GenAl in Spotify

Using AI to improve Experience Konstantina Palla



about me

Senior Research Scientist

Tech Research @ Spotify

Joined Spotify in 2022

Find me at konstantinap@spotify.com



a very short trip over time

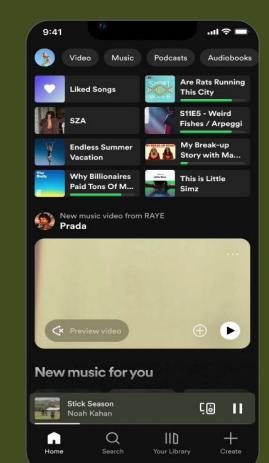


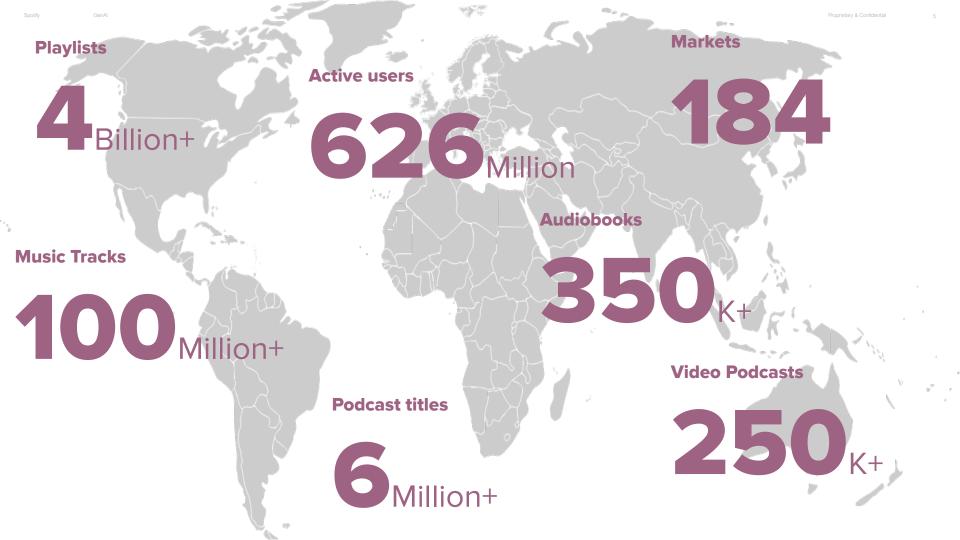
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The 20/20 Experience	>
The Dark Side Of The by Pink Floyd	>
Young the Giant by Young the Giant	>
Ioanna Gika Gone	

2013-2018: Curation



Present: Personalized Entertainment



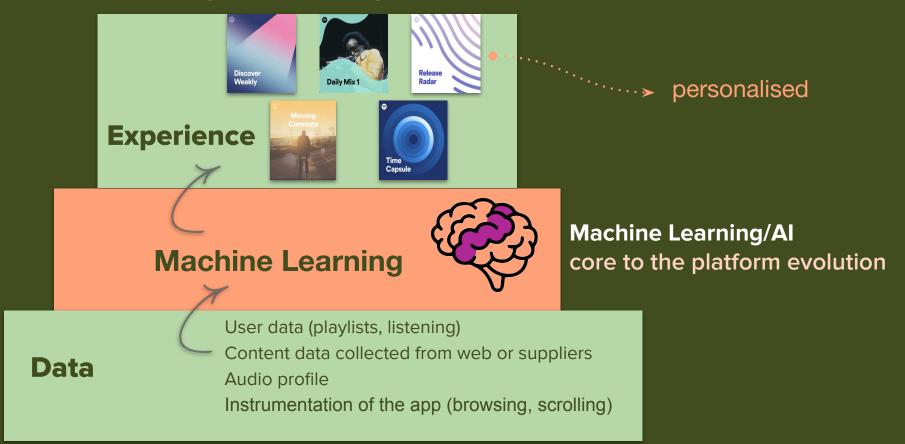




When you ask our listeners what they most admire about Spotify, more than 81% cite the personalization.

- Spotify Investor Day 2022

Streaming Intelligence



How does Machine Learning power Spotify?

Or else: a very brief story of evolution of algorithms



User understanding

Content Discovery

User understanding Content Discovery

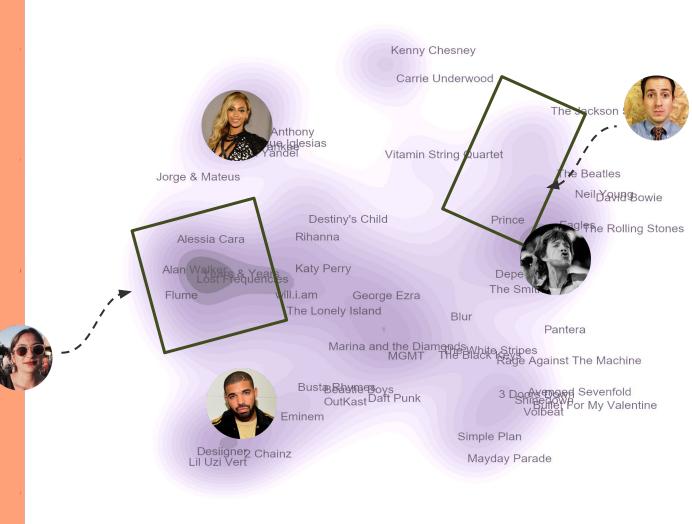
Foundation Mapping interests to content

Foundation: mapping user interest to content

connect the things listeners want with the things creators make Entertained Focused Thrilled Motivated Sleepy Connected Relaxed Hip Hop Sports Podcast Daily Mix Scenic Route This is David Bowie Coding Mode Chill Mix Understanding user music tastes is crucial for effective recommendation



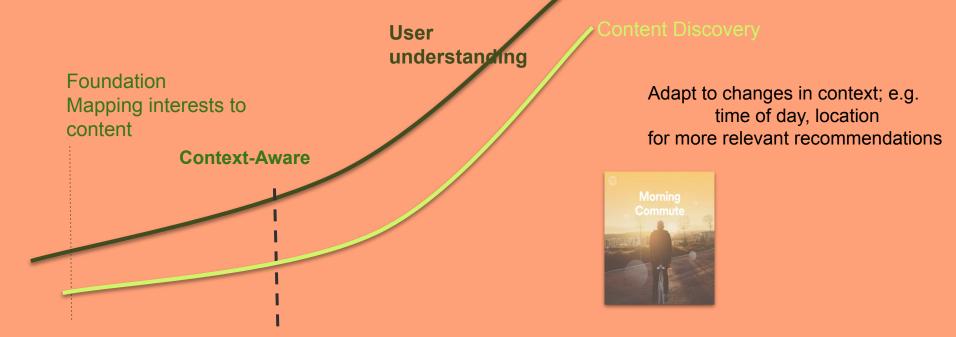
Embedding a universe of users and content







Collaborative filtering to suggest songs based on your listening history and the listening habits of similar users



Foundation Mapping interests to content

Context-Aware

understanding

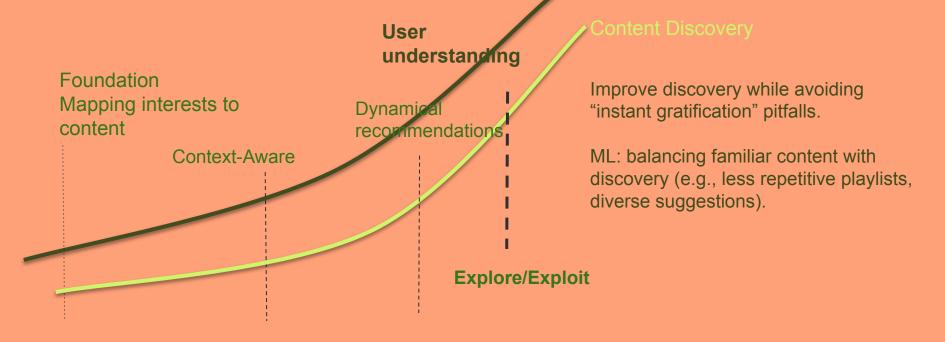
Dynamic recommendations

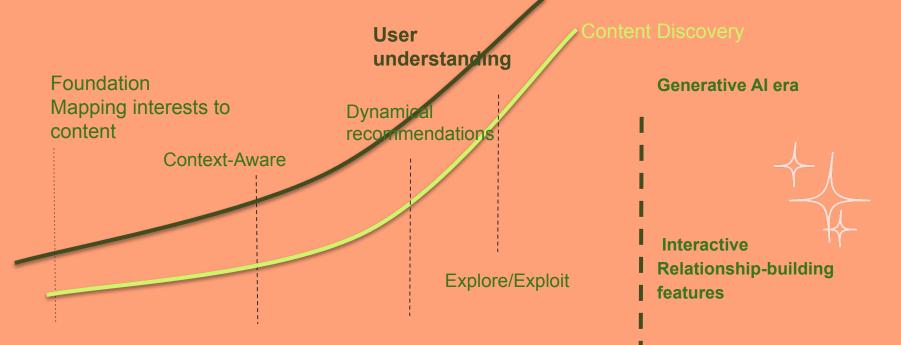
User

Content Discover

Log: sequence of user activity

Adjust recommendations based on changing contexts (e.g., likes, pause, skipping tracks)





Artificial Intelligence (AI)

Technology that simulates human behavior, allowing machines to learn and execute tasks without explicit programming.

Machine Learning (ML)

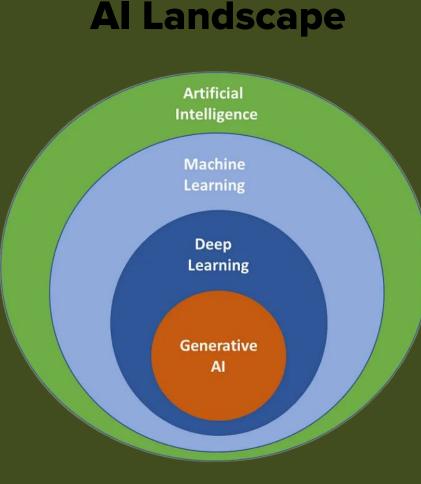
A branch of AI where systems learn autonomously, using data and algorithms to make predictions.

Deep Learning

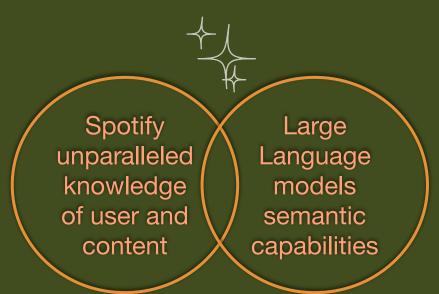
A specialized area of ML that employs multi-layered neural networks to process large datasets and perform complex predictive tasks.

Generative Al

A form of deep learning that generates new content, such as text, code, or images, based on input descriptions.



GenAl in Spotify



GenAl in Spotify

How can we combine Spotify personalization with the power of generative AI for playlist curation?

Spotify Premium Users Can Now Turn Any Idea Into a Personalized Playlist With Al Playlist in Beta. For The Record, April 2024.

Users love creating playlists and discovering new music, but traditionally, this requires lots of effort.

- Out-of-the-box LLMs understand complex conversational intents and possess extensive knowledge of music.
- However, they lack access access to recent trends, Spotify's data and personalization technologies.

How can LLMs integrate with Spotify's data and personalization technologies?

Users enabled to excel in music curation and express their creativity.





Interactive experience

Al Playlist converts a natural language prompt to a playlist by combining generative Al with Spotify's existing recs systems.

The user in "dialogue" with the algorithm

Natural language prompt \rightarrow playlist: by combining GenAl with Spotify's recs systems.

The technology understands the user's request and along with Spotify's recs systems deliver high quality recommendations.

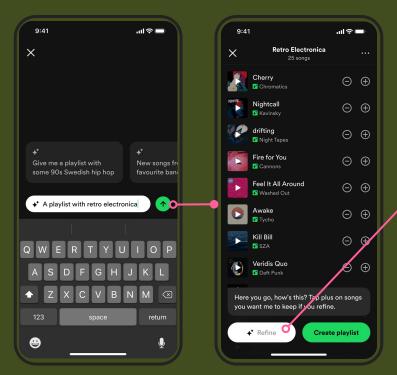
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Multi-turn conversations for iterative refinement.

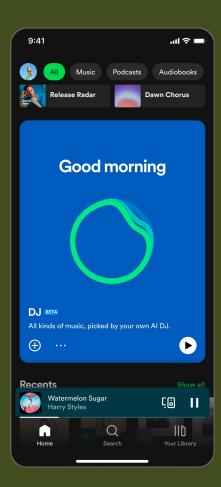






A "friend", your personal DJ?

like a friend is curating your music



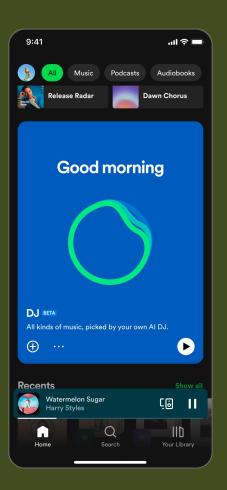
A "friend", your personal DJ

Spotify personalization technology

Generative Al

Realistic Al voice





A "friend", your personal DJ

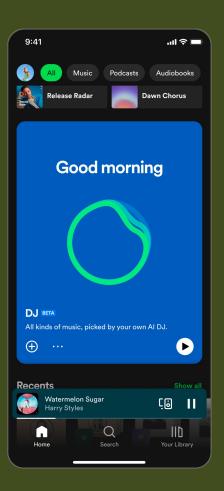
The power of Narration - Contextual Commentary

personalized insights about the music

Artist stories (e.g., "This artist just performed in your city.")

Trending updates (e.g., "This song is gaining popularity worldwide.")

Mood-based recommendations (e.g., "This track is perfect for a rainy afternoon.")



A "friend" Experience: your personal DJ

Realistic Voice:

Uses **digitized human voices** to create a friendly, believable presence.

Sounds conversational and engaging, making it feel like a friend is curating your music.

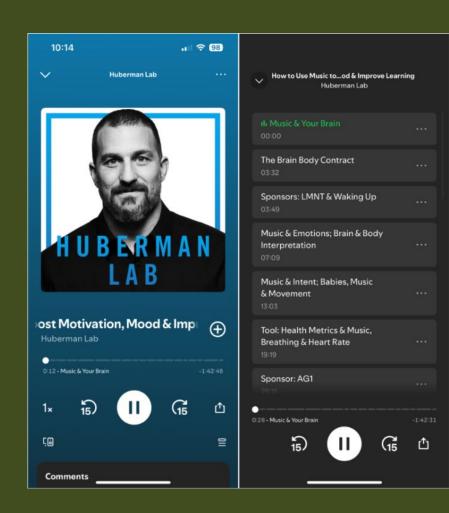
GenAl for content enrichment

GenAl for content enrichment: podcast chapters

Challenge: Navigating long podcast episodes is hard (30 mins to 1 hour on average).

Solution: Use Large Language models to generate chapters and titles for easier browsing.

A Ghazimatin and E Garmash, G Penha, K Sheets, M Achenbach, O Semerci, R Galvez, M Tannenberg, S Mantravadi, D Narayanan, O Kalaydzhyan, D Cole, B Carterette, A Clifton, P Bennett, C Hauff & M Lalmas. PODTILE: Facilitating Podcast Episode Browsing With Auto-generated Chapters. CIKM 2024.



GenAl for content enrichment: podcast chapters

LLM-Chapterization allows listeners in exploration mode to quickly assess and access relevant podcasts segments.

• Improved user engagement

• Enhances search effectiveness

Popular items



GenAl for increased discoverability in Search



How can we increase the discoverability of entities with search? Users should be able to discover the entire catalogue of entities, but the retrievability bias (popular items) is an obstacle to discovery.

Popular items

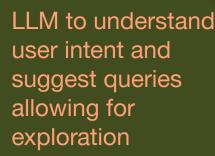


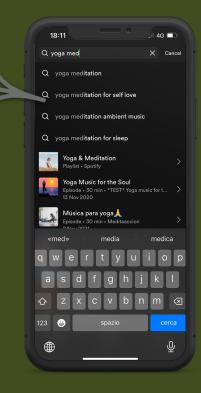
We want users to discover *more* items through search.



Hidden gems

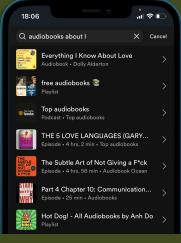
How can we increase the discoverability of content with Search? LLMs to generate queries to better assist users in formulating their queries, and increase retrievability of valued contents





MG Penha, E Palumbo, M Aziz, A Wang & H Bouchard. Improving Content Retrievability in Search with Controllable Query Generation. The Web Conference, 2023. Synthetic query generation using LLMs improves content discoverability.

query suggestions increase discoverability.



Before



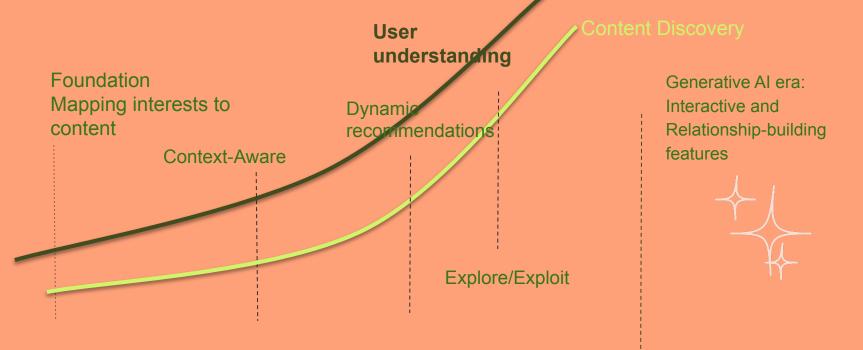


Included in Premium The Girl in the Garden

Afte

G Penha, E Palumbo, M Aziz, A Wang & H Bouchard. Improving Content Retrievability in Search with Controllable Query Generation. The Web Conference 2023.

A step back



Personalization is a journey



Some Reflections/Notes

- Effective personalization requires more than advanced algorithms Data, Team effort
- Generative AI, along with specialized machine learning models, will significantly shape the future of personalization.

foundational

• Safety

Safety is a key focus in generative AI research. How can we stay at the forefront as generative AI evolve and used in more scenarios?

• Hyper-personalization

How can generative AI deliver highly personalized recommendations by understanding complex user preferences to create tailored listening experiences.

• Exploration

How can generative AI introduce listeners to new and varied content to support the exploration experience?

• Timeliness

user interaction

How can generative AI quickly respond to trends and current events to keep recommendations relevant and timely?

• Human in the loop

How can AI and human editors collaborate to ensures the quality and relevance of the personalized experience?

• Integration

 How can we integrate Generative AI into existing systems to optimize personalization and unlock new capabilities?

• Cost

integration & performance

• How can we balance the advantages of Generative AI with the associated costs to ensure success?

• Scalability and latency

• How can we ensure our systems are scalable and low-latency to effectively meet users' needs and expectations?

Orchestration

 As AI systems evolve into interconnected agents with specialized models, including Generative AI, how can we efficiently orchestrate them?

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Tack Kiitos Shukran Arigato Spasibo Danke

Thank you Grazie

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@konstantina_pll

Do jeh Merci Asante

Dziekuje Obrigado Ευχαριστώ