# A BALLAD OF NLP

LYRICS GENERATION USING LANGUAGE MODELS

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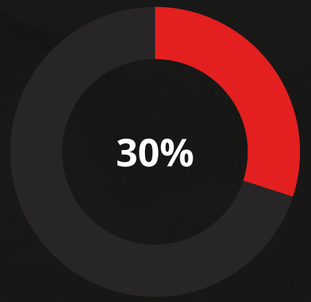
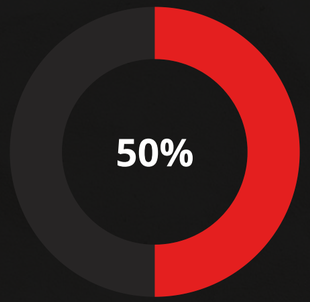
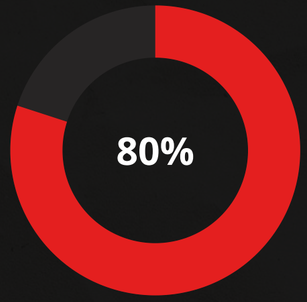
# AGENDA




DATASETS



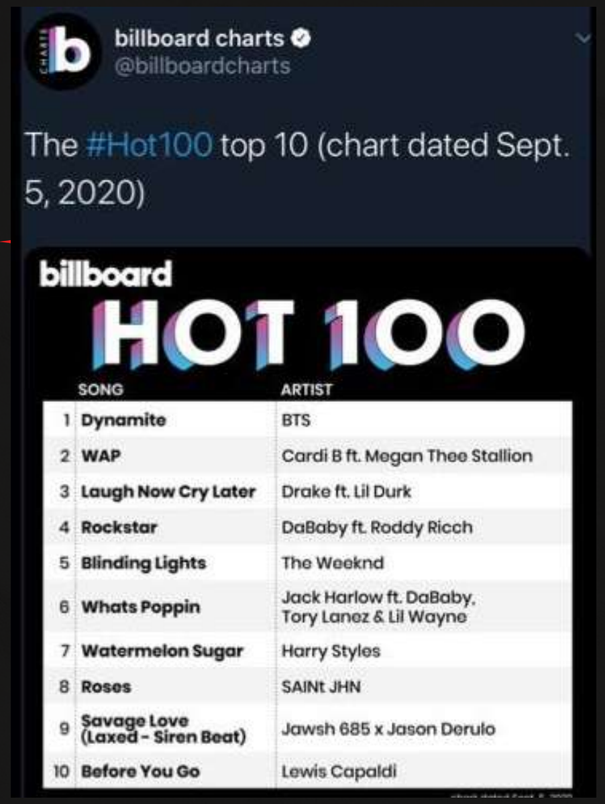

EDA




LANGUAGE MODELS


FUTURE IMPROVEMENTS AND CONCLUSION

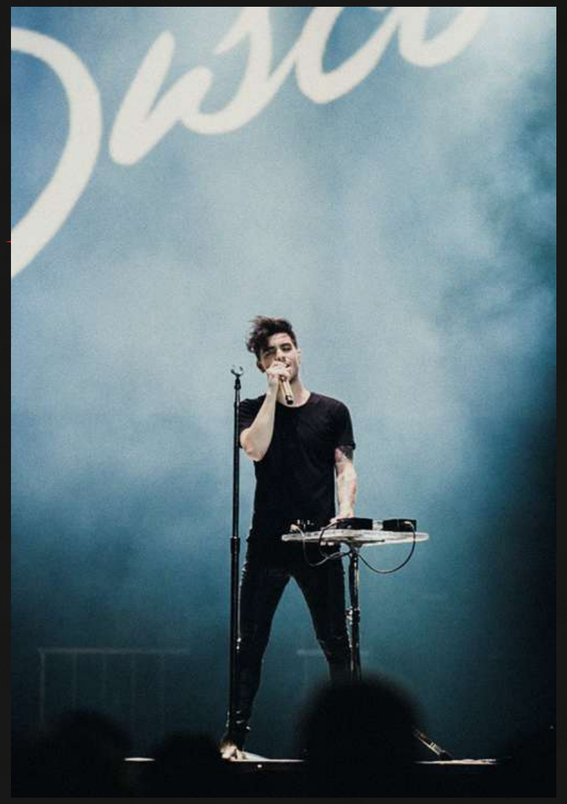
# HOW MANY DATASETS DO WE HAVE?




| | SONG | ARTIST |
|---|---|---|
| 1 | Dynamite | BTS |
| 2 | WAP | Cardi B ft. Megan Thee Stallion |
| 3 | Laugh Now Cry Later | Drake ft. Lil Durk |
| 4 | Rockstar | DaBaby ft. Roddy Ricch |
| 5 | Blinding Lights | The Weeknd |
| 6 | Whats Poppin | Jack Harlow ft. DaBaby, Tory Lanez & Lil Wayne |
| 7 | Watermelon Sugar | Harry Styles |
| 8 | Roses | SAINt JHN |
| 9 | Savage Love (Laxed - Siren Beat) | Jawsh 685 x Jason Derulo |
| 10 | Before You Go | Lewis Capaldi |

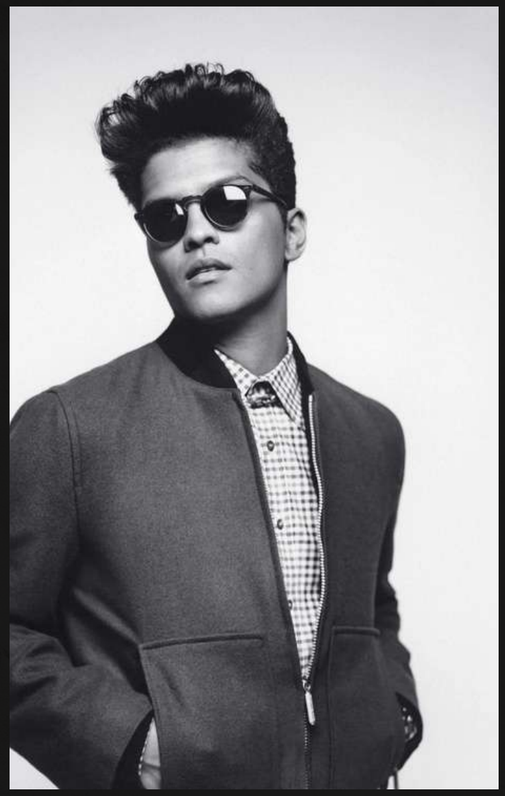
**BILLBOARD DATASET**

PRIMARY DATASET



**P!ATD DATASET**

SECONDARY DATASET



**BRUNO MARS DATASET**

SECONDARY DATASET

# CREATING DATASET

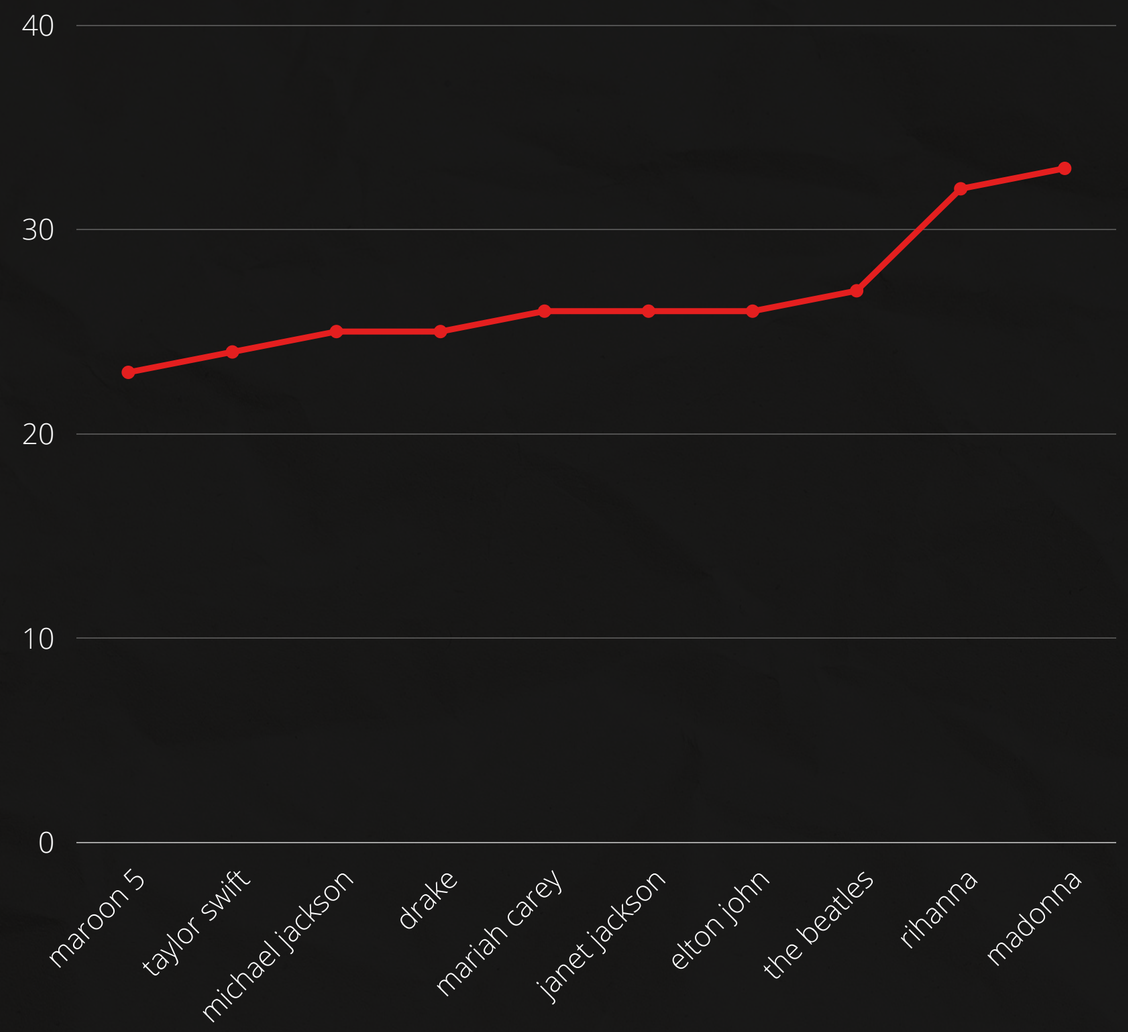
## CREATING THE BILLBOARD DATASET

1. COLLECTING SONGS FROM WIKIPEDIA (1959-2022)
2. CLEANNG UP THE DATA COLLECTED FROM WIKIPEDIA
3. SCRAPPING LYRICS USING DETAILS OBTAINED FROM STEP 2
4. CLEANING UP LYRICS TO BE USED BY THE MODELS

# CREATING DATASET

## CREATING THE ARTISTS DATASET

1. USING SPOTIFY API, WE COLLECT SONGS FOR EACH ARTIST
2. USING THE DETAILS COLLECTED TO SCRAPE THE LYRICS FROM WEBSITES
3. CLEANING UP THE DATASET
4. SAVING THE DATASET TO BE USED FOR LATER

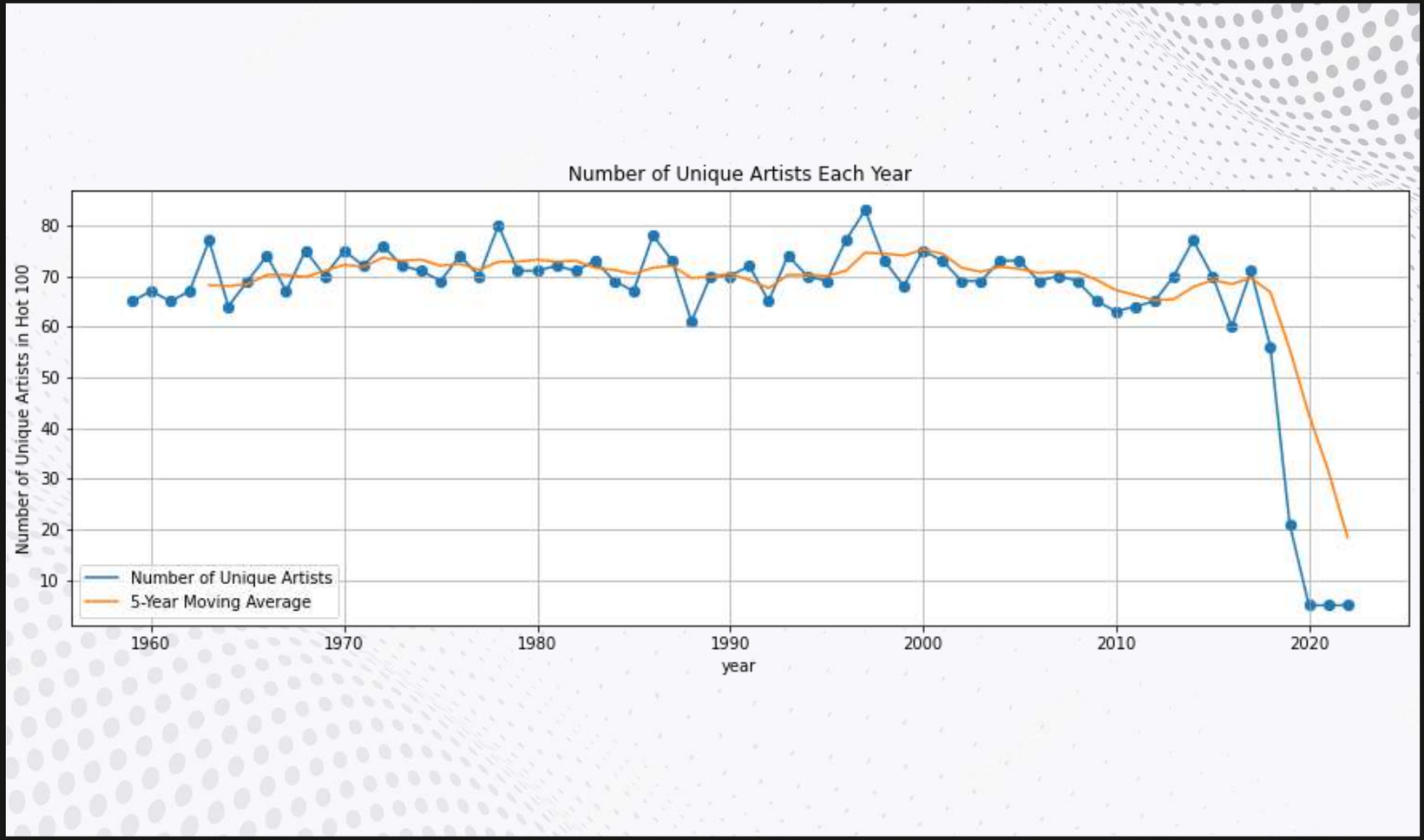



# EDA

## ARTISTS TO HAVE THE MOST NUMBER OF MUSIC IN THE DATASET

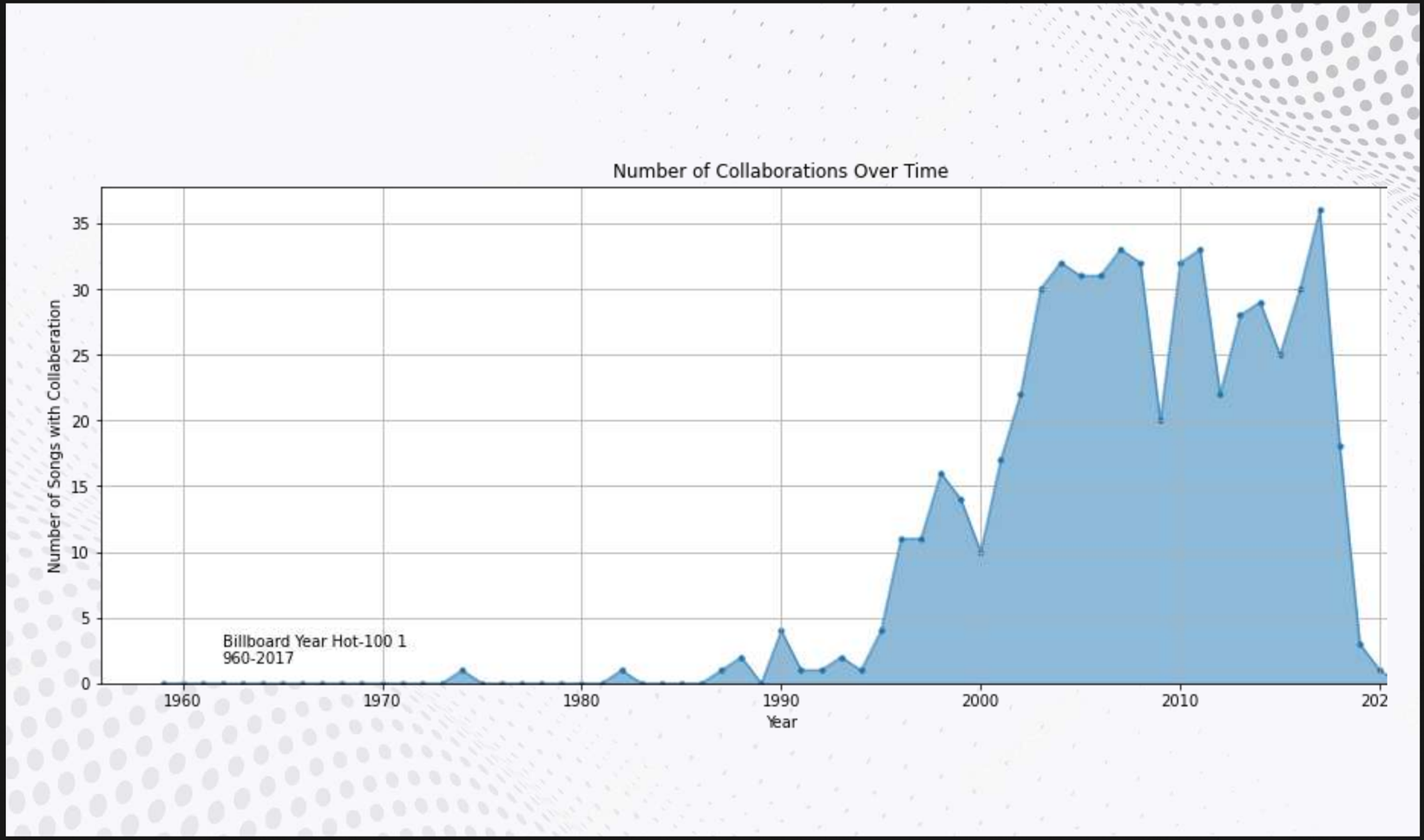
# EDA

## CHECKING FOR ARTIST DIVERSITY THROUGHOUT THE YEARS



# EDA

## CHECKING THE COLLABORATION TREND




# EDA

## CREATING A WORD MAP TO SHOWCASE THE MOST FREQUENT WORDS

# LANGUAGE MODELS USED ?

## 2 MODELS

- SIMPLE LSTM BASELINE MODEL
- SOTA MODEL WITH PRE-TRAINED WEIGHTS

# MODELS USED

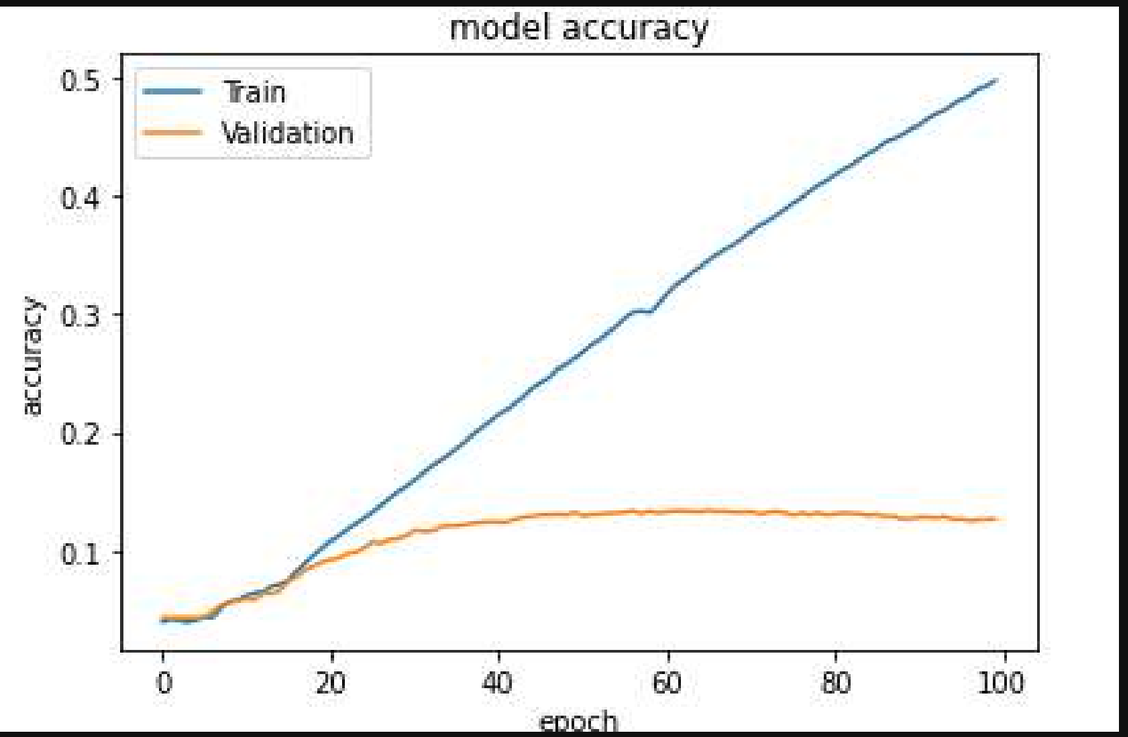
# MODEL A : BASELINE MODEL

## THE BASELINE MODEL IS A UNIDIRECTIONAL LSTM MODEL

## DESIGN CHOICES:

- VOCABULARY SIZE= 8000
- EMBEDDING DIMENSION : 8000X300
- 2 LSTM LAYERS OF 300, 512 UNITS
- 1 DENSE LAYER WITH SOFTMAX ACTIVATION
- LOSS : SPARSE_CATEGORICAL_CROSSENTROPY
- OPTIMIZER : ADAM(0.01)

# MODEL RESULTS




## LYRICS PREDICTION:

**SENTENCE** : SOMETHING IN THE WAY YOU

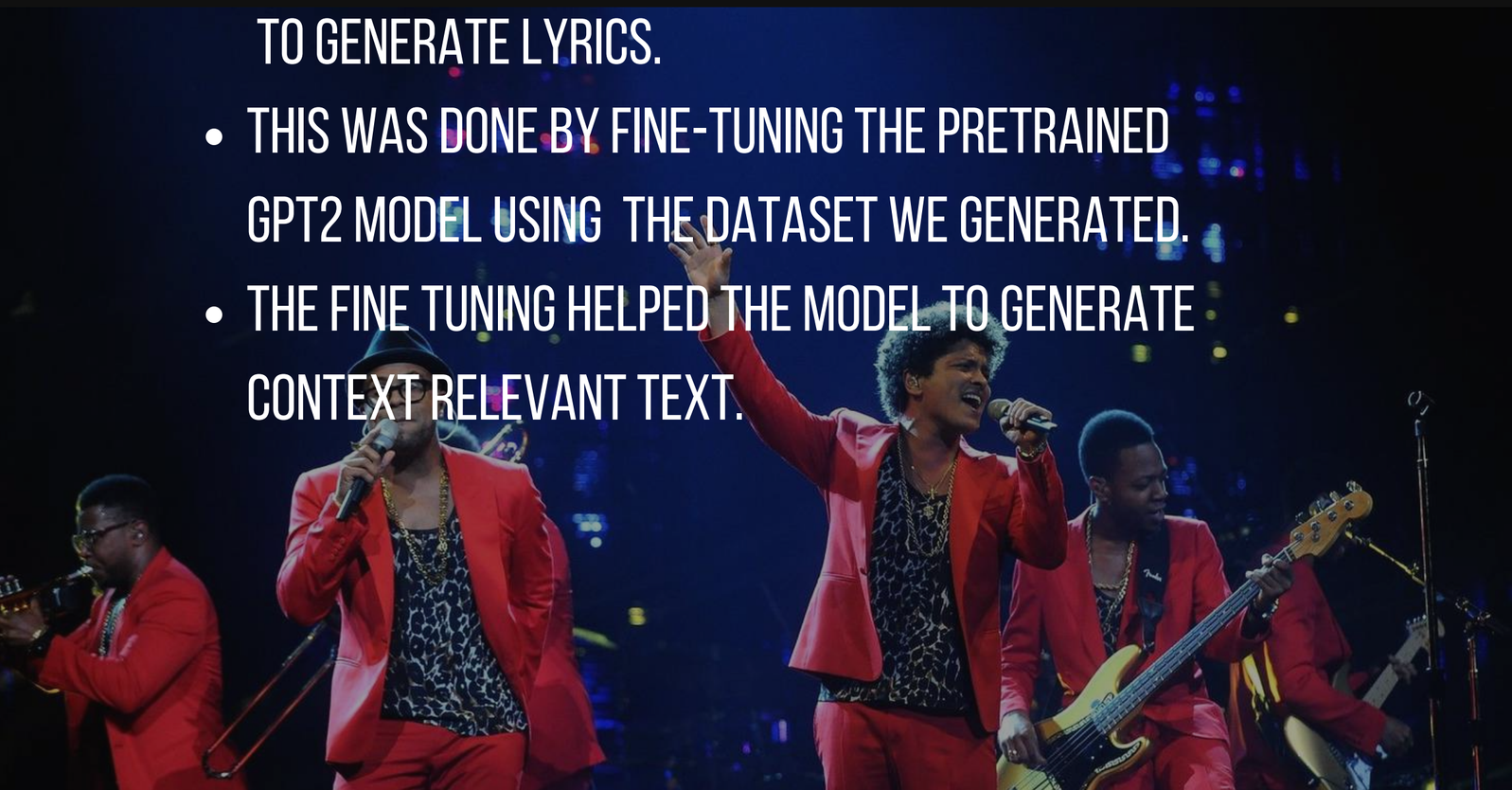
**PREDICTED LYRICS:**

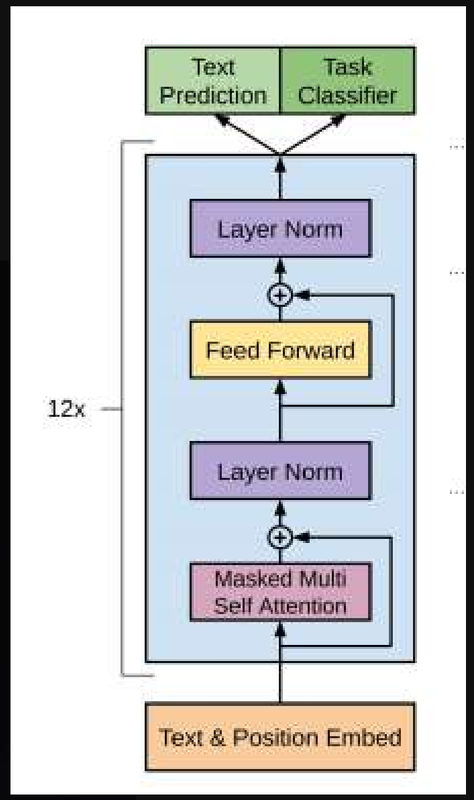
WERE TOO MORE ONLY TOO MORE THEN TAKE WAY GIVE WHY AS GIVE AROUND AINT MORE BY IVE ARE NIGHT NEED ONLY IVE SOME ILL THATS AINT WILL NEVER HER FEEL BACK WHERE ILL HERE WONT HERE THATS AT ILL COME SOME THINK ONLY NEVER GIRL GOOD TELL MAN KEEP NIGHT IVE WANNA WAS AT THEN AROUND NEVER THEY GIVE THINK HEART WAS GIVE TELL WAY GOOD AINT IVE WERE TOO WERE DAY COME SAID OOH ILL GIRL HE WELL AT ARE NA OOH THINK GIRL WELL COME THERE AT GOOD GIRL ARE IVE AROUND

**INFERENCE:** THE MODEL DOESN'T TAKE INTO ACCOUNT THE CONTEXT OF THE SONG EFFICIENTLY. THE WORD EMBEDDINGS ARE POOR. THESE LACUNAS ARE OVERCOME IN THE NEXT SOTA MODEL.

# MODEL B: SOTA MODEL

- WE USED A STATE OF THE ART MODEL FROM OPENAI CALLED GENERATIVE PRETRAINED TRANSFORMER 2 TO GENERATE LYRICS.
- THIS WAS DONE BY FINE-TUNING THE PRETRAINED GPT2 MODEL USING THE DATASET WE GENERATED.
- THE FINE TUNING HELPED THE MODEL TO GENERATE CONTEXT RELEVANT TEXT.






Model architecture GPT2

# MODEL RESULTS

**PROMPT :**

"I'M JUST A LONELY BOY, LONELY AND BLUE, I'M ALL ALONE, WITH NOTHINN TO DO"

**GENERATED LYRICS:**

I'M JUST A LONELY BOY, LONELY AND BLUE,
I'M ALL ALONE, WITH NOTHINN TO DO AND A LITTLE RAIN TO MAKE ME GET BACK HOME.
IN VAIN LOVE IN VAIN TENDER WORDS SHE SINGS AND SINGES OF ALL THE COLORS IN THE SKY
SHE BRINGS ALL YOU NEVER KNEW O OH SHE DANCES AROUND ON
THE ROCK ON THE WAY HOME WHERE DREAMS ARE MADE
SHE SINGS AND SINGS ON THE HILL SINGING SOME VERSES BUT NEVER
MUCH A GIRL WOULD DO IT FOR ME OH OH O
OH SHE SINGS A FEW WORDS AND SINGS ON THE HILL
SINGING SOME VERSES BUT NEVER MUCH A GIRL WOULD DO IT FOR ME OH

- We also fine tuned the model separately on the songs of 2 different **artists** to see how the fine tuning affected the lyrics generated by the model

- This was done using songs of 2 artists :
  a. Panic! At The Disco
  b. Bruno Mars

  - Due to the contrasting nature of both singers!
  - Reggae/Pop and Punk Rock do not have a huge similarity!
  - Proof? Word2Vec Embeddings

**Prompt :** "Tonight, I just want to take you higher , Throw your hands up in the sky , Let's set this party off right"

| Lyrics generated by the Bruno Mars model | Lyrics generated by the Panic ! at the Disco model |
| --- | --- |
| Tonight, I just want to take you higher,<br>Throw your hands up in the sky,<br>Let's set this party off right **here on Earth.**<br>**I know you're not going to believe it, but**<br>**the sun is always setting right here in the sky.**<br>**It's always setting right here in the sky.**<br>**I know you're not going to believe it, but**<br>**the sun is always setting right here in the sky.**<br>**I know you're not going to believe it, but**<br>**the sun is always setting right here in the sky.**<br>**It's always setting right here in the sky.** | Tonight, I just want to take you higher,<br>Throw your hands up in the sky,<br>Let's set this party off right **over there!**<br>**Yes, I think we've got it. I think we've got it. I think we've got it.**<br>**Now that we've got it, I'm gonna have you grow and move,**<br>**keep your head down and move and turn and move and turn**<br>**and move and turn and move and turn and turn and move and turn and turn**<br>**and move and turn and move to the sky. No, don't stop moving,**<br>**I can't hear you and the wind is ripping your hair off** |

# FURTHER IMPROVEMENTS AND CONCLUSION

- We can improve on our own baseline model whereby we can make use of models which take into consideration Context in a much better manner such as BERT, ELMO etc
- We can also train our model on a much larger dataset i.e not only billboard songs
- We'd also like to make use of both audio and lyrics to generate a model that can create it's own song. Maybe AI-5?
- The lyrics generated from our SOTA are great and the thing we set out to do was accomplished
- There are still improvements that can be done to increase the Accuracy and creation of Context-Dependent Lyrics
- Music brings color to our life and we truly enjoyed making this project.

# REFERENCES

- LYRICS SCRAPING 1
- LYRICS SCRAPING 2
- LYRICS EDA
- TRANSFORMERS DOCUMENTATION
- GPT-2 FINE TUNING
- GHOSTWRITER:  PETER POTASH ET AL

# THANK YOU

TEAM ACES