

Homework 3: Search for Movie Plots

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Recommendation

All three models have their own pros and cons. The baseline semantic search model is the simplest and most easily understandable model out of the three, but performed the worst out of the three [1]. The BM25 lexical search model is probably less computationally demanding than the other two semantic models and is really only good at matching keyword frequencies [2]. The Reranker semantic search model is the most computationally demanding out of the three but has greater depth as it is able to build upon the baseline semantic search model [3].

Production

Before putting the model into production, I would recommend understanding the use case a bit more. For example, are we expecting the search tool to work more like Google or more like a library's research database? This will help us anticipate the types of queries users might enter. On paper, we can examine the final experiment results between the three models [5]. The highest performing models are BM25 and Reranker. However, we can look at specific examples and notice that BM25 and Reranker perform better using different queries. BM25 seems to do better with shorter, vague queries as opposed to Reranker which needs more context in its queries. Thus, understanding and defining the use case more can help us decide between them.

RAG/LLMs

The results using RAG/LLMs are not as strong as the three aforementioned models. We can evaluate the model's performance using the two metrics as we have established, Recall@1 and Mean Reciprocal Rank, but just from observation we notice that it is worse. It only successfully retrieved 2 ground truth movies from the 6 example queries [4]. The major factors that affect the model's performance are its tendencies to hallucinate and generate movies that might not even be part of the given dataset. Further investigation may be needed into refining this method and relevant steps, such as prompt engineering.

Fine Tuning

I believe fine tuning is a great idea, assuming we have lots of golden data and resources to make it happen. Investments would need to be made on all ends, time, money, and computational resources, and golden data in order to really make the effort and gain of fine tuning pre-trained models worthwhile.

Appendix

[1] Baseline Semantic Search Model

Query	Ground Truth Movie	Results
"Documentaries showcasing indigenous peoples' survival and daily life in Arctic regions"	'Nanook of the North'	<ol style="list-style-type: none">1. 0.457, 'Nanook of the North'2. 0.264, 'David Copperfield'3. 0.252, 'Straight Shooting'4. 0.244, 'The Frozen North'5. 0.237, 'The Boy Friend'
"Western romance"	'The Lucky Horseshoe'	<ol style="list-style-type: none">1. 0.305, 'The Great Gatsby'2. 0.295, 'Youth's Endearing Charm'3. 0.283, 'Frankenstein'4. 0.280, 'High Society Blues'5. 0.277, 'Romance'
"Silent film about a Parisian star moving to Egypt, leaving her husband for a baron, and later reconciling after finding her family in poverty in Cairo."	'Sahara'	<ol style="list-style-type: none">1. 0.449, 'Married in Hollywood'2. 0.394, 'The King on Main Street'3. 0.392, 'Sahara'4. 0.389, 'One Hysterical Night'5. 0.388, 'Bound in Morocco'
"Comedy film, office disguises, boss's daughter, elopement."	'Ask Father'	<ol style="list-style-type: none">1. 0.403, 'Youth's Endearing Charm'2. 0.400, 'Dressed to Kill'3. 0.398, 'The Boy Friend'4. 0.390, 'A Little Journey'5. 0.373, 'This Is Heaven'
"Lost film, Cleopatra charms Caesar, plots world rule, treasures from mummy, revels with Antony, tragic end with serpent in Alexandria."	'Cleopatra'	<ol style="list-style-type: none">1. 0.537, 'Cleopatra'2. 0.365, 'The Lost World'3. 0.358, 'The Man Who Lost Himself'4. 0.353, 'The Golden Louis'5. 0.337, 'Reaching for the Moon'
"Denis Gage Deane-Tanner"	'Captain Alvarez'	<ol style="list-style-type: none">1. 0.365, 'Souls for Sale'2. 0.363, 'The Man in Possession'3. 0.344, 'The Man from Blankley's'4. 0.333, 'Blind Youth'5. 0.303, 'Old Clothes'

[2] BM25 Lexical Search Model

Query	Ground Truth Movie	Results
"Documentaries showcasing indigenous peoples' survival and daily life in Arctic regions"	'Nanook of the North'	<ol style="list-style-type: none"> 1. 9.241, 'I Do' 2. 8.233, 'Uncharted Seas' 3. 6.430, 'Powers that Prey' 4. 4.977, 'Rough Waters' 5. 4.425, 'The King of Kings'
"Western romance"	'The Lucky Horseshoe'	<ol style="list-style-type: none"> 1. 6.245, 'The Call of the Wild' 2. 5.915, 'Romance' 3. 5.534, 'Four Sons' 4. 5.406, 'A Man's Fight' 5. 5.308, 'Gun Smoke'
"Silent film about a Parisian star moving to Egypt, leaving her husband for a baron, and later reconciling after finding her family in poverty in Cairo."	'Sahara'	<ol style="list-style-type: none"> 1. 35.189, 'Sahara' 2. 16.194, 'He Who Gets Slapped' 3. 14.018, 'Inspiration' 4. 13.940, 'A Lad from Old Ireland' 5. 12.716, 'The Maltese Falcon'
"Comedy film, office disguises, boss's daughter, elopement."	'Ask Father'	<ol style="list-style-type: none"> 1. 13.079, 'Mabel's Blunder' 2. 9.579, 'Bucking Broadway' 3. 8.525, 'Ask Father' 4. 8.119, 'The Front Page' 5. 7.893, 'His Wedding Night'
"Lost film, Cleopatra charms Caesar, plots world rule, treasures from mummy, revels with Antony, tragic end with serpent in Alexandria."	'Cleopatra'	<ol style="list-style-type: none"> 1. 71.493, 'Cleopatra' 2. 10.778, 'Captain Applejack' 3. 9.089, 'Fair Lady' 4. 8.353, 'Reaching for the Moon' 5. 8.273, 'Tom Sawyer'
"Denis Gage Deane-Tanner"	'Captain Alvarez'	<ol style="list-style-type: none"> 1. 29.003, 'Captain Alvarez' 2. 4.123, 'Hangman's House' 3. 0.000, 'Red Courage' 4. 0.000, 'The Sea Lion' 5. 0.000, 'A Sailor-Made Man'

[3] Reranker Semantic Search Model

Query	Ground Truth Movie	Results (after applying softmax)
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“Documentaries showcasing indigenous peoples' survival and daily life in Arctic regions“	‘Nanook of the North’	1. 0.989, ‘Nanook of the North’ 2. 0.006, ‘The Frozen North’ 3. 0.002, ‘The Big Trail’ 4. 0.001, ‘David Copperfield’ 5. 0.001, ‘Straight Shooting’
“Western romance”	‘The Lucky Horseshoe’	1. 0.979, ‘Romance’ 2. 0.018, ‘Married in Hollywood’ 3. 0.001, ‘The Great Gatsby’ 4. 0.001, ‘Youth’s Endearing Charm’ 5. 0.001, ‘Frankenstein’
“Silent film about a Parisian star moving to Egypt, leaving her husband for a baron, and later reconciling after finding her family in poverty in Cairo.“	‘Sahara’	1. 1.000, ‘Sahara’ 2. 0.000, ‘A Little Journey’ 3. 0.000, ‘The Golden Louis’ 4. 0.000, ‘Married in Hollywood’ 5. 0.000, ‘The King on Main Street’
“Comedy film, office disguises, boss's daughter, elopement.“	‘Ask Father’	1. 0.590, ‘Manhandled’ 2. 0.297, ‘Dressed to Kill’ 3. 0.091, ‘Youth’s Endearing Charm’ 4. 0.014, ‘A Daughter of the Gods’ 5. 0.008, ‘A Little Journey’
“Lost film, Cleopatra charms Caesar, plots world rule, treasures from mummy, revels with Antony, tragic end with serpent in Alexandria.“	‘Cleopatra’	1. 1.000, ‘Cleopatra’ 2. 0.000, ‘The Lost World’ 3. 0.000, ‘The Man Who Lost Himself’ 4. 0.000, ‘The Golden Louis’ 5. 0.000, ‘Reaching for the Moon’
“Denis Gage Deane-Tanner“	‘Captain Alvarez’	1. 0.362, ‘The Man in Possession’ 2. 0.282, ‘The Blot’ 3. 0.161, ‘Souls for Sale’ 4. 0.099, ‘Blind Youth’ 5. 0.096, ‘The Man from Blankey’s’

[4] RAG Model

Query	Ground Truth Movie	Results (only model suggestions)
“Documentaries showcasing indigenous peoples' survival and daily life	‘Nanook of the North’	1. Nanook of the North 2. The Frozen North 3. Blood and Sand 4. The Arctic

in Arctic regions“		5. The Inuit People: A Journey Through the Arctic
“Western romance”	‘The Lucky Horseshoe’	1. "The Road to Romance" 2. "Romance" 3. "The Lone Ranger" 4. "The Good, the Bad and the Ugly" 5. "The Wild Bunch"
“Silent film about a Parisian star moving to Egypt, leaving her husband for a baron, and later reconciling after finding her family in poverty in Cairo.”	‘Sahara’	1. “The Circle” 2. “Married in Hollywood” 3. “Fifty-Fifty” 4. “The Parisian Star” 5. “The Parisian Night”
“Comedy film, office disguises, boss's daughter, elopement.”	‘Ask Father’	1. “The Circle” 2. “Married in Hollywood” 3. “Fifty-Fifty” 4. “The Office Disguises” 5. “Elopement”
“Lost film, Cleopatra charms Caesar, plots world rule, treasures from mummy, revels with Antony, tragic end with serpent in Alexandria.”	‘Cleopatra’	1. Cleopatra 2. Julius Caesar 3. Antony and Cleopatra 4. The Mummy 5. The Serpent and the Rainbow
“Denis Gage Deane-Tanner“	‘Captain Alvarez’	1. The Circle 2. Fifty-Fifty 3. Married in Hollywood 4. The Lady Catherine 5. The Porteous Affair

[5] Experiment Results

	Average Recall@1	Mean Reciprocal Rank (MRR)
Semantic Search	0.33	0.38
BM25	0.50	0.55
Reranker	0.50	0.50