cat_tree_reviews_to_images

November 25, 2025

1 Cat Tree Reviews to Images

1.0.1 Import libraries

[37]:
```
!pip install sentence-transformers faiss-cpu scikit-learn -q
```

[38]:
```
!pip install scikit-learn matplotlib seaborn -q
```

[39]:
```
import pandas as pd
import numpy as np

from sentence_transformers import SentenceTransformer
import faiss
from sklearn.cluster import KMeans
import matplotlib.pyplot as plt

from sklearn.manifold import TSNE
from sklearn.decomposition import PCA
import matplotlib.pyplot as plt
import seaborn as sns

import os
import json
import openai
```

1.1 Part 1 - Preprocessing Reviews

[40]:
```
from google.colab import drive
drive.mount('/content/drive')
print("Google Drive mounted successfully")
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount("/content/drive", force_remount=True).
Google Drive mounted successfully
```

[41]:
```
csv_path = '/content/drive/MyDrive/CMU /Gen AI Lab/cat_tree_reviews.csv'
df = pd.read_csv(csv_path)
```

```
[42]: df
```

```
[42]:
               f7       f7 2                  b              flex  \
0    Jul 13, 2025      Janie       Item details  Color: Dark Gray   
1     Oct 7, 2025      MattM       Item details  Color: Dark Gray   
2    Oct 12, 2025    Chasidy       Item details  Color: Dark Gray   
3    Sep 22, 2025  Kittyfood       Item details  Color: Dark Gray   
4     Oct 6, 2025    Katrina       Item details       Color: Pink   
..            …        …                …                …   
736  Aug 28, 2023    Candice                NaN               NaN   
737  Apr 25, 2023      Britt  Verified Purchase               NaN   
738  Dec 23, 2023        Mia                NaN               NaN   
739   Nov 7, 2023      susan                NaN               NaN   
740  Apr 26, 2023    jeffrey                NaN               NaN   

                              flex 2                  b 2  \
0    Assembled product height: 54 in              Sold by   
1    Assembled product height: 54 in              Sold by   
2    Assembled product height: 54 in  Sold and shipped by   
3    Assembled product height: 54 in              Sold by   
4      Assembled product height: 56"  Sold and shipped by   
..                                 …                  …   
736                              NaN              Sold by   
737                              NaN                  NaN   
738                              NaN              Sold by   
739                              NaN              Sold by   
740                              NaN                  NaN   

                                mv1           b 3    mv1 2  \
0    Factory Direct Wholesales, LLC  Delivered by  Walmart   
1    Factory Direct Wholesales, LLC  Delivered by  Walmart   
2    Factory Direct Wholesales, LLC           NaN      NaN   
3    Factory Direct Wholesales, LLC  Delivered by  Walmart   
4    Factory Direct Wholesales, LLC           NaN      NaN   
..                              …           …      …   
736  Factory Direct Wholesales, LLC           NaN      NaN   
737                             NaN           NaN      NaN   
738  Factory Direct Wholesales, LLC           NaN      NaN   
739  Factory Direct Wholesales, LLC           NaN      NaN   
740                             NaN           NaN      NaN   

                      w_iUH7                b 4  \
0    5 out of 5 stars review  Verified Purchase   
1    5 out of 5 stars review  Verified Purchase   
2    5 out of 5 stars review  Verified Purchase   
3    5 out of 5 stars review  Verified Purchase   
4    3 out of 5 stars review  Verified Purchase   
```

```
..                       …                …
736  5 out of 5 stars review  Verified Purchase
737  5 out of 5 stars review                NaN
738  3 out of 5 stars review  Verified Purchase
739  5 out of 5 stars review  Verified Purchase
740  3 out of 5 stars review  Verified Purchase

                                                  tl-m  ml1  \
0    The Best Pet Tower has been a blessing to my t…  (0)
1    I found the assembly process quite enjoyable. …  (0)
2    it's a lot smaller than I thought it would be …  (0)
3    Yes ordering online and having it shipped to y…  (0)
4    I ordered the 56 inch activity house. My cat i…  (0)
..                                                 …  …
736                          I Love it my cats love it  (0)
737  Very strong , tall and my cat loves it worth i…  (0)
738  It was for a large/Big cat. It should have bee…  (0)
739  Made very well and easy to put together. Very …  (0)
740  It was a good value, they give you the wrench …  (0)

                                                w_kV33
0                                                  NaN
1                                                  NaN
2    smaller cats or kittens for sure who know larg…
3                                                  NaN
4                            Too small for AVERAGE cat
..                                                 …
736                                         Five stars
737                                   Will buy again !
738                                       Live n learn
739                                                NaN
740                                           Cat tree

[741 rows x 14 columns]
```

[43]:

```
# Extract and clean reviews column
df_reviews = df[['tl-m']].copy()

# Remove rows with NaN values
df_reviews = df_reviews.dropna()

# Rename column to 'review'
df_reviews = df_reviews.rename(columns={'tl-m': 'review'})

# Reset index after dropping NaN
df_reviews = df_reviews.reset_index(drop=True)
```

```
df_reviews
```

[43]:

```
                                                review
0    The Best Pet Tower has been a blessing to my t…
1    I found the assembly process quite enjoyable. …
2    it's a lot smaller than I thought it would be …
3    Yes ordering online and having it shipped to y…
4    I ordered the 56 inch activity house. My cat i…
..                                                 …
725                           I Love it my cats love it
726  Very strong , tall and my cat loves it worth i…
727  It was for a large/Big cat. It should have bee…
728  Made very well and easy to put together. Very …
729  It was a good value, they give you the wrench …

[730 rows x 1 columns]
```

[44]:

```
# Save cleaned data
output_path = '/content/drive/MyDrive/CMU /Gen AI Lab/cat_tree_reviews_cleaned.
 ↪csv'
df_reviews[['review']].to_csv(output_path, index=False)
print(f"\nCleaned reviews saved to: {output_path}")
```

```
Cleaned reviews saved to: /content/drive/MyDrive/CMU /Gen AI
Lab/cat_tree_reviews_cleaned.csv
```

1.2 Part 2 - LLM Analysis of Reviews

1.2.1 Combine all reviews

[45]:

```
from google.colab import drive
drive.mount('/content/drive')
print("Google Drive mounted successfully")
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount("/content/drive", force_remount=True).
Google Drive mounted successfully
```

[46]:

```
csv_path = '/content/drive/MyDrive/CMU /Gen AI Lab/cat_tree_reviews_cleaned.csv'
df_reviews = pd.read_csv(csv_path)
```

[47]:

```
df_reviews
```

[47]:

```
                                                review
0    The Best Pet Tower has been a blessing to my t…
1    I found the assembly process quite enjoyable. …
2    it's a lot smaller than I thought it would be …
3    Yes ordering online and having it shipped to y…
```

```
4    I ordered the 56 inch activity house. My cat i…
..                                                …
725                            I Love it my cats love it
726  Very strong , tall and my cat loves it worth i…
727  It was for a large/Big cat. It should have bee…
728  Made very well and easy to put together. Very …
729  It was a good value, they give you the wrench …

[730 rows x 1 columns]
```

[48]:

```python
# Combine all reviews into one large text corpus
all_reviews_text = "\n\n---REVIEW---\n\n".join(df_reviews['review'].tolist())

print(f"Total reviews: {len(df_reviews)}")
print(f"Combined text length: {len(all_reviews_text)} characters")
print(f"Estimated tokens: ~{len(all_reviews_text) // 4}")  # Rough estimate: 1 token  4 chars

# Preview combined text
print("\n--- First 500 characters of combined reviews ---")
print(all_reviews_text[:500])
```

```
Total reviews: 730
Combined text length: 114899 characters
Estimated tokens: ~28724

--- First 500 characters of combined reviews ---
The Best Pet Tower has been a blessing to my two cats.  They love it but are too
big for some of the smaller pet houses. The tower is adjustable as  took off the
smaller pet houses and replaced them with the larger benches.  Great product
that makes my cats me-wow!

---REVIEW---

I found the assembly process quite enjoyable. Everything was very compact in the
box for the size of the finished product.  My cat loves it despite being over 10
and less active than he used to be. At first, he ignored
```

1.2.2 Visualization - Embedding & Clustering Analysis

[49]:

```python
model = SentenceTransformer('all-MiniLM-L6-v2')
embeddings = model.encode(df_reviews['review'].tolist(), show_progress_bar=True)
```

```
Batches:   0%|          | 0/23 [00:00<?, ?it/s]
```

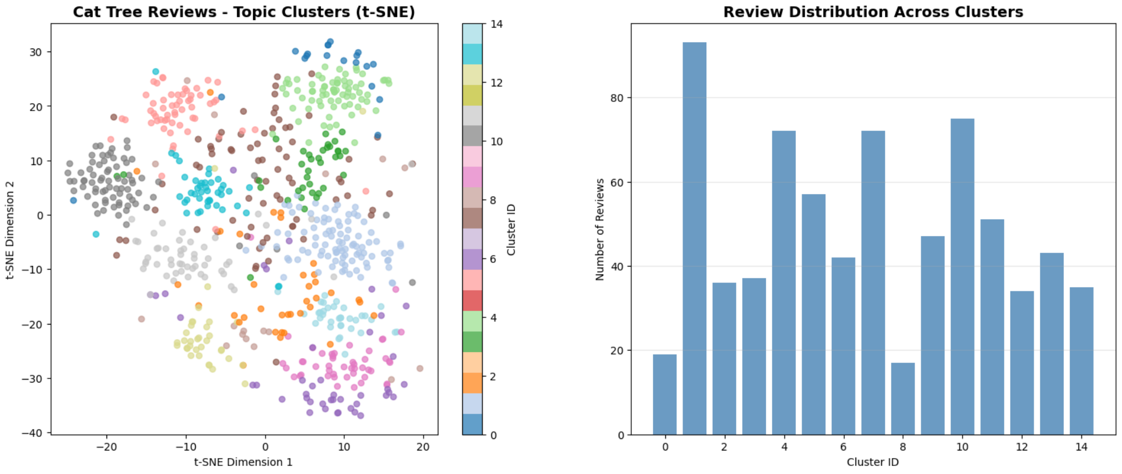
[50]:

```python
# KMeans clustering
from sklearn.cluster import KMeans
n_clusters = 15
```

```
kmeans = KMeans(n_clusters=n_clusters, random_state=42, n_init=10)
cluster_labels = kmeans.fit_predict(embeddings)

# Add cluster column to dataframe
df_reviews['cluster'] = cluster_labels
```

[51]:

```
# PART 1: Visualization - Embedding & Clustering Analysis

# Visualize clusters using t-SNE (2D projection)
tsne = TSNE(n_components=2, random_state=42, perplexity=30)
embeddings_2d = tsne.fit_transform(embeddings)

# Create visualization
fig, axes = plt.subplots(1, 2, figsize=(18, 7))

# Plot 1: Cluster distribution
scatter = axes[0].scatter(embeddings_2d[:, 0], embeddings_2d[:, 1],
                          c=df_reviews['cluster'], cmap='tab20', alpha=0.7, s=30)
axes[0].set_title('Cat Tree Reviews - Topic Clusters (t-SNE)', fontsize=14,␣
 ↪fontweight='bold')
axes[0].set_xlabel('t-SNE Dimension 1')
axes[0].set_ylabel('t-SNE Dimension 2')
plt.colorbar(scatter, ax=axes[0], label='Cluster ID')

# Plot 2: Cluster size distribution
cluster_counts = df_reviews['cluster'].value_counts().sort_index()
axes[1].bar(cluster_counts.index, cluster_counts.values, color='steelblue',␣
 ↪alpha=0.8)
axes[1].set_title('Review Distribution Across Clusters', fontsize=14,␣
 ↪fontweight='bold')
axes[1].set_xlabel('Cluster ID')
axes[1].set_ylabel('Number of Reviews')
axes[1].grid(axis='y', alpha=0.3)
```



[52]:

```
# Extract and display sample reviews from each cluster (topic analysis)
print("CLUSTER TOPIC ANALYSIS")

cluster_topics = {}
for cluster_id in range(n_clusters):
    cluster_reviews = df_reviews[df_reviews['cluster'] == cluster_id]
    # Get a representative sample
    sample_review = cluster_reviews['review'].iloc[0]
    cluster_topics[cluster_id] = {
        'count': len(cluster_reviews),
        'sample': sample_review[:150] + "..." if len(sample_review) > 150 else␣
 ↪sample_review
    }
    print(f"\nCluster {cluster_id} ({cluster_topics[cluster_id]['count']}␣
 ↪reviews):")
    print(f"  Sample: {cluster_topics[cluster_id]['sample']}")
```

```
CLUSTER TOPIC ANALYSIS

Cluster 0 (19 reviews):
  Sample: My fur baby circled around it for several days…took hidden treats to
get her on it-guess she is still adjusting to the change.

Cluster 1 (93 reviews):
  Sample: I found the assembly process quite enjoyable. Everything was very
compact in the box for the size of the finished product.  My cat loves it
despite be…

Cluster 2 (36 reviews):
  Sample: I love it!! Super easy to assemble and simple instructions! It came
really fast and my cats are playing with it immediately! I wish I had more space
t…

Cluster 3 (37 reviews):
  Sample: The flash sale price was amazing, the size after putting together was
not what I was expecting. The platforms are very small and they have a lot of
mo…

Cluster 4 (72 reviews):
  Sample: Now that my cat has had more time… she absolutely loves it! My
husband sprinkled a bit of cat nip from Shady Cat in each box and finally she
took to…

Cluster 5 (57 reviews):
  Sample: it's a lot smaller than I thought it would be but it did go together.
```

```
the instructions leave a lot to be desired but I did get it together only had
to…

Cluster 6 (42 reviews):
  Sample: I have not put the product together, but I will tell you FedEx was in
the middle of my yard. I have a ramp he left it at the very bottom of the ramp
w…

Cluster 7 (72 reviews):
  Sample: The worst. Do not buy.  It's not well situated for cats. No real place
for them to jump. The rope for claws is in the back and too low for cats to
use…

Cluster 8 (17 reviews):
  Sample: Yes ordering online and having it shipped to you is the way to go. You
get a better price than what the store has in stock. My kitty hasn't got on it
…

Cluster 9 (47 reviews):
  Sample: I got this item Friday and noticed one of the legs were wobbly and I
unscrewed it to re tighten it and now it won't go into the screw. Now this screw
…

Cluster 10 (75 reviews):
  Sample: I have never had a cat tree I am a cat and dog lover but I have had
animals most of my life but this time I had to have a way to keep the cat food
awa…

Cluster 11 (51 reviews):
  Sample: Looked nice but wasn't very sturdy. My cat hated it. The only way I
could get her to get on it was to put treats on it. She climbed it, ate the
treats…

Cluster 12 (34 reviews):
  Sample: This is definitely good value for the money, these books to record
what you've eaten are wonderful with one small exception: there's not a lot of
room…

Cluster 13 (43 reviews):
  Sample: The Best Pet Tower has been a blessing to my two cats.  They love it
but are too big for some of the smaller pet houses. The tower is adjustable as
t…

Cluster 14 (35 reviews):
  Sample: assembly wasn't great. we had to poke holes in the fabric where the
screws go but the product it's self is very sturdy and  looks great in the
living …
```

1.2.3 OpenAI API analysis

[53]:
```
from google.colab import userdata
OPENAI_API_KEY = userdata.get('OPENAI_API_KEY')
os.environ['OPENAI_API_KEY'] = OPENAI_API_KEY
print("OpenAI API key loaded")

from openai import OpenAI
client = OpenAI(api_key=OPENAI_API_KEY)
```

```
OpenAI API key loaded
```

[54]:
```
# Prepare the analysis prompt
# Prompt 1
analysis_prompt = f"""You are an expert product analyst. Analyze the following␣
  ↪{len(df_reviews)} customer reviews for a BestPet 70in Cat Tree Tower (Dark␣
  ↪Gray).

Your task is to extract VISUAL and STRUCTURAL information useful for generating␣
  ↪product images. Focus on:

1. **Structure & Dimensions**: Height, number of levels/tiers, platform␣
  ↪arrangement, base design
2. **Materials & Textures**: Fabric types (plush, carpet, sisal), surface␣
  ↪textures
3. **Key Components**: Scratching posts, cat houses/condos, perches, ladders,␣
  ↪hammocks
4. **Design Elements**: Hanging toys, pom-poms, color schemes, platform shapes
5. **Overall Aesthetic**: Sturdy/wobbly, compact/spacious style

Provide a JSON output with this structure:
{{
  "structure": {{
    "height": "description",
    "tiers": "number and arrangement",
    "base": "stability and design"
  }},
  "materials": {{
    "primary_covering": "material type",
    "textures": ["list of textures mentioned"],
    "quality": "overall quality perception"
  }},
  "components": {{
    "scratching_posts": "description",
    "enclosed_spaces": "cat houses/condos details",
    "platforms": "types and sizes",
    "toys": "hanging toys, balls, etc."
  }},
  "colors": {{
    "primary": "main color",
    "accents": ["additional colors"]
  }},
  "keywords": ["descriptive adjectives from reviews"],
  "image_prompt": "A comprehensive prompt for image generation based on all extracted features"
}}

CUSTOMER REVIEWS:
---
{all_reviews_text}
---

Provide ONLY valid JSON output, no additional text or markdown.
"""

# Call OpenAI API

try:
    response = client.chat.completions.create(
        model="gpt-4o",
        messages=[
            {"role": "system", "content": "You are an expert product analyst. Output only valid JSON."},
            {"role": "user", "content": analysis_prompt}
        ],
        temperature=0.3,
        max_tokens=2000
    )

    llm_output = response.choices[0].message.content
    print("Response received!\n")

    # Clean and parse JSON
    # Remove markdown code blocks if present
    llm_output_clean = llm_output.strip()
    if llm_output_clean.startswith("```"):
        llm_output_clean = llm_output_clean.split("```")[1]
        if llm_output_clean.startswith("json"):
            llm_output_clean = llm_output_clean[4:]
    llm_output_clean = llm_output_clean.strip()

    # Parse JSON
    extracted_features = json.loads(llm_output_clean)

    # Display results
```

```
    print("EXTRACTED VISUAL FEATURES")
    print(json.dumps(extracted_features, indent=2))

    # Save to file
    output_path = '/content/drive/MyDrive/CMU /Gen AI Lab/
  ↪cat_tree_extracted_features.json'
    with open(output_path, 'w') as f:
        json.dump(extracted_features, f, indent=2)
    print(f"Features saved to: {output_path}")

    # Display the image generation prompt
    print("FINAL IMAGE GENERATION PROMPT")
    print(extracted_features.get('image_prompt', 'N/A'))

except Exception as e:
    print(f"Error: {str(e)}")
```

```
Response received!

EXTRACTED VISUAL FEATURES
{
  "structure": {
    "height": "70 inches",
    "tiers": "multiple levels, compact arrangement",
    "base": "stability issues, compact design"
  },
  "materials": {
    "primary_covering": "plush fabric",
    "textures": [
      "soft",
      "fuzzy",
      "plush"
    ],
    "quality": "mixed reviews, some perceive as low quality"
  },
  "components": {
    "scratching_posts": "sisal rope, some reviews mention insufficient
quantity",
    "enclosed_spaces": "small cat houses/condos, not suitable for larger cats",
    "platforms": "small platforms, not suitable for large cats",
    "toys": "hanging toys, pom-poms, easily detachable"
  },
  "colors": {
    "primary": "dark gray",
    "accents": [
      "navy blue",
      "light gray"
    ]
  },
  "keywords": [
    "compact",
    "wobbly",
    "affordable",
    "soft",
    "small",
    "easy assembly",
    "unstable",
    "cute",
    "cheap",
    "sturdy"
  ],
  "image_prompt": "A tall, dark gray cat tree tower with multiple compact levels
and small platforms. It features plush fabric covering and includes small
enclosed spaces like cat houses. The design incorporates sisal rope scratching
posts and hanging toys such as pom-poms. The overall structure appears wobbly
and is suitable for kittens or small cats, with a compact base design. The color
scheme includes dark gray as the primary color with possible navy blue or light
gray accents. The aesthetic is affordable and cute, but may appear unstable for
larger cats."
}
Features saved to: /content/drive/MyDrive/CMU /Gen AI
Lab/cat_tree_extracted_features.json
FINAL IMAGE GENERATION PROMPT
A tall, dark gray cat tree tower with multiple compact levels and small
platforms. It features plush fabric covering and includes small enclosed spaces
like cat houses. The design incorporates sisal rope scratching posts and hanging
toys such as pom-poms. The overall structure appears wobbly and is suitable for
kittens or small cats, with a compact base design. The color scheme includes
dark gray as the primary color with possible navy blue or light gray accents.
The aesthetic is affordable and cute, but may appear unstable for larger cats.
```

[55]:

```
# Improve prompt to only retain positive features
# Prompt 2
improved_prompt = f"""Analyze these {len(df_reviews)} customer reviews for a␣
 ↪cat tree tower.

Extract TWO separate outputs:

1. **POSITIVE VISUAL FEATURES**: Physical features mentioned in POSITIVE␣
 ↪reviews (4-5 stars)
   - Structure, materials, components that customers LIKED

2. **NEGATIVE VISUAL FEATURES**: Issues mentioned in NEGATIVE reviews (1-3␣
 ↪stars)
   - Problems like size, stability, quality concerns
```

````
3. **IDEAL_IMAGE_PROMPT**: Based ONLY on positive features, create an image generation prompt that represents the product at its best.

4. **REALISTIC_IMAGE_PROMPT**: A balanced prompt reflecting both positive aspects and common complaints.

Output JSON format:
{{
  "positive_features": {{...}},
  "negative_features": {{...}},
  "ideal_image_prompt": "prompt focusing on best features",
  "realistic_image_prompt": "balanced prompt"
}}

REVIEWS:
{all_reviews_text}
"""

# Call OpenAI API

try:
    response = client.chat.completions.create(
        model="gpt-4o",
        messages=[
            {"role": "system", "content": "You are an expert product analyst. Output only valid JSON."},
            {"role": "user", "content": analysis_prompt}
        ],
        temperature=0.3,
        max_tokens=2000
    )

    llm_output = response.choices[0].message.content
    print("Response received!\n")

    # Clean and parse JSON
    # Remove markdown code blocks if present
    llm_output_clean = llm_output.strip()
    if llm_output_clean.startswith("```"):
        llm_output_clean = llm_output_clean.split("```")[1]
        if llm_output_clean.startswith("json"):
            llm_output_clean = llm_output_clean[4:]
    llm_output_clean = llm_output_clean.strip()

    # Parse JSON
    extracted_features = json.loads(llm_output_clean)
````

```
    # Display results
    print("EXTRACTED VISUAL FEATURES")
    print(json.dumps(extracted_features, indent=2))

    # Save to file
    output_path = '/content/drive/MyDrive/CMU /Gen AI Lab/
  ↪cat_tree_extracted_positive_features.json'
    with open(output_path, 'w') as f:
        json.dump(extracted_features, f, indent=2)
    print(f"Features saved to: {output_path}")

    # Display the image generation prompt
    print("FINAL IMAGE GENERATION PROMPT")
    print(extracted_features.get('image_prompt', 'N/A'))

except Exception as e:
    print(f"Error: {str(e)}")
```

```
Response received!

EXTRACTED VISUAL FEATURES
{
  "structure": {
    "height": "70 inches",
    "tiers": "multiple levels with compact arrangement",
    "base": "stability issues, often described as wobbly"
  },
  "materials": {
    "primary_covering": "plush fabric",
    "textures": [
      "soft",
      "fuzzy",
      "plush"
    ],
    "quality": "perceived as low quality, prone to shedding and instability"
  },
  "components": {
    "scratching_posts": "limited number, often described as too small",
    "enclosed_spaces": "small cat houses/condos, not suitable for larger cats",
    "platforms": "small and compact, not suitable for larger cats",
    "toys": "hanging balls, often detached easily"
  },
  "colors": {
    "primary": "dark gray",
    "accents": [
      "navy blue",
      "light gray"
    ]
  },
  "keywords": [
    "compact",
    "wobbly",
    "small",
    "soft",
    "affordable",
    "unstable",
    "easy assembly",
    "cheap"
  ],
  "image_prompt": "A 70-inch tall dark gray cat tree tower with multiple compact
tiers and small platforms. The structure includes small enclosed cat houses and
limited scratching posts covered in soft plush fabric. Hanging toys like balls
are attached, though they appear easily detachable. The overall design is
compact and slightly wobbly, suitable for kittens or smaller cats, with a color
scheme of dark gray and occasional navy blue or light gray accents. The
aesthetic is affordable but not very sturdy, with a focus on soft textures."
}
Features saved to: /content/drive/MyDrive/CMU /Gen AI
Lab/cat_tree_extracted_positive_features.json
FINAL IMAGE GENERATION PROMPT
A 70-inch tall dark gray cat tree tower with multiple compact tiers and small
platforms. The structure includes small enclosed cat houses and limited
scratching posts covered in soft plush fabric. Hanging toys like balls are
attached, though they appear easily detachable. The overall design is compact
and slightly wobbly, suitable for kittens or smaller cats, with a color scheme
of dark gray and occasional navy blue or light gray accents. The aesthetic is
affordable but not very sturdy, with a focus on soft textures.
```

[56]:

```
# Manually reduce negative words in the prompt
# Prompt 3
ideal_prompt = """
A 70-inch tall multi-tiered cat tree tower in dark gray plush fabric,
featuring 5-6 spacious platforms at different heights,
sisal-wrapped scratching posts,
two cozy enclosed cat condos with circular entrances,
soft carpeted perches,
hanging pom-pom toys,
sturdy wide base for stability,
set against a clean white background,
product photography style,
high quality, detailed textures
"""
```

1.3 Part 3 - Image Generation

1.3.1 3 prompts

[57]:

```
import requests
import base64
from PIL import Image
from io import BytesIO
```

[58]:

```
# Create output folder
output_folder = '/content/drive/MyDrive/CMU /Gen AI Lab/generated_images'
os.makedirs(output_folder, exist_ok=True)
```

[59]:

```
# 3 prompts from Part B
prompts = {
    "review_based": """A 70-inch dark gray cat tree tower with multiple compact␣
 ↪tiers. It features small platforms and enclosed spaces, covered in soft␣
 ↪plush fabric. The base is not very stable, and the structure includes␣
 ↪limited sisal scratching posts. Hanging toys like balls are attached but␣
 ↪easily detachable. The overall aesthetic is compact and affordable, suitable␣
 ↪for small cats or kittens.""",

    "positive_extracted": """A tall, dark gray cat tree tower with multiple␣
 ↪compact levels and small platforms. It features plush fabric covering with a␣
 ↪soft texture. The structure includes small enclosed cat houses and a few␣
 ↪low-placed scratching posts. Hanging toys like balls are attached but appear␣
 ↪easily detachable. The overall design looks wobbly and is more suitable for␣
 ↪kittens or small cats. The color scheme is primarily dark gray with some␣
 ↪navy blue and light gray accents.""",

    "ideal_manual": """A 70-inch tall multi-tiered cat tree tower in dark gray␣
 ↪plush fabric, featuring 5-6 spacious platforms at different heights,␣
 ↪sisal-wrapped scratching posts, two cozy enclosed cat condos with circular␣
 ↪entrances, soft carpeted perches, hanging pom-pom toys, sturdy wide base for␣
 ↪stability, set against a clean white background, product photography style,␣
 ↪high quality, detailed textures"""
}
```

1.3.2 DALL-E

[71]:

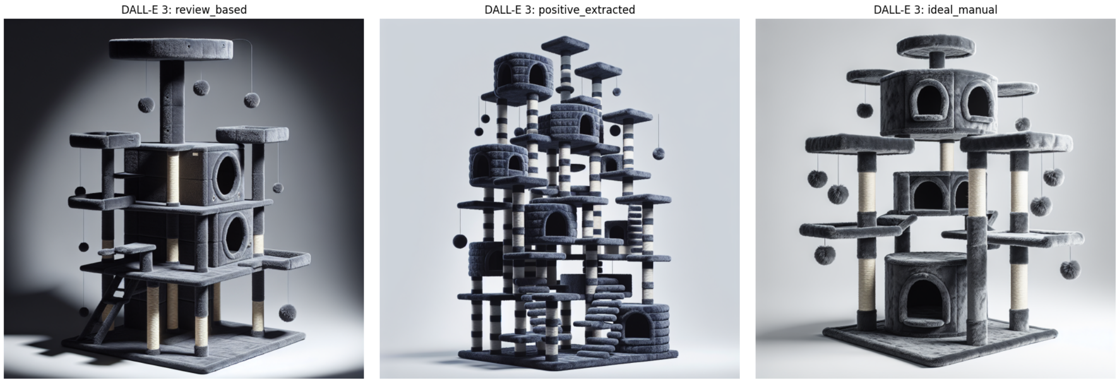
```
dalle_images = {}

for prompt_name, prompt_text in prompts.items():
    print(f"\nGenerating: {prompt_name}...")

    try:
        response = client.images.generate(
            model="dall-e-3",
            prompt=prompt_text,
            size="1024x1024",
            quality="standard",
            n=1
        )

        image_url = response.data[0].url
        dalle_images[prompt_name] = image_url

        # Download and save image
        img_response = requests.get(image_url)
        img = Image.open(BytesIO(img_response.content))
        save_path = f"{output_folder}/dalle3_{prompt_name}.png"
        img.save(save_path)

        print(f"Saved: dalle3_{prompt_name}.png")

    except Exception as e:
        print(f"Error: {str(e)}")
```

```
Generating: review_based…
Saved: dalle3_review_based.png

Generating: positive_extracted…
Saved: dalle3_positive_extracted.png

Generating: ideal_manual…
Saved: dalle3_ideal_manual.png
```

[72]:

```
# Display DALL-E images
print("\n--- DALL-E 3 Results ---")
fig, axes = plt.subplots(1, 3, figsize=(18, 6))
for idx, (prompt_name, _) in enumerate(prompts.items()):
    img_path = f"{output_folder}/dalle3_{prompt_name}.png"
    if os.path.exists(img_path):
        img = Image.open(img_path)
        axes[idx].imshow(img)
        axes[idx].set_title(f"DALL-E 3: {prompt_name}", fontsize=12)
        axes[idx].axis('off')
plt.tight_layout()
plt.savefig(f"{output_folder}/dalle3_comparison.png", dpi=300,␣
 ↪bbox_inches='tight')
plt.show()
```

```
--- DALL-E 3 Results ---
```



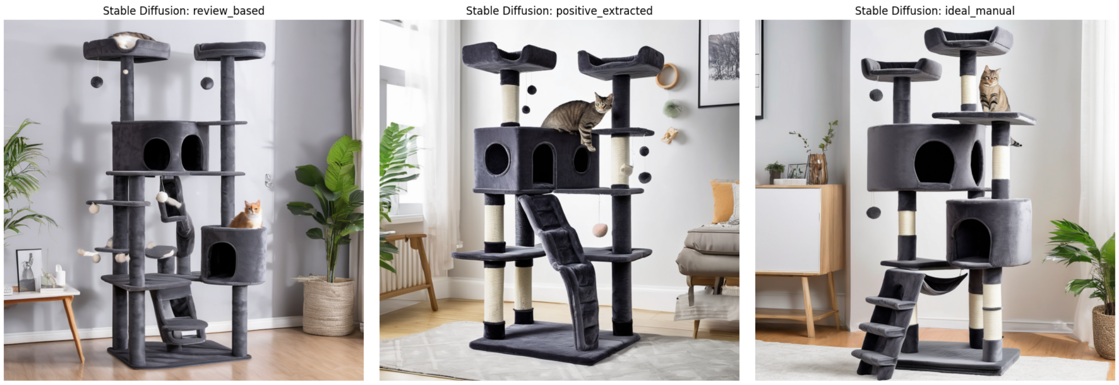
DALL-E 3: review_based
DALL-E 3: positive_extracted
DALL-E 3: ideal_manual

1.3.3 Stable Diffusion

[66]:
```
try:
    STABILITY_API_KEY = userdata.get('STABILITY_API_KEY')

    sd_images = {}

    for prompt_name, prompt_text in prompts.items():
        print(f"\nGenerating: {prompt_name}...")

        response = requests.post(
            "https://api.stability.ai/v1/generation/
 ↪stable-diffusion-xl-1024-v1-0/text-to-image",
            headers={
                "Content-Type": "application/json",
                "Authorization": f"Bearer {STABILITY_API_KEY}"
            },
            json={
                "text_prompts": [{"text": prompt_text, "weight": 1}],
                "cfg_scale": 7,
                "height": 1024,
                "width": 1024,
                "samples": 1,
                "steps": 30
            }
        )

        if response.status_code == 200:
            data = response.json()
            img_data = base64.b64decode(data["artifacts"][0]["base64"])
            img = Image.open(BytesIO(img_data))
            save_path = f"{output_folder}/sd_{prompt_name}.png"
            img.save(save_path)
```

```python
            sd_images[prompt_name] = save_path
            print(f"Saved: sd_{prompt_name}.png")
        else:
            print(f"Error: {response.status_code} - {response.text}")

    # Display SD images
    print("\n--- Stable Diffusion Results ---")
    fig, axes = plt.subplots(1, 3, figsize=(18, 6))
    for idx, (prompt_name, _) in enumerate(prompts.items()):
        img_path = f"{output_folder}/sd_{prompt_name}.png"
        if os.path.exists(img_path):
            img = Image.open(img_path)
            axes[idx].imshow(img)
            axes[idx].set_title(f"Stable Diffusion: {prompt_name}", fontsize=12)
            axes[idx].axis('off')
    plt.tight_layout()
    plt.savefig(f"{output_folder}/sd_comparison.png", dpi=300, bbox_inches='tight')
    plt.show()

except Exception as e:
    print(f"{str(e)}")
```

```
Generating: review_based…
Saved: sd_review_based.png

Generating: positive_extracted…
Saved: sd_positive_extracted.png

Generating: ideal_manual…
Saved: sd_ideal_manual.png

--- Stable Diffusion Results ---
```


Stable Diffusion: review_based
Stable Diffusion: positive_extracted
Stable Diffusion: ideal_manual

[62]:

[62]: