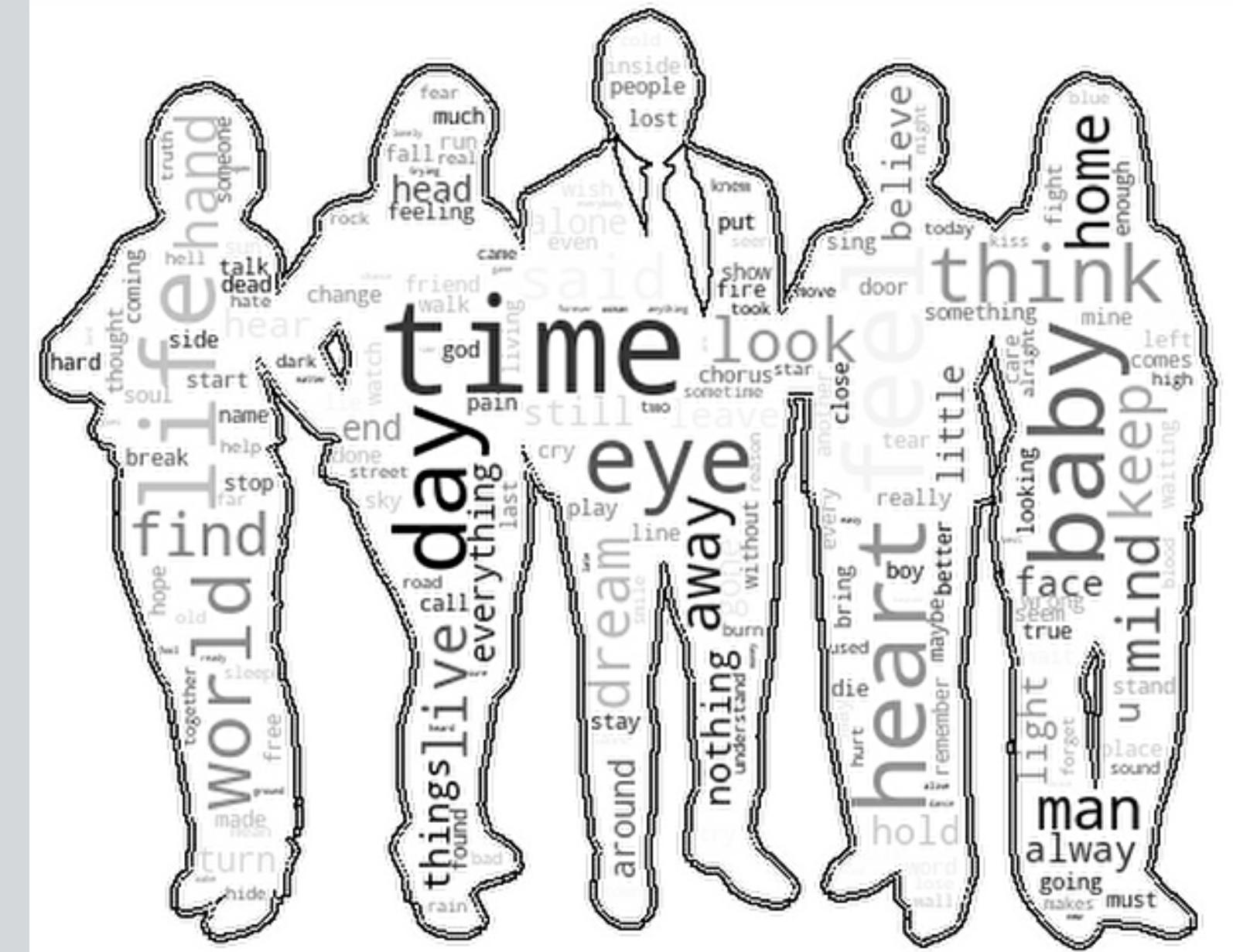


WORD CLOUD

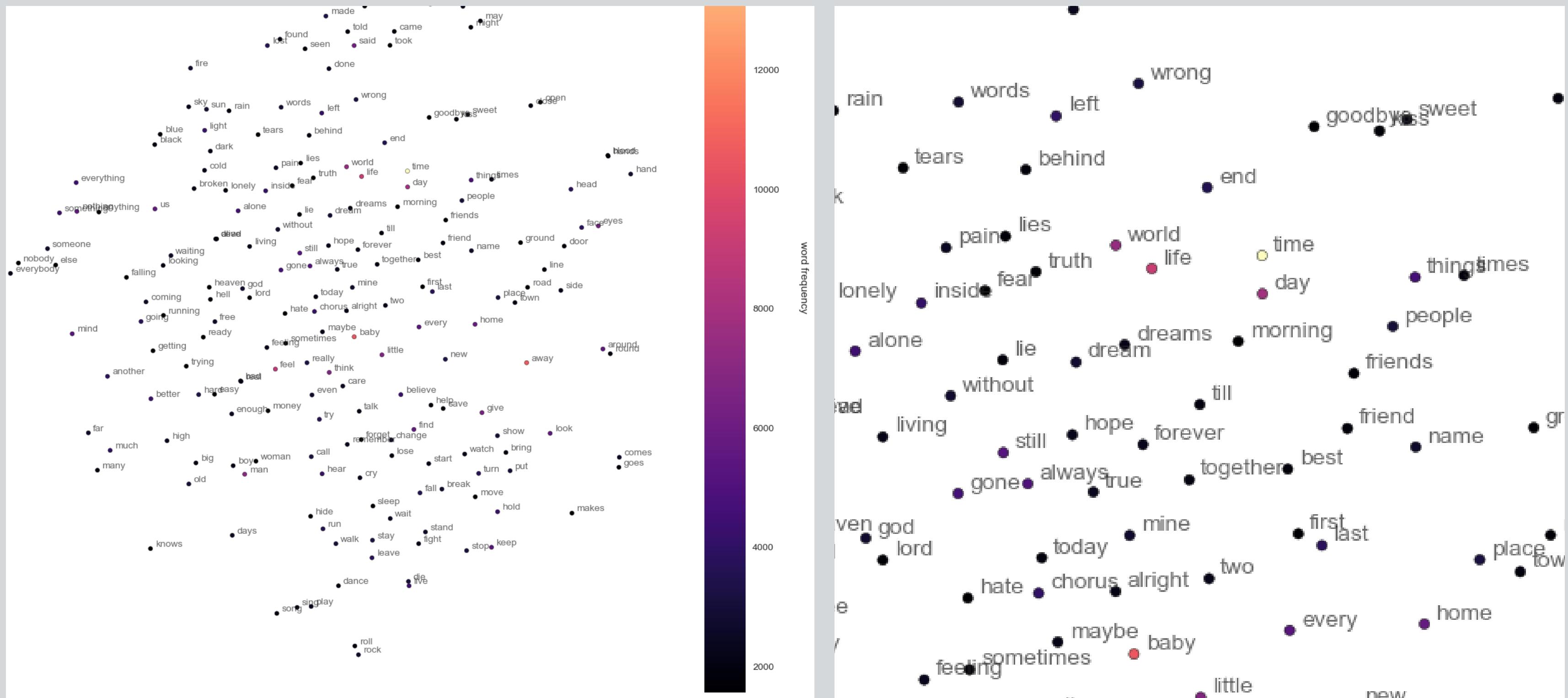
For each topic



For all documents



WORD FREQUENCY



CLASSIFICATION MODEL

Solving existing issues before model building:

- Imbalanced classes issue solved by using SMOTE
Class 0: 5527, Class 1: 1288, Class 2: 6850, Class 3: 1565, Class 4: 2176 and Class 5: 1367

Splitting Data:

- Data was split by making the newly found topics from topic modeling as Y & the lyrics as X

Logistic Regression



- Training Score:0.9948
- Validation Score:0.9276
- Test Score: 0.9271
- Error Rate: 0.0728

Random Forest

- Training Score:1.0
- Validation Score:0.7804

Decision Tree

- Training Score:1.0
- Validation Score:0.8552

Gradient Boosting

- Training Score:0.9287
- Validation Score:0.8106

Multinomial

- Training Score:0.8660
- Validation Score:0.6673

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▶ 03

▶ 04

▶ 05

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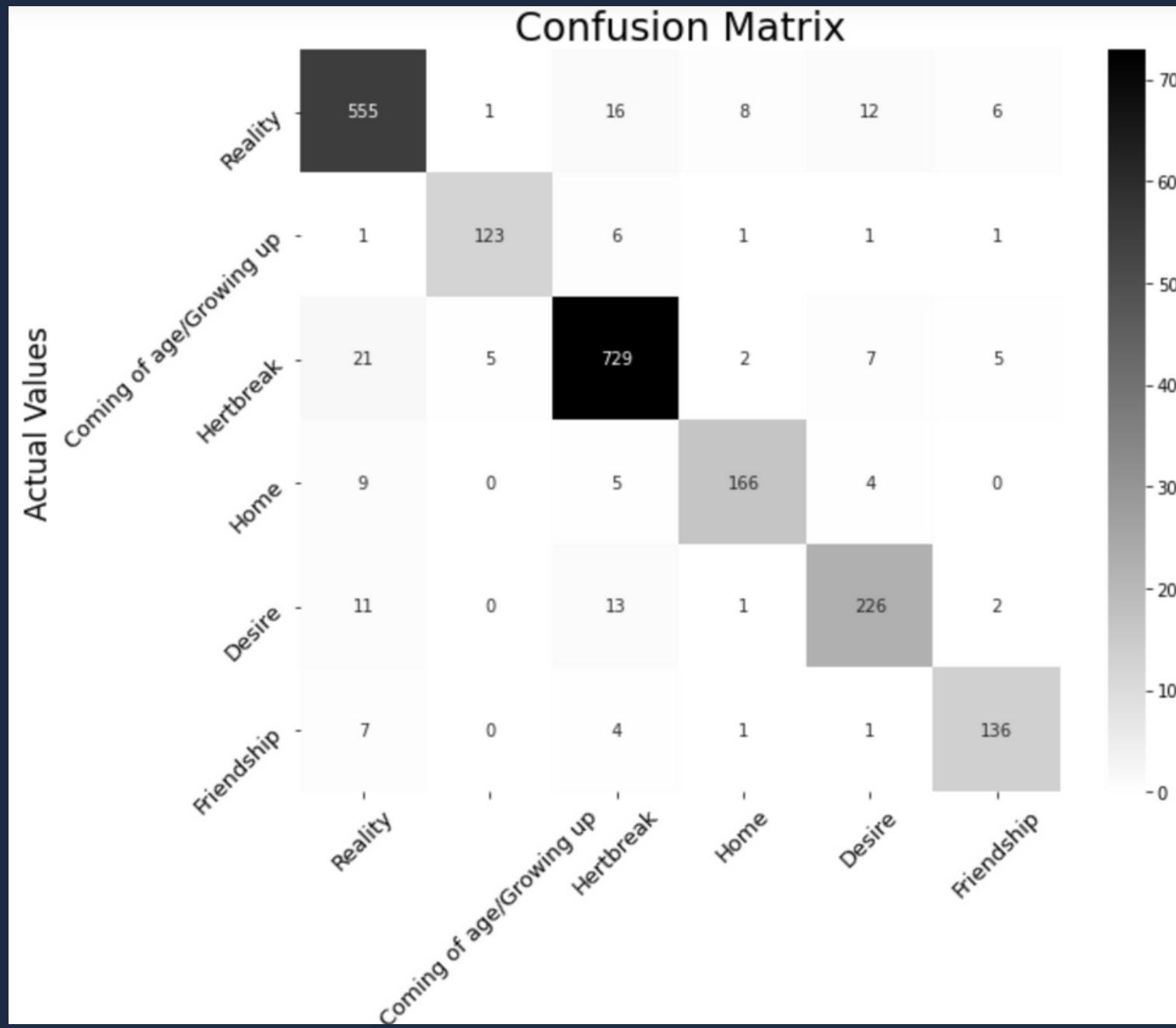
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CONFUSION MATRIX & PREDICTION

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You've Got a Friend in Me
Toy Story

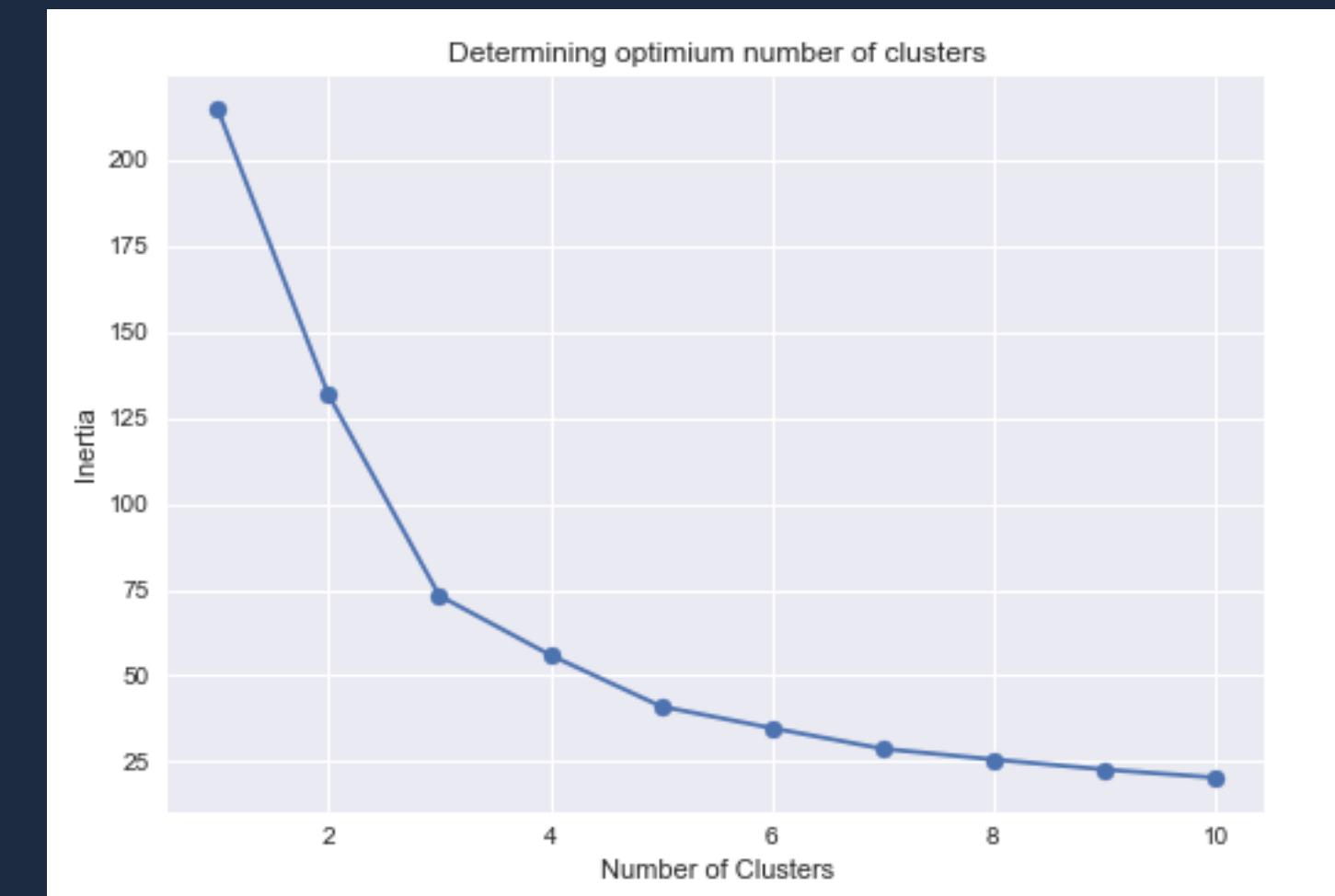
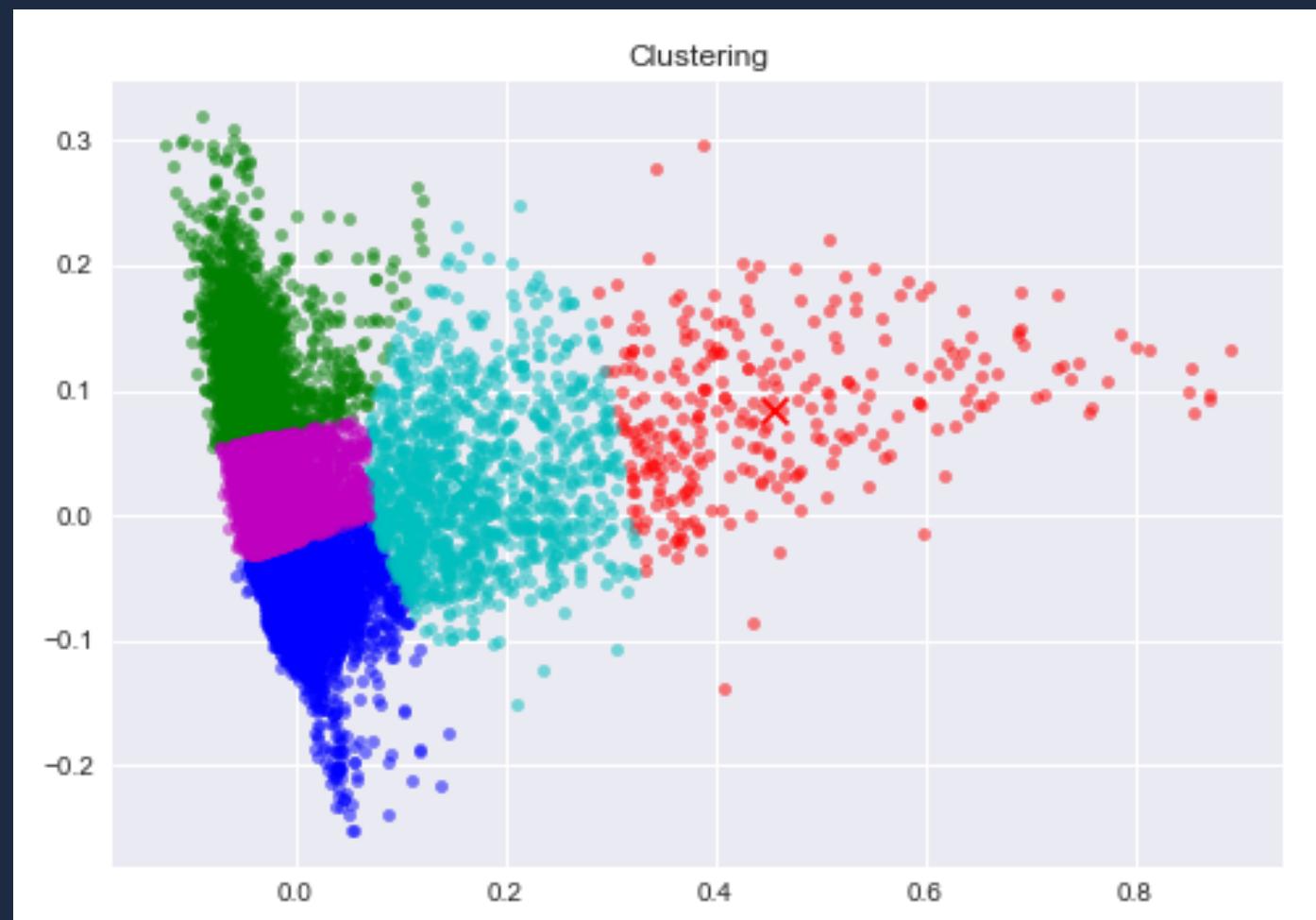


You've got a friend in me You've got a friend in me When the road looks rough ahead And you're miles and miles From y our nice warm bed You just remember what your old pal said Boy, you've got a friend in me Yeah, you've got a friend i n me You've got a friend in me You've got a friend in me You got troubles, I've got 'em too There isn't anything I wo uldn't do for you We stick together and see it through 'Cause you've got a friend in me You've got a friend in me .
The topic of this song is: ---> : (Friendship)

CLUSTERING

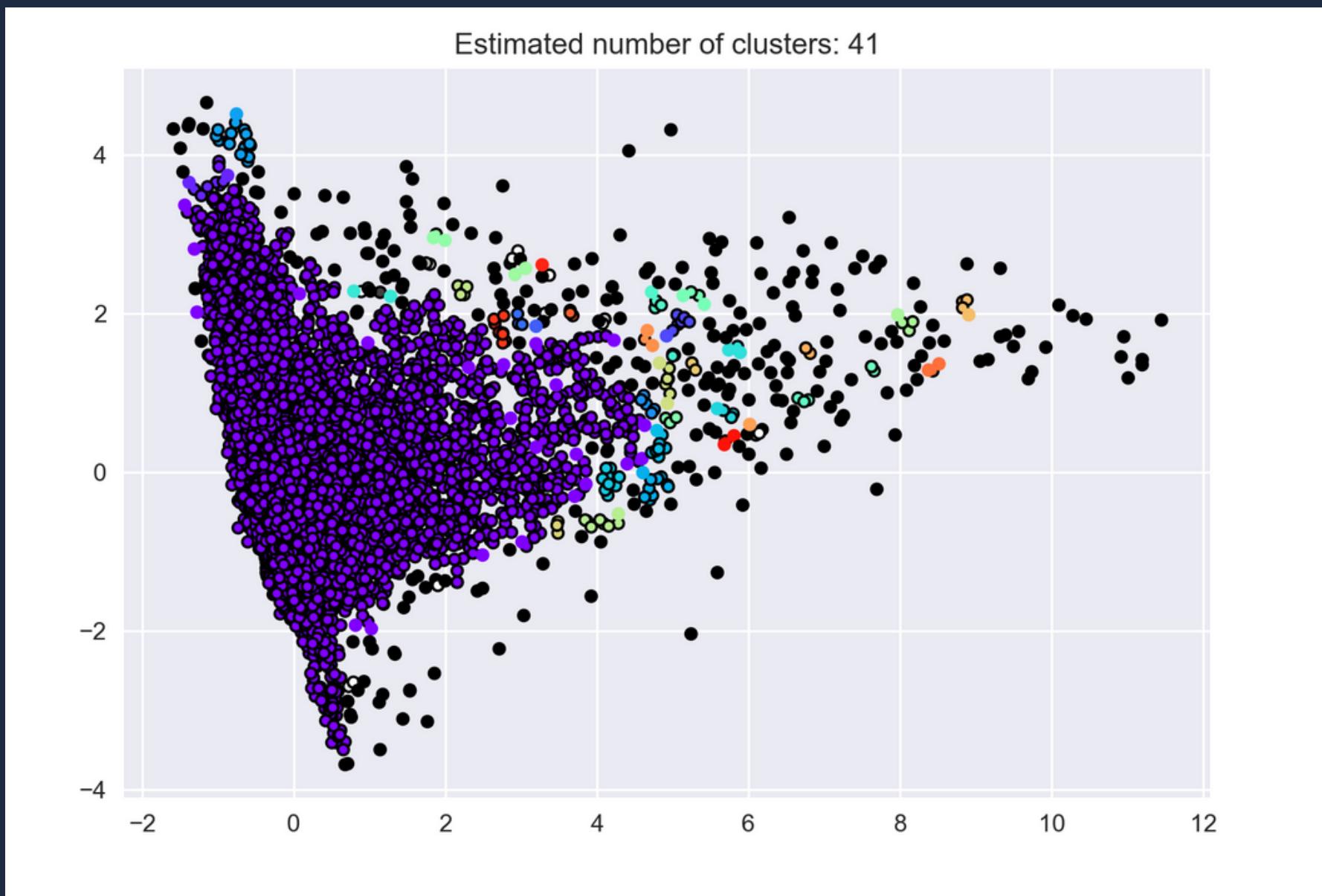
Using KMeans Clustering

- Best number of clusters is 5



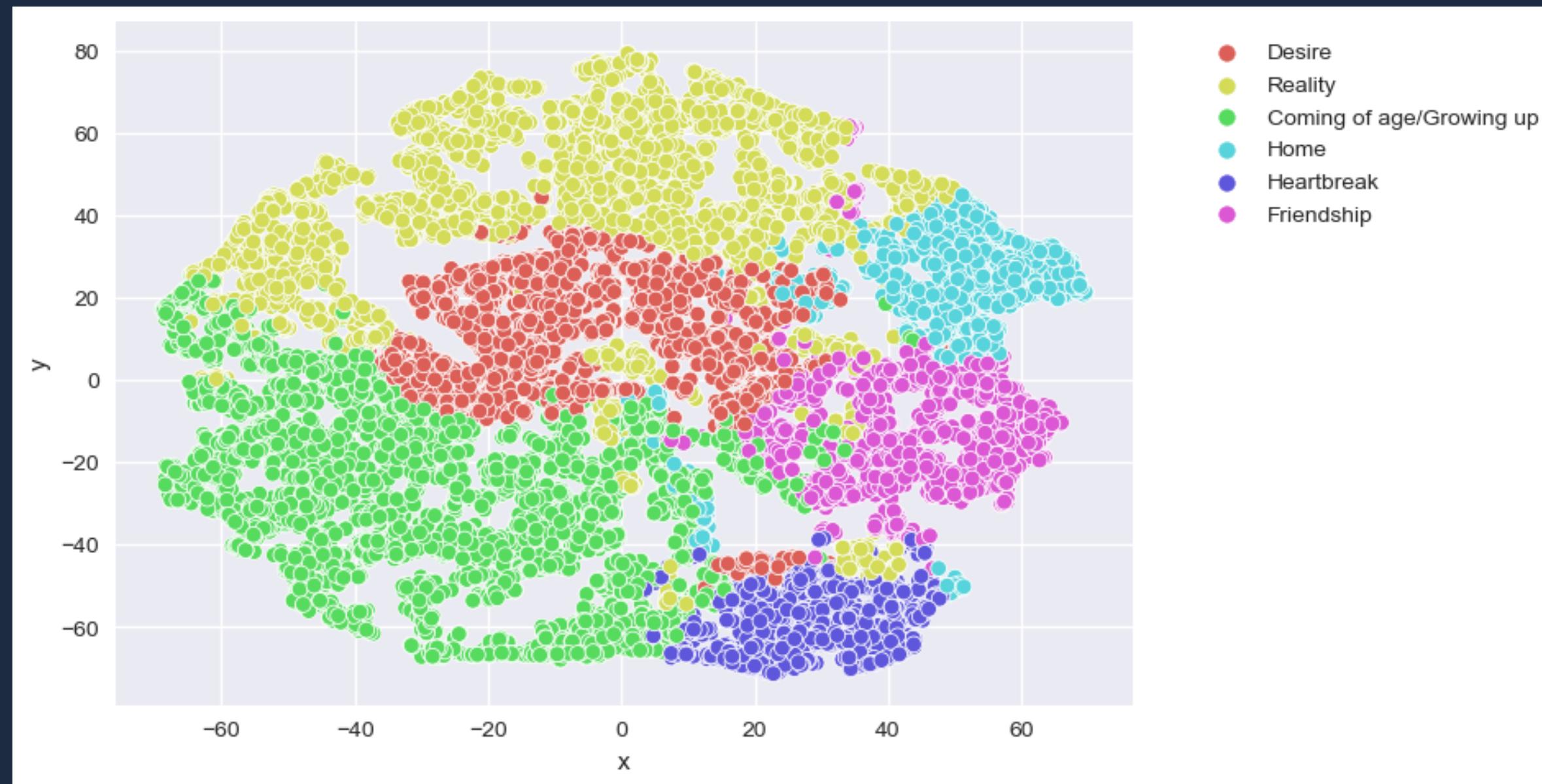
CLUSTERING

Using DBSCAN Clustering

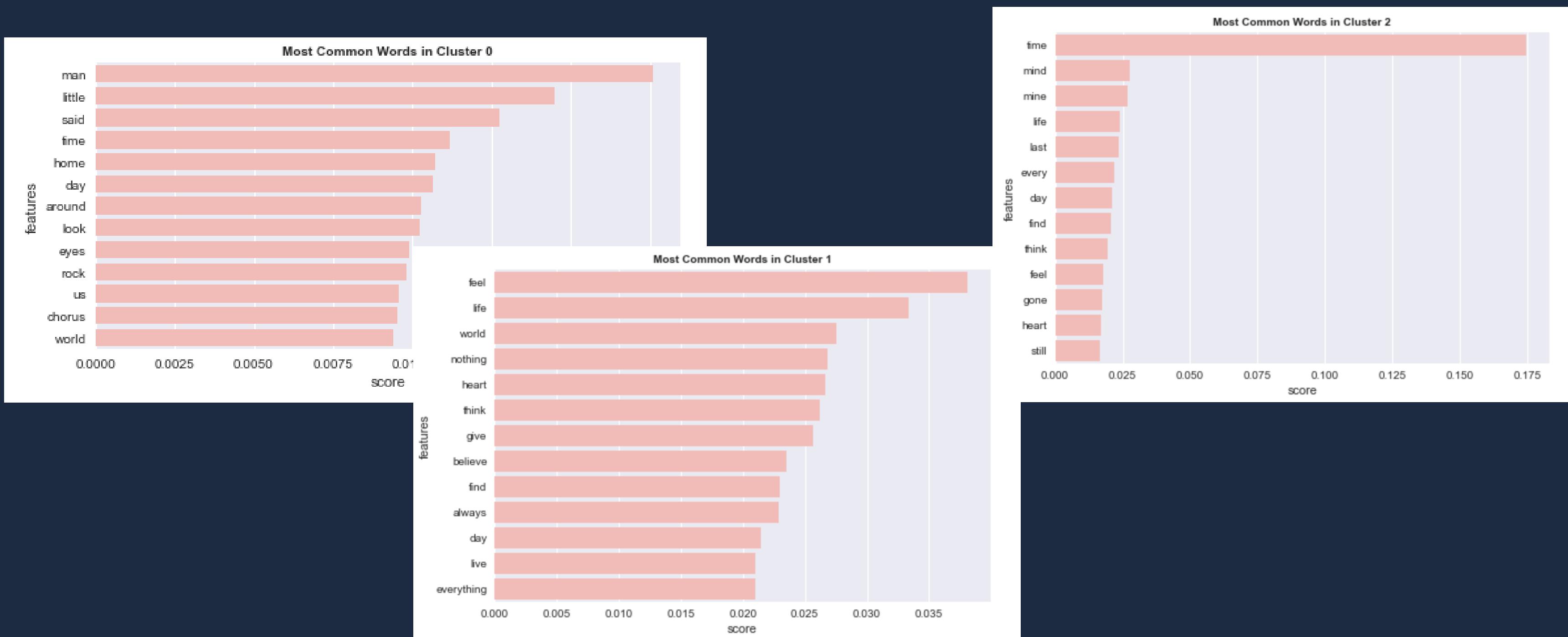


CLUSTERING

Using TSNE



WORD FOR EACH CLUSTER

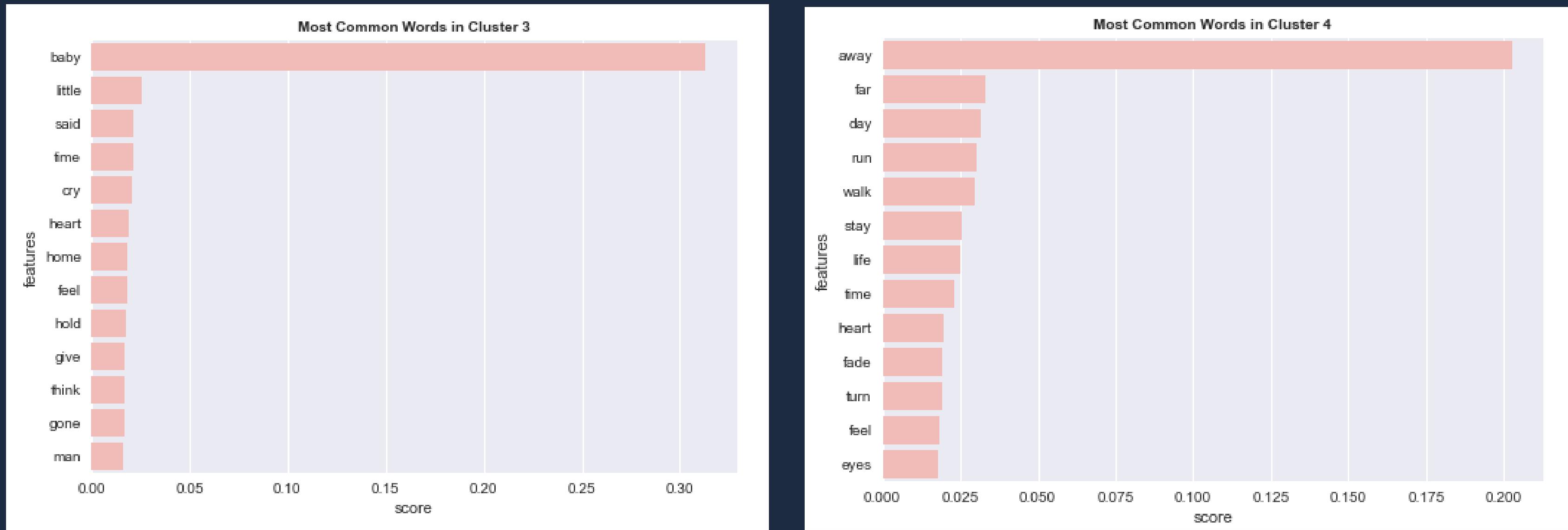


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WORD FOR EACH CLUSTER

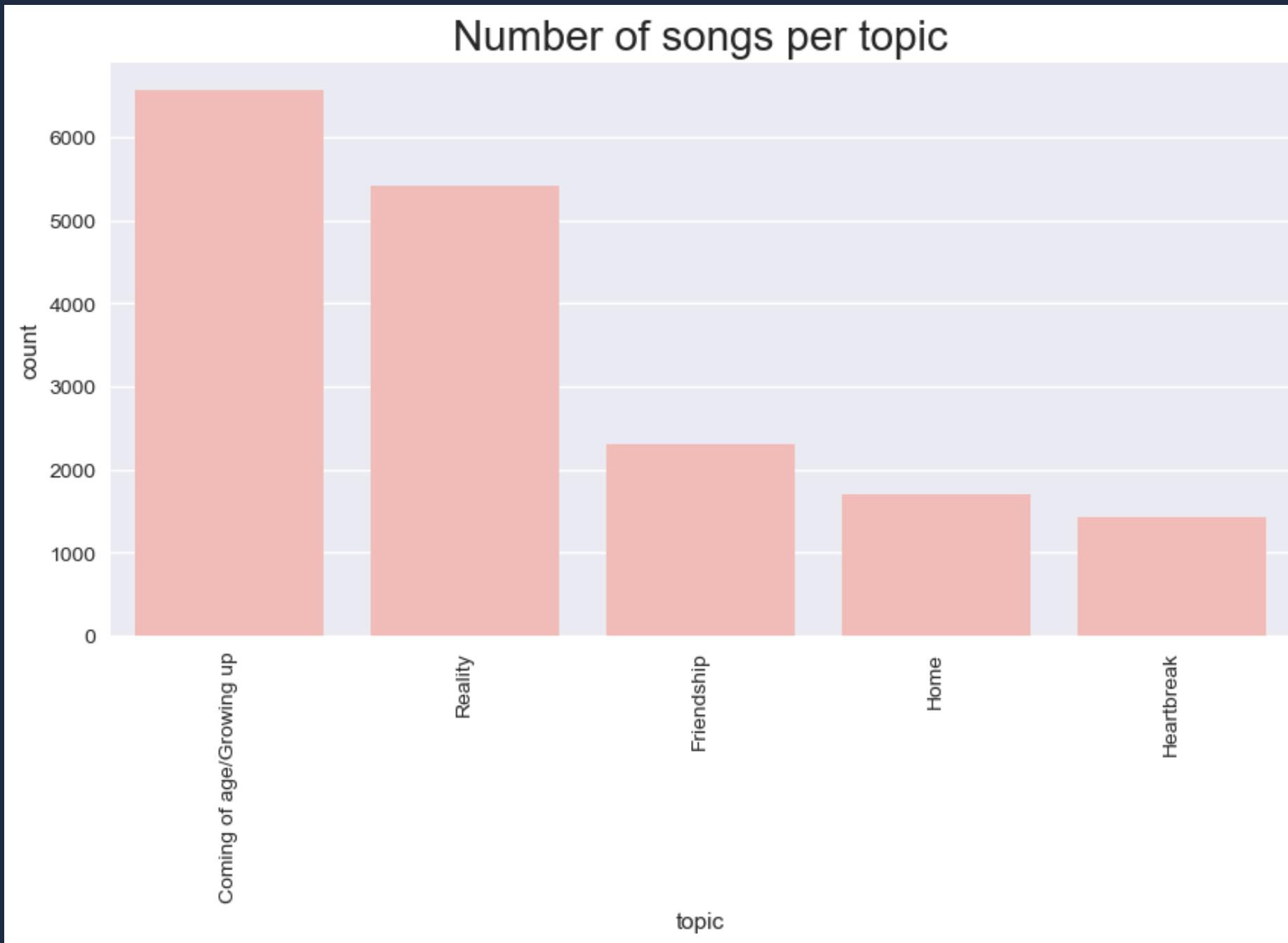


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SCATTER TEXT



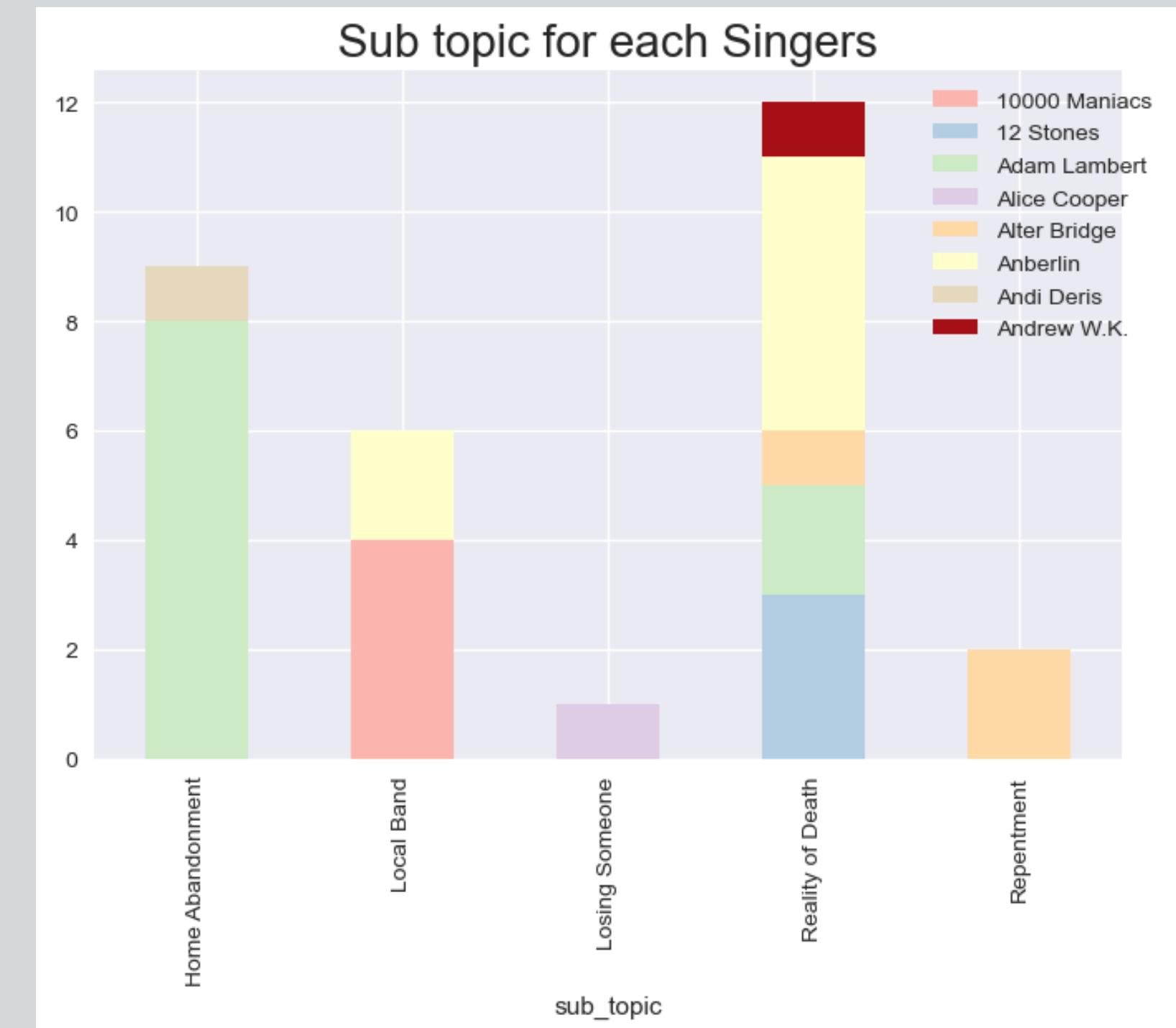
Multi-Category

- Only plotted the most popular topics among singers
- Coming of Age - Growing up
 - Reality



Derived sub-topics by using Corex and applied anchors to each document in the main topic

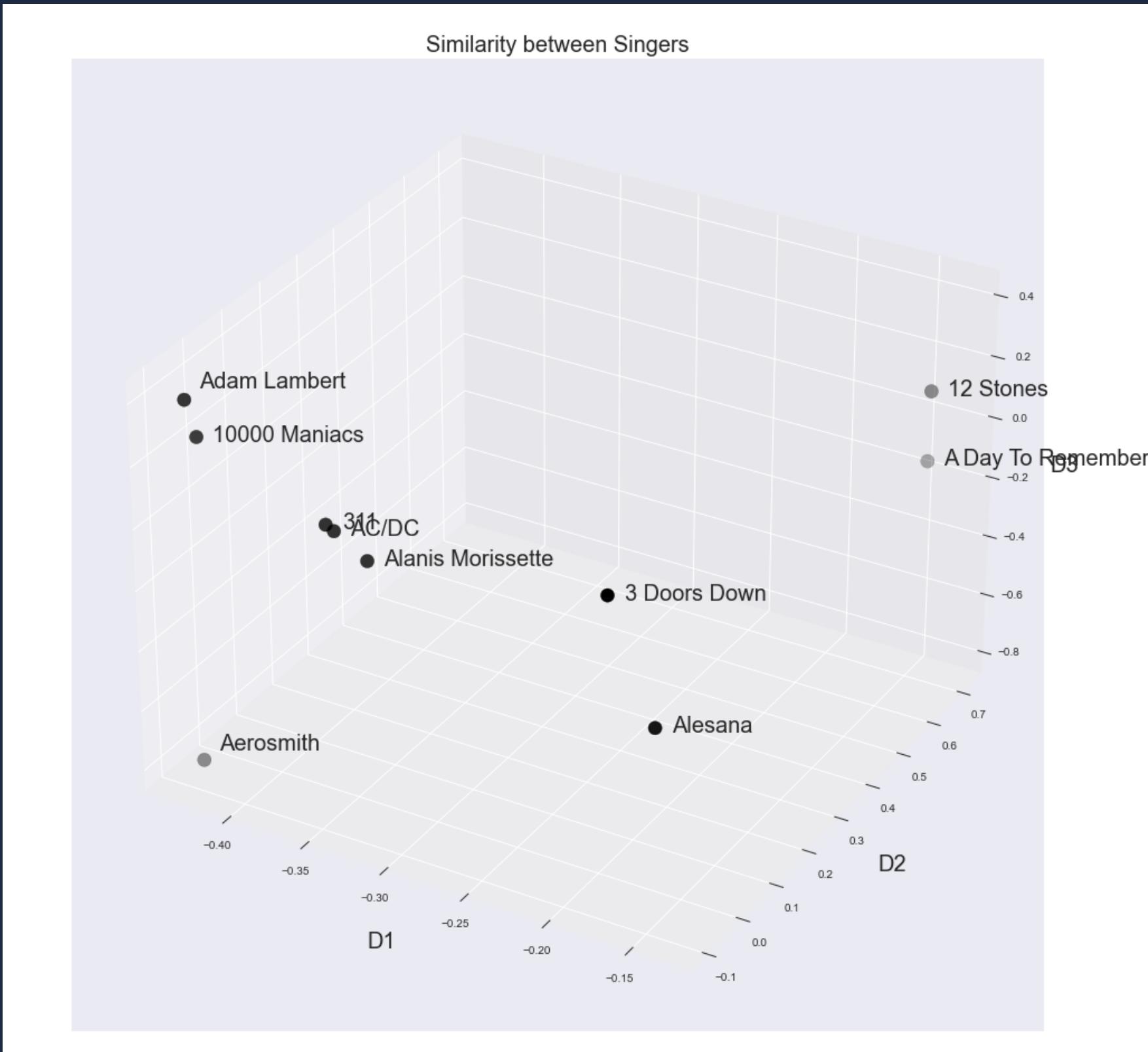
- Reality: Life & Die
 - Heartbreak: Cry & Heart
 - Coming of Age - Growing up: Little & Old
 - Friendship: Friend
 - Home: Away & Home
 - Desire: Think & Believe
-
- Reality: Reality of death
 - Heartbreak: Loss of someone
 - Coming of Age - Growing up: Local band
 - Friendship: The end of a friendship
 - Home: Home abandonment
 - Desire: Repentment



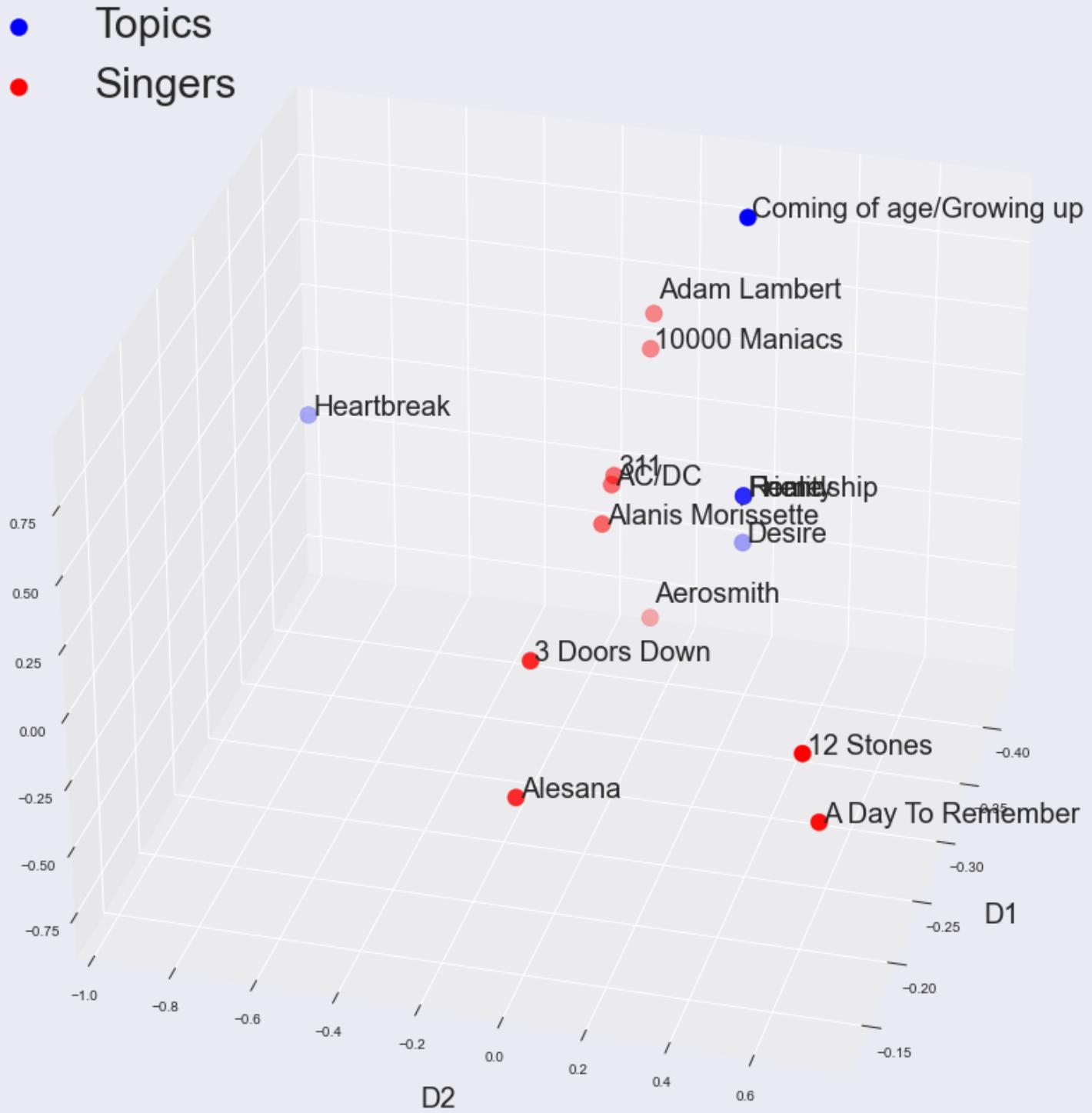
RECOMMENDER SYSTEM

Recommender system for singers

- Recommends possible collabs between similar artists
- Since 311, AC/DC and Alanis Morissette are similar based on the topics they sing about. A collab would be successful



Similarity between Artists and Topics



RECOMMENDER SYSTEM

Recommender system for singers & topics

- Recommends possible topics between similar artists and topics
- Since 311, AC/DC and Alanis Morissette are similar based on the topics they sing about. They should try out similar topics like: Friendship, Home, Reality and Desire

RECOMMENDER SYSTEM

After building the recommender system for both singers and topics. It suggests the following:

- Artists who usually sing about Coming of Age - Growing up they should try to sing about Friendship & Home next
- Artist Alanis Morissette is most similar to Artist 311 and Alanis Morissette should try out the topics 311 usually sings about and they are: Coming of Age - Growing up, Home, Reality, Friendship and Desire





Thank you for listening

Any questions?

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