

Cheat Sheet: Foundations of Multimodal AI

Concept	Description	Implementation Example
Image captioning	Generate descriptive captions for images using multimodal models.	<pre>def generate_image_caption(model, encoded_image): """Generate a descriptive caption for an image.""" prompt = "Please provide a detailed description of this image." return send_multimodal_query(model, encoded_image, prompt) # Example usage caption = generate_image_caption(model, encoded_image) print("Image Caption:", caption)</pre>
Image processing	Basic image processing and encoding for multimodal applications.	<pre>import base64 from PIL import Image from io import BytesIO def encode_image(image_path): """Convert image to base64 for model input.""" with open(image_path, "rb") as image_file: encoded_string = base64.b64encode(image_file.read()).decode('utf-8') return encoded_string def process_image(image_path, target_size=(224, 224)): """Process image for model input.""" image = Image.open(image_path) image = image.resize(target_size) return image # Example usage image_path = "example.jpg" encoded_image = encode_image(image_path) processed_image = process_image(image_path)</pre>
Multimodal model setup	Basic setup for working with multimodal AI models using IBM watsonx.ai platform.	<pre>from ibm_watsonx_ai import Credentials from ibm_watsonx_ai.foundation_models import ModelInference from ibm_watsonx_ai.foundation_models.schema import TextChatParameters credentials = Credentials(url="https://us-south.ml.cloud.ibm.com",) params = TextChatParameters(temperature=0.2, top_p=0.5, max_tokens=2000) model = ModelInference(model_id="meta-llama/llama-3-2-90b-vision-instruct", credentials=credentials, project_id="skills-network", params=params)</pre>

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Multimodal query	Send a combined text and image query to a multimodal model.	<pre>def send_multimodal_query(model, encoded_image, prompt): """Send combined text and image query to model.""" messages = [{ "role": "user", "content": [{ "type": "text", "text": prompt }, { "type": "image_url", "image_url": { "url": f"data:image/jpeg;base64,{encoded_image}" } }] }] response = model.chat(messages=messages) return response['choices'][0]['message']['content'] # Example usage response = send_multimodal_query(model, encoded_image, prompt) print("Model Response:", response)</pre>
Text processing	Basic text processing and prompt engineering for multimodal applications.	<pre>def create_prompt(image_description, user_query): """Create a structured prompt for multimodal analysis.""" prompt = f""" Analyze the following image and answer the question. Image Description: {image_description} User Query: {user_query} Please provide a detailed response that: 1. Describes the image content 2. Answers the specific question 3. Provides relevant context """ return prompt # Example usage image_desc = "A cat sitting on a windowsill" user_question = "What is the cat doing?" prompt = create_prompt(image_desc, user_question)</pre>

Visual question answering	Answer questions about image content using multimodal models.	<pre>def visual_question_answering(model, encoded_image, question): """Answer questions about image content.""" prompt = f>Please answer the following question about the image: {question}" return send_multimodal_query(model, encoded_image, prompt) # Example usage question = "What color is the cat in the image?" answer = visual_question_answering(model, encoded_image, question) print("Answer:", answer)</pre>
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