

MIE431 Prompt Engineering Assignment

Natural Language Task: Recommendation

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1.0 Task Definition and Motivation

1.1 Task Description

The main natural language (NL) task for this assignment is recommendation and the chosen subtask is music recommendations given a NL query describing preferences and user's recently liked music

- Inputs: User's NL query describing their specific music preferences and a list of user's recently liked music
- Outputs: A ranked list of 20 songs that closely match the user query based on their similarity to existing items.

1.2 Evaluation Metric

The evaluation metric for this subtask is inter-rater reliability with LLM as the second judge. The metric involves:

- Human Judgments: I will manually assess the relevance of the recommendations produced by GPT-4 for a minimum of 10 examples.
- LLM Judgments: GPT-4 will also evaluate the relevance of the same recommendations using a predefined evaluation prompt.

Relevance will be evaluated on a continuous scale ranging from -1 to 1, where -1 indicates that the recommendation is not relevant at all, 0 signifies partial relevance with some alignment to the query, and 1 represents a highly relevant recommendation that directly matches the user's preferences.

A contingency table will be created to compare human and LLM scores for the 10 examples. The Kappa score will be calculated to assess the agreement between human and LLM judgments.

The evaluation prompt for the LLM will be:

"You are tasked with evaluating the relevance of music recommendations. Each recommendation consists of a song or playlist description provided in response to a user query. Based on the content of the user query and the corresponding song or playlist description, assign a relevance score on a continuous scale from -1 to 1, where:

- 1: The recommendation is highly relevant, perfectly aligning with the user query and preferences.
- 0: The recommendation is partially relevant, aligning with some aspects of the query but not others.
- -1: The recommendation is completely irrelevant, showing no alignment with the user query or preferences.

Provide only the numeric score (e.g., -0.7, 0.3, 0.9) for each example."

1.3 Motivation

The task of query-based music recommendations is highly relevant in real-world applications, particularly in music streaming platforms where personalized recommendations significantly enhance user satisfaction and engagement. With users often seeking music tailored to specific activities, moods, or preferences, a well-performing recommendation system is critical to meeting these expectations.

For instance, a user searching for “energetic music for workout” can benefit from recommendations that align with tempo and mood preferences, ensuring a motivating and enjoyable workout experience. Similarly, a query like “calm instrumental music for relaxation” addresses users’ wellness needs, supporting mental health by curating playlists that reduce stress and aid in focus.

2.0 Data Curation

2.1 Example Listing

User #	Input	Target Output
1	"energetic music for workout pls" Recently liked music: User1 = ["Shape of You - Ed Sheeran", "Blinding Lights - The Weeknd", "Levitating - Dua Lipa ft. DaBaby", "Shallow - Lady Gaga & Bradley Cooper", "drivers license - Olivia Rodrigo", "Good 4 U - Olivia Rodrigo", "Old Town Road - Lil Nas X ft. Billy Ray Cyrus", "Memories - Maroon 5", "Someone You Loved - Lewis Capaldi", "All of Me - John Legend"]	List of 10 energetic, upbeat tempo, exciting music suitable for working out, considering music taste that prefers pop genre with strong beats and rhythms.
2	"Play me relaxing piano music for focus" Recently liked music: User2 = ["Bohemian Rhapsody - Queen", "Hotel California - Eagles", "Smells Like Teen Spirit - Nirvana", "Sweet Child O' Mine - Guns N' Roses", "Highway to Hell - AC/DC", "Comfortably Numb - Pink Floyd", "Stairway to Heaven - Led Zeppelin", "Imagine - John Lennon", "Blackbird - The Beatles", "American Pie - Don McLean"]	List of 10 piano soundtracks that are calm, relaxing, often with slow tempo and simple melodic lines, despite the music taste.
3	"rec some bangers for a road trip, idk maybe some indie songs?" Recently liked music: User3 = ["Sunflower - Post Malone & Swae Lee", "Circles - Post Malone", "Rockstar - Post Malone ft. 21 Savage", "Sicko Mode - Travis Scott", "HUMBLE. - Kendrick Lamar", "DNA. - Kendrick Lamar", "God's Plan - Drake", "Laugh Now Cry Later - Drake ft. Lil Durk", "One Dance - Drake ft. WizKid & Kyla", "Suge - DaBaby"]	List of 10 songs with catchy, melodic hooks that have chill, rhythmic vibes. Based on taste, this user enjoys a mix of hip-hop, pop, and R&B genres. The mood of the songs should be uplifting considering the setting of a road trip.
4	"Suggest popular jaza tracks for a dinner party" Recently liked music: User4 = ["Sugar - Maroon 5", "Girls Like You - Maroon 5 ft. Cardi B", "Love Story - Taylor Swift", "You Belong With Me - Taylor Swift", "Anti-Hero - Taylor Swift", "Blank Space - Taylor Swift", "Enchanted - Taylor Swift", "Rolling in the Deep - Adele", "Hello - Adele", "Take Me to Church - Hozier"]	List of 10 smooth and elegant jazz tracks that create a sophisticated yet inviting atmosphere for a dinner party. This user seems to enjoy melodic, emotionally rich songs with polished production and a blend of contemporary and classic vibes. The mood of the songs should be warm, relaxed, and elegant to complement the dinner setting.
5	"U got any romantic ballads for date night"	List of 10 romantic ballads with heartfelt

	<p>Recently liked music:</p> <p>User5 = ["Montero (Call Me By Your Name) - Lil Nas X", "Industry Baby - Lil Nas X & Jack Harlow", "Bad Guy - Billie Eilish", "Happier Than Ever - Billie Eilish", "Everything I Wanted - Billie Eilish", "bury a friend - Billie Eilish", "My Future - Billie Eilish", "Ocean Eyes - Billie Eilish", "Lovely - Billie Eilish & Khalid", "Stay - The Kid LAROI & Justin Bieber"]</p>	<p>lyrics and soulful melodies that create an intimate and emotional atmosphere. The user seems to enjoy emotionally evocative and contemporary tracks with strong vocal performances, often leaning toward R&B, pop, and soft ballads. The mood of the songs should be tender and passionate for a romantic date night.</p>
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Table 1: Five Example listings of data

The rest of the example data used for this report can be found in Table 5 in the Appendix.

2.2 Process Description

I have used GPT-4o to curate the data for 10 users' recently liked music history.

The prompt for creating the data was:

“Curate a dataset of 10 users and their recently liked music history. Include 10 songs including the song title and artist name. Call the users “User#N” where N is 1-10. Try to make the data close to diverse real-world users that have distinctive taste. Answer only by returning 10 lists for the 10 different users.”

I have then personally written 10 prompts that will be randomly matched with the users in the synthetic music-like dataset with casual language often found in social media, including slangs and typos.

3.0 Prompt Styles

3.1 Prompt Documentation and Description

Prompt Style	Description	Template
Basic Zero-Shot (Baseline)	This is a minimal zero-shot prompt with no additional instruction engineering. The goal is to establish a baseline for the LLM's raw performance.	<p>"Recommend a list of 10 songs based on the following input:</p> <p>User Query: {user_query}</p> <p>Recently Liked Music: {recently_liked_music}"</p>
Few-Shot	Few-Shot (FS) prompting provides detailed instructions on how to approach the recommendation task and includes examples to guide LLM. The goal is to improve performance by clarifying the task and expectations.	<p>"You are a music recommendation assistant. Your task is to recommend a list of 10 songs that best match the user's query and align with their recently liked music. Recommend songs that match the query and align with their taste.</p> <p>Example:</p> <p>User Query: rec piano tunes for studying</p> <p>Recently Liked Music: ['One Summer's Day - Joe Hisaishi', 'A Town with an Ocean View - Joe Hisaishi']</p> <p>Recommendation: ['Merry-Go-Round of Lie - Joe Hisaishi', 'Reprise - Yashida Miyota']</p> <p>Now, generate recommendations for the following input:</p> <p>User Query: {user_query}</p> <p>Recently Liked Music: {recently_liked_music}"</p>

Chain-of-Thought	Chain-of-Thought (COT) prompting encourages the model to reason step-by-step through the task. For music recommendation, this style involves explicitly analyzing the query, identifying patterns in the user's music preferences, and finally generating recommendations.	<p>"You are a music recommendation assistant. Your task is to recommend a list of 10 songs that best match the user's query and align with their recently liked music.</p> <p>Follow these steps:</p> <ol style="list-style-type: none"> 1. Analyze the user's query to understand the genre, mood, or activity they are requesting. 2. Identify patterns in the user's recently liked music (e.g., genres, artists, tempos, themes). 3. Based on the above, recommend a list of 10 songs that match the query while aligning with the user's preferences. <p>Now, generate recommendations for the following input: User Query: {user_query} Recently Liked Music: {recently_liked_music}"</p>
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Table 2: Prompt templates for different prompt styles

4.0 Results and Discussion

4.1 Aggregated Results

User #	Zero-Shot	Few-Shot	Chain-of-Thought
1	<p>"Can't Stop the Feeling!" - Justin Timberlake</p> <p>"Uptown Funk" - Mark Ronson ft. Bruno Mars</p> <p>"Stronger" - Kanye West</p> <p>"Don't Start Now" - Dua Lipa</p> <p>"Titanium" - David Guetta ft. Sia</p> <p>"Bang Bang" - Jessie J, Ariana Grande, Nicki Minaj</p> <p>"Party Rock Anthem" - LMFAO</p> <p>"Shut Up and Dance" - Walk the Moon</p> <p>"Cheap Thrills" - Sia ft. Sean Paul</p> <p>"One Kiss" - Calvin Harris & Dua Lipa</p>	<p>Don't Start Now - Dua Lipa</p> <p>Uptown Funk - Mark Ronson ft. Bruno Mars</p> <p>Can't Hold Us - Macklemore & Ryan Lewis ft. Ray Dalton</p> <p>Break Free - Ariana Grande ft. Zedd</p> <p>Titanium - David Guetta ft. Sia</p> <p>Party Rock Anthem - LMFAO ft. Lauren Bennett, GoonRock</p> <p>Stronger - Kanye West</p> <p>Higher Love - Kygo & Whitney Houston</p> <p>Bang Bang - Jessie J, Ariana Grande, Nicki Minaj</p> <p>Blinding Lights (Remix) - The Weeknd ft. ROSALÍA</p>	<p>"Physical" by Dua Lipa</p> <p>"Uptown Funk" by Mark Ronson ft. Bruno Mars</p> <p>"Don't Start Now" by Dua Lipa</p> <p>"Can't Hold Us" by Macklemore & Ryan Lewis ft. Ray Dalton</p> <p>"Good 4 U" by Olivia Rodrigo</p> <p>"Montero (Call Me By Your Name)" by Lil Nas X</p> <p>"Work This Body" by Walk the Moon</p> <p>"Cutting Shapes" by Don Diablo</p> <p>"Thunderstruck" by AC/DC</p> <p>"Lose Control" by Missy Elliott</p>
2	<p>"River Flows in You" - Yiruma</p> <p>"Comptine d'un autre été, l'après-midi" - Yann Tiersen</p> <p>"Clair de Lune" - Claude Debussy</p> <p>"Nuvole Bianche" - Ludovico Einaudi</p> <p>"Gymnopédie No. 1" - Erik Satie</p> <p>"Theme from Schindler's List" - John Williams</p> <p>"A Thousand Years (Piano Version)" - Christina Perri</p> <p>"Scenes from Childhood, Op. 15: No. 7 Träumerei" - Robert Schumann</p> <p>"The Heart Asks Pleasure First" - Michael Nyman</p> <p>"Una Mattina" - Ludovico Einaudi</p>	<p>River Flows in You - Yiruma</p> <p>Clair de Lune - Claude Debussy</p> <p>Comptine d'un autre été, l'après-midi - Yann Tiersen</p> <p>Nuvole Bianche - Ludovico Einaudi</p> <p>Gymnopédie No. 1 - Erik Satie</p> <p>Scenes from Childhood: Of Foreign Lands and Peoples - Robert Schumann</p> <p>The Heart Asks Pleasure First - Michael Nyman</p> <p>Imagine (Piano Cover) - John Lennon</p> <p>Theme from Schindler's List - John Williams</p>	<p>"Bohemian Rhapsody" (Piano Cover)</p> <p>"Hotel California" (Piano Cover)</p> <p>"Smells Like Teen Spirit" (Piano Cover)</p> <p>"Sweet Child O' Mine" (Piano Cover)</p> <p>"Highway to Hell" (Piano Cover)</p> <p>"Comfortably Numb" (Piano Cover)</p> <p>"Stairway to Heaven" (Piano Cover)</p> <p>"Imagine" (Piano Cover)</p> <p>"Blackbird" (Piano Cover)</p> <p>"American Pie" (Piano Cover)</p>

		Mad World (Instrumental Piano) - Gary Jules	
3	"Electric Feel" - MGMT "Sweater Weather" - The Neighbourhood "Are You Bored Yet?" - Wallows ft. Clairo "Young Folks" - Peter Bjorn and John "Pumped Up Kicks" - Foster the People "Taro" - alt-J "Take a Walk" - Passion Pit "Tongue Tied" - Grouplove "Why'd You Only Call Me When You're High?" - Arctic Monkeys "Kids" - MGMT	Electric Feel - MGMT Sweater Weather - The Neighbourhood Young Folks - Peter Bjorn and John Feel It Still - Portugal. The Man Riptide - Vance Joy Somebody Else - The 1975 Sweet Disposition - The Temper Trap Pumped Up Kicks - Foster The People A-Punk - Vampire Weekend Fluorescent Adolescent - Arctic Monkeys	"Take Me Out" by Franz Ferdinand "Electric Feel" by MGMT "Pumped Up Kicks" by Foster The People "Dog Days Are Over" by Florence + The Machine "Riptide" by Vance Joy "A-Punk" by Vampire Weekend "Young Folks" by Peter Bjorn and John "Lisztomania" by Phoenix "1901" by Phoenix "Float On" by Modest Mouse
4	"Feeling Good" - Nina Simone "At Last" - Etta James "What a Wonderful World" - Louis Armstrong "Come Away With Me" - Norah Jones "Take Five" - Dave Brubeck "Fly Me to the Moon" - Frank Sinatra "Georgia on My Mind" - Ray Charles "Autumn Leaves" - Chet Baker "Moondance" - Van Morrison "Don't Know Why" - Norah Jones	Fly Me to the Moon - Frank Sinatra At Last - Etta James Feeling Good - Nina Simone L-O-V-E - Nat King Cole Moondance - Van Morrison Don't Know Why - Norah Jones What a Wonderful World - Louis Armstrong The Girl from Ipanema - Stan Getz & João Gilberto Come Away With Me - Norah Jones Cheek to Cheek - Ella Fitzgerald & Louis Armstrong	"Take Five" by The Dave Brubeck Quartet "Feeling Good" by Nina Simone "At Last" by Etta James "Autumn Leaves" by Cannonball Adderley "My Favorite Things" by John Coltrane "All of Me" by Billie Holiday "Blue in Green" by Miles Davis "The Girl from Ipanema" by Stan Getz & João Gilberto "Don't Know Why" by Norah Jones "What a Wonderful World" by Louis Armstrong
5	"All of Me" - John Legend "Perfect" - Ed Sheeran "Love Me Like You Do" - Ellie Goulding "Someone Like You" - Adele "Stay With Me" - Sam Smith "I'm Yours" - Jason Mraz "You Are the Reason" - Calum Scott "When I Look at You" - Miley Cyrus "Falling" - Harry Styles "Can't Help Falling in Love" - Elvis Presley (modern covers by Kina Grannis or Haley Reinhart also work well)	All of Me - John Legend When I Was Your Man - Bruno Mars You Are the Reason - Calum Scott Make You Feel My Love - Adele Jealous - Labrinth Say You Won't Let Go - James Arthur Stay With Me - Sam Smith I'm Yours - Jason Mraz Can't Help Falling in Love - Haley Reinhart Perfect - Ed Sheeran	"All of Me" by John Legend "Adore You" by Harry Styles "Perfect" by Ed Sheeran "Love on the Brain" by Rihanna "Die for You" by The Weeknd "Say You Won't Let Go" by James Arthur "Lover" by Taylor Swift "Beyond" by Leon Bridges "Best Part" by Daniel Caesar ft. H.E.R. "Can't Help Falling in Love" by Haley Reinhart
6	"Coffee" - Beabadoobee "Slow Dancing in the Dark" - Joji "Night Owl" - Galimatias "Lover Is a Day" - Cuco "Flowers" - In Love With a Ghost "Weightless" - Mac Miller "Warm" - Dre'es ft. Mia "Sleepyhead" - Passion Pit "Home" - Tom Rosenthal "First Love / Late Spring" - Mitski	Night Owl - Galimatias Weightless - Marconi Union Coffee - Beabadoobee Sunset Lover - Petit Biscuit Lose Sight - ODESZA ft. Madelyn Grant Drift - Hippy Sabotage Home - Edith Whiskers Landslide (Instrumental Cover) - Fleetwood Mac Lofi Study - Chillhop Essentials Tadow - Masego & FKJ	"Weightless" by Marconi Union "Night Owl" by Galimatias "Sunset Lover" by Petit Biscuit "Cold Little Heart" by Michael Kiwanuka "Tadow" by Masego & FKJ "Get You" by Daniel Caesar ft. Kali Uchis "Lost in Japan" by Shawn Mendes (Zedd Remix) "Electric Feel" by MGMT "Redbone" by Childish Gambino

			"Riptide" by Vance Joy
7	"Living' la Vida Loca" - Ricky Martin "Smooth" - Santana ft. Rob Thomas "Jenny from the Block" - Jennifer Lopez "Get Busy" - Sean Paul "Bailamos" - Enrique Iglesias "Whenever, Wherever" - Shakira (yes, it's worth repeating for the vibe!) "It Wasn't Me" - Shaggy ft. RikRok "La Copa de la Vida" - Ricky Martin "I'm Real (Murder Remix)" - Jennifer Lopez ft. Ja Rule "Gasolina" - Daddy Yankee	Living' la Vida Loca - Ricky Martin Bailamos - Enrique Iglesias She Bangs - Ricky Martin Hips Don't Lie (2006 Remix) - Shakira ft. Wyclef Jean Whenever, Wherever - Shakira The Ketchup Song (Aserejé) - Las Ketchup Gasolina - Daddy Yankee La Bomba - Azul Azul Suavemente - Elvis Crespo Macarena - Los Del Rio	"Living' la Vida Loca" by Ricky Martin "Bailamos" by Enrique Iglesias "La Bomba" by Azul Azul "Macarena" by Los Del Rio "Oye Mi Canto" by N.O.R.E. ft. Daddy Yankee, Nina Sky, Gem Star, and Big Mato "Dile" by Don Omar "Obsesión" by Aventura "La Negra Tiene Tumbao" by Celia Cruz "Danza Kuduro" by Don Omar ft. Lucenzo "Gasolina" by Daddy Yankee
8	"Skinny Love" - Bon Iver "Let Her Go" - Passenger "Say You Won't Let Go" - James Arthur "Thinking Out Loud" - Ed Sheeran "Photograph" - Ed Sheeran "All I Want" - Kodaline "The A Team" - Ed Sheeran "Falling Slowly" - Glen Hansard & Markéta Irglová "I Will Follow You Into the Dark" - Death Cab for Cutie "Bloom" - The Paper Kites	I See Fire - Ed Sheeran Let Her Go - Passenger Stay - Rihanna ft. Mikky Ekko Skinny Love - Bon Iver Holocene - Bon Iver The A Team - Ed Sheeran Say You Love Me - Jessie Ware All of Me - John Legend Falling - Harry Styles Tenerife Sea - Ed Sheeran	"Stay With Me" by Sam Smith "Thinking Out Loud" by Ed Sheeran "Say You Won't Let Go" by James Arthur "Let Her Go" by Passenger "All of Me" by John Legend "Skinny Love" by Bon Iver "Tenerife Sea" by Ed Sheeran "I Will Follow You into the Dark" by Death Cab for Cutie "The A Team" by Ed Sheeran "Stay" by Rihanna ft. Mikky Ekko
9	"Blinding Lights" - The Weeknd "Shut Up and Dance" - Walk the Moon "Levitating" - Dua Lipa ft. DaBaby "Can't Stop the Feeling!" - Justin Timberlake "Dynamite" - BTS "On Top of the World" - Imagine Dragons "Wake Me Up" - Avicii "Shake It Off" - Taylor Swift "Happy" - Pharrell Williams "Sugar" - Maroon 5	Shut Up and Dance - WALK THE MOON Blinding Lights - The Weeknd Levitating - Dua Lipa ft. DaBaby Can't Stop the Feeling! - Justin Timberlake Runaway (U & I) - Galantis Sugar - Maroon 5 Feel It Still - Portugal. The Man Dynamite - BTS Pocketful of Sunshine - Natasha Bedingfield Wake Me Up - Avicii	"Blinding Lights" by The Weeknd "Shut Up and Dance" by WALK THE MOON "Can't Stop the Feeling!" by Justin Timberlake "Uptown Funk" by Mark Ronson ft. Bruno Mars "Levitating" by Dua Lipa "High Hopes" by Panic! At The Disco "On Top of the World" by Imagine Dragons "Wake Me Up" by Avicii "Happy" by Pharrell Williams "Adventure of a Lifetime" by Coldplay
10	"Clair de Lune" - Claude Debussy "Nocturne in E-flat Major, Op. 9, No. 2" - Frédéric Chopin "Canon in D" - Johann Pachelbel "The Swan (Le Cygne)" - Camille Saint-Saëns "Piano Sonata No. 16 in C Major, K. 545: I. Allegro" - Wolfgang Amadeus Mozart "Air on the G String" - Johann Sebastian Bach "Gymnopédie No. 1" - Erik Satie "Liebestraum No. 3" - Franz Liszt "Moonlight Sonata (Adagio	Clair de Lune - Claude Debussy Nocturne in E-flat Major, Op. 9 No. 2 - Frédéric Chopin Gymnopédie No. 1 - Erik Satie The Four Seasons: Spring - Antonio Vivaldi Canon in D Major - Johann Pachelbel Adagio for Strings - Samuel Barber Prelude in C Major, BWV 846 - Johann Sebastian Bach Liebesträume No. 3 - Franz Liszt Ave Maria - Franz Schubert Swan Lake: Scene - Pyotr Ilyich	"Clair de Lune" by Claude Debussy "Gymnopédie No. 1" by Erik Satie "Nocturne in E-flat Major, Op. 9 No. 2" by Frédéric Chopin "Canon in D Major" by Johann Pachelbel "Air on the G String" by Johann Sebastian Bach "Pavane" by Gabriel Fauré "Adagio for Strings" by Samuel Barber "The Swan" from 'Carnival of the Animals' by Camille Saint-Saëns "Spiegel im Spiegel" by Arvo Pärt

	Sostenuto)" - Ludwig van Beethoven "Meditation from Thaïs" - Jules Massenet	Tchaikovsky	"Meditation" from 'Thaïs' by Jules Massenet
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Table 3: Results

4.2 Examples of Success and Failure (COT Prompting)

	User #	Input	Output	Justification
Success	1	"energetic music for workout pls" ["Shape of You - Ed Sheeran", "Blinding Lights - The Weeknd", "Levitating - Dua Lipa ft. DaBaby", "Shallow - Lady Gaga & Bradley Cooper", "drivers license - Olivia Rodrigo", "Good 4 U - Olivia Rodrigo", "Old Town Road - Lil Nas X ft. Billy Ray Cyrus", "Memories - Maroon 5", "Someone You Loved - Lewis Capaldi", "All of Me - John Legend"]	"Physical" by Dua Lipa "Uptown Funk" by Mark Ronson ft. Bruno Mars "Don't Start Now" by Dua Lipa "Can't Hold Us" by Macklemore & Ryan Lewis ft. Ray Dalton "Good 4 U" by Olivia Rodrigo, etc.	The LLM did well in recommending pop songs that are rhythmic and high energy enough to suit a workout.
	7	"pls gimme sum throwback hits, 90s or early 00s vibes!" ["Waka Waka - Shakira", "Hips Don't Lie - Shakira ft. Wyclef Jean", "Whenever, Wherever - Shakira", "Bailando - Enrique Iglesias", "Despacito - Luis Fonsi ft. Daddy Yankee", "Mi Gente - J Balvin & Willy William", "Taki Taki - DJ Snake ft. Selena Gomez, Ozuna & Cardi B", "La Bicicleta - Shakira & Carlos Vives", "Gasolina - Daddy Yankee", "Con Calma - Daddy Yankee & Snow"]	"Livin' la Vida Loca" by Ricky Martin "Bailamos" by Enrique Iglesias "La Bomba" by Azul Azul "Macarena" by Los Del Río "Oye Mi Canto" by N.O.R.E. ft. Daddy Yankee, Nina Sky, Gem Star, and Big Mato, etc.	The LLM did well in recommending 90s or early 00s songs that consider the user's preference for Latin songs, but remaining a good balance by not only returning latin songs.
	10	"Looking for relaxing classical music for studying. Any ideas?" ["Zombie - The Cranberries", "Boulevard of Broken Dreams - Green Day", "In the End - Linkin Park", "Numb - Linkin Park", "Chasing Cars - Snow Patrol", "The Scientist - Coldplay", "Yellow - Coldplay", "Fix You - Coldplay", "Viva La Vida - Coldplay", "Iris - Goo Goo Dolls"]	"Clair de Lune" by Claude Debussy "Gymnopédie No. 1" by Erik Satie "Nocturne in E-flat Major, Op. 9 No. 2" by Frédéric Chopin "Canon in D Major" by Johann Pachelbel "Air on the G String" by Johann Sebastian Bach, etc.	The LLM did well in returning classical music for studying, disregarding the user's usual music taste for a special occasion.
Failure	2	"Play me relaxing piano music for focus" ["Bohemian Rhapsody - Queen", "Hotel California - Eagles", "Smells Like Teen Spirit - Nirvana", "Sweet Child O' Mine - Guns N' Roses", "Highway to Hell - AC/DC", "Comfortably Numb - Pink Floyd", "Stairway to Heaven - Led Zeppelin", "Imagine - John Lennon", "Blackbird - The Beatles", "American Pie - Don McLean"]	"Bohemian Rhapsody" (Piano Cover) "Hotel California" (Piano Cover) "Smells Like Teen Spirit" (Piano Cover) "Sweet Child O' Mine" (Piano Cover) "Highway to Hell" (Piano Cover), etc.	The LLM outputted simply piano covers of the recently liked music which is insufficient for a recommendation of relaxing piano music for focus.

	3	"rec some bangers for a road trip, idk maybe some indie songs?" ["Sunflower - Post Malone & Swae Lee", "Circles - Post Malone", "Rockstar - Post Malone ft. 21 Savage", "Sicko Mode - Travis Scott", "HUMBLE. - Kendrick Lamar", "DNA. - Kendrick Lamar", "God's Plan - Drake", "Laugh Now Cry Later - Drake ft. Lil Durk", "One Dance - Drake ft. WizKid & Kyla", "Suge - DaBaby"]	"Take Me Out" by Franz Ferdinand "Electric Feel" by MGMT "Pumped Up Kicks" by Foster The People "Dog Days Are Over" by Florence + The Machine "Riptide" by Vance Joy, etc.	The prompt was very unsure about wanting indie songs, using languages like "idk" or "maybe". The outputted list seems to have the most focus on the music being all indie songs, not accounting for the user's taste that much.
	9	"Can u pls recommend some upbeat songs for a morning jog? Something energtic and fun." ["As It Was - Harry Styles", "Watermelon Sugar - Harry Styles", "Adore You - Harry Styles", "Golden - Harry Styles", "Late Night Talking - Harry Styles", "Night Changes - One Direction", "Story of My Life - One Direction", "Little Things - One Direction", "Drag Me Down - One Direction", "What Makes You Beautiful - One Direction"]	"Blinding Lights" by The Weeknd "Shut Up and Dance" by WALK THE MOON "Can't Stop the Feeling!" by Justin Timberlake "Uptown Funk" by Mark Ronson ft. Bruno Mars "Levitating" by Dua Lipa, etc.	The user is clearly a fan of One Direction, only listening to songs by them or their members. The recommendation did not acknowledge that or take that into account.

Table 4: Successes and Failures

We can hypothesize the reasons for the success and failures to be: the LLM performs well when queries are clear and specific, aligning naturally with user preferences or universally recognized music themes. On the other hand, the LLM struggles with ambiguous queries or highly specific user preferences, often overemphasizing one aspect of the query while neglecting contextual nuances.

5.0 Limitations

5.1 Deployment Issues

- **Ambiguity Issues:**
The LLM struggles with ambiguous or informal queries, such as "idk maybe some indie songs," where it overemphasizes certain keywords while neglecting user preferences. This could result in irrelevant or overly generalized recommendations, frustrating users. In practice, to avoid this problem, we could fine-tuning the LLM on datasets with similar ambiguous queries and their ideal responses to improve its robustness.
- **Preference Integration:**
- The LLM sometimes fails to prioritize strong user-specific preferences, as seen with the One Direction fan query, where generic upbeat songs were suggested instead of tailored recommendations. This could alienate users who expect highly personalized results. In practice, we could handle these issues by using a hybrid approach where an LLM generates initial recommendations, and a collaborative filtering system further personalizes results by weighting past preferences more heavily.

6.0 Appendix

User #	Input	Target Output
6	<p>"lookin for some vibey songs to chill to, sumthin like lofi or mellow beats?"</p> <p>Recently liked music:</p> <p>User6 = ["Believer - Imagine Dragons", "Thunder - Imagine Dragons", "Radioactive - Imagine Dragons", "Demons - Imagine Dragons", "Counting Stars - OneRepublic", "Apologize - OneRepublic", "Good Life - OneRepublic", "Run - OneRepublic", "I Lived - OneRepublic", "Secrets - OneRepublic"]</p>	<p>List of 10 mellow and melodic songs with relaxing vibes, blending light instrumentals and soft beats. This user enjoys emotional, anthemic pop-rock, so recommendations should have a chilled-out mood while maintaining melodic richness.</p>
7	<p>"pls gimme sum throwback hits, 90s or early 00s vibes!"</p> <p>Recently liked music:</p> <p>User7 = ["Waka Waka - Shakira", "Hips Don't Lie - Shakira ft. Wyclef Jean", "Whenever, Wherever - Shakira", "Bailando - Enrique Iglesias", "Despacito - Luis Fonsi ft. Daddy Yankee", "Mi Gente - J Balvin & Willy William", "Taki Taki - DJ Snake ft. Selena Gomez, Ozuna & Cardi B", "La Bicicleta - Shakira & Carlos Vives", "Gasolina - Daddy Yankee", "Con Calma - Daddy Yankee & Snow"]</p>	<p>List of 10 throwback songs from the 1990s and early 2000s, featuring infectious rhythms, nostalgic melodies, and energetic Latin and pop influences. Recommendations should reflect their love for upbeat, danceable tracks.</p>
8	<p>"tryna set the mood for a cozy night in, hit me w/ those slow jams or accoustic vibes"</p> <p>Recently liked music:</p> <p>User8 = ["Wake Me Up - Avicii", "The Nights - Avicii", "Levels - Avicii", "Don't You Worry Child - Swedish House Mafia", "Save the World - Swedish House Mafia", "Greyhound - Swedish House Mafia", "Clarity - Zedd ft. Foxes", "Stay the Night - Zedd ft. Hayley Williams", "Titanium - David Guetta ft. Sia", "She Wolf (Falling to Pieces) - David Guetta ft. Sia"]</p>	<p>List of 10 slow, acoustic, or atmospheric songs with a warm and intimate feel. This user prefers electronic anthems but would appreciate stripped-down versions or similarly emotional tracks for a cozy setting.</p>
9	<p>"Can u pls recommend some upbeat songs for a morning jog? Something energtic and fun."</p> <p>Recently liked music:</p> <p>User9 = ["As It Was - Harry Styles", "Watermelon Sugar - Harry Styles", "Adore You - Harry Styles", "Golden - Harry Styles", "Late Night Talking - Harry Styles", "Night Changes - One Direction", "Story of My Life - One Direction", "Little Things - One Direction", "Drag Me Down - One Direction", "What Makes You Beautiful - One Direction"]</p>	<p>List of 10 upbeat, fun, and energizing songs with catchy hooks and a steady rhythm, ideal for motivating morning jogs. The user is clearly a big fan of one direction, so one direction songs that match the descriptionList of 10 classical pieces with a calming and focus-enhancing effect, blending gentle melodies and soothing dynamics. The user's taste in upbeat and melodic pop suggests an appreciation for emotionally rich classical compositions. should be prioritized.</p>
10	<p>"Looking for relaxing clasical music for studying. Any ideas?"</p> <p>Recently liked music:</p> <p>User10 = ["Zombie - The Cranberries", "Boulevard of Broken Dreams - Green Day", "In the End - Linkin Park", "Numb - Linkin Park", "Chasing Cars - Snow Patrol", "The Scientist - Coldplay", "Yellow - Coldplay", "Fix You - Coldplay", "Viva La Vida - Coldplay", "Iris - Goo Goo Dolls"]</p>	<p>List of 10 classical pieces with a calming, emotive quality, suitable for focus and reflection during study sessions. This user enjoys emotionally rich alternative and rock ballads with introspective tones, so recommendations should evoke a similar sense of depth and atmosphere. However, the music should prioritize the calming part more.</p>

Table 5: Five remaining example listings of data