# content_filtering

December 6, 2023

[54]:
```
# lib
import pandas as pd
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.metrics.pairwise import cosine_similarity
import ast
import matplotlib.pyplot as plt
```

[55]:
```
# Function to convert stringified lists/dictionaries to lists/dictionaries
def parse_stringified_json(data_str):
    try:
        return ast.literal_eval(data_str)
    except:
        return []

# Load and clean the movie metadata
def clean_data(metadata_path):
    # Load data
    movies_metadata = pd.read_csv(metadata_path)
    print(movies_metadata.shape)

    # Select relevant columns
    relevant_columns = ['id', 'title', 'genres', 'overview']
    movies_metadata = movies_metadata[relevant_columns]

    # Handle missing values
    movies_metadata.dropna(inplace=True)

    # Remove duplicates
    movies_metadata.drop_duplicates(subset='id', keep='first', inplace=True)

    # Convert 'id' to int
    movies_metadata['id'] = pd.to_numeric(movies_metadata['id'],␣
 ↪errors='coerce')
    movies_metadata.dropna(subset=['id'], inplace=True)
    movies_metadata['id'] = movies_metadata['id'].astype(int)

    # Parse genres from stringified JSON to list
```

```
    movies_metadata['genres'] = movies_metadata['genres'].
↪apply(parse_stringified_json)
    movies_metadata['genres'] = movies_metadata['genres'].apply(lambda x: ' '.
↪join([i['name'] for i in x]))

    # Combine genres and overview for feature extraction
    movies_metadata['combined_features'] = movies_metadata['genres'] + " " +␣
↪movies_metadata['overview']

    return movies_metadata

metadata_path = 'data/Movie/movies_metadata.csv'

movies_metadata = clean_data(metadata_path)
movies_metadata.head(5)
```

```
C:\Users\yi_ch\AppData\Local\Temp\ipykernel_35436\48314276.py:11: DtypeWarning:
Columns (10) have mixed types. Specify dtype option on import or set
low_memory=False.
  movies_metadata = pd.read_csv(metadata_path)
```

```
(45466, 24)
```

[55]:

| | id | title | genres | \ |
|---|---|---|---|---|
| 0 | 862 | Toy Story | Animation Comedy Family | |
| 1 | 8844 | Jumanji | Adventure Fantasy Family | |
| 2 | 15602 | Grumpier Old Men | Romance Comedy | |
| 3 | 31357 | Waiting to Exhale | Comedy Drama Romance | |
| 4 | 11862 | Father of the Bride Part II | Comedy | |

| | overview | \ |
|---|---|---|
| 0 | Led by Woody, Andy's toys live happily in his … | |
| 1 | When siblings Judy and Peter discover an encha… | |
| 2 | A family wedding reignites the ancient feud be… | |
| 3 | Cheated on, mistreated and stepped on, the wom… | |
| 4 | Just when George Banks has recovered from his … | |

| | combined_features |
|---|---|
| 0 | Animation Comedy Family Led by Woody, Andy's t… |
| 1 | Adventure Fantasy Family When siblings Judy an… |
| 2 | Romance Comedy A family wedding reignites the … |
| 3 | Comedy Drama Romance Cheated on, mistreated an… |
| 4 | Comedy Just when George Banks has recovered fr… |

### TF-IDF with 2000 features

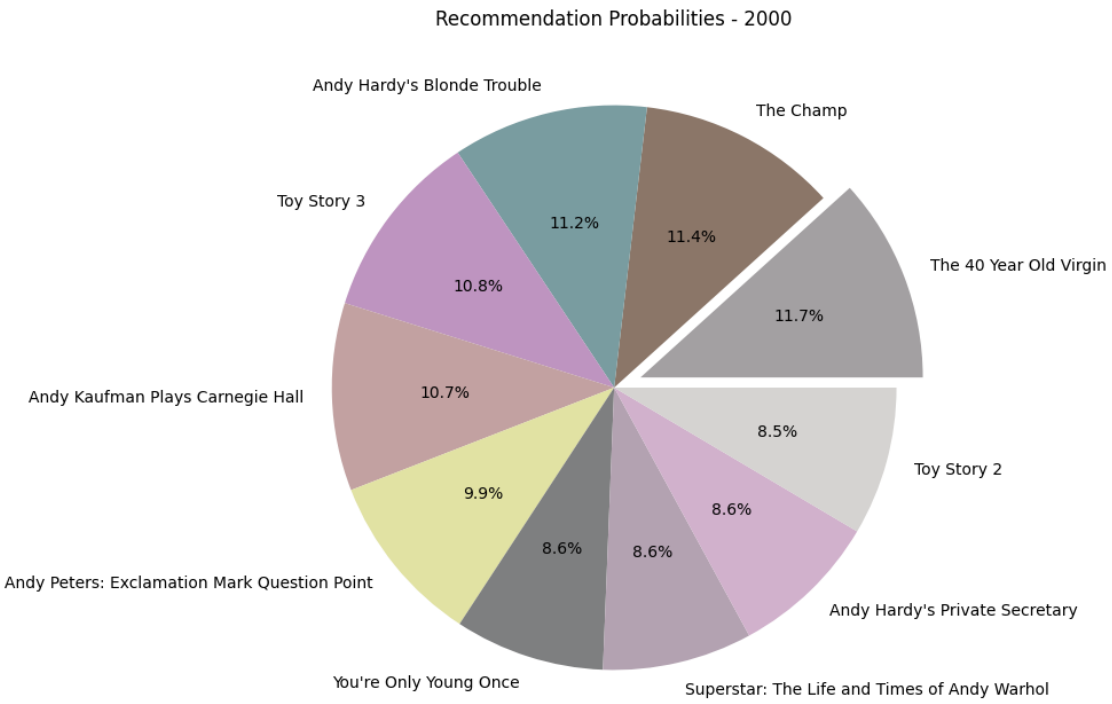
[56]:
```
# 2000 features
# Feature extraction and similarity calculation
max_features = 2000  # Limiting to 2000 features
```

```
tfidf_vectorizer = TfidfVectorizer(stop_words='english',␣
 ↪max_features=max_features)
tfidf_matrix = tfidf_vectorizer.
 ↪fit_transform(movies_metadata['combined_features'])
cosine_sim = cosine_similarity(tfidf_matrix, tfidf_matrix)

# Recommendation function
def recommend_movies_with_scores(movie_id, cosine_sim, movies_metadata,␣
 ↪top_n=10):
    if movie_id not in movies_metadata['id'].values:
        return "Movie ID not found."
    idx = movies_metadata.index[movies_metadata['id'] == movie_id].tolist()[0]
    sim_scores = list(enumerate(cosine_sim[idx]))
    sim_scores = sorted(sim_scores, key=lambda x: x[1], reverse=True)
    sim_scores = sim_scores[1:top_n+1]
    movie_indices = [i[0] for i in sim_scores]
    movie_scores = [i[1] for i in sim_scores]
    return movies_metadata['title'].iloc[movie_indices].tolist(), movie_scores

# Running the recommendation system with scores
movie_id = 862  # Toy Story
recommended_movies, scores = recommend_movies_with_scores(movie_id, cosine_sim,␣
 ↪movies_metadata)

# Creating a pie chart for the recommendation probabilities
colors = ['#a3a0a2', '#8b7668', '#799ca0', '#be94c0', '#c2a1a1', '#e1e2a3',␣
 ↪'#7e7f80', '#b3a2b1', '#d1b1cc', '#d5d3d1']
max_score = scores.index(max(scores))
explode = [0.1 if i == max_score else 0 for i in range(len(scores))]
plt.figure(figsize=(8, 8))
plt.pie(scores, labels=recommended_movies, autopct='%1.1f%%', colors = colors,␣
 ↪explode = explode)
plt.title('Recommendation Probabilities - 2000')
plt.show()
```




[57]:
```
input_movie_genre = movies_metadata[movies_metadata['id']==movie_id]['genres']
input_movie_genre
```

[57]:
```
0    Animation Comedy Family
Name: genres, dtype: object
```

[58]:
```
for x in recommended_movies:
    genres = movies_metadata[movies_metadata['title'] == x]['genres'].values
    print(list(genres))
```

```
['Comedy Romance']
['Drama Family', 'Drama']
['Comedy Family Romance']
['Animation Family Comedy']
['']
['Comedy']
['Comedy Romance']
['Documentary']
['Comedy Romance']
['Animation Comedy Family']
```

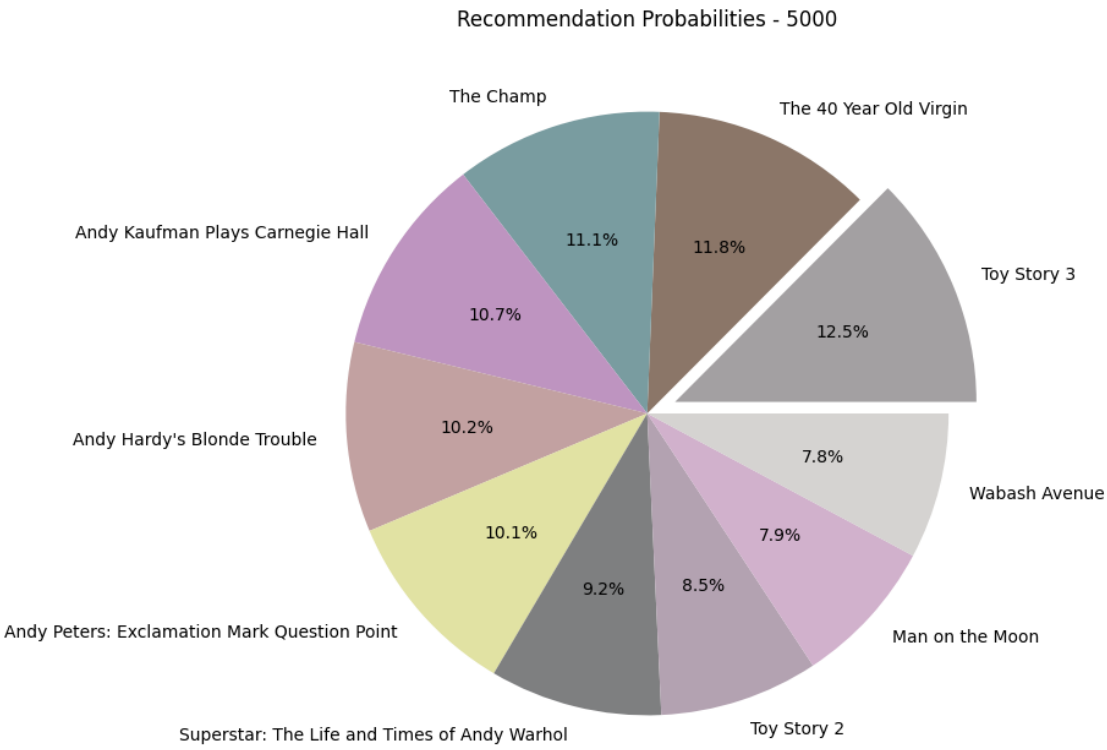
### TF-IDF with 5000 features

[59]:
```
# 5000 features
# Feature extraction and similarity calculation
max_features = 5000  # Limiting to 5000 features
tfidf_vectorizer = TfidfVectorizer(stop_words='english',␣
 ↪max_features=max_features)
tfidf_matrix = tfidf_vectorizer.
 ↪fit_transform(movies_metadata['combined_features'])
cosine_sim = cosine_similarity(tfidf_matrix, tfidf_matrix)

# Recommendation function
def recommend_movies_with_scores(movie_id, cosine_sim, movies_metadata,␣
 ↪top_n=10):
    if movie_id not in movies_metadata['id'].values:
        return "Movie ID not found."
    idx = movies_metadata.index[movies_metadata['id'] == movie_id].tolist()[0]
    sim_scores = list(enumerate(cosine_sim[idx]))
    sim_scores = sorted(sim_scores, key=lambda x: x[1], reverse=True)
    sim_scores = sim_scores[1:top_n+1]
    movie_indices = [i[0] for i in sim_scores]
    movie_scores = [i[1] for i in sim_scores]
    return movies_metadata['title'].iloc[movie_indices].tolist(), movie_scores

# Running the recommendation system with scores
movie_id = 862  # Toy Story
recommended_movies, scores = recommend_movies_with_scores(movie_id, cosine_sim,␣
 ↪movies_metadata)

# Creating a pie chart for the recommendation probabilities
colors = ['#a3a0a2', '#8b7668', '#799ca0', '#be94c0', '#c2a1a1', '#e1e2a3',␣
 ↪'#7e7f80', '#b3a2b1', '#d1b1cc', '#d5d3d1']
max_score = scores.index(max(scores))
explode = [0.1 if i == max_score else 0 for i in range(len(scores))]
plt.figure(figsize=(8, 8))
plt.pie(scores, labels=recommended_movies, autopct='%1.1f%%', colors = colors,␣
 ↪explode = explode)
plt.title('Recommendation Probabilities - 5000')
plt.show()
```




[60]:
```
input_movie_genre = movies_metadata[movies_metadata['id']==movie_id]['genres']
input_movie_genre
```

[60]:
```
0    Animation Comedy Family
Name: genres, dtype: object
```

[61]:
```
for x in recommended_movies:
    genres = movies_metadata[movies_metadata['title'] == x]['genres'].values
    print(list(genres))
```

```
['Animation Family Comedy']
['Comedy Romance']
['Drama Family', 'Drama']
['']
['Comedy Family Romance']
['Comedy']
['Documentary']
['Animation Comedy Family']
['Comedy Drama Romance']
['Music']
```

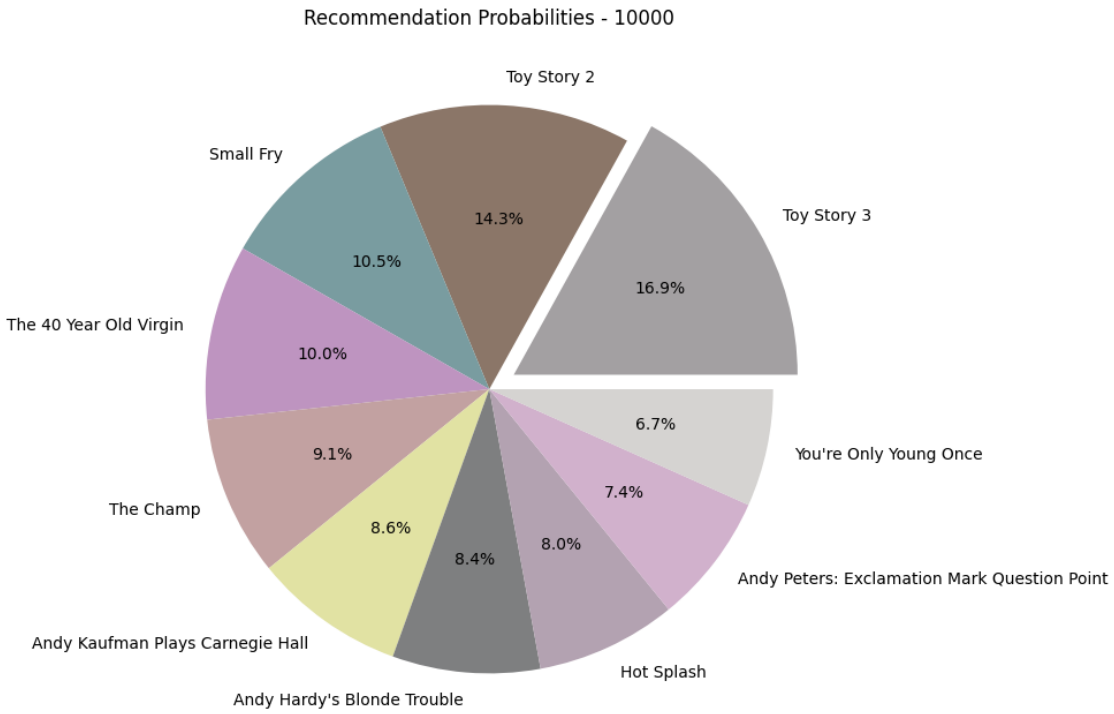
### TF-IDF with 10000 features

[62]:
```
# 10000 features
# Feature extraction and similarity calculation
max_features = 10000  # Limiting to 10000 features
tfidf_vectorizer = TfidfVectorizer(stop_words='english',␣
 ↪max_features=max_features)
tfidf_matrix = tfidf_vectorizer.
 ↪fit_transform(movies_metadata['combined_features'])
cosine_sim = cosine_similarity(tfidf_matrix, tfidf_matrix)

# Recommendation function
def recommend_movies_with_scores(movie_id, cosine_sim, movies_metadata,␣
 ↪top_n=10):
    if movie_id not in movies_metadata['id'].values:
        return "Movie ID not found."
    idx = movies_metadata.index[movies_metadata['id'] == movie_id].tolist()[0]
    sim_scores = list(enumerate(cosine_sim[idx]))
    sim_scores = sorted(sim_scores, key=lambda x: x[1], reverse=True)
    sim_scores = sim_scores[1:top_n+1]
    movie_indices = [i[0] for i in sim_scores]
    movie_scores = [i[1] for i in sim_scores]
    return movies_metadata['title'].iloc[movie_indices].tolist(), movie_scores

# Running the recommendation system with scores
movie_id = 862  # Toy Story
recommended_movies, scores = recommend_movies_with_scores(movie_id, cosine_sim,␣
 ↪movies_metadata)

# Creating a pie chart for the recommendation probabilities
colors = ['#a3a0a2', '#8b7668', '#799ca0', '#be94c0', '#c2a1a1', '#e1e2a3',␣
 ↪'#7e7f80', '#b3a2b1', '#d1b1cc', '#d5d3d1']
max_score = scores.index(max(scores))
explode = [0.1 if i == max_score else 0 for i in range(len(scores))]
plt.figure(figsize=(8, 8))
plt.pie(scores, labels=recommended_movies, autopct='%1.1f%%', colors = colors,␣
 ↪explode = explode)
plt.title('Recommendation Probabilities - 10000')
plt.show()
```




[63]:
```
input_movie_genre = movies_metadata[movies_metadata['id']==movie_id]['genres']
input_movie_genre
```

[63]:
```
0    Animation Comedy Family
Name: genres, dtype: object
```

[64]:
```
for x in recommended_movies:
    genres = movies_metadata[movies_metadata['title'] == x]['genres'].values
    print(list(genres))
```

```
['Animation Family Comedy']
['Animation Comedy Family']
['Animation Family']
['Comedy Romance']
['Drama Family', 'Drama']
['']
['Comedy Family Romance']
['']
['Comedy']
['Comedy Romance']
```