Modelling a Tag System
For
Understanding Musical Content

BY SHEN Jinji
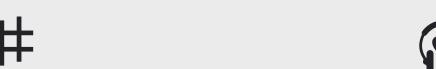
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Introduction

Introduction

Background

- Understanding musical tastes is key to Deezer's growth.
- We aim to explore how listeners tag their contents.

Mission

- Develop a model to study similarities between musical tags.
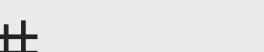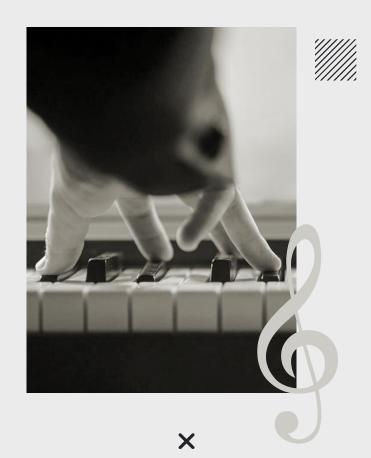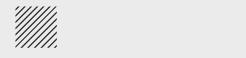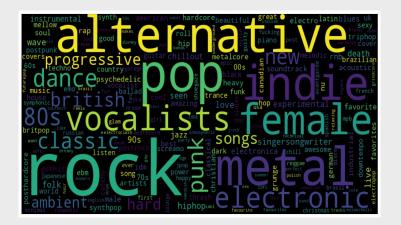- Design a tag recommendation system.
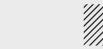
Methodology

Part 1 - Preprocessing

- ❏ **Tag Data Overview:**
  - Utilized last.fm's user-generated tags as raw data
- ❏ **Preprocessing Steps:**
  - Cleaned the data by making it uniform (lowercase, no special characters, etc.)
  - Removed irrelevant words like 'none' for more accurate analysis
- ❏ **Examples:** j-rock → jrock; 80's → 80s

Part 2 - Model Training

- **Model Choice**: Used proven techniques (Word2Vec & BERT) to capture tag relationships.
- **Training Process**: Trained models to recognize how tags relate to each other.

❏ **Word2Vec**

- **What Is It?:** Think of Word2Vec as a method that teaches computers to understand words and their meanings.
- **How Does It Work?:** It's like placing every word on a map, where similar words end up close together. The word "king" might be near "queen," and "cat" might be near "kitten."
- **Why Use It?:** By understanding the relationships between words, we can better represent musical tags and explore similarities, such as finding out that "rock" is close to "guitar."
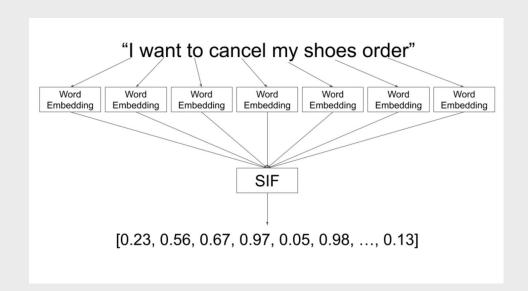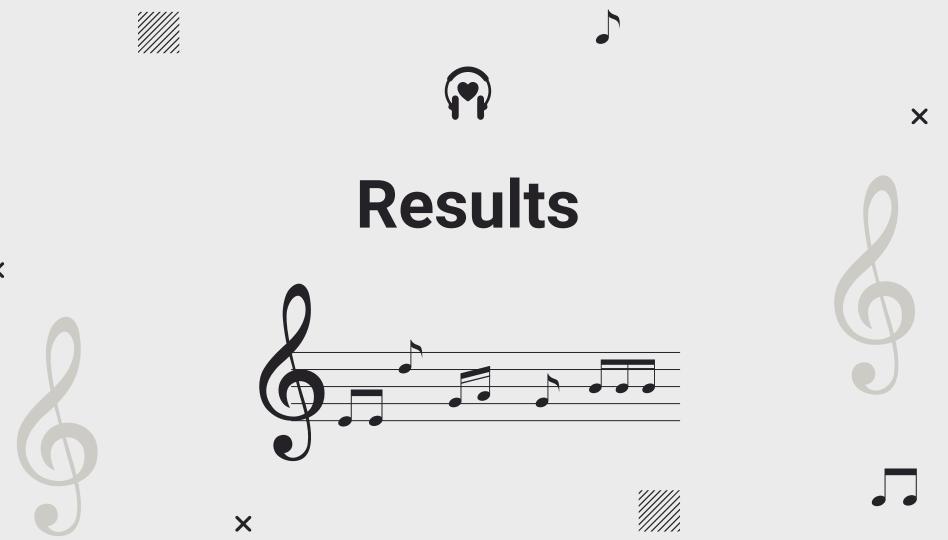
Part 2 - Model Training

❑ **BERT**
(Bidirectional Encoder Representations from Transformers)

"I want to cancel my shoes order"

Word Embedding | Word Embedding | Word Embedding | Word Embedding | Word Embedding | Word Embedding | Word Embedding

SIF

[0.23, 0.56, 0.67, 0.97, 0.05, 0.98, …, 0.13]

- **What Is It?**: BERT is a way to teach computers to read and understand the structure of a sentence, not just individual words.
- **How Does It Work?**: Imagine reading a book and understanding the entire plot, characters, and themes instead of just knowing the definition of each word. BERT analyzes the entire sentence to get the context.
- **Why Use It?**: This understanding helps us see more complex relationships between tags, such as that "love song" has a certain sentiment and might be related to tags like "romantic."
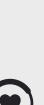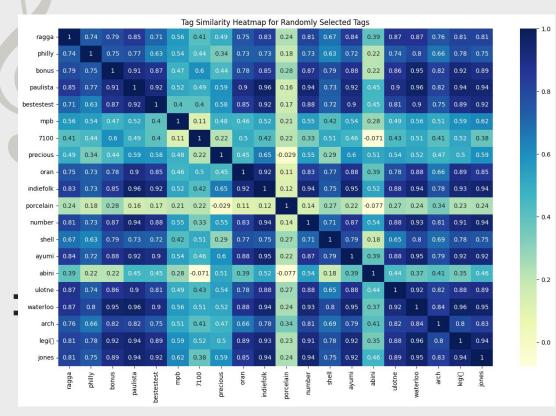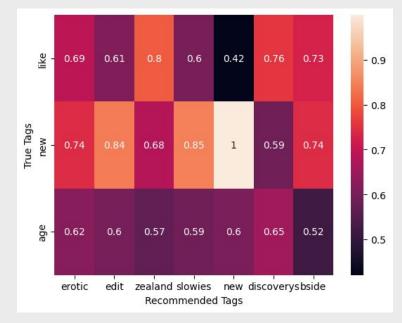
Results

Numerical Performance

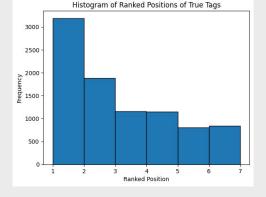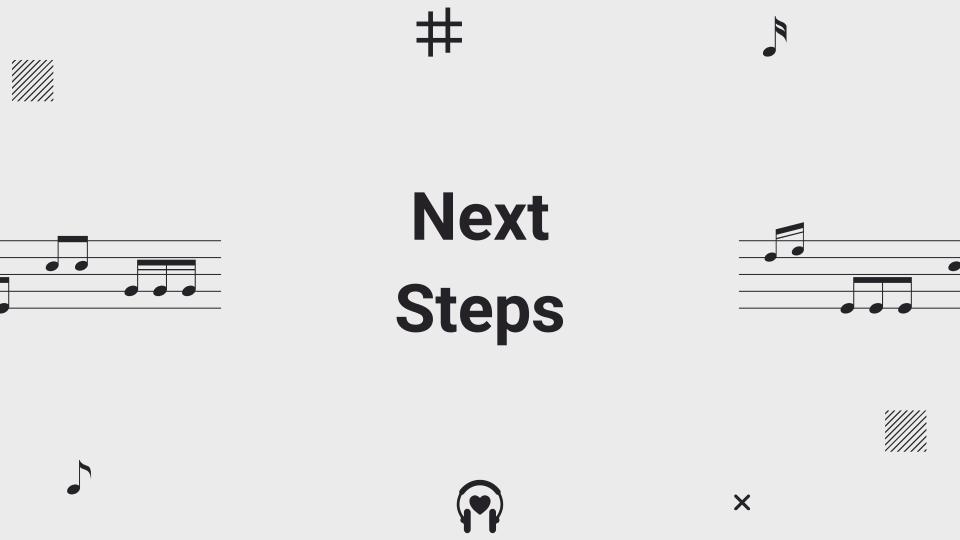| Model	Precision	Recall	F1-score
Word2Vec	0.26	0.42	0.26
Word2Vec (with Hyperparameters Tuning)	0.32	**0.45**	**0.31**
Bert	**0.36**	0.23	0.23

- **Top Right Heatmap:** If we see mostly light colors, it means the recommendations are close to what people actually tag, and the system is doing well.

Histogram: If most of the bars are on the left side, it means the system often puts the right tags at the top – a sign of success.

Next Steps

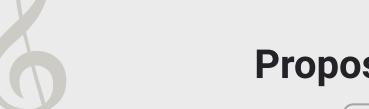## Understand the Current Model's Performance

- **What We've Done**: Our tag modeling system has been successful in understanding and connecting musical tags, creating recommendations.
- **What Can Improve**: While we've made significant progress, there are areas where we can fine-tune our model to better understand specific nuances, making our recommendations even more precise.

Proposed Improvements

1 | **Collect More Data** | By gathering more user tagging behavior, we can better understand the diverse ways people categorize music. More data will help our model to learn more effectively.

2 | **Explore More Techniques** | There are always new and innovative techniques being developed. We can explore integrating some of these to further refine our understanding of musical tags.

3 | **User Feedback Integration** | Implementing a system that takes user feedback on the tag recommendations can help us continuously learn and adapt to what users really want.

4 | **Collaboration with Music Expert** | Collaborating with musicians, DJs, or musicologists to understand musical tagging from an expert's point of view can enhance our model's comprehension.

5 | **Regular Monitoring and Adjustments** | Constantly monitoring our system's performance and making periodic adjustments ensures that we stay ahead and that our recommendations remain relevant and accurate.