



This Magic Card Does Not Exist

Making fake cards with Gen AI





Outline

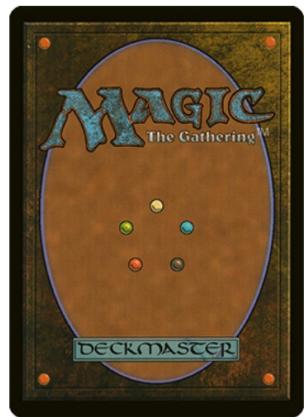
- Background
- Demo
- Implementation
- Prior Work
- Future Work
- Questions



x

Background

- Magic The Gathering
 - Trading Card Game
 - 30 years of history and 30,000+ cards
 - High Fantasy
 - Notoriously complex



?

< 3.1 >







***Magic: The Gathering* Comprehensive Rules**

These rules are effective as of October 13, 2023.

Introduction

This document is the ultimate authority for *Magic: The Gathering*® competitive game play. It consists of a series of numbered rules followed by a glossary. Many of the numbered rules are divided into subrules, and each separate rule and subrule of the game has its own number. (Note that subrules skip the letters “l” and “o” due to potential confusion with the numbers “1” and “0”; subrule 704.5k is followed by 704.5m, then 704.5n, then 704.5p, for example.)

Changes may have been made to this document since its publication. You can download the most recent version from the *Magic* rules website at Magic.Wizards.com/Rules. If you have questions, you can get the answers from us at Support.Wizards.com.

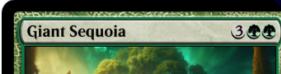




Demo

thismagiccarddoesnotexist.com/create

Gallery Create About



Demo

thismagiccarddoesnotexist.com/create

Gallery Create About





Implementation

- Text Generation
- Artwork Generation
- Rendering





Text



Arcanis the Omnipotent {3}{U}{U}{U}
Legendary Creature – Wizard
{T}: Draw three cards.
{2}{U}{U}: Return Arcanis the Omnipotent to its owner's hand.
3/4





Card Generation - Text

GPT-4

N create a magic the gathering card based off a moose

Certainly! Here's a card inspired by a moose:

Majestic Forest Moose
{3}{G}{G}
Creature - Elk

Trample

Whenever Majestic Forest Moose blocks or becomes blocked by a creature, that creature loses all abilities until end of turn.

The quiet might of the forest, encapsulated in a single powerful being.

4/5





Card Generation - Art

N

Give a very short description of the artwork that would go on this card



A towering moose stands amidst a dense forest, sunlight filtering through the canopy, casting dappled patterns on its majestic antlers. Its imposing stance, with a raised hoof and piercing gaze, warns of its dominance over this woodland realm. The background shows shadowy figures of other forest creatures pausing to acknowledge the moose's authority.





Structured Data

We want

```
{  
  "card_name": "Majestic Forest Moose",  
  "mana_cost": "{3}{G}{G}",  
  "rules_text": "Trample\n\nWhenever Majestic Forest Moose blocks a creature,  
 it becomes blocked by a creature, that creature loses all abilities until  
 the end of turn.",  
  "card_type": "Creature",  
  "sub_type": "Elk",  
  "flavor_text": "The quiet might of the forest, encapsulated in a single powerful being.",  
  "color": "#A0C0F0",  
  "rarity": "Common",  
  "set": "M13",  
  "id": 1000000000000000000}
```





ChatGPT Functions

Function calling allows you to more reliably get structured data back from the model. For example, you can:

- Create chatbots that answer questions by calling external APIs (e.g. like ChatGPT Plugins)
 - e.g. define functions like `send_email(to: string, body: string)`, or
`get_current_weather(location: string, unit: 'celsius' | 'fahrenheit')`
- Convert natural language into API calls
 - e.g. convert "Who are my top customers?" to `get_customers(min_revenue: int, created_before: string, limit: int)` and call your internal API
- Extract structured data from text
 - e.g. define a function called `extract_data(name: string, birthday: string)`, or
`sql_query(query: string)`

<https://platform.openai.com/docs/guides/gpt/function-calling>





ChatGPT Functions

```
function_schema = \  
{  
    'name': 'create_card',  
    'description': 'Creates a Magic The Gathering card with the p  
vided details.',  
    'parameters': {  
        'type': 'object',  
        'properties': {  
            'card_name': {  
                'description': 'The name of the card.',  
                'type': 'string',  
                'examples': [  
                    'The Force Awakens',  
                    'Jedi Mind Trick'  
                ]  
            }  
        }  
    }  
}
```





ChatGPT Functions

```
prompt = get_prompt() # "a moose"
messages = [{"role": "user", "content": f"Create a Magic The Gathering card like {prompt}"}]

response = openai.ChatCompletion.create(
    model="gpt-4-0613",
    messages=messages,
    functions=[function_schema],
    function_call={"name": "create_card"}
)
```





Image Generation - Criteria

- 4:3 Aspect Ratio support
- API support
- Quality
- Price





Image Generation - Quality Test



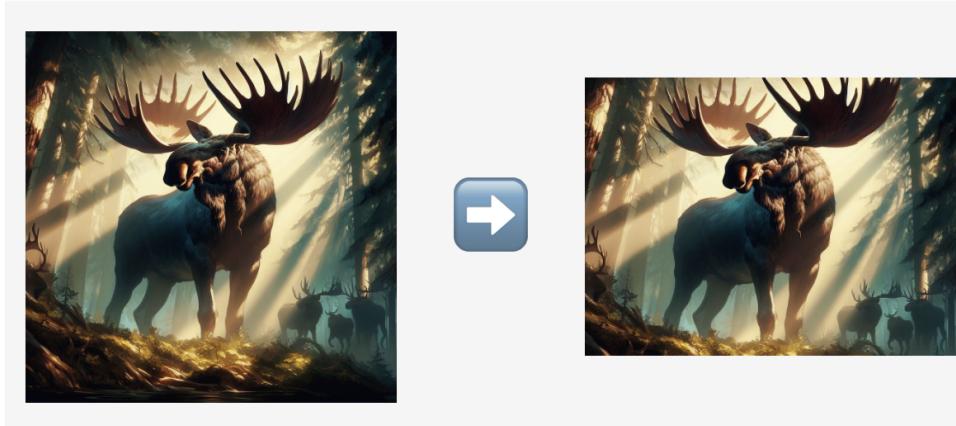
Image Generation

System	Aspect Ratio	Quality	Price
Stable Diffusion	✓	✗	\$
DALLE-2	✗	✗	\$\$
Midjourney	✓	✓	\$\$\$
Bing Image Creator	✗	✓	Free



Aspect Ratio

Attempt 1: Cropping

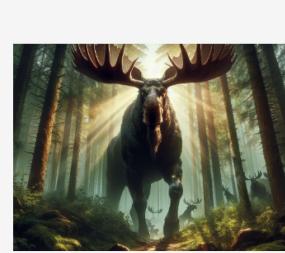
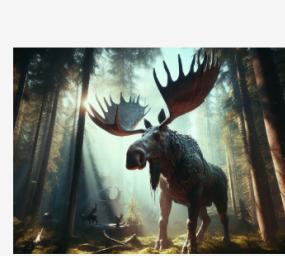
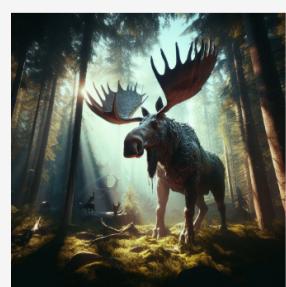




Aspect Ratio

Attempt 2: Prompt Engineering

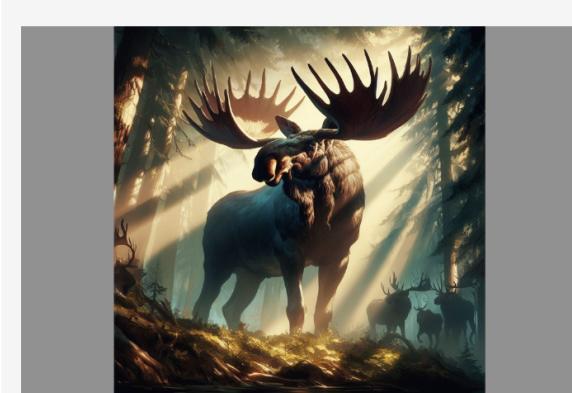
A towering moose [...] *slightly zoomed out*





Aspect Ratio

Attempt 3: DALLE-2 Outpainting





Rendering Card



<http://mtg.design/>





MTG.Design

Home Create

mtgdne ▾

Create a Card

New Card

#	Total	Set	Lang	Designer
1234	1	SET	EN	

Name Mana Cost

Super Type Sub

Special Frames Color Indicator Rarity

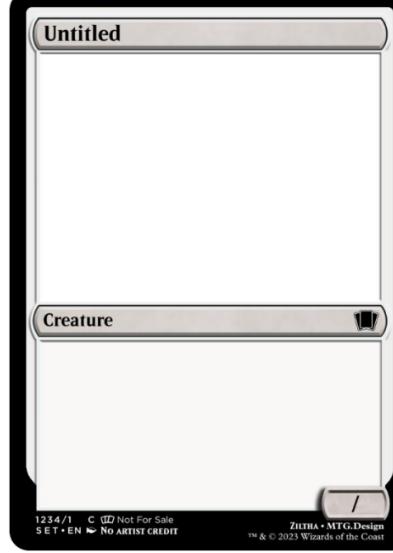
Normal None Common

Rules Text ([Show Syntax](#))

Flavor Text

Text Size (38pt) Center Foil Border

Render Download Save & Share





Create a Card

Edit “Prismatic Pocketwatch” (DONE)

#	Total	Set	Lang	Designer
1	1	SET	EN	thismagiccarddoesnotexist.com

Name Mana Cost

Super Type Sub

Special Frames Color Indicator Rarity

Rules Text (Show Syntax)
`{T},{X}: Add X charge counters to ~
{T}, Remove 1 charge counter from ~: Add one mana of any color`

Flavor Text
`With each tick, it captures a moment of magic`

Text Size (36pt)
Center Foil Border



Render



Download



Save & Share

<https://mtg.design/i/sjcl02>



Putting it all together





Prior Work - Urza's AI (May 2022)

- Fine-tuned Large Language Model from Cohere accessed via API
- 52 billion parameters

<https://thenewstack.io/cohere-vs-openai-in-the-enterprise-which-will-cios-choose/>

- Wombo AI for art generation





Prior Work - Urza's AI (May 2022)



<https://news.ycombinator.com/item?id=31419017>

<https://news.ycombinator.com/item?id=31413940>

<https://news.ycombinator.com/item?id=31414133>





Prior Work - Robo Rosewater (2015)

- Character-based Recurrent Neural Network
- Trained on all MTG cards with substantial pre-processing

All decimal numbers are represented in unary [...] 0 is &, 1 is &^, 2 is &^^, 11 is &^^^^^^^^^, and so on.

- A little over one million parameters

With a good GPU, I can train a 3-layer, size 512 network in a few hours; on a CPU this will probably take at least a day.



<https://github.com/billzorn/mtgencode#tutorial>



Prior Work - Robo Rosewater (2015)



<https://twitter.com/RoboRosewater/status/804046343253659652>

<https://twitter.com/RoboRosewater/status/838103705446658050>

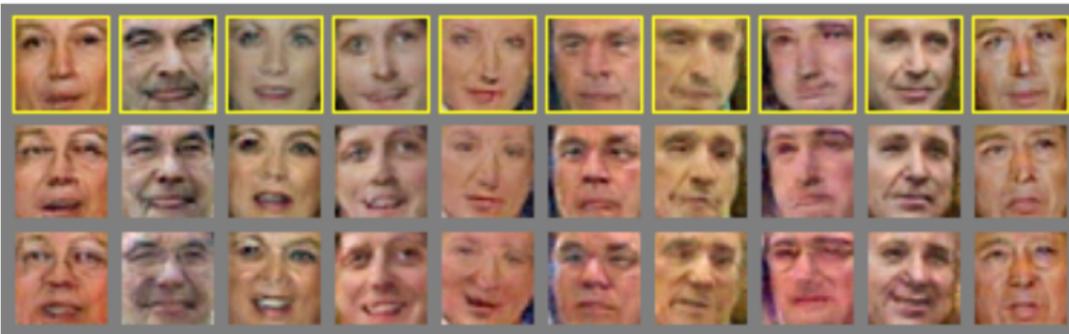
<https://twitter.com/RoboRosewater/status/1044666093774659584>





SotA Image Generation in 2015

- Generative Adversarial Networks
- Model must be trained on specific entity (face, cat, etc.)



<http://www.foldl.me/2015/conditional-gans-face-generation/>





Review

	8 Years Ago	1.5 Years Ago	Now
Model Architecture	Custom model	Fine-tuned off-the-shelf model	Off-the-shelf model
Training Data	Pre-processed corpus of cards	Corpus of cards	None
Image Quality	No images	Almost recognizable	On par with real cards
Card Mechanics	Poor	Medium	High





What Comes Next?





Future Work

N

Create an image of a magic the gathering card based on a moose. In your prompt say exactly what text should go on the card i.e. name, mana cost, abilities, etc. Respond with just the image



DALL-E 3

Created image



×

X ⤓ □



Prompt

Illustration of a Magic: The Gathering card. At the top, the card name reads 'Mystical Moose'. Below the name, the mana cost is '4G' (4 colorless and 1 green mana). The card art depicts a majestic moose standing in a mystical forest, with ethereal glows surrounding it. At the bottom, the card type is 'Creature - Moose'. The text box contains the following abilities: 'Trample. When Mystical Moose enters the battlefield, gain 5 life. Tap: Add one green mana to your mana pool.'. The power and toughness of the creature is '4/5' at the bottom right of the card.

Copy



Prediction

	8 Years Ago	1.5 Years Ago	Now	6 Months From Now??
Model Architecture	Custom model	Fine-tuned off-the-shelf model	Off-the-shelf model	What's a model?
Training Data	Pre-processed corpus of cards	Corpus of cards	None	Why would you need training data?
Image Quality	No images	Almost recognizable	On par with real cards	Indistinguishable
Card Mechanics	Poor	Medium	High	Yes



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Thank You!

Questions?

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