Cheat Sheet: Integrating Visual and Video Modalities

Package/Method	Description	Code Example

Base64 response format	Instead of returning URLs, you can get images as base64 data for immediate use without downloading from a URL. Useful when you need to process or store the images directly.	`import base64`
		`from PIL import Image`
		`import io`
		
		`response = client.images.generate(`
		`  model="dall-e-2",`
		`  prompt="a white siamese cat",`
		`  size="512x512",`
		`  response_format="b64_json",  # Get base64 instead of URL`
		`  n=1,`
		`)`
		
		`// Convert base64 to image`
		`image_data = base64.b64decode(response.data[0].b64_json)`
		`image = Image.open(io.BytesIO(image_data))`
		`image.show()  # Display the image`

Credentials setup	Sets up the credentials for accessing the watsonx API. The api_key is not needed in the lab environment, and the project_id is preset.	`from ibm_watsonx_ai import Credentials`
		`import os`
		
		`credentials = Credentials(`
		`  url="https://us-south.ml.cloud.ibm.com",`
		`  )`
		
		`project_id="skills-network"`

DALL-E 2 image generation	Uses DALL-E 2 to generate an image based on a text prompt. DALL-E 2 supports generations, edits, and variations, simultaneously allowing up to 10 images.	`response = client.images.generate(`
		`  model="dall-e-2",`
		`  prompt="a white siamese cat",`
		`  size="1024x1024",`
		`  quality="standard",`
		`  n=1,`
		`)`
		
		`url = response.data[0].url`
		`display.Image(url=url, width=512)`

DALL-E 3 image generation	Uses DALL-E 3 to generate higher quality images. DALL-E 3 only supports image generation (no edits or variations) but produces more detailed, accurate images.	`response = client.images.generate(`
		`  model="dall-e-3",`
		`  prompt="a white siamese cat",`
		`  size="1024x1024",`
		`  quality="standard",`
		`  n=1,`
		`)`
		
		`url = response.data[0].url`
		`display.Image(url=url, width=512)`

Effective prompting	Tips for crafting effective prompts to get better results from DALL-E models:
	• Be specific and detailed in your
		`// Basic prompt`
		`prompt = "a cat"`
		
		`// Improved detailed prompt`
		`prompt = "a fluffy white siamese cat with`
		`blue eyes sitting on a window sill,`
		`golden hour lighting, soft shadows,`
		`shallow depth of field,`
		`professional photography style"`

	descriptions • Include artistic style references • Specify lighting, perspective, and composition • Add context or setting information	`// Artistic style prompt` `prompt = “a white siamese cat in the style of a Renaissance oil painting, dramatic lighting, rich colors, detailed fur texture”`

File download	Function to download an image file from a URL if it doesn't already exist locally.	`import requests`
		
		`def load_file(filename, url):`
		`  # Download file if it doesn’t already exist`
		`  if not os.path.isfile(filename):`
		`  print(“Downloading file”)`
		`  response = requests.get(url, stream=True)`
		`  if response.status_code == 200:`
		`  with open(filename, ‘wb’) as f:`
		`  f.write(response.content)`
		`  else:`
		`  print(“Failed to download file. Status code:”, response.status_code)`
		`  else:`
		`  print(“File already exists”)`

Image captioning	Loop through the images to see the text descriptions produced by the model in response to the query, "Describe the photo".	`user_query = "Describe the photo"`
		`for i in range(len(encoded_images)):`
		`  image = encoded_images[i]`
		`  response = generate_model_response(image, user_query)`
		`  // Print the response with a formatted description`
		`  print(f"Description for image {i + 1}: {response}/n/n")`

Image display	Displays an image in the notebook using IPython's display functionality.	`from IPython.display import Image`
		
		`Image(filename=filename_tim, width=300)`

Image encoding	Encodes an image to base64 format for inclusion in the model request. This is necessary because JSON is text-based and doesn't support binary data directly.	`import base64`
		`import requests`
		
		`def encode_images_to_base64(image_urls):`
		`  encoded_images = []`
		`  for url in image_urls:`
		`  response = requests.get(url)`
		`  if response.status_code == 200:`
		`  encoded_image = base64.b64encode(response.content).decode(“utf-8”)`
		`  encoded_images.append(encoded_image)`
		`  print(type(encoded_image))`
		`  else:`
		`  print(f”Warning: Failed to fetch image from {url} (Status code: {response.status_code})”)`
		`  encoded_images.append(None)`
		`  return encoded_images`

Message formatting	Creates a structured message containing both text and image data to send to the model.	`messages = [{`
		`  "role": "user",`
		`  "content": [`
		`  {`
		`  "type": "text",`
		`  "text": question`
		`  },`
		`  {`
		`  "type": "image_url",`

		"image_url": {
		"url": "" + encoded_string,
		}
		}
		]
		}]
		return messages

Model invocation	Sends the formatted message to the model and receives a response with an analysis of the image.	response = model.chat(messages=my_message_1) print(response["choices"][0]["message"]["content"])
Model initialization	Initializes the vision model with specific parameters for text generation.	from ibm_watsonx_ai.foundation_models.schema import TextChatParameters from ibm_watsonx_ai.foundation_models import ModelInference model_id = 'ibm/granite-vision-3-2-2b' params = TextChatParameters(temperature=0.2, top_p=0.5,) model = ModelInference(model_id=model_id, credentials=credentials, project_id=project_id, params=params)

Multiple images (DALL-E 2)	Generate multiple images at once with DALL-E 2 using the 'n' parameter. DALL-E 2 can generate up to 10 images in a single request.	response = client.images.generate(
		model="dall-e-2",
		prompt="a white siamese cat",
		size="1024x1024",
		quality="standard",
		n=4, # Generate 4 different images
		)
		
		// Access all generated images
		for i, image_data in enumerate(response.data):
		print(f" URL for image {i+1}: {image_data.url}")
		display.Image(url=image_data.url, width=256)

OpenAI client initialization	Creates an instance of the OpenAI client to interact with the API.	from openai import OpenAI from IPython import display client = OpenAI()
Object dectection	Ask the model to define objects from a specific image.	image = encoded_images[1] user_query = "How many cars are in this image?" print("User Query: ", user_query) print("Model Response: ", generate_model_response(image, user_query))

pip install	Installs the necessary Python libraries required for working with watsonx and vision models.	`%pip install ibm-watsonx-ai==1.1.20 image==1.5.33 requests==2.32.0`

Quality options	Quality settings for generated images:
	• DALL-E 2: Only supports "standard"
	• DALL-E 3: Supports "standard" (default) and "hd" for enhanced detail
		`// DALL-E 3 with high-definition quality`
		`response = client.images.generate(`
		`  model="dall-e-3",`
		`  prompt="a mountain landscape",`
		`  size="1024x1024",`
		`  quality="hd",`
		`  n=1,`
		`)`

Saving generated images	Save the generated images to your local filesystem for later use.	`import requests`
		
		`// Save from URL`
		`response = client.images.generate(`
		`  model="dall-e-2",`
		`  prompt="a white siamese cat",`
		`  size="1024x1024",`
		`)`
		
		`url = response.data[0].url`
		`image_data = requests.get(url).content`
		
		`with open("generated_cat.jpg", "wb") as f:`
		`  f.write(image_data)`
		
		`print("Image saved to generated_cat.jpg")`

Size options	Different size options available for DALL-E models:
	• DALL-E 2: 256x256, 512x512, 1024x1024
	• DALL-E 3: 1024x1024, 1024x1792, 1792x1024
		`// DALL-E 2 with smaller size`
		`response = client.images.generate(`
		`  model="dall-e-2",`
		`  prompt="a white siamese cat",`
		`  size="512x512",`
		`  quality="standard",`
		`  n=1,`
		`)`
		
		`// DALL-E 3 with widescreen format`
		`response = client.images.generate(`
		`  model="dall-e-3",`
		`  prompt="a beautiful landscape",`
		`  size="1792x1024",`
		`  quality="standard",`
		`  n=1,`
		`)`

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