

# Natural Language Processing (CIS-5300)

Reifon Chiu  
Aditya Jayant G  
Edward Park  
Chengyi Zhang

## Final Project Presentation

## Multimodal Lyric Generation From Image



Penn  
Engineering  
UNIVERSITY of PENNSYLVANIA

# A Lot of Songs are Inspired by the Views



[Verse 1: Paul McCartney]

In Penny Lane there is a barber showing photographs  
Of every head he's had the pleasure to know  
And all the people that come and go  
Stop and say hello

[Verse 2: Paul McCartney]

On the corner is a banker with a motorcar  
The little children laugh at him behind his back  
And the banker never wears a mac  
In the pouring rain  
Very strange

[Chorus: Paul McCartney with John Lennon & George Harrison]

Penny Lane is in my ears and in my eyes  
There beneath the blue suburban skies  
I sit and meanwhile back

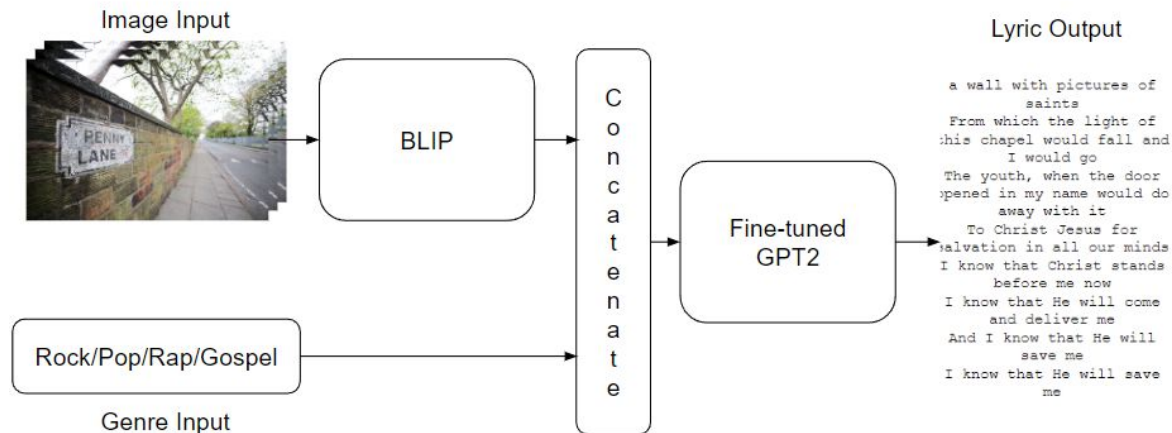
# Introduction

Fine-tune GPT-2 for lyric generation

Process the lyrics data based on genres

Further train the model for genre-based generation

Incorporate pretrained image-to-text model



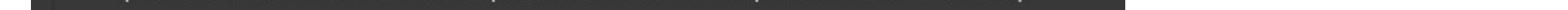


# Data



ALink	SName	SLink	Lyric	language
/ivete-sangalo/	Careless Whisper	/ivete-sangalo/careless-whisper.html	I feel so unsure\nAs I take your hand and lead...	en
/ivete-sangalo/	Could You Be Loved / Citação Musical do Rap: S...	/ivete-sangalo/could-you-be-loved-citacao-musi...	Don't let them fool, ya\nOr even try to school...	en
/ivete-sangalo/	Cruisin' (Part. Saulo)	/ivete-sangalo/cruisin-part-saulo.html	Baby, let's cruise, away from here\nDon't be c...	en
/ivete-sangalo/	Easy	/ivete-sangalo/easy.html	Know it sounds funny\nBut, I just can't stand ...	en
/ivete-sangalo/	For Your Babies (The Voice cover)	/ivete-sangalo/for-your-babies-the-voice-cover...	You've got that look again\nThe one I hoped I ...	en

	Artist	Genres	Songs	Popularity	Link
0	Ivete Sangalo	Pop; Axé; Romântico	313.0	4.4	/ivete-sangalo/
1	Chiclete com Banana	Axé	268.0	3.8	/chiclete-com-banana/
2	Banda Eva	Axé; Romântico; Reggae	215.0	2.3	/banda-eva/
3	É O Tchan	Axé	129.0	1.6	/e-o-tchan/
4	Claudia Leitte	Pop; Axé; Romântico	167.0	1.5	/claudia-leitte/

Gender	Percentage
Male	45%
Female	55%



# Accumulated Gradient

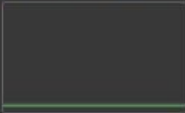
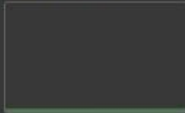

✓ V100 RAM  Disk  Colab AI

**Resources** ✕

You are subscribed to Colab Pro. [Learn more.](#)  
Available: 31.14 compute units  
Usage rate: approximately 5.36 per hour  
You have 1 active session. [Manage sessions](#)

Want even more memory and disk space? [Upgrade to Colab Pro+](#) ✕

Python 3 Google Compute Engine backend (GPU)  
Showing resources since 7:49 PM

System RAM	GPU RAM	Disk
0.8 / 12.7 GB		27.0 / 166.8 GB
		

```
if (accumulating_batch_count % batch_size) == 0:  
    optimizer.step()  
    scheduler.step()  
    optimizer.zero_grad()  
    model.zero_grad()  
  
accumulating_batch_count += 1
```

# Evaluation Metrics

$$B = \begin{cases} 1 & \text{if } c > r \\ e^{1-r/c} & \text{otherwise} \end{cases}$$

$$\text{BLEU-4} = B \cdot \left( \prod_{i=1}^4 \text{precision}_i \right)^{\frac{1}{4}}$$

# First Fine-tuning

Index	SName	Lyric	Artist	Genres	True_end_lyrics	Generated_lyrics
172	Dance Like This	Bamboooooooooo Tembaleuluwaaluweeee Anubaleeee le...	Shakira	Pop; Pop/Rock; Dance	chants, sounds like spirits from africa Bamboo...	cheers It is so sudden Let's go La mirada de ..
980	Heartache All Over The World	Music by Elton John Lyrics by Bernie Taupin Av...	Elton John	Soft Rock; Romântico; Pop/Rock	do on a weekend honey When your heart's on fire	do on a weekend honey When your heart's on fi...
997	Secret Friend	Feel like you've never fit before Here we are ...	Paul McCartney	Rock; Pop/Rock	friend I need ya I need ya I need ya	friend Feel like you've never fel before, on...
2738	Southampton Dock	They disembarked in '45 And no-one spoke and n...	Pink Floyd	Progressivo; Rock; Psicodelia	the bottom of our hearts We felt the final cut.	their place stood what looks like a grim ston...
499	I Don't Give a Damn	Everytime you go away, It actually kinda makes...	Avril Lavigne	Rock Alternativo; Rock; Pop/Punk	a damn What you say about that, (what you say)	a damn, What you say about that You know I d...
...	...	...	...	...	...	...
4033	Just Another Day	Yeah man, play that New York drum, Homer Show ...	Lady Gaga	Dance; Pop; Pop/Rock	oo, ooh oo And after all It's just another day	oo [Chorus] We both know I could learn a thin...
7516	Find The Right Man	You found the right man in the right place Onc...	Alanis Morissette	Pop/Rock; Rock	For his love, for his love (repeat 2X until end)	For his love, for his love He feels the same ..
7656	Let Me Roll It	You gave me something, I understand, You gave ...	Paul McCartney	Rock; Pop/Rock	Let me roll it to you Let me roll it	Let me roll it to you Let me roll it to you I...
10332	Atomica	(trecho) I'm just a rockstar, stabbin' away I ...	David Bowie	Rock	get atomica Let's rock 'till we explode Let's ...	get atomica Let's rock 'till we explode Let's...
2600	Karma Police	Karma Police, arrest this man, he talks in mat...	Radiohead	Indie; Rock; Rock Alternativo	For a minute there, I lost myself, I lost myself	for a minute there, I lost myself phew, for a...



# Fine-tuning with Genre Tag

```
artists_pre = pd.read_csv('/content/drive/MyDrive/cis530_data/final_project/artists-data.csv')
artists_rock = artists_pre[(artists_pre['Genres'].str.contains('Rock', na=False, regex=False)) & (artists_pre['Popularity'] > 5)
& (~artists_pre['Genres'].str.contains('Pop|Rap|Gospel', na=False))]
artists_pop = artists_pre[(artists_pre['Genres'].str.contains('Pop', na=False, regex=False)) & (artists_pre['Popularity'] > 5)
& (~artists_pre['Genres'].str.contains('Rap|Gospel', na=False))]
artists_rap = artists_pre[(artists_pre['Genres'].str.contains('Rap', na=False, regex=False))
& (~artists_pre['Genres'].str.contains('Gospel', na=False))]
artists_gospel = artists_pre[(artists_pre['Genres'].str.contains('Gospel', na=False, regex=False))]
```

```
100%|██████████| 1/1 [00:01<00:00, 1.26s/it]
100%|██████████| 1/1 [00:01<00:00, 1.23s/it]
100%|██████████| 1/1 [00:01<00:00, 1.28s/it]
100%|██████████| 1/1 [00:00<00:00, 1.02it/s]
100%|██████████| 1/1 [00:00<00:00, 1.34it/s]<Gospel>: A man looking in the mirror. You're my savior
I won't hide from you, man. I'll tell you everything. I'll keep your life.
```

I'll just see the world  
through your eyes  
For your part, I'll tell you everything

Life in this world, man.

This world is the path of my life  
in your arms, the blind man, the left hand of the holy prophet.  
My life in this world, man.

I'll see the world  
through your eyes  
For your part, I'll tell you everything

Life in this world, man.

I'll see the world  
through your eyes  
For your part, I'll tell you everything

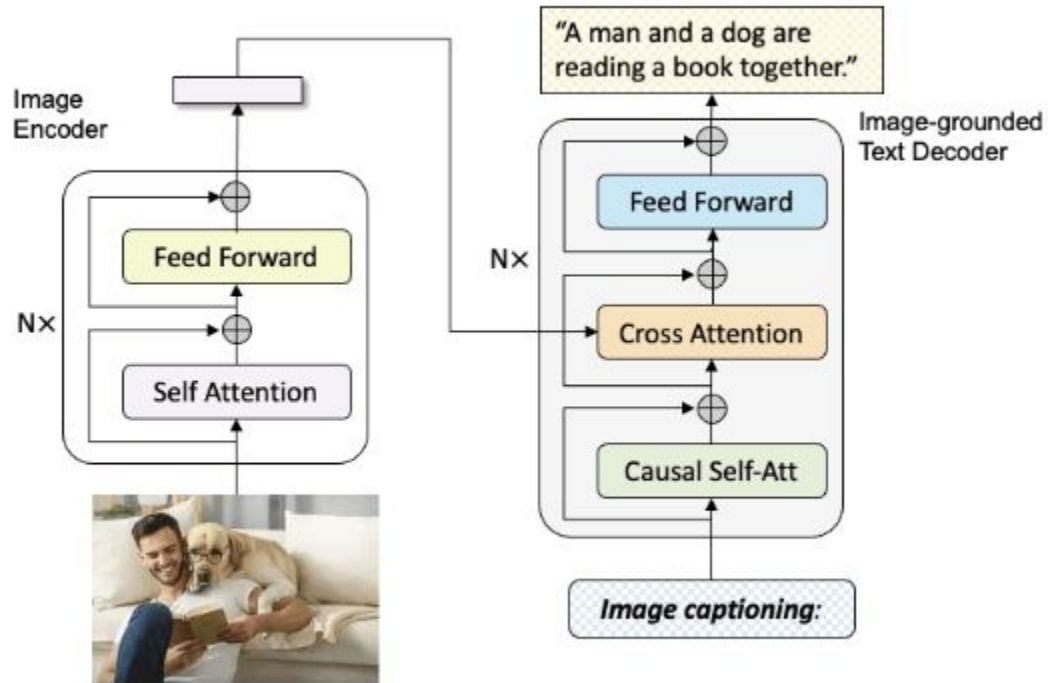
Life in this world<|endoftext|>

```
100%|██████████| 1/1 [00:00<00:00, 1.33it/s]
100%|██████████| 1/1 [00:01<00:00, 1.05s/it]
100%|██████████| 1/1 [00:00<00:00, 1.06it/s]
100%|██████████| 1/1 [00:00<00:00, 1.00it/s]<Rap>: A man looking in the mirror.
```

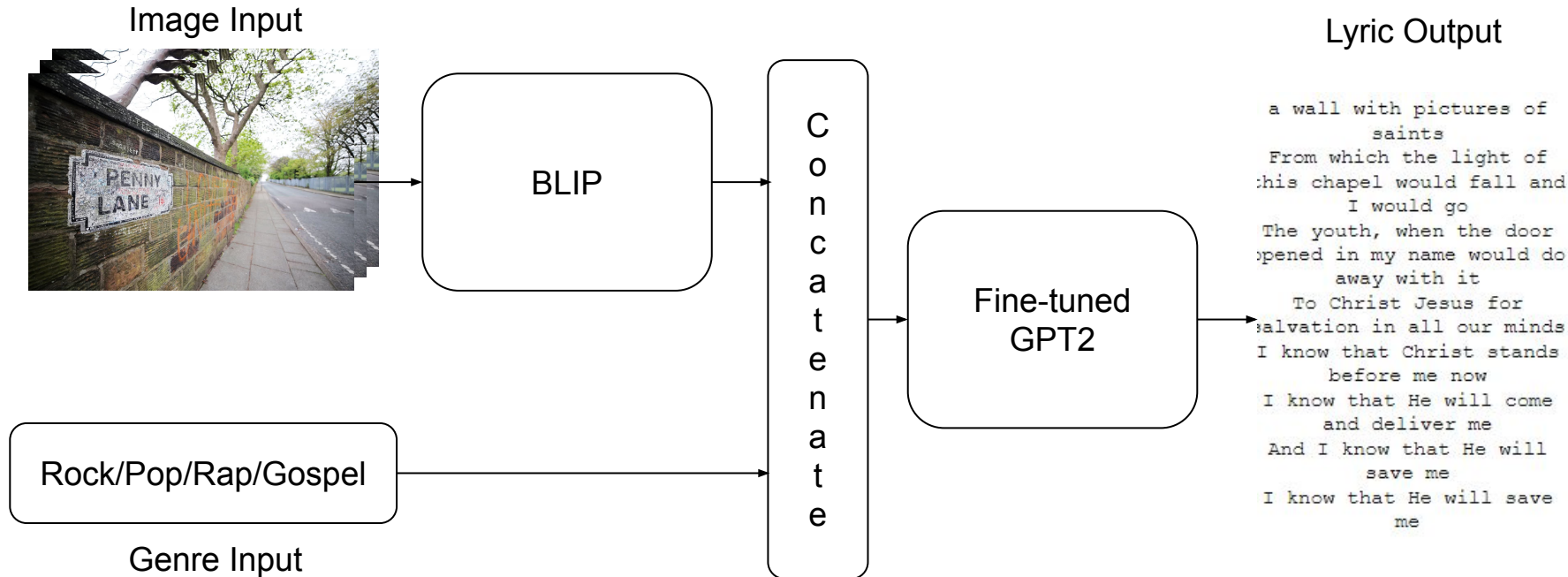
When I say that the man looks in the mirror  
I'm speaking of the man who says it's my turn.  
Yeah, and I was wondering what I was doing  
When the door opened and I saw my shoe...  
Btw, I had no idea how I was feeling  
Then I thought  
What a shame, you had to admit  
So why am I letting it slip in?  
Why am I not going through with my plan?  
And this time the guy who is sitting in the mirror

Was that a mistake?  
Yes, I remember what happened  
<|endoftext|>

# Image-To-Text Model



# Final Model



# Going Back to Penny Lane





# Going Back to Penny Lane

Gospel	Pop	Rock	Rap
<p>a wall with pictures of saints</p> <p>From which the light of this chapel would fall and I would go</p> <p>The youth, when the door opened in my name would do away with it</p> <p>To Christ Jesus for salvation in all our minds I know that Christ stands before me now</p> <p>I know that He will come and deliver me</p> <p>And I know that He will save me</p> <p>I know that He will save me</p>	<p>Jump on a street that will only stand for my song</p> <p>Come out in droves, try and fight and get down</p> <p>But wait for the train to run off by now</p> <p>I don't care what the hell you say, it'll be the same</p> <p>'cause we'll all try to get out alive</p> <p>If you can't hit a rock</p> <p>If you can't break a guitar</p> <p>If you can't smash a record</p> <p>Then take this love, make it easy to be strong</p> <p>Your name is Sonics</p> <p>I'll dance, sing and sing and sing</p> <p>I won't change it, they're yours</p>	<p>Telling you that this is you</p> <p>And all the time I've been there I've seen you dream and you never give a damn</p> <p>It's because of what you did</p> <p>Wake up tomorrow, all the right</p> <p>And I can hear you saying, Dear God, God</p> <p>This is a word from you That you would really do for us</p> <p>A word from God that we could never hear</p> <p>If you would give us this chance</p> <p>We'll do something for you</p> <p>And I don't think the people in your town would understand, or know, what you've done</p>	<p>There's nothing out there, nobody knows</p> <p>So my mom used to tell me You go to the store and pick up somethin'</p> <p>You do everything in your power to save the world</p> <p>I mean, what else can I do?</p> <p>You say I'll go in the next cab, and</p> <p>the cab comes by, you go in the next cab</p> <p>Yeah, you're gonna be the winner</p> <p>All this other shit just make you cry</p> <p>I don't wanna let you go</p> <p>And I want you gone</p> <p>You better stay home</p>