

USING LLM-POWERED NPC FOR MORE IMMERSIVE VIDEO GAME EXPERIENCE

LETS PLAY



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THE TEAM



Nabiha Naqvie
ML Engineer



Sarah Hoover
Data Analyst



Bindu Thota
Software Engineer



Dave Zack
Data Scientist

NON-PLAYABLE CHARACTER (NPC)

What are NPC?

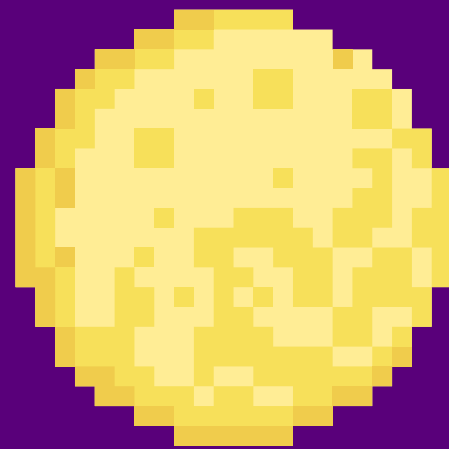
- Exist in story based games
- Part of the story

Why are they important?

- Purpose is to convey important information

Examples?

- Grand Theft Auto (GTA)
- Skyrim





PROBLEM

- **Scripted**
 - Response options are not diverse



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 - Few response options



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- **Scripted**
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- **Limited**
 - Few response options
- **Non-Replayable**
 - Limits the immersive experience



PROBLEM - DEMO





Current State of NPC Generation



Game Developer



Script



User



Proposed Method of NPC Generation



Game Developer



LLM Model



User



Capstone Project - NPChat

- Scripted
- One-dimensional
- Limited
- Not Replayable



Capstone Project - NPChat

- ~~Scripted~~

- ~~One-dimensional~~

- ~~Limited~~

- ~~Not Replayable~~



- Dynamic

- Multi-Dimensional

- Unlimited Conversation

- Replayable

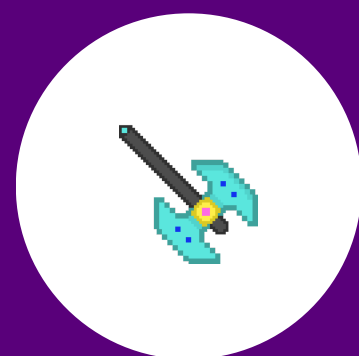




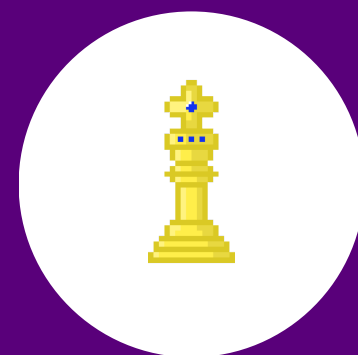
PIPELINE - DATA ANALYSIS



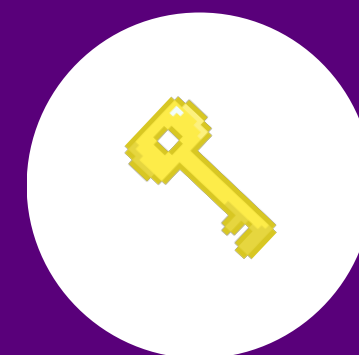
Data Analysis & Preparation



Model Training



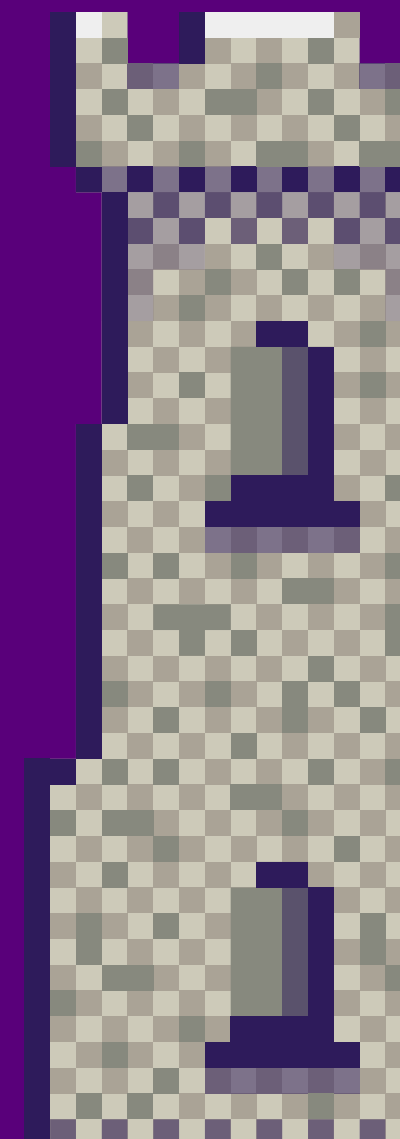
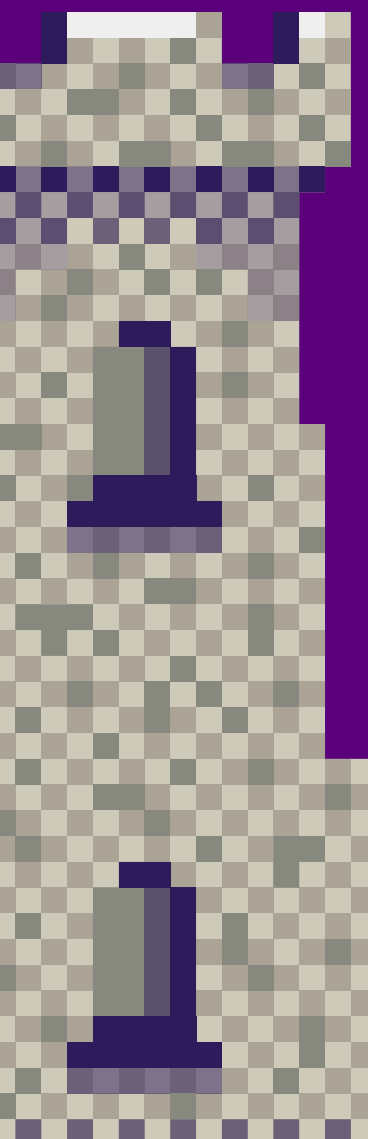
Model Evaluation & Selection



Model Enhancement with RAG



Model Deployment





DATASET

[NPC-Dialog Dataset From HuggingFace](#)

Total Samples	1915
Train	1723
Test	192



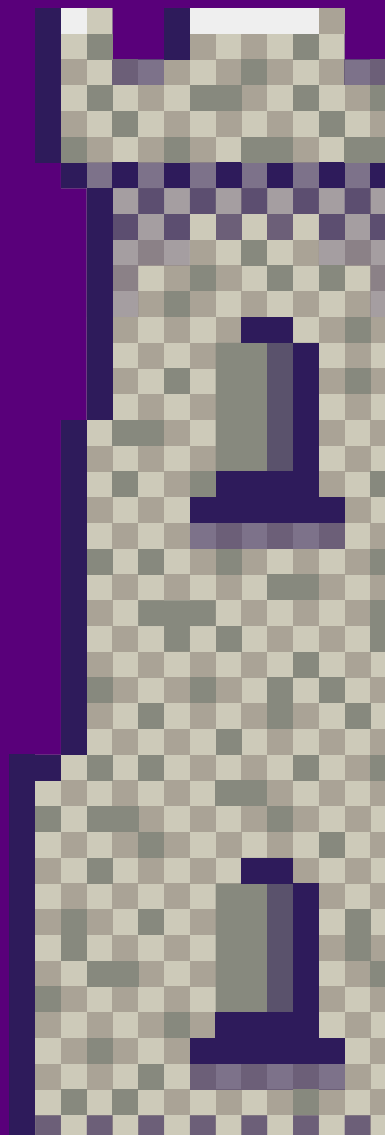
DATA SAMPLE 1

Name	Arn, the Knight Templar
Biography	Arn is a highly skilled and honorable knight
Query	What is your greatest strength?
Response	Honor, courage, unwavering.



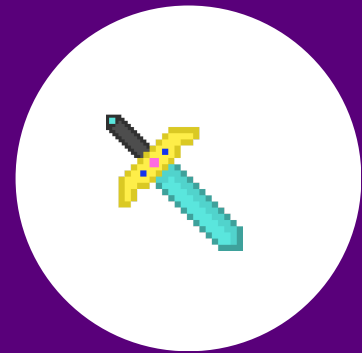
TRAIN DATA SUMMARY

Total NPCs	101
Min Query/Response count per NPC	1 (Aria Nightshade)
Max Query/Response count per NPC	23 (Laura Croft)
Mean Query/Response count per NPC	17

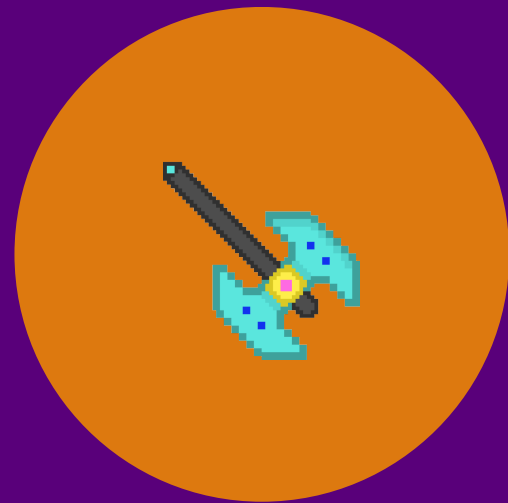




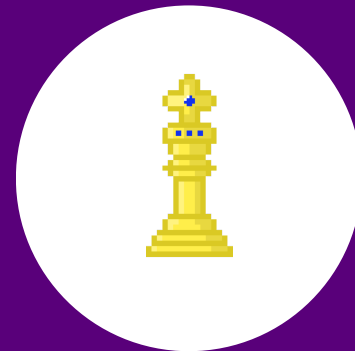
PIPELINE - MODEL TRAINING



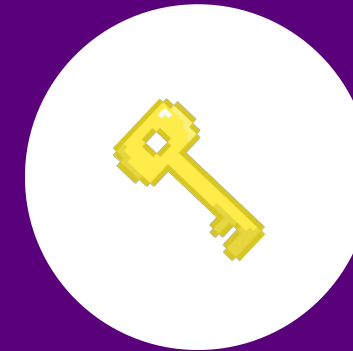
Data Analysis & Preparation



Model Training



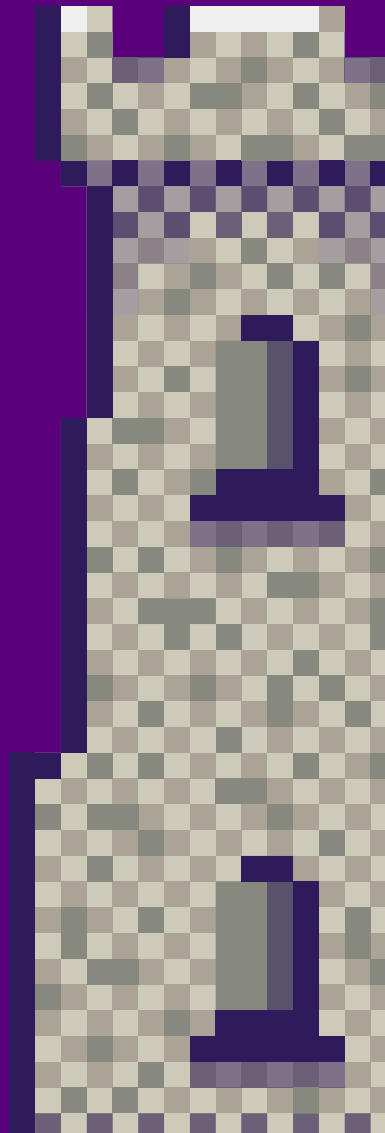
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MODEL ARCHITECTURE

Architecture

Fine-Tuning

**Few-shot
Learning**

Base Models

DialoGPT (OpenAI)

T-5 (Google)

LLaMa-2 (Meta)

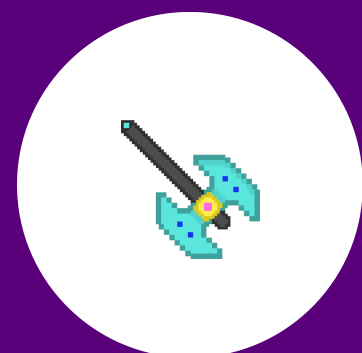
DialogStudio-T5 (Salesforce)



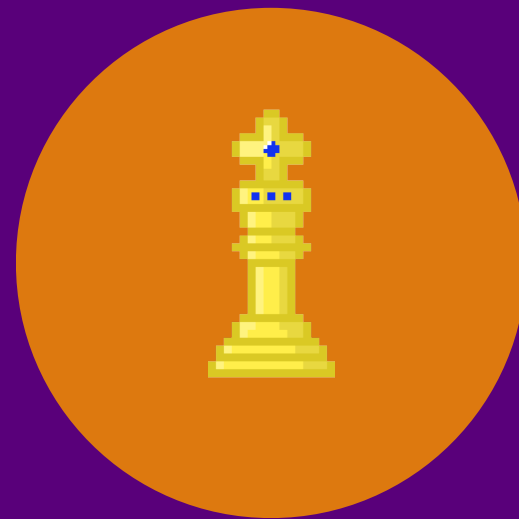
PIPELINE - MODEL EVALUATION



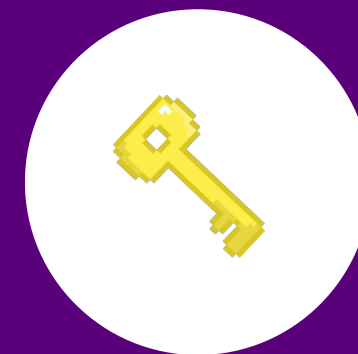
Data Analysis & Preparation



Model Training



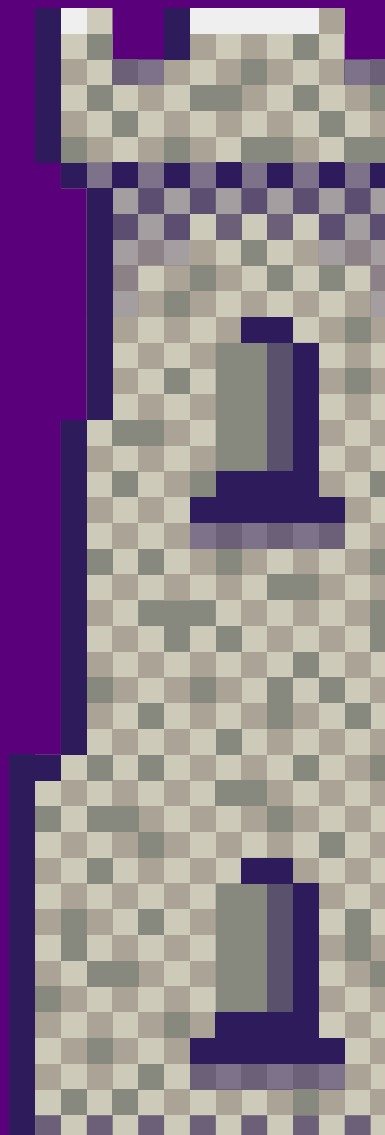
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MODEL EVALUATION

Evaluation Metrics

- Rouge scores
- Human annotation
 - Fluidity
 - Correctness



MODEL EVALUATION - ROUGE SCORE

DialogStudio-T5	0.222
LLaMa-2	0.251

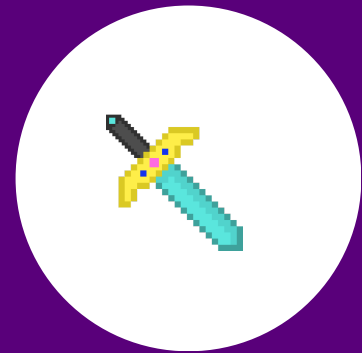


HUMAN ANNOTATION

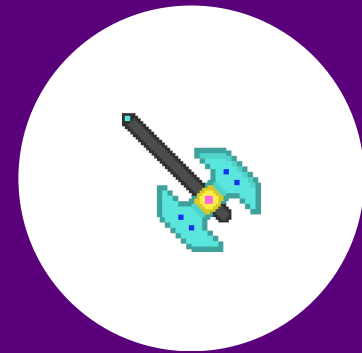
NPC	Question	DialogStudio-T5 Response	LLaMa-2 Response
Arn, the Knight Templar Arn is a highly skilled and honorable knight	Have you ever made a difficult decision?	Difficult decisions are part of my duty as a knight	Difficult decisions, part of duty
SpongeBob A square yellow sponge named SpongeBob SquarePants lives in a pineapple with his pet snail, Gary.	What color are you?	Light blue, like my dress	Yellow, of course!



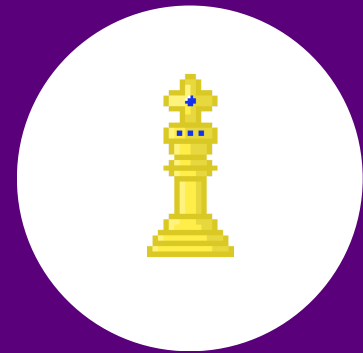
PIPELINE - MODEL ENHANCEMENT WITH RAG



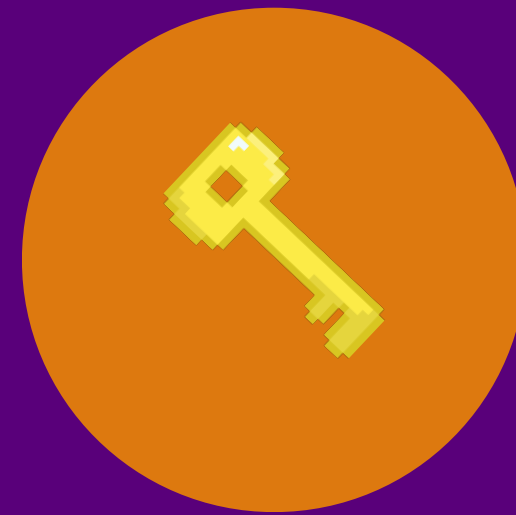
Data Analysis &
Preparation



Model Training



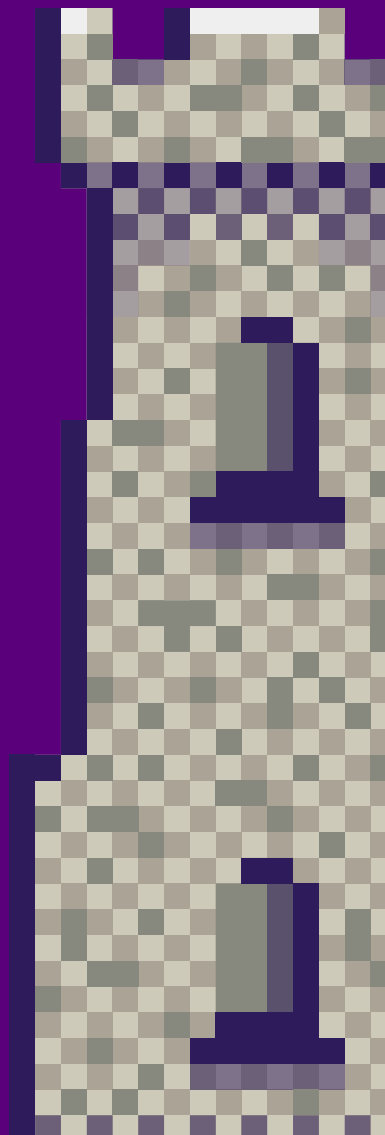
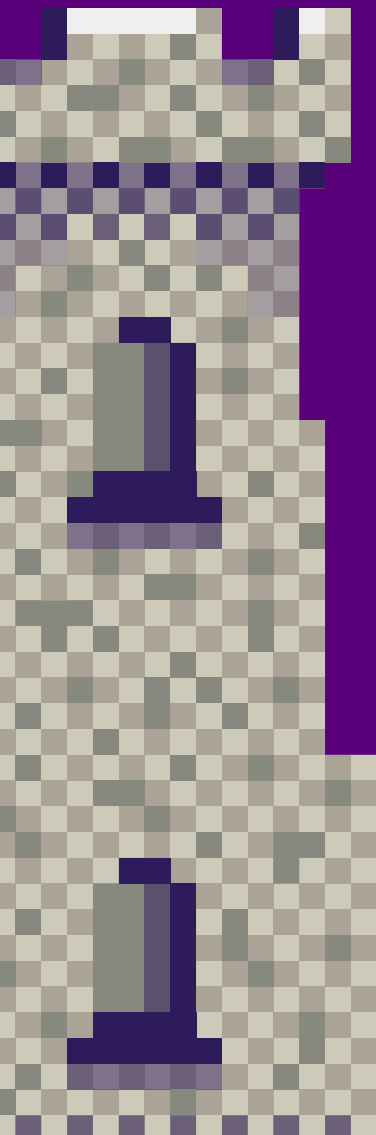
Model Evaluation



Model Enhancement
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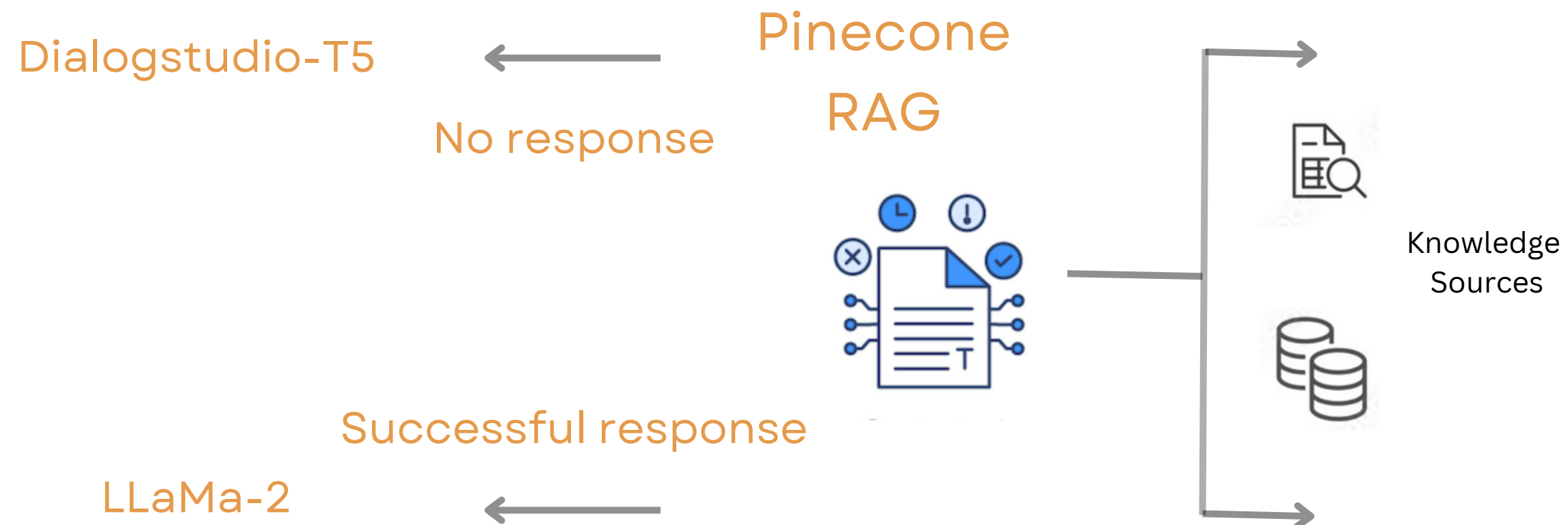


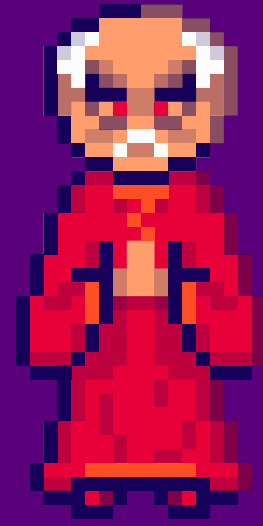
Model
Deployment



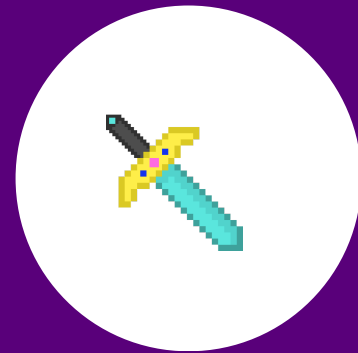


NPCHAT USING RETRIEVAL AUGMENTED GENERATION (RAG)

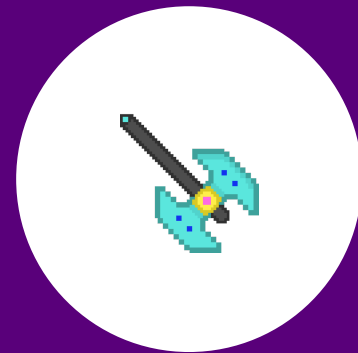




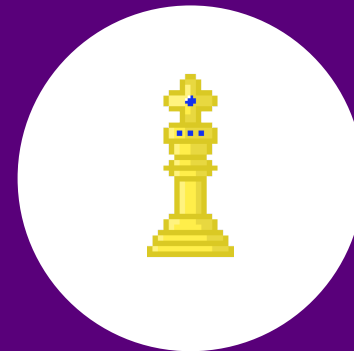
PIPELINE - MODEL DEPLOYMENT



Data Analysis & Preparation



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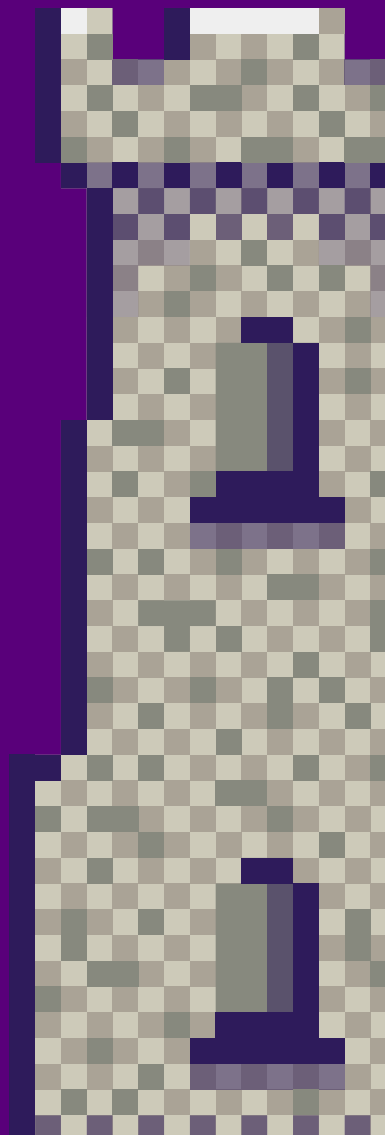
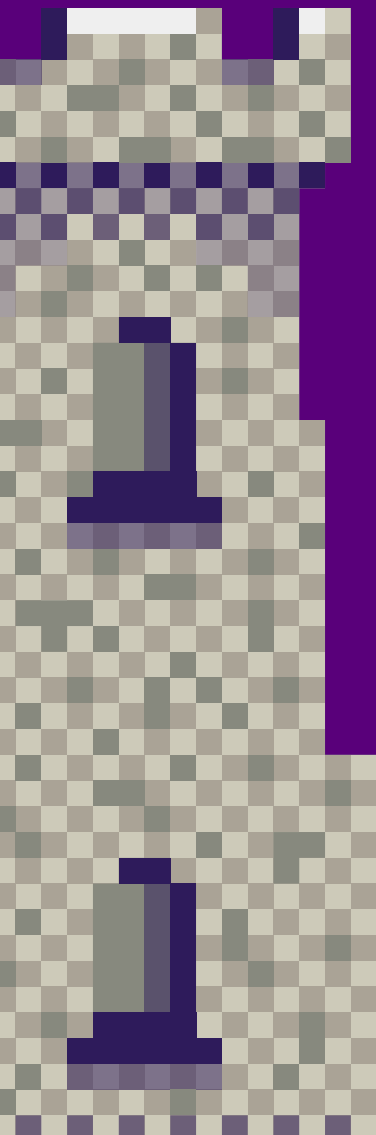
Model Evaluation



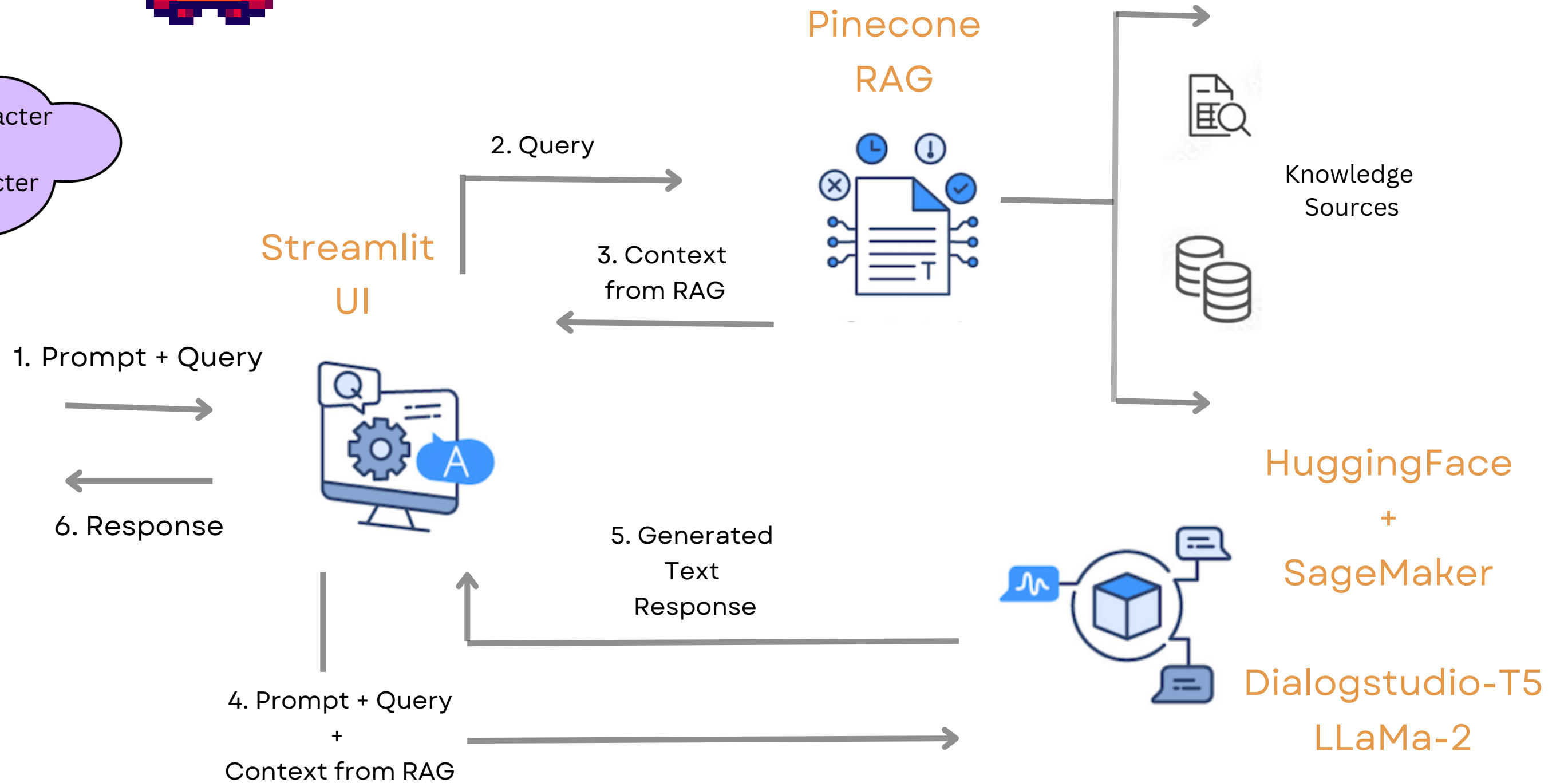
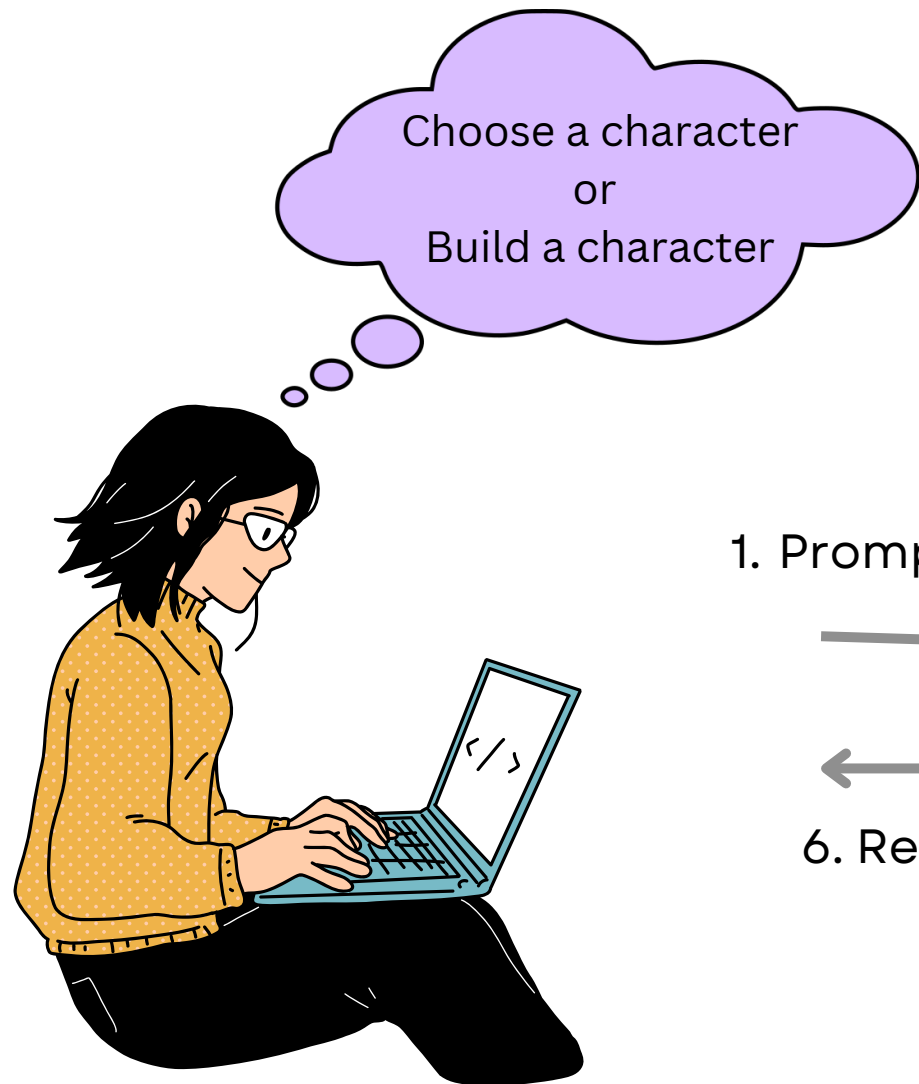
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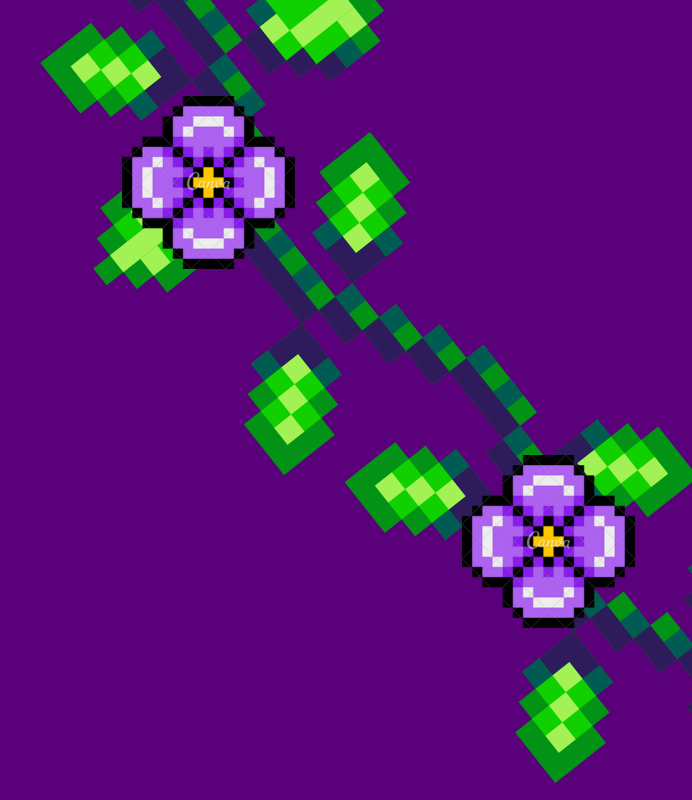
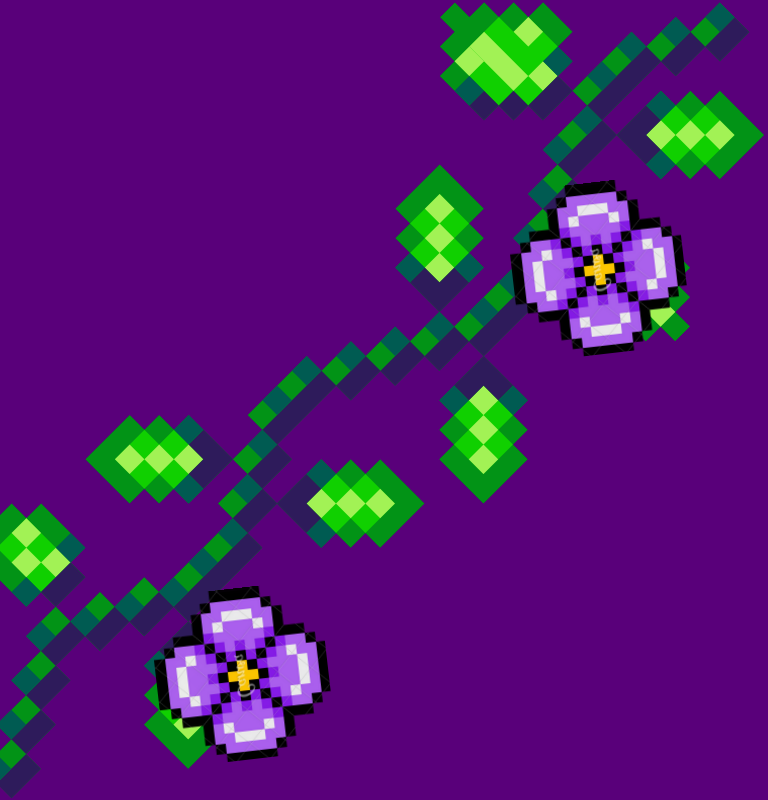


Model
Deployment

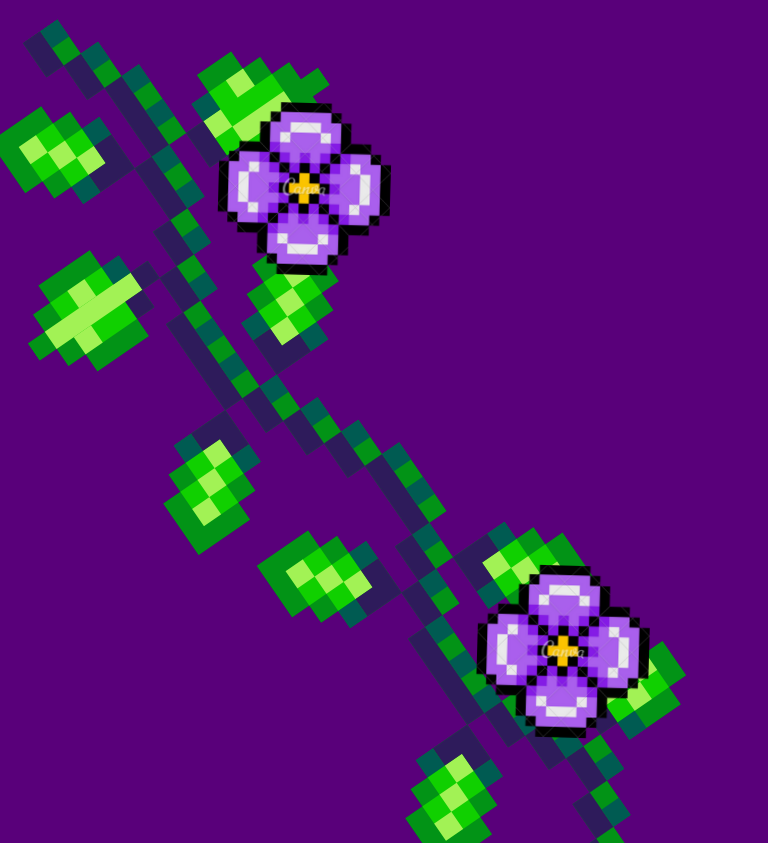


NPCHAT MVP





MVP - NPChat



Challenges & Future Steps

- The HuggingFace NPC dataset:
 - small set of main-characters
 - limited dialogue combinations
 - Fine-tuning on character dialogue more similar to NPC interactions would be more effective

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 - Fine-tuning on character dialogue more similar to NPC interactions would be more effective
- Combination of DialogStudio and LLaMa-2
- Implement the LLM into the video game



Acknowledgements

Zona Kostic

Cornelia Llin

Robert Wang

W210 Instruction Team

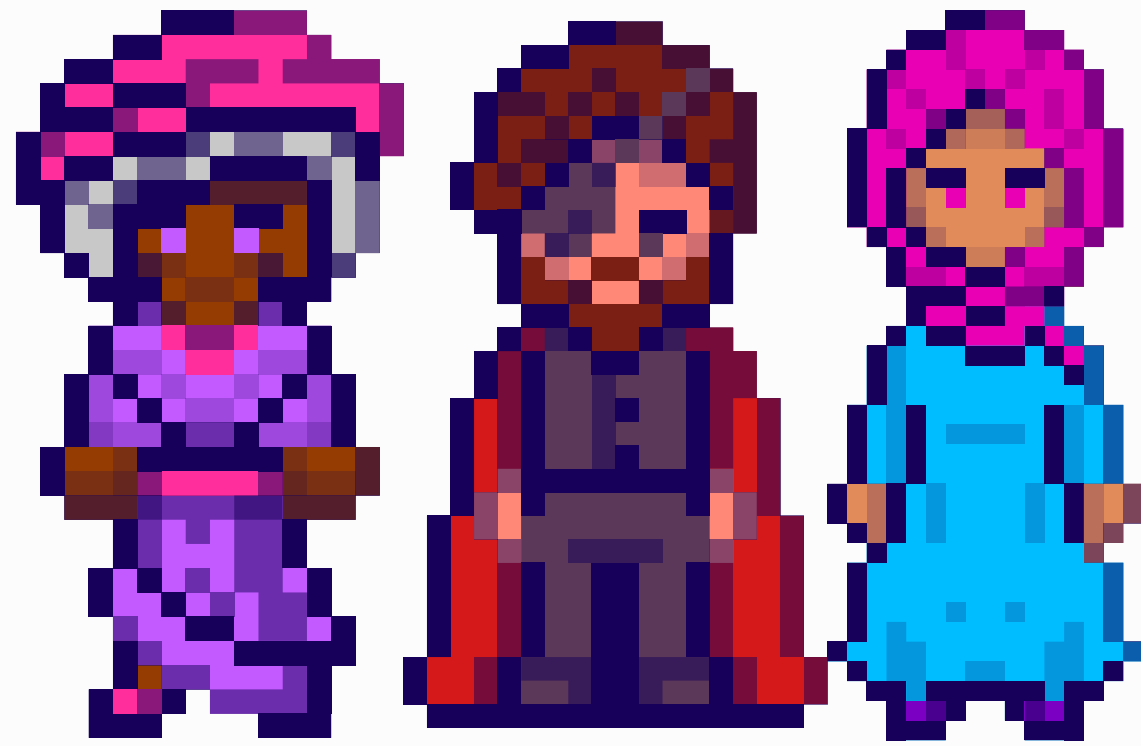
Salesforce Team

Dr. Mark Butler



Project Mission

Creating a more interactive and immersive gaming experience by revolutionizing the way NPCs are generated.



NPChat



THANK YOU

