Tay-I: The Music Composition with Machine Learning (Taylor Swift Case Study)

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Abstract

The purpose of this project is to create lyrics verse by using words and phrases from Taylor Swift's oeuvre from her self-titled album Taylor Swift (2006) to Midnights (2022) into new lyrics and melody. By incorporating machine learning called OpenAI, this initiative may allow musicians, songwriters, or fans to contribute their artistic works.

Table of Contents

Table of Contents (cont.)

List of Figures

Chapter 1
Introduction

1.1 Introduction

My project idea stemmed from my interests on how songwriters compose a song, MasterClass [1], an online learning resource, suggests that most songwriters compose song using two approaches: (1) humming the melody then fitting words into melodies and (2) writing lyrics then creating melodies. Writing a song using creativity, imagination, and experience from songwriters. What if the songwriter runs out of idea to make a song? She might not be able to find a word that rhymes with other verses with the correct sentiment

Therefore, my project, Tay-I, will help solving the lyrics problem by generating new lyrics using words from Taylor Swift's song with machine learning. The results of generated words will be the new verses or sentences that can be used in lyrics or a poem. So, this project may help songwriters to use as an idea to make a song.

1.2 Objectives

This project objective is to create a web application which can generate lyrics via the internet by using Next.js and OpenAI API to generate for songwriters. Also learning how API connected with web application and how framework language work.
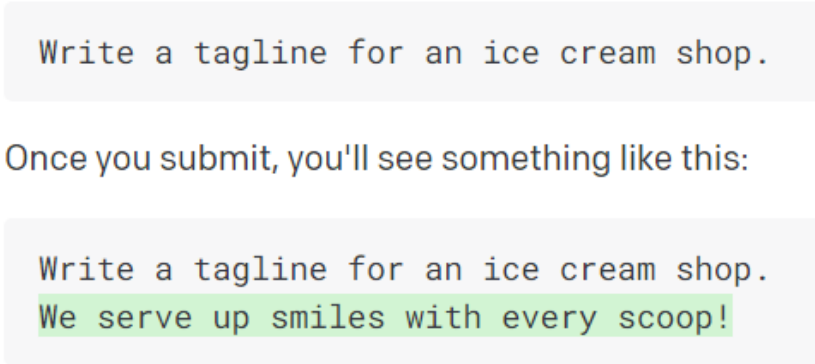
1.3 Scope

The goal of this project is to develop a lyric generator that uses OpenAI GPT-3 to produce text and forecast mood from user-inputted keywords to develop song ideas.

1.4 Definitions

OpenAI [2] is a non-profit artificial intelligence research company. Their goal is to advance digital intelligence in the way that is most likely to benefit humanity, unconstrained by a need to generate financial return. Their recently project is DALL·E 2, a new AI system that can create realistic images and art from a description in natural language. And another is GitHub Copilot, it uses the OpenAI Codex to suggest code and entire functions in real-time, right from your editor.

GPT-3 [3] is the model that returns a text completion in natural language. Developers can "program" GPT-3 by showing it just examples or "prompts."

```
Write a tagline for an ice cream shop.
```

Once you submit, you'll see something like this:

```
Write a tagline for an ice cream shop.
We serve up smiles with every scoop!
```

Figure 1.1 Text completion example (prompt above, and generated text below)

Davinci is a part of GPT-3 model, which is good at Complex intent, cause and effect, summarization for audience. Davinci is quite good at solving kinds of logic problems and explaining the motives of characters.

1.5 Benefits

Songwriter can use lyrics to make a song or idea to make a song.

Chapter 2
Literature Review

2.1 Background

GPT-3 is an autoregressive language model that uses deep learning to produce human-like text. Given an initial text as prompt, it will produce text that continues the prompt.

React [4] is an open-source JavaScript framework and library developed by Facebook. It is used for building interactive user interfaces and web applications quickly and efficiently with significantly less code than you would with vanilla JavaScript.

Next.js [5] is a React framework that gives you building blocks to create web applications. We refer to the Next framework. The tooling and setup needed for React are managed by Next.js, which also gives your application more structure, features, and optimizations.

JavaScript [6] is used by programmers across the world to create dynamic and interactive web content like applications and browsers. JavaScript is so popular that it is the most used programming language in the world, used as a client-side programming language by 97.0% of all websites. Client-side languages are those whose action takes place on the user's computer, rather than on the server.

Tailwind CSS [7] Tailwind CSS is a utility-first CSS framework designed to enable users to create applications faster and easier. Without leaving your HTML or creating a single line of new CSS, you can use utility classes to adjust the layout, color, spacing, font, shadows, and more to create a completely unique component design.

2.2 Related Works

An Application of Customized GPT-2 Text Generator for Modern Content Creators [8]

As a result, a customized and efficient "idea" generator has become necessary in author times, and any content creator, whether video, advertising, or writing, can benefit from making their content unique efficiently without losing their style. The advent of GPT- 2/3 makes this possible, and in author's thesis, author will explore the types of models, feasibility of streamlining, and practical challenges of customizing a text generator for content creators nowadays. In my project, I will focus on how GPT-3 generated text.

Do Massively Pretrained Language Models Make Better Storytellers? [9]

In this study, author find that GPT2-117 is a better story generation model than the Fusion Model in several specific ways: it conditions much more strongly on the provided context, is more sensitive to correct ordering of events, and generates text that is a content (using more rare words, concrete words, and named entities).

Can a machine win a Grammy? An evaluation of AI-generated song lyrics [10]

Lu and Eirinaki compare two deep learning models for lyrics generation. The first language model was trained based on the generative pretrained transformer (GPT-2) deep learning model. The second language model was trained on a traditional long short-term memory (LSTM)-based deep learning model which sequentially used for recurrent neural networks (RNN). Eleven genres were studied, their dataset also includes lyrics in different languages, such as English, Korean, and Spanish.

I have limited the language used in this experiment to English only and have GPT-3 as the primary model I am training

Chapter 3
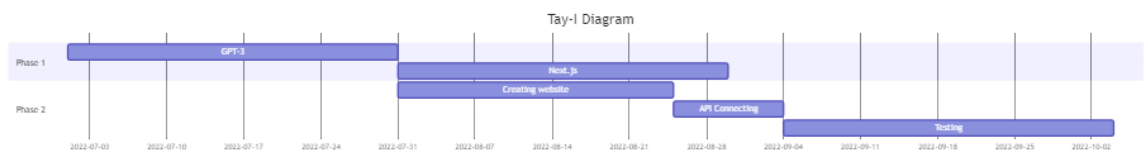# Methodology

3.1 Method

Figure 3.1 Tay-I Gantt diagram workflow

Steps:

1. Learning how GPT-3 works and what GPT-3 model that related to my project
2. Developing a website by using Next.js
3. Connect OpenAI's API into website and testing. A website should display result as a lyric that user enter a keyword.

Tools:

    Visual Studio Code [11] is a lightweight but powerful source code editor which runs on your desktop and is available for Windows, macOS and Linux. It contains support for JavaScript, TypeScript, and Node.js built in, as well as a robust community of extensions for other languages and runtimes.
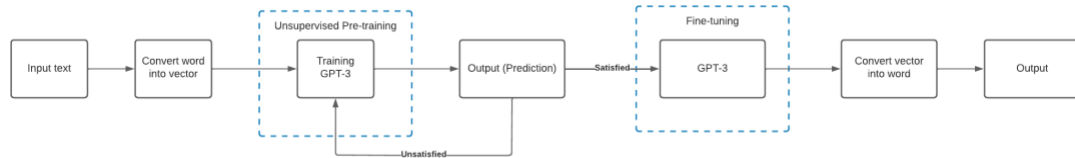
3.2 Design and Implementation

Figure 3.2 Tay-I System overview

System Architecture

This system architecture in Figure 3.2.1 shows how the systems work by using GPT-3 Davinci as a model to generate lyrics.
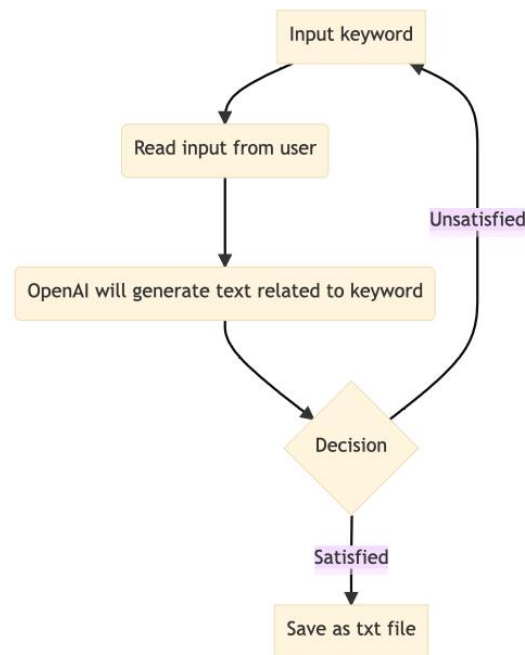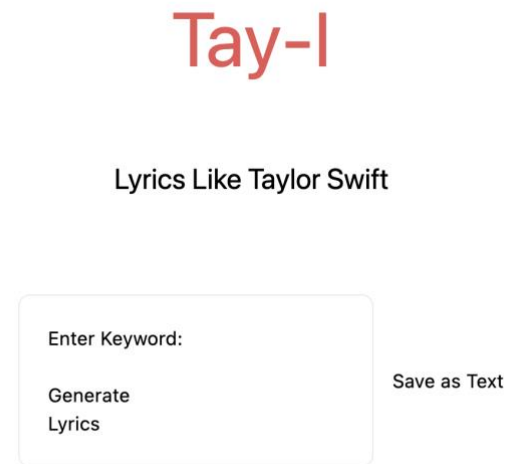

Figure 3.3 Tay-I Flow chart

Flowchart

The flowchart in Figure 3.2.2 shown the data in the system travel through website, GPT-3 model.

Tay-I

Lyrics Like Taylor Swift

Enter Keyword:

Generate
Lyrics

Save as Text

Figure 3.4 Tay-I UI/UX Design

UX/UI design:

When the user open Tay-I website, user will see the form that can be type the keyword that user want to be, when the user type keyword complete, user can press "Generate" button to let GPT-3 model generate the lyrics that related to user keyword. When lyric generated, user can press generate again if user don't like it or press save as txt to save for use lyrics later.

3.3 Testing

This website evaluated by type the keyword in "Enter Keyword" form. Then press "Generate." If lyrics appear after loading that would be success.

Figure 3.5 Tay-I pie chart user survey result about interface and design

Figure 3.6 Tay-I pie chart user survey result about text size and format

Figure 3.7 Tay-I pie chart user survey result about color

Figure 3.8 Tay-I pie chart user experience survey result after using Tay-I
website about how lyrics related to keyword

Figure 3.9 Tay-I pie chart user experience survey result after using Tay-I
website about the length of the lyrics created

Figure 3.10 Tay-I pie chart user experience survey result after using Tay-I
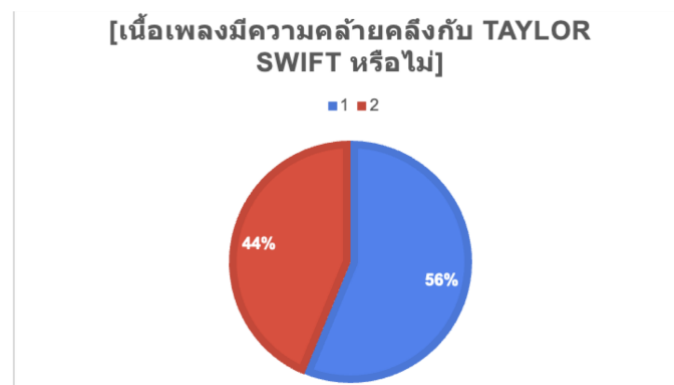website about the melodiousness of the language

Figure 3.11 Tay-I pie chart user experience survey result after using Tay-I website about how created lyrics similar to Taylor Swift.

Chapter 4
Results and Discussion

4.1 Results

       The testing results came out as a text. As in Figure 4.1.1 and 4.1.2 once user has entered keyword, OpenAI will generate the lyrics.

Figure 4.1 User Interface of Tay-I website

Figure 4.2 Result when user press "Generate" button after user input their keyword "Love"
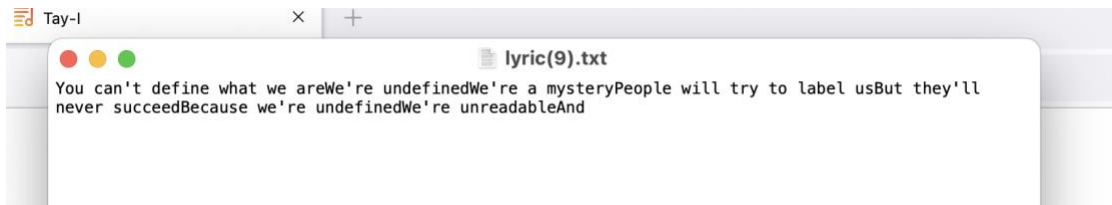
Figure 4.3 Result when user press "Save as Text" and open in TextEdit

4.2 Discussion

In other lyrics generator, they use GPT-2 model and LSTM model as a lyric generator. I decided to use GPT-3 the new generation of OpenAI model instead because it can do more complex task than old generation. Found out that lyric does not relate to keyword that user given.

The limitation of this project is user must be connected to the internet to generated lyrics.

Chapter 5
Conclusions

5.1 Conclusions

At the very first idea of making a project. I wanted to compare two models between OpenAI's GPT-3 model and LSTM to show how text generator works.

The first problem that I need to downscale my project is RNN problem because of "textgenrnn" and "tensorflow". In this project I use MacBook Air M1 (2021) to work and tensorflow cause a problem like an extension call "keras" and the answer is keras does not match with my computer. So, I need to change a focus on OpenAI only.

Website was evaluated in August till now, result was satisfied. Website can be generated as a lyric, but unfortunately it does not split into paragraph. Also, lyrics that generated cannot be fixed because output of the lyrics did not keep as a file in computer. It stored as a cache in website. I managed it to send output into a flex box, and it do not stack text repeatedly.

The second problem is I used OpenAI since July till now and testing so many times, but OpenAI have a limited usage quota for personal user. If you wanted to use more than that, you need to pay for more usage quota and be a business organizer to use.

5.2 Limitations

The limitations of the project are:

1. The keyword generated as the fact and meaning of their input keyword, not as the mood of the keyword.
2. The Davinci model in GPT-3 have limited usage quota.

5.3 Recommendations

Lyrics that generated should rhyme with word in another verse of the song. And input instrumental datasets like drum, guitar, or keyboard to OpenAI and output will be a backing track.

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