

Screenshot of the running instances in the cloud or local environment.
Docker Builds, Images, and containers:

The screenshot displays two main sections of the Docker Desktop interface: the Containers view and the Builds view.

Containers View (Top Half):

- Left Sidebar:** Contains links for Containers, Images, Volumes, Builds, Docker Scout, and Extensions.
- Header:** Shows Container CPU usage (0.00% / 1000%) and Container memory usage (84.41MB / 7.48GB).
- Table:** Lists running containers under the "src" project. Each container has a name, image, status, port(s), CPU (%), and last started time.

Name	Image	Status	Port(s)	CPU (%)	Last started	Actions
src		Running (5/5)		0%	35 seconds ago	[⋮] [trash]
llm-rag-chromadb	chromadb/chron 7cd32bf6	Running	8000:8000 ↗	0%	36 seconds ago	[⋮] [trash]
gemini-finetuner	gemini-finetuner 656ef591 <none>	Running		0%	36 seconds ago	[⋮] [trash]
data-versioning	data-versioning 8b83370<none>	Running		0%	36 seconds ago	[⋮] [trash]
dataset-creator	dataset-creator aec0777<none>	Running		0%	36 seconds ago	[⋮] [trash]
llm-rag-llm-rag-cli	llm-rag-llm-rag-cli 0bc98b1<none>	Running		0%	35 seconds ago	[⋮] [trash]

Builds View (Bottom Half):

- Left Sidebar:** Contains links for Containers, Images, Volumes, Builds, Docker Scout, and Extensions. "Builds" is selected.
- Header:** Shows RAM 2.68 GB, CPU 0.81%, Disk 44.03 GB avail. of 62.67 GB.
- Selected builder:** desktop-linux
- Buttons:** Import builds and Builder settings.
- Notification:** A purple box encourages using the Docker Build Cloud for faster builds.
- Table:** Lists build history for the "src" project. Each build has an ID, name, builder, status, duration, created time, and author.

ID	Name	Builder	Status	Duration	Created	Author
NJXFSR	src/dataset-creator	default	✓ Completed	0.2s	Just now	N/A
E2LRLR	src/data-versioning	default	✓ Completed	0.2s	Just now	N/A
OKOLQB	src/gemini-finetuner	default	✓ Completed	0.2s	Just now	N/A
HSQBPZ	src/llm-rag	default	✓ Completed	3.3s	Just now	N/A
IV70ZT	src/dataset-creator	default	✓ Completed	0.1s	11 hours ago	N/A
CHC4RC	src/data-versioning	default	✓ Completed	0.1s	11 hours ago	N/A
219WJI	src/gemini-finetuner	default	✓ Completed	0.2s	11 hours ago	N/A
31NVL9	src/llm-rag	default	✓ Completed	2.3s	11 hours ago	N/A

Docker Desktop Images section showing 5 images:

Name	Tag	Status	Created	Size	Actions
llm-rag-cli	latest	In use	57 seconds ago	1.93 GB	⋮
gemini-finetuner	latest	In use	56 seconds ago	869.31 MB	⋮
data-versioning	latest	In use	12 hours ago	1.55 GB	⋮
dataset-creator	latest	In use	55 seconds ago	1.09 GB	⋮
chromadb/chroma	0.5.6	In use	1 month ago	472.73 MB	⋮

Selected 1 of 5

Versioned Data Strategy: GCS Bucket that contains Strict Format Dataset

Google Cloud Storage Bucket details for 'llm-strict-format-dataset'.

Bucket Structure:

- llm-strict-format-dataset
 - dvc_store/
 - files/
 - md5/
 - 31/
 - 42/
 - 43/
 - 91/
 - a3/
 - 99/
 - llm-finetune-dataset/
 - instruct-dataset.csv
 - sys-instruct.csv
 - test.csv
 - test.jsonl
 - train.csv
 - train.jsonl

DVC pushed files/md5/* into the dvc_store directory.

Data-creator container: python cli.py –upload uploads all *.csv and *.jsonl files to the bucket.
sys-instruct.csv records the prompt that generates the data.

A screenshot for sys-instruct.csv:

The screenshot shows a terminal window with the following content:

```
GCS bucket mounted at /mnt/gcs_data
mount: /app/cheese_dataset: special device /mnt/gcs_data/images does not exist.
mount: /app/cheese_dataset: failed to mount after failed mount system call.
Launching gunicorn in virtual environment...
root@bb83701c0e:/app# source /root/.local/share/virtualenvs/app-4PlapB0/bin/activate
```

DVC Version and Status:

```
(app) root@8b8337010c11:/app# dvc version
DVC version: 3.55.2 (pip)
-----
Platform: Python 3.11.10 on Linux-6.10.4-linuxkit-aarch64-with-glibc2.36
Subprojects:
    dvc_data = 3.16.6
    dvc_objects = 5.1.0
    dvc_render = 1.0.2
    dvc_task = 0.40.2
    scmrepo = 3.3.8
Supports:
    gs (gcsfs = 2024.9.0.post1),
    http (aiohttp = 3.10.10, aiohttp-retry = 2.8.3),
    https (aiohttp = 3.10.10, aiohttp-retry = 2.8.3)
Config:
    Global: /root/.config/dvc
    System: /etc/xdg/dvc
Cache types: symlink
Cache directory: fakeowner on /run/host_mark/Users
Caches: local
Remotes: gs
Workspace directory: fakeowner on /run/host_mark/Users
Repo: dvc, git
Repo.site_cache_dir: /var/tmp/dvc/repo/14de0754eac6e7ed9e155d0ed42210e9
(app) root@8b8337010c11:/app# dvc status
Data and pipelines are up to date.
(app) root@8b8337010c11:/app# █
```

DVC log can be found in git log submitted via Canvas

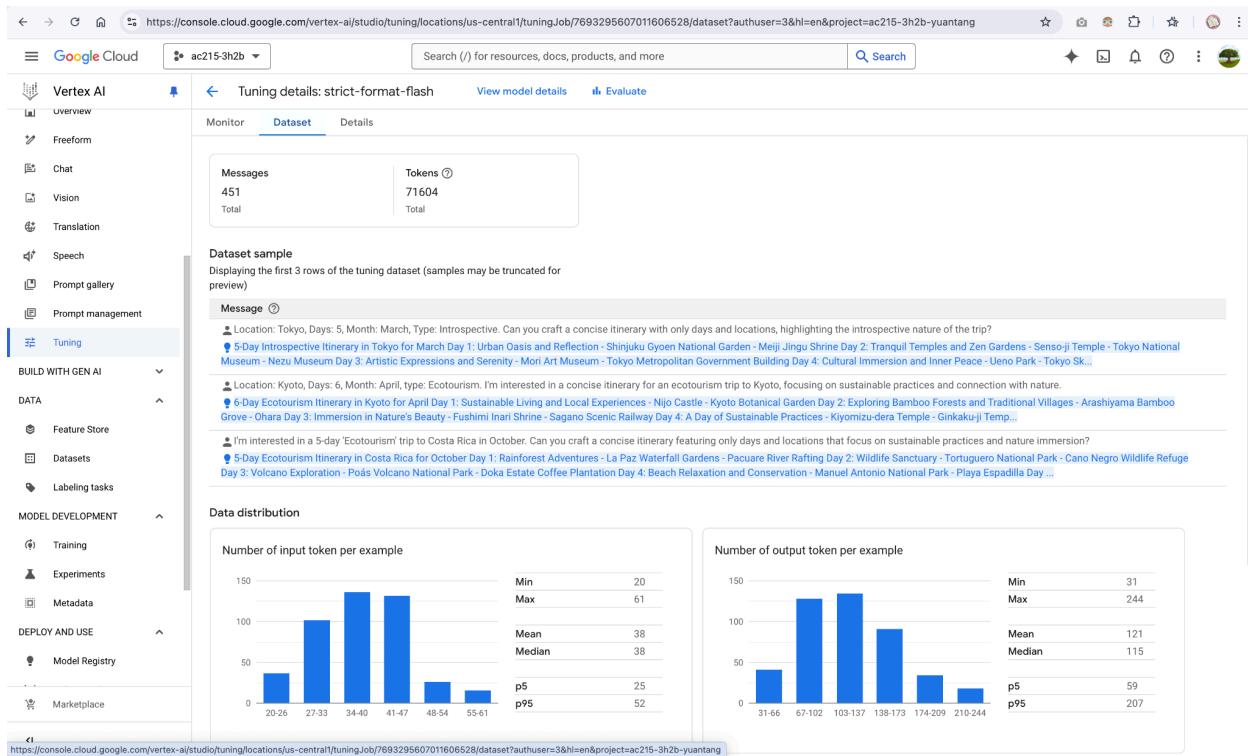
DVC traced datasets can be found by looking at the `./src/dataset-creator/data/*.dvc` files.

Why DVC?

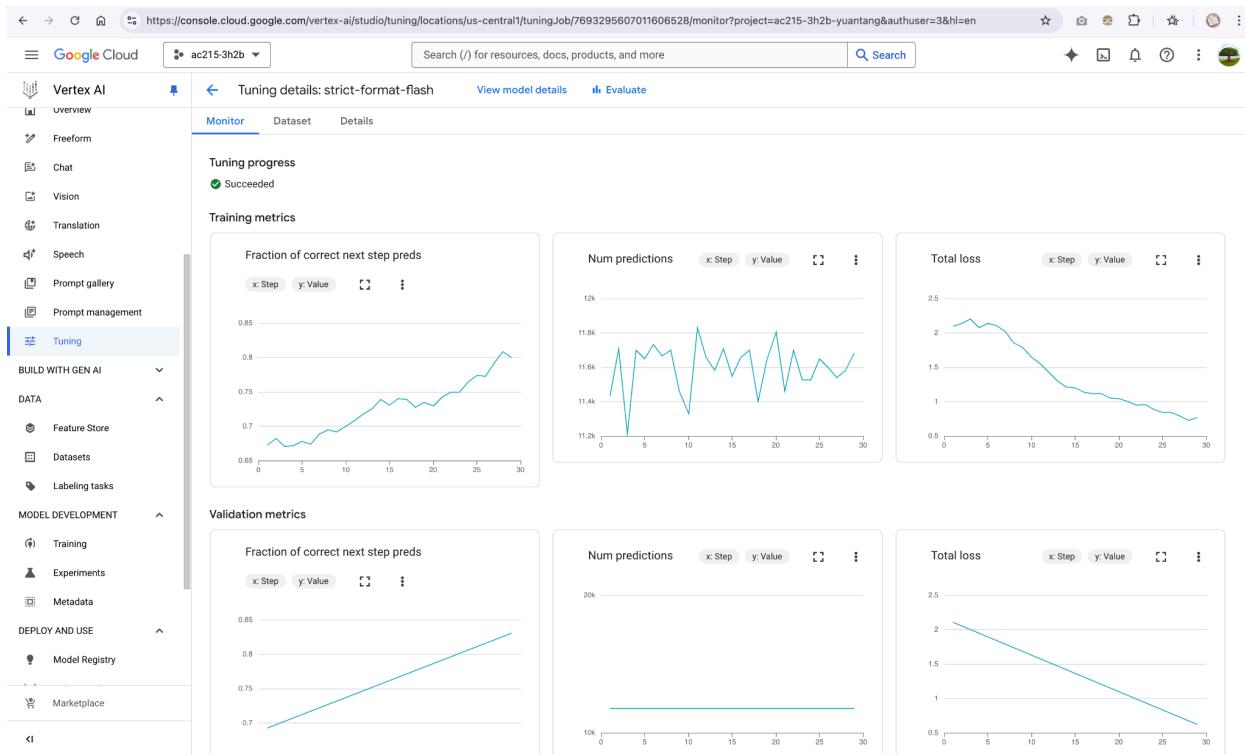
The reason we chose DVC for versioning the Strict Format Dataset is that we want to trace changes in the dataset, monitoring whether different generation system instructions can improve the fine-tuning results of the Gemini model. We have several ideas in mind regarding the type of synthetic dataset we need. For question-and-answer pairs, the answers must follow a strict format. However, for the questions, we can either focus on generating more diverse questions, which would provide more flexibility when constructing user prompts, or generate questions that also adhere to a strict format, so that when we construct the prompt during deployment, we can follow the same question format used in fine-tuning. With this approach in mind, DVC is a good choice for tracking changes in the dataset.

Fine Tuning:

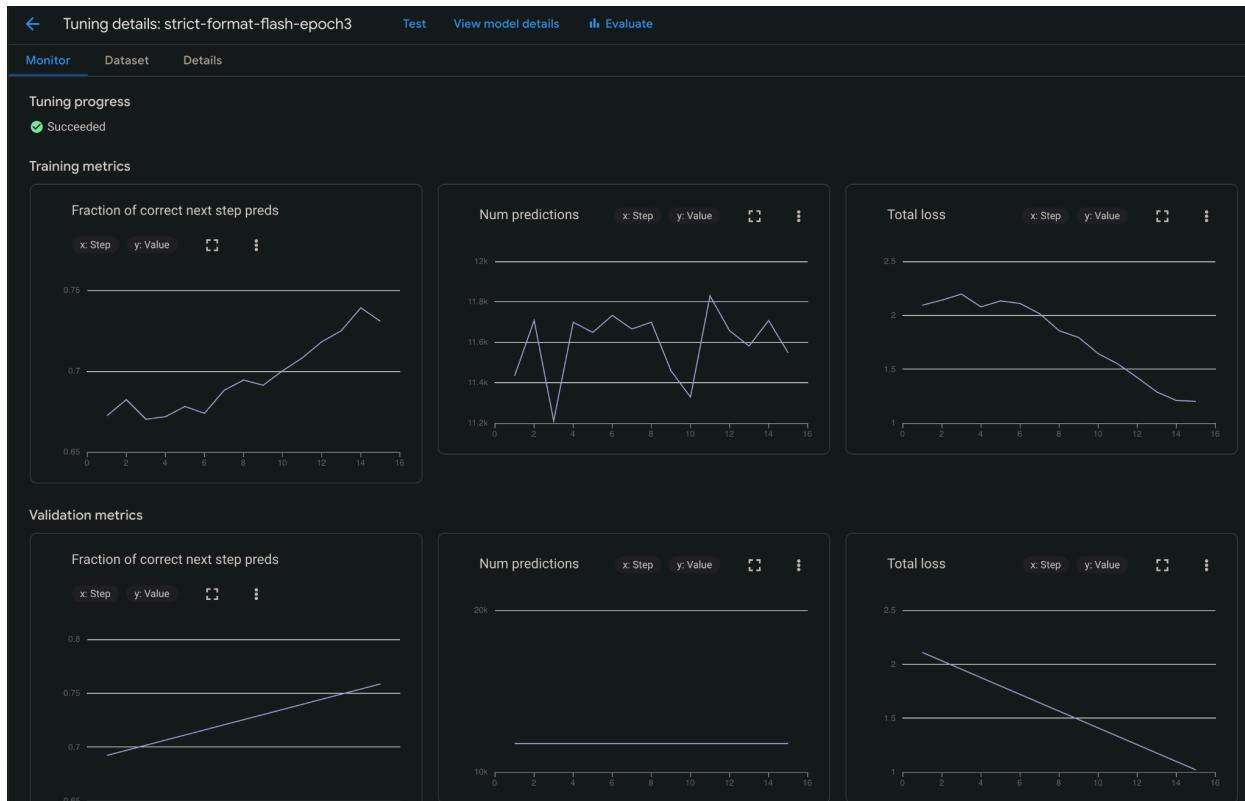
The Strict Format Dataset visualization.



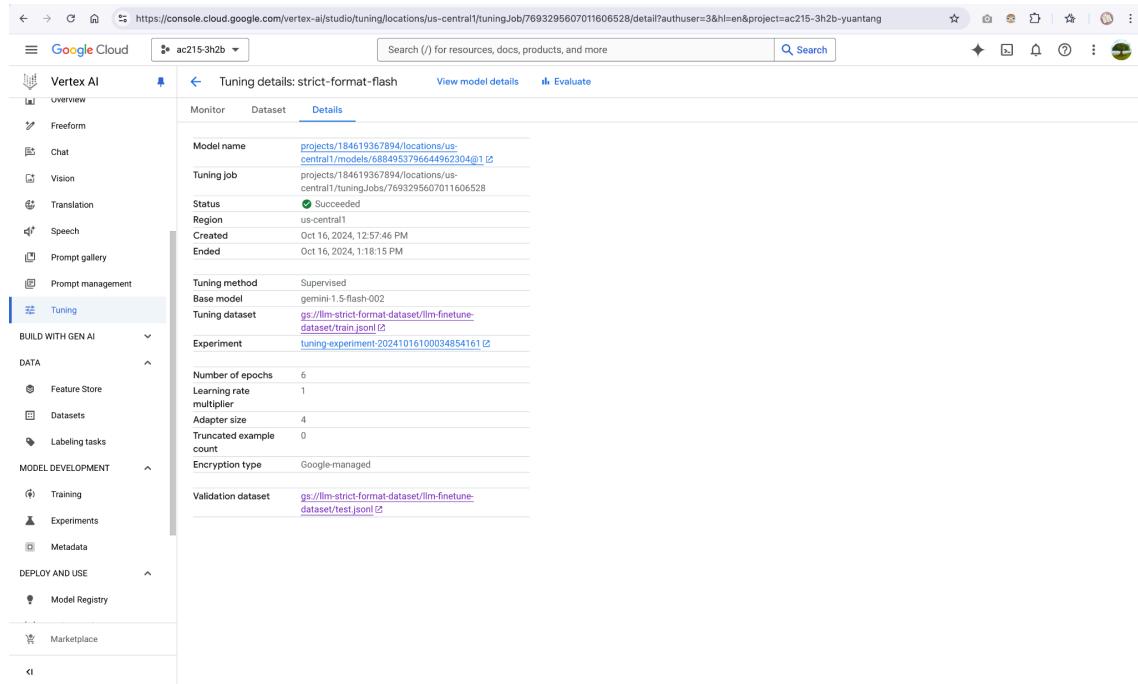
The Gemini training and validation metrics (epochs=6, adapter_size=4, and learning_rate_multiplier=1.0):



The Gemini training and validation metrics (epochs=3, adapter_size=4, and learning_rate_multiplier=1.0):



Fine tuned Gemini Metadata (epochhs=6, adapter_size=4, and learning_rate_multiplier=1.0):



The screenshot shows the Google Cloud Vertex AI Tuning details page for a job named 'strict-format-flash'. The 'Details' tab is selected. Key information includes:

- Model name:** projects/184619367894/locations/us-central1/models/6884953796644962304@1
- Tuning job:** projects/184619367894/locations/us-central1/tuningJobs/7693295607011606528
- Status:** Succeeded
- Region:** us-central1
- Created:** Oct 16, 2024, 12:57:46 PM
- Ended:** Oct 16, 2024, 1:18:15 PM

Under 'Tuning method', it shows 'Supervised' and 'Base model' as 'gemini-1.5-flash-002'. The 'Tuning dataset' is listed as 'gs://llm-strict-format-dataset/llm-finetune-dataset/train.jsonl'. The 'Experiment' is 'tuning-experiment-20241016100034854161'.

The left sidebar shows navigation categories like Vertex AI Overview, Freeform, Chat, Vision, Translation, Speech, Prompt gallery, Prompt management, Tuning, Build with Gen AI, Data, Model Development, and Deploy and Use.

We fine-tuned the Gemini 1.5 Flash 002 model using the Strict Format Dataset. We uploaded the dataset to the GCP bucket and submitted the model tuning job to Vertex AI, using the bucket dataset. The detailed training instruction is demonstrated in the README.md. The hyperparameters we used were: epochhs=6, adapter_size=4, and learning_rate_multiplier=1.0, which resulted in a successfully fine-tuned Gemini model that met our goal. We also ran another set of hyperparameters: epochhs=3, adapter_size=4, and learning_rate_multiplier=1.0, but it failed to meet the goal. For the successful model, we achieved a training loss of 0.77 and a validation loss of 0.62. The fraction of correct next-step predictions for training is 0.8, and for testing, it is 0.83. The next step we could take is to generate more question-and-answer pairs and train the model with additional iterations to see if this improves performance.

Fine-tuning comparison results:

Fine-tuned model prompt and output screenshots:

```
(app) app@656ef591860f:/app$ python cli.py --chat
CLI Arguments: Namespace(train=False, chat=True, delete_model=False, delete_hyperparameter_tuning_job=False)
chat()
query: Location: Bangkok, Days: 5, month: January, type: Culinary. What is a concise itinerary for my trip?
Fine-tuned LLM Response: 5-Day Culinary Itinerary in Bangkok for January

Day 1: Authentic Thai Flavors
- Wat Arun Ratchawaram Ratchawaramahawihan
- Chatuchak Weekend Market
- Yaowarat (Chinatown)

Day 2: Street Food Delights
- Khao San Road
- Sukhumvit
- Siam Paragon
- Pratunam Market

Day 3: Michelin-Starred Experiences
- Nahm
- Gaggan Anand
- Le Normandie
- Bo.lan

Day 4: Culinary-Themed Markets
- Or Tor Kor Market
- Talat Noi
- Pak Khlong Talat

Day 5: Rooftop Bars and Culinary Views
- Sky Bar
- Vertigo and Moon Bar
- Octave Rooftop Lounge and Bar
- Above Eleven Rooftop Bar and Lounge
```

```
(app) app@656ef591860f:/app$ python cli.py --chat
CLI Arguments: Namespace(train=False, chat=True, delete_model=False, delete_hyperparameter_tuning_job=False)
chat()
query: Location: Bangkok, Days: 5, month: January, type: Culinary. What is a concise itinerary for my trip?
Fine-tuned LLM Response: 5-Day Culinary Itinerary in Bangkok for January

Day 1: Street Food Delights
- Chatuchak Weekend Market
- Yaowarat (Chinatown)
- Asiatique The Riverfront

Day 2: Fine Dining and Rooftop Bars
- Nahm
- Gaggan Anand
- Sky Bar at Lebua

Day 3: Authentic Thai Cuisine
- Somboon Seafood
- Supanniga Eating Room
- Thipsamai Pad Thai

Day 4: Culinary Classes and Workshops
- Silom Thai Cooking School
- Bangkok Food Tours
- Maeklong Railway Market

Day 5: Sweet Treats and Dessert Delights
- Mango Sticky Rice
- Thai Iced Tea
- Coconut Ice Cream
```

Fine-tuned model prompt and output text:

First try:

query: Location: Bangkok, Days: 5, month: January, type: Culinary. What is a concise itinerary for my trip?

Fine-tuned LLM Response: 5-Day Culinary Itinerary in Bangkok for January

Day 1: Authentic Thai Flavors

- Wat Arun Ratchawaram Ratchawaramahawihan
- Chatuchak Weekend Market
- Yaowarat (Chinatown)

Day 2: Street Food Delights

- Khao San Road

- Sukhumvit
- Siam Paragon
- Pratunam Market

Day 3: Michelin-Starred Experiences

- Nahm
- Gaggan Anand
- Le Normandie
- Bo.lan

Day 4: Culinary-Themed Markets

- Or Tor Kor Market
- Talat Noi
- Pak Khlong Talat

Day 5: Rooftop Bars and Culinary Views

- Sky Bar
- Vertigo and Moon Bar
- Octave Rooftop Lounge and Bar
- Above Eleven Rooftop Bar and Lounge

Second try:

query: Location: Bangkok, Days: 5, month: January, type: Culinary. What is a concise itinerary for my trip?

Fine-tuned LLM Response: 5-Day Culinary Itinerary in Bangkok for January

Day 1: Street Food Delights

- Chatuchak Weekend Market
- Yaowarat (Chinatown)
- Asiatique The Riverfront

Day 2: Fine Dining and Rooftop Bars

- Nahm
- Gaggan Anand
- Sky Bar at Lebua

Day 3: Authentic Thai Cuisine

- Somboon Seafood
- Supanniga Eating Room
- Thipsamai Pad Thai

Day 4: Culinary Classes and Workshops

- Silom Thai Cooking School
- Bangkok Food Tours

- Maeklong Railway Market

Day 5: Sweet Treats and Dessert Delights

- Mango Sticky Rice
- Thai Iced Tea
- Coconut Ice Cream

The response follows the exact format we want for multiple attempts. More details on the desired format can be found in the README.md.

Non-fine-tuned model prompt and output screenshots:

USER Location: Bangkok, Days: 5, month: January, type: Culinary. What is a concise itinerary for my trip?

AI

Bangkok Culinary 5-Day Itinerary (January):

Day 1: Explore Chinatown (street food galore!), evening: Yaowarat street food tour. Day 2: Cooking class (focus on Thai cuisine), afternoon: explore Chatuchak Weekend Market (food stalls!), evening: upscale dinner at a riverside restaurant. Day 3: Explore different neighborhoods: Sukhumvit (modern restaurants), Thonglor (trendy cafes & bars), evening: rooftop bar with city views and snacks. Day 4: Day trip to Ayutthaya (ancient capital, explore local food). Evening: return to Bangkok, explore a local market for snacks. Day 5: Explore fresh markets (Or Tor Kor or Khlong Toei), indulge in a final delicious meal at a restaurant of your choice, reflecting on your culinary adventure.

Note: This itinerary is a suggestion and can be adjusted based on your preferences and energy levels. Consider booking cooking classes and tours in advance, especially during January, which is peak season.

Like Dislike

USER Location: Bangkok, Days: 5, month: January, type: Culinary. What is a concise itinerary for my trip?

AI

Bangkok Culinary Itinerary (5 Days, January):

Day 1: Explore Chinatown (street food, dim sum), evening at Yaowarat (night market, seafood).

Day 2: Cooking class (learn Thai classics), afternoon at Or Tor Kor Market (fresh produce, snacks), evening at a rooftop bar with city views & cocktails.

Day 3: Boat trip along the Chao Phraya River (floating markets, riverside restaurants), evening exploring the Sukhumvit area (street food, upscale dining options).

Day 4: Explore local markets (e.g., Khlong Toei Market for authentic experiences), afternoon exploring a specific cuisine (e.g., Isaan food), evening at a fine-dining Thai restaurant.

Day 5: Explore a less-touristy neighborhood for hidden culinary gems (e.g., Bang Rak), enjoy a final delicious meal before departure.

Note: This is a flexible framework. Consider making reservations, especially for cooking classes and popular restaurants, especially in January when it's peak season. Adjust based on your preferred level of spice and adventurousness!

Like Dislike

For the Gemini model that was not fine-tuned on our Strict Format Dataset, the response does not follow any format at all, making it extremely difficult for us to extract the date, location, and theme information.

RAG

Dataset

For the RAG documents, we scraped information from 51 cities worldwide (predominantly capital cities or well-known tourist destinations). Each city's Wikipedia page is used as a source of data. The pages contain information about the city's main features, including history, economy, transport, education, and culture. The scraped content from each page underwent initial data cleaning, such as removing extra sections and ensuring formatting consistency. Each cleaned dataset was then saved in plain text (.txt) format. As a result, we created 51 text files, each corresponding to a specific city which contain the entire content of the Wikipedia page for that city. These text files form the dataset for the RAG application.

Chunking and Embedding:

The chunking involves breaking down large text documents into smaller coherent pieces for easier retrieval. We are using three different chunking methods.

1. Character Based Splitting: This splits text based on character count with each chunk containing 350 characters and an overlap of 20 characters to maintain context between chunks.
2. Recursive Splitting: In this method, the text is split at logical boundaries such as sentences or paragraphs and makes sure that each chunk remains meaningful. If necessary, further split is done to sentence level.
3. Semantic Splitting: This is handled by the SemanticChunker class and groups related sentences together based on their semantic similarity using cosine similarity between sentence embeddings.

After preparing the chunks and the query, we sent both to text-embedding-004 to obtain the embeddings for each chunk and query.

Generative Model and Response Generation

By comparing the embeddings of the chunks and the query, the top 10 closest chunks are retrieved from ChromaDB. Gemini 1.5 Flash 002 processes the selected chunks, user query, and system instructions to generate the final output. The model operates under carefully crafted system instructions to ensure that it only uses the retrieved content for generating responses and avoids using external knowledge sources. For example, if a user asks about the best travel destinations in a city, the model pulls relevant chunks and crafts a detailed itinerary or travel tips.

Comparison of Results

It can be observed that sending the query to the baseline model without RAG provides somewhat accurate results, but the description of the city is less precise, lengthy and more 'poetic', using many adjectives and unclear nouns to describe the city of Beijing without particular specifications.

For char-split, the results are much more accurate. The chosen embeddings show that most of the embeddings are from the ‘Beijing’ txt file, albeit some chunks being from ‘Shanghai’, which would be similar. The LLM output shows that the description of Beijing as a city is much more objective and concise compared to the pre-RAG results.

The results from the recursive-split shows even better accuracy than the character split. Almost all the embeddings that were chosen by this method were from Beijing, and they contained more information about the history and culture from Beijing’s Wikipedia page. This is proven by its LLM output, where its information travel recommendations are much more specific.

The semantic split seems to depict slightly worse outcomes compared to char-split and recursive-split. Perhaps it is because the chunks are divided based on semantic meaning, but there were more chunks that pertain to ‘Shanghai’ in the embeddings compared to the results from char-split and recursive-split. This causes the later inputs to contain mixed information of Shanghai and Beijing, possibly leading to issues with information accuracy. The LLM output is also less descriptive and detailed compared to the first two methods.

From this initial experiment, using the recursive-split for the chunking-embedding process seems to be the most promising approach. The following query and images below depict one of the queries used for testing and its corresponding output for embeddings, LLM input and LLM output:

Query Provided to the Chat:

“””
I have this travel itinerary: 1-Day Solo Itinerary in Beijing for April

Day 1:

- Journey Through Imperial Majesty
- Forbidden City
- Temple of Heaven
- Summer Palace.

Expand on how and why those locations are a good solo trip.

At the start of the itinerary, give an interesting introduction to Beijing regarding Beijing’s history, culture, etc. For the main body of the answer, give me a more detailed travel itinerary without changing my plan, meaning no change of days and the locations in the original plan. At the end of the itinerary, give user tips specifically for this travel, considering about the month and its respective season.

“””

Before RAG

USER I have this travel itinerary: 1-Day Solo Itinerary in Beijing for April\nDay 1: Journey Through Imperial Majesty\n- Forbidden City\n- Temple of Heaven\n- Summer Palace. Expand on how and why those locations are a good solo trip. At the start of the itinerary, give an interesting introduction to Beijing regarding Beijing's history, culture, etc. For the main body of the answer, give me a more detailed travel itinerary without changing my plan, meaning no change of days and the locations in the original plan. At the end of the itinerary, give user tips specifically for this travel, considering about the month and its respective season.

AI Beijing: A Solo Journey Through Imperial Majesty



Beijing, a city steeped in millennia of history and culture, pulsates with a unique energy that blends ancient traditions with modern dynamism. For centuries, it served as the imperial capital of China, a majestic seat of power that witnessed the rise and fall of dynasties. From the imposing Great Wall, a testament to human ingenuity and defensive prowess, to the intricate artistry found in the Forbidden City's palaces and the serene beauty of the Summer Palace's gardens, Beijing offers a captivating journey through time. Its vibrant hutongs (traditional alleyways), bustling markets overflowing with exotic goods, and delectable cuisine provide a rich tapestry of experiences for the solo traveler. Exploring Beijing independently allows you to discover hidden gems, immerse yourself in the local culture at your own pace, and create unforgettable memories. This itinerary focuses on some of the city's most iconic imperial sites, perfect for a day of solo exploration.

1-Day Solo Itinerary in Beijing for April: Journey Through Imperial Majesty

Morning (Forbidden City):

- 8:00 AM: Begin your day at the majestic Forbidden City (紫禁城, Zijinchéng). Arrive early to avoid the largest crowds. Purchase your ticket online in advance to save time. Consider a guided tour, or explore at your own pace with an audio guide (available in multiple languages). Allow at least 3 hours to wander through the vast complex of palaces, courtyards, and museums. Focus on key highlights like the Meridian Gate, the Hall of Supreme Harmony, and the Palace of Heavenly Purity. Take your time to absorb the grandeur and history surrounding you. Solo travel offers the flexibility to linger longer in areas that capture your interest.
- 11:00 AM: Grab a quick and delicious breakfast or brunch near the Forbidden City. Many small eateries offer traditional Chinese breakfast items.

Afternoon (Temple of Heaven):

- 12:00 PM: Take a taxi or Didi (Chinese ride-hailing app) to the Temple of Heaven (天坛, Tiāntán). This UNESCO World Heritage site was where emperors performed ceremonies to Heaven. Explore the vast park-like complex, marvel at the intricate architecture of the Hall of Prayer for Good Harvests and the Imperial Vault of Heaven. The expansive grounds provide a peaceful escape from the city's hustle and bustle, ideal for quiet contemplation during your solo journey. Allow approximately 2 hours.
- 2:00 PM: Enjoy a traditional Chinese lunch at a restaurant near the Temple of Heaven. Many options are available catering to different budgets.

Late Afternoon/Evening (Summer Palace):

- 3:30 PM: Travel to the Summer Palace (颐和园, Yíhéyuán), a breathtaking imperial garden complex. Again, Didi or a taxi are convenient options. The Summer Palace offers a serene contrast to the previous sites. Explore the Longevity Hill, wander along the picturesque Kunming Lake, and admire the stunning views. Rent a boat for a unique perspective of the lake and gardens. Allow at least 2-3 hours to fully appreciate this oasis of tranquility. This is a fantastic place for solo reflection and enjoying the beauty of nature.
- 6:30 PM: Enjoy a relaxing dinner near the Summer Palace or head back towards your accommodation for dinner.

User Tips for April in Beijing:

- Weather:** April in Beijing offers pleasant weather, but pack layers as temperatures can fluctuate throughout the day. Expect sunshine but also potential for some rain showers, so bring an umbrella or a light raincoat.
- Crowds:** April is shoulder season, so expect fewer crowds than peak season (but more than the off-season). However, the Forbidden City and Temple of Heaven will still be busy, especially during peak hours. Arriving early helps a great deal.
- Transportation:** Beijing has an excellent public transportation system (subway and buses). Didi (ride-hailing app) is also very convenient and affordable. Learn some basic Mandarin phrases to facilitate communication.
- Food:** Explore Beijing's diverse culinary scene! Venture beyond tourist areas to discover authentic local dishes.
- Safety:** Beijing is generally a safe city for solo travelers, but be aware of your belongings, especially in crowded areas.
- Language:** While English is spoken in tourist areas, learning a few basic Mandarin phrases will enhance your experience. Download a translation app.
- Accommodation:** Book your accommodation in advance, especially if traveling during peak season. Consider locations with easy access to public transportation.

Remember to wear comfortable shoes as you'll be doing a significant amount of walking. Enjoy your solo adventure in the imperial heart of Beijing!



Chat with Char-Split Method

Embedding search results with char-split

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Input prompt with char-split

INPUT_PROMPT:
I have this travel itinerary: 1-Day Solo Itinerary in Beijing for April
Day 1: Journey Through Imperial Majesty
- Forbidden City
- Temple of Heaven
- Summer Palace.
Expand on how and why those locations are a good solo trip.
At the start of the itinerary, give an interesting introduction to Beijing regarding Beijing's history, culture, etc. For the main body of the answer, give me a more detailed travel itinerary without changing my plan, meaning no change of days and the locations in the original plan. At the end of the itinerary, give user tips specifically for this travel, considering about the month and its respective season.
Architectures, with one side of the city being modernized and renovated to fit the times, and the other half still offering traditional hutong districts. Beijing is one of the oldest cities in the world, with a rich history dating back over three millennia. As the last of the Four Great Ancient Capitals of China, Beijing has been the political center
Beijing landmarks...the city remains an epicenter of tradition with the treasures of nearly 2,000 years as the imperial capital still on view-in the famed Forbidden City and in the city's lush pavilions and gardens...- National Geographic Qianmen Avenue is a traditional commercial street outside Qianmen Gate along the southern Central Axis. At the ", 'a variety of trees, bushes and flowers, and an extensive peony garden. The Taoranting, Longtan, Chaoyang, Haidian, Milu Yuan and Zizhu Yuan parks are some of the notable recreational parks in the city. The Beijing Zoo is a center of zoological research that also contains rare animals from various continents, including the Chinese giant panda.

LLM response with char-split

LLM Response: Embark on a journey through Imperial Majesty: A Solo Trip to Beijing in April
Beijing, one of the world's oldest cities, boasts a history spanning over three millennia. As the last of China's Four Great Ancient Capitals, it served as the political center for nearly 2,000 years, leaving behind a rich legacy visible in its opulent palaces, temples, parks, gardens, tombs, walls, and gates. The city presents a fascinating blend of old and new, with modernized areas juxtaposed against traditional hutong districts. Beijing's cultural significance is undeniable, making it a top global tourist destination.
Day 1: Journey Through Imperial Majesty
This itinerary focuses on exploring Beijing's imperial past. The day begins with a visit to the Forbidden City, the former imperial palace, offering a glimpse into the lives of emperors and their court. Next, travel to the Temple of Heaven, where emperors performed ceremonies to Heaven. Conclude your day at the Summer Palace, an expansive imperial garden with stunning lakes and architecture.
User Tips for April Travel:
April in Beijing marks the transition from spring to summer. Expect pleasant weather, but pack layers as temperatures can fluctuate. Consider purchasing a Beijing Tourist Pass for convenient access to public transportation and attractions. Remember to stay hydrated and wear comfortable shoes, as you'll be doing a significant amount of walking. Research opening times and potential crowds for the attractions beforehand.

Chat with Recursive-Split Method

Embedding search results with recursive-split

Results: {'ids': [['65bb46ed07b2bbf1-768', '65bb46ed07b2bbf1-384', '65bb46ed07b2bbf1-47', '65bb46ed07b2bbf1-760', '65bb46ed07b2bbf1-765', '65bb46ed07b2bbf1-197', '65bb46ed07b2bbf1-401', '65bb46ed07b2bbf1-39', '65bb46ed07b2bbf1-443', '65bb46ed07b2bbf1-391']], 'distances': [[0.2872387766838074, 0.2888669967651367, 0.291862428188324, 0.29190337657928467, 0.29984108593795776, 0.30269914865493774, 0.3034622873173523, 0.304279625415802, 0.3057584762573242, 0.306724488735199]], 'embeddings': None, 'metadatas': [{"city": "Beijing", "continent": "Asia", "country": "China"}, {"city": "Beijing", "continent": "Asia", "country": "China"}], 'documents': [{}], 'uris': None, 'data': None, 'included': ['metadatas', 'documents', 'distances']}}}

Input prompt with recursive-split

INPUT_PROMPT:
I have this travel itinerary: 1-Day Solo Itinerary in Beijing for April
Day 1: Journey Through Imperial Majesty
- Forbidden City
- Temple of Heaven
- Summer Palace.
Expand on how and why those locations are a good solo trip.
At the start of the itinerary, give an interesting introduction to Beijing regarding Beijing's history, culture, etc. For the main body of the answer, give me a more detailed travel itinerary without changing my plan, meaning no change of days and the locations in the original plan. At the end of the itinerary, give user tips specifically for this travel, considering about the month and its respective season.
^ "About Beijing". Archived from the original on 29 September 2008.
^ a b "Beijing's Museums & Galleries". Archived from the original on 13 August 2008. Retrieved 19 August 2008.
^ "Imperial Tombs of the Ming and Qing Dynasties". UNESCO World Heritage Center. 10 December 2003. Archived from the original on 2 August 2009. Retrieved 22 July 2009.
Places of interest[edit]
See also: Major National Historical and Cultural Sites (Beijing) and List of Beijing landmarks
...the city remains an epicenter of tradition with the treasures of nearly 2,000 years as the imperial capital still on view—in the famed Forbidden City and in the city's lush pavilions and gardens...— National Geographic
Palace, Ming Tombs, Zhoukoudian Peking Man Site, Beijing Central Axis and parts of the Great Wall and the Grand Canal—all of which are popular tourist locations. Siheyuans, the city's traditional housing style, and hutongs, the narrow alleys between siheyuans, are major tourist attractions and are common in urban Beijing.
^ "Beijing, Places of a Lifetime". National Geographic Society. Archived from the original on 3 August 2008. Retrieved 3 August 2008.
^ "The Imperial Palace of the Ming and Qing Dynasties" (PDF). UNESCO World Heritage Center. 29 December 1986. Archived (PDF) from the original on 6 March 2009. Retrieved 22 July 2009.
^ "Summer Palace, an Imperial Garden in Beijing". UNESCO World Heritage Center. Archived from the original on 24 July 2008. Retrieved 4 August 2008.
^ "Temple of Heaven: an Imperial Sacrificial Altar in Beijing". UNESCO World Heritage Center. Archived from the original on 1 August 2008. Retrieved 4 August 2008.

LLM response with recursive-split

LLM Response: Embark on a journey through Imperial Majesty: A Solo Trip to Beijing in April

Beijing, a city steeped in history spanning nearly two millennia, stands as an epicenter of tradition. Its imperial past is vividly showcased in iconic landmarks like the Forbidden City and the city's numerous lush pavilions and gardens. Traditional architecture, including siheyuan (traditional courtyard houses) and hutongs (narrow alleys), adds to the city's unique charm and offers a captivating blend of modern and ancient styles. Beyond the imperial legacy, Beijing boasts a wealth of cultural treasures, including temples, bridges, and parks, showcasing its rich heritage.

****Day 1: Journey Through Imperial Majesty****

This itinerary focuses on exploring Beijing's imperial past. It's ideal for solo travelers as each location offers ample opportunities for independent exploration and reflection.

* **Morning:** Begin your day at the Forbidden City, the former imperial palace. Allow ample time to wander through its vast courtyards and halls, immersing yourself in the grandeur of the Ming and Qing dynasties.

* Afternoon: Travel to the Temple of Heaven, where emperors performed ceremonies to Heaven. The serene atmosphere and architectural significance make it a perfect spot for quiet contemplation.

g in the beauty of the lake and

****User Tips for April Travel:****

April in Beijing offers pleasant weather, typically ranging from 10°C to 22°C. However, pack layers as temperatures can fluctuate. Comfortable walking shoes are essential, given the amount of walking involved in exploring the sites. Consider purchasing a Beijing Tourist Pass for convenient access to public transportation and potential discounts at attractions. Remember to stay hydrated throughout the day, especially when exploring outdoors.

Embedding search results with semantic-split

Input prompt with semantic-split

INPUT_PROMPT:

I have this travel itinerary: 1-Day Solo Itinerary in Beijing for April

Day 1: Journey Through Imperial Majesty

- Forbidden City
- Temple of Heaven
- Summer Palace.

Expand on how and why those locations are a good solo trip.

At the start of the itinerary, give an interesting introduction to Beijing regarding Beijing's history, culture, etc. For the main body of the answer, give me a more detailed travel itinerary without changing my plan, meaning no change of days and the locations in the original plan. At the end of the itinerary, give user tips specifically for this travel, considering about the month and its respective season.

Archived from the original on 4 October 2018. Retrieved 3 October 2018. ^ "Beijing, Places of a Lifetime". National Geographic Society. Archived from the original on 3 August 2008. Retrieved 3 August 2008. ^ "The Imperial Palace of the Ming and Qing Dynasties" (PDF). UNESCO World Heritage Center. 29 December 1986. Archived (PDF) from the original on 26 March 2009.

Archived from the original on 2 July 2007. ^ Littlewood, Misty and Mark Littlewood (2008). Gateways to Beijing: a travel guide to Beijing. Armour Publishing Pte Ltd. p. 182. ISBN 978-981-4222-12-9. ^ "Summer Palace, an Imperial Garden in Beijing". UNESCO World Heritage Center. Archived from the original on 24 July 2008. Retrieved 4 August 2008. ^ "Temple of Heaven: an Imperial Sacrificial Altar in Beijing". UNESCO World Heritage Center. Archived from the original on 1 August 2008.

Retrieved 4 August 2008. ^ (Chinese) [北京地区博物馆名录 (截止2008年6月)] 6 January 2009[full citation needed]

^ "About Beijing". Archived from the original on 29 September 2008. ^ a b "Beijing's Museums & Galleries". Archived from the original on 13 August 2008. Retrieved 19 August 2008.

^ "Imperial Tombs of the Ming and Qing Dynasties". UNESCO World Heritage Center. 10 December 2003. Archived from the original on 2 August 2009.

The Beijing Ancient Observatory displays pre-telescopic spheres dating back to the Ming and Qing dynasties. The Fragrant Hills (Xiangshan) is a public park that consists of natural landscaped areas as well as traditional and cultural relics. The Beijing Botanical Garden exhibits over 6,000 species of plants, including a variety of trees, bushes and flowers, and an extensive peony garden. The Taoranting, Longtan, Chaoyang, Haidian, Milu Yuan and Zizhu Yuan parks are some of the notable recreational parks in the city. The Beijing Zoo is a center of zoological research that also contains rare animals from various continents, including the Chinese giant panda. There are 144 museums and galleries (as of June 2008[update]) in the city. In addition to the Palace Museum in the Forbidden City and the National Museum of China, other major museums include the National Art Museum of China, the Capital Museum, the Beijing Art Museum, the Military Museum of the Chinese People's Revolution, the Geological Museum of China, the Beijing Museum of Natural History and the Paleozoological Museum of China. Located at the outskirts of urban Beijing, but within its municipality are the Thirteen Tombs of the Ming dynasty, the lavish and elaborate burial sites of thirteen Ming emperors, which have been designated as part of the UNESCO World Heritage Site Imperial Tombs of the Ming and Qing Dynasties. The archaeological Peking Man site at Zhoukoudian is another World Heritage Site within the municipality, containing a wealth of discoveries, among them one of the first specimens of Homo erectus and an assemblage of bones of the gigantic hyena *Pachycrocuta brevirostris*. There are several sections of the UNESCO World Heritage Site Great Wall of China, most notably Badaling, Jinshanling, Simatai and Mutianyu. According to the World Travel & Tourism Council (WTTC), Beijing is the second highest earning tourist city in the world after Shanghai. Theme parks located within the city include Universal Studios Beijing and Happy Valley Beijing, both of which are among the most visited theme parks in Asia. Intangible cultural heritage[edit]

Peking opera

The cultural heritage of Beijing is rich and diverse. Starting 2006, the Beijing government started the process of selecting and preserving cultural heritages. Five cultural heritage lists have been published over the years. 288 distinct practices are categorized as cultural heritage.

Archived from the original on 15 July 2017. Retrieved 24 August 2017. ^ MorTraveling Team. "The Asian Cities You Should Spend Some Time In". MorTraveling. Archived from the original on 2 May 2024. Retrieved 2 May 2024. ^ "Peking (Beijing)". Encyclopædia Britannica. Vol. 29 (Macropaedia, 15th ed.). p.

Archived from the original on 24 June 2011. Retrieved 28 November 2016. ^ "Beijing". World Book Encyclopedia. 2008. Archived from the original on 19 May 2008. Retrieved 7 August 2008. ^ Töre, Özgür (22 October 2018). "WTTC reveals the world's best performing tourism cities". fttnews.com.

Retrieved 22 July 2009. ^ "Peking Man Site at Zhoukoudian". UNESCO World Heritage Center. Archived from the original on 23 July 2008. Retrieved 4 August 2008. ^ "The Great Wall". UNESCO World Heritage Center. Archived from the original on 31 July 2008. Retrieved 4 August 2008. ^ Töre, Özgür (22 October 2018). "WTTC reveals the world's best performing tourism cities". fttnews.com.

Retrieved 7 August 2014. ^ a b 上海市佛教概況 [An overview of Buddhism in Shanghai]. Shanghai Ethnic and Religions (in Chinese). 29 September 2003. Archived from the original on 23 October 2019. Retrieved 23 October 2019. ^ 第一节 佛寺 [Chapter One: Jade Buddha Temple]. Office of Shanghai Chronicles (in Chinese). 21 March 2007. Archived from the original on 23 October 2019.

LLM response with semantic-split

LLM Response: Embark on a captivating journey through the imperial heart of Beijing, a city steeped in history and culture. Beijing's rich heritage, dating back centuries, is evident in its magnificent architecture, imperial palaces, and traditional practices. It's a city that seamlessly blends ancient traditions with modern dynamism, offering a unique and unforgettable experience for solo travelers.

****1-Day Solo Itinerary in Beijing for April: Journey Through Imperial Majesty****

****Morning:**** Begin your day at the Forbidden City, the former imperial palace, a sprawling complex showcasing breathtaking architecture and offering a glimpse into the lives of emperors and their court. Allow ample time to explore its vast courtyards and halls.

****Afternoon:**** Next, visit the Temple of Heaven, where emperors performed ceremonies to Heaven. The serene atmosphere and impressive architecture provide a tranquil escape from the bustling city.

****Evening:**** Conclude your day at the Summer Palace, a stunning imperial garden with a lake, temples, and pavilions. Enjoy a leisurely stroll through the gardens, taking in the beauty of the landscape and the historical significance of the site. Consider enjoying a traditional Chinese dinner near the Summer Palace before returning to your accommodation.

****User Tips for April Travel in Beijing:****

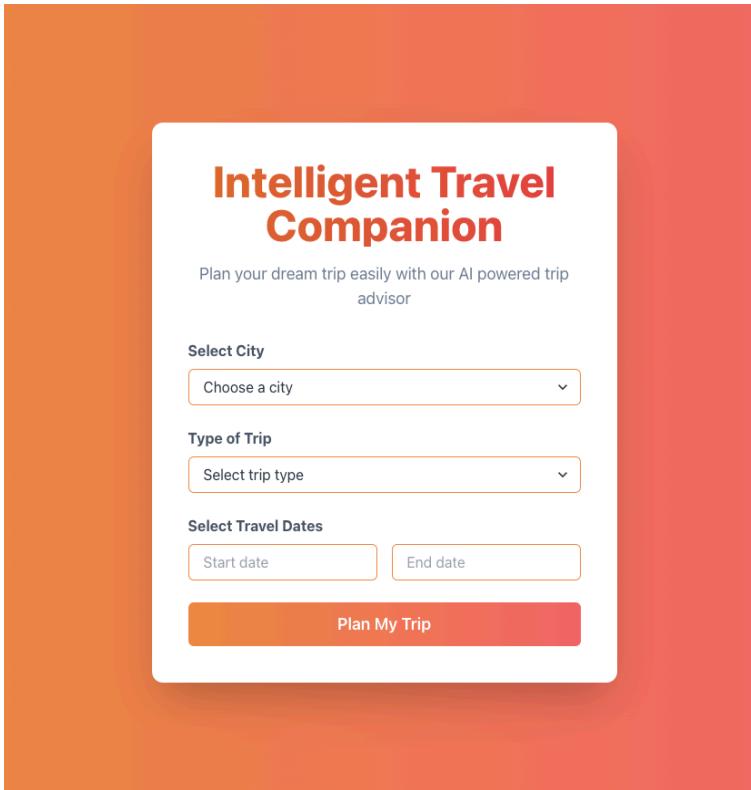
April in Beijing marks the transition from spring to summer. Expect pleasant weather, but be prepared for potential showers. Pack layers of clothing as temperatures can fluctuate throughout the day. Comfortable walking shoes are essential, as you'll be doing a significant amount of walking. Consider purchasing a Beijing Tourist Pass for convenient access to public transportation and attractions. Remember to stay hydrated, especially during outdoor activities.

Mock-up of the Application

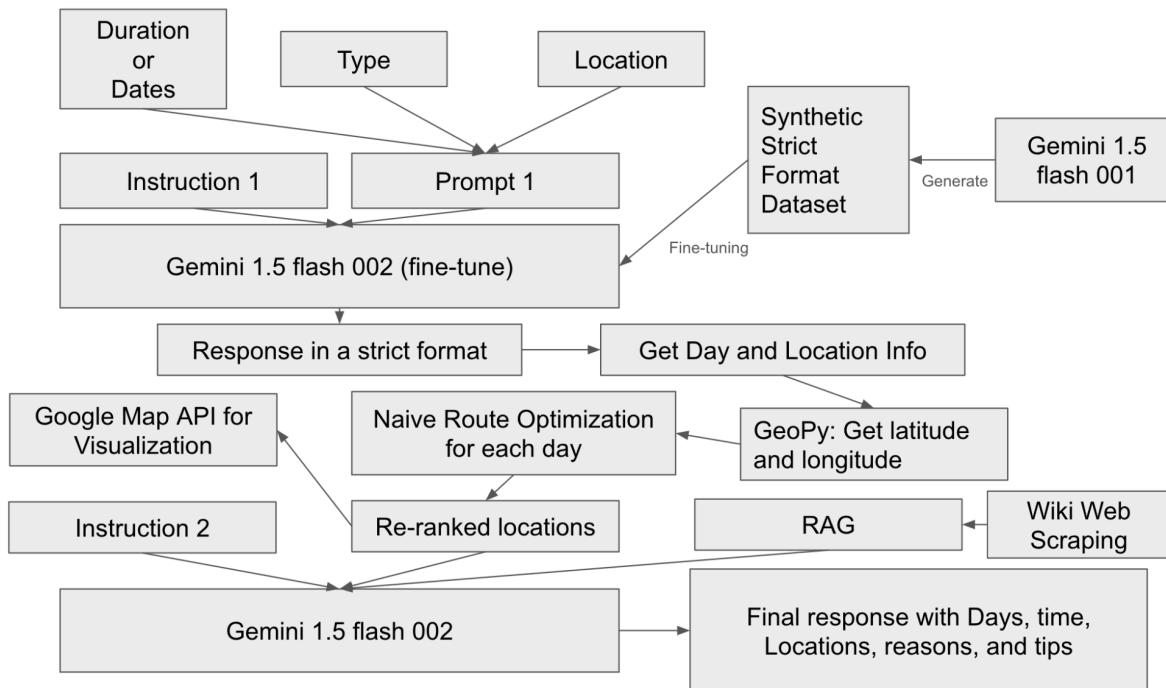
The main page of the application serves as a UI where users can input details such as the trip type, country, and desired travel dates. Once the user submits the form, the data is passed to an API. This API processes the form input which is fed into a fine-tuned model that has been trained to output the best travel spots in a strict format based on the user's preferences. This output is then passed to the route optimization API which retrieves the longitude and latitude and outputs the information in order of shortest distances (first location is picked randomly). The

final location information is passed back to the frontend which displays an interactive map on the left side. Finally, additional information such as reasons for the location being chosen and travel tips is retrieved from the RAG component's API and displayed on the right side of the page.

First Page UI:



ML workflow:



Result Display UI:

Your Trip Itinerary

Day 1: Architectural

Recommended Start Time: 10:00 AM

Westminster Abbey
Reason: Historic site with rich history
Tips: Arrive early to avoid crowds

Tower of London
Reason: Historic site with rich history
Tips: Arrive early to avoid crowds

St. Paul's Cathedral
Reason: Historic site with rich history
Tips: Arrive early to avoid crowds

[Back to Home](#)