

anc_ollama

February 6, 2026

0.1 A Geology Flaneur needs an Agentic Companion

Imagine a traveler wearing **Apple Vision Pro**, moving through mountain corridors as a true **geology flaneur**: observing roadcuts, folds, and landforms in context, with grounded explanations layered into the moment.

This notebook is the proof path toward that experience: route-aware field guidance, citation-backed answers, and quality-gated reasoning that can later power an immersive spatial interface.

1 ANC: Wikipedia with (FAISS, Ollama and StateGraph)

This notebook combines two Ollama workflows in one place:

- Baseline notebook pipeline: Wikipedia -> chunking -> FAISS -> local Q&A with ChatOllama
- Canonical orchestration diagram + run flow via shared `naturalist_companion.stategraph_shared`

1.1 POC Motivation and Evidence

1.1.1 Why this notebook exists

This notebook is the local Ollama proof-of-concept for route-grounded geology guidance. It validates grounded retrieval + generation + quality checks before full app productionization.

1.1.2 Hypotheses under test

1. Local Ollama embeddings and LLM models can produce useful grounded answers.
2. Wikipedia-only retrieval can support safety-aware field guidance with citations.
3. Shared orchestration (`stategraph_shared`) can enforce quality gates and stable output structure.

1.1.3 How to capture comparable evidence

- Record Stage 1/2/3 and Stage 3b timings from notebook logs.
- Run the StateGraph eval harness and capture pass rate + citation validity.
- Keep model names/config values with each run artifact for apples-to-apples comparisons.

1.1.4 What this run does not prove yet

- Multi-user serving scale and concurrency behavior
- Persistent shared retrieval indexes for app traffic

- End-to-end mobile app integration with route + camera UX
- Production SLO/cost governance

1.2 Prerequisites (Run First)

1.2.1 Local Ollama setup

- Ensure Ollama is installed and running: `ollama serve`
- Pull the embedding model: `ollama pull nomic-embed-text`
- Pull the chat model used in this notebook: `ollama pull llama3.1:8b`
- Optional smaller/faster local model: `ollama pull llama3.2:3b`

1.2.2 Optional notebook installs

Run the install cell below only if preflight reports missing packages.

```
[15]: # Uncomment in fresh environments or if preflight fails:
```

```
%pip install -U -r ./requirements-ollama-dev.txt

# Optional only if rich widgets are missing:
# %pip install -U ipywidgets jupyterlab_widgets
```

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Requirement already satisfied: flask==3.1.2 in /Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages (from -r /Users/ryan/Developer/naturalist-companion/requirements.txt (line 1)) (3.1.2)
Requirement already satisfied: langgraph==0.5.3 in /Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages (from -r /Users/ryan/Developer/naturalist-companion/requirements.txt (line 2)) (0.5.3)
Requirement already satisfied: python-dotenv==1.2.1 in /Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages (from -r /Users/ryan/Developer/naturalist-companion/requirements.txt (line 3)) (1.2.1)
Requirement already satisfied: wikipedia==1.4.0 in /Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages (from -r /Users/ryan/Developer/naturalist-companion/requirements.txt (line 4)) (1.4.0)
Requirement already satisfied: langchain==0.3.27 in /Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages (from -r /Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line 1)) (0.3.27)
Requirement already satisfied: langchain-core==0.3.83 in /Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages (from -r /Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line 2)) (0.3.83)
Requirement already satisfied: langchain-community==0.3.31 in /Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages (from -r /Users/ryan/Developer/naturalist-companion/requirements-target-
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common.txt (line 3)) (0.3.31)
Requirement already satisfied: faiss-cpu==1.13.2 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from -r /Users/ryan/Developer/naturalist-companion/requirements-target-
common.txt (line 4)) (1.13.2)
Requirement already satisfied: chromadb==1.4.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from -r /Users/ryan/Developer/naturalist-companion/requirements-target-
common.txt (line 5)) (1.4.1)
Requirement already satisfied: langchain-chroma==0.2.6 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from -r /Users/ryan/Developer/naturalist-companion/requirements-target-
common.txt (line 6)) (0.2.6)
Requirement already satisfied: langchain-huggingface==0.3.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from -r /Users/ryan/Developer/naturalist-companion/requirements-target-
common.txt (line 7)) (0.3.1)
Requirement already satisfied: sentence-transformers==5.2.2 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from -r /Users/ryan/Developer/naturalist-companion/requirements-target-
common.txt (line 8)) (5.2.2)
Requirement already satisfied: torch==2.9.1 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from -r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
9)) (2.9.1)
Requirement already satisfied: langchain-ollama==0.3.10 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from -r /Users/ryan/Developer/naturalist-companion/requirements-ollama.txt
(line 3)) (0.3.10)
Requirement already satisfied: jupyterlab in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from -r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(4.5.3)
Requirement already satisfied: ipykernel in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from -r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 2))
(7.2.0)
Requirement already satisfied: ipywidgets in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from -r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 3))
(8.1.8)
Requirement already satisfied: blinker>=1.9.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from flask==3.1.2->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 1)) (1.9.0)
Requirement already satisfied: click>=8.1.3 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from flask==3.1.2->-r
/Users/ryan/Developer/naturalist-companion/requirements.txt (line 1)) (8.3.1)
```

```
Requirement already satisfied: itsdangerous>=2.2.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from flask==3.1.2->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 1)) (2.2.0)
Requirement already satisfied: jinja2>=3.1.2 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from flask==3.1.2->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 1)) (3.1.6)
Requirement already satisfied: markupsafe>=2.1.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from flask==3.1.2->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 1)) (3.0.3)
Requirement already satisfied: werkzeug>=3.1.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from flask==3.1.2->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 1)) (3.1.5)
Requirement already satisfied: langgraph-checkpoint<3.0.0,>=2.1.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langgraph==0.5.3->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 2)) (2.1.2)
Requirement already satisfied: langgraph-prebuilt<0.6.0,>=0.5.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langgraph==0.5.3->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 2)) (0.5.2)
Requirement already satisfied: langgraph-sdk<0.2.0,>=0.1.42 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langgraph==0.5.3->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 2)) (0.1.74)
Requirement already satisfied: pydantic>=2.7.4 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langgraph==0.5.3->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 2)) (2.12.5)
Requirement already satisfied: xxhash>=3.5.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langgraph==0.5.3->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 2)) (3.6.0)
Requirement already satisfied: beautifulsoup4 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from wikipedia==1.4.0->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 4)) (4.14.3)
Requirement already satisfied: requests<3.0.0,>=2.0.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from wikipedia==1.4.0->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 4)) (2.32.5)
Requirement already satisfied: langchain-text-splitters<1.0.0,>=0.3.9 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain==0.3.27->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 1)) (0.3.11)
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Requirement already satisfied: langsmith>=0.1.17 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain==0.3.27->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 1)) (0.6.9)
Requirement already satisfied: SQLAlchemy<3,>=1.4 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain==0.3.27->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 1)) (2.0.46)
Requirement already satisfied: PyYAML>=5.3 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from langchain==0.3.27->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
1)) (6.0.3)
Requirement already satisfied: tenacity!=8.4.0,<10.0.0,>=8.1.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-core==0.3.83->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 2)) (9.1.3)
Requirement already satisfied: jsonpatch<2.0.0,>=1.33.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-core==0.3.83->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 2)) (1.33)
Requirement already satisfied: typing-extensions<5.0.0,>=4.7.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-core==0.3.83->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 2)) (4.15.0)
Requirement already satisfied: packaging<26.0.0,>=23.2.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-core==0.3.83->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 2)) (25.0)
Requirement already satisfied: uuid-utils<1.0,>=0.12.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-core==0.3.83->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 2)) (0.14.0)
Requirement already satisfied: aiohttp<4.0.0,>=3.8.3 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-community==0.3.31->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 3)) (3.13.3)
Requirement already satisfied: dataclasses-json<0.7.0,>=0.6.7 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-community==0.3.31->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 3)) (0.6.7)
Requirement already satisfied: pydantic-settings<3.0.0,>=2.10.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-community==0.3.31->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 3)) (2.12.0)
Requirement already satisfied: httpx-sse<1.0.0,>=0.4.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-community==0.3.31->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 3)) (0.4.3)
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Requirement already satisfied: numpy>=1.26.2 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-community==0.3.31->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 3)) (2.4.2)
Requirement already satisfied: build>=1.0.3 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (1.4.0)
Requirement already satisfied: pybase64>=1.4.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (1.4.3)
Requirement already satisfied: uvicorn>=0.18.3 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from uvicorn[standard]>=0.18.3->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (0.40.0)
Requirement already satisfied: posthog<6.0.0,>=2.4.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (5.4.0)
Requirement already satisfied: onnxruntime>=1.14.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (1.24.1)
Requirement already satisfied: opentelemetry-api>=1.2.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (1.39.1)
Requirement already satisfied: opentelemetry-exporter-otlp-proto-grpc>=1.2.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (1.39.1)
Requirement already satisfied: opentelemetry-sdk>=1.2.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (1.39.1)
Requirement already satisfied: tokenizers>=0.13.2 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (0.22.2)
Requirement already satisfied: pypika>=0.48.9 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (0.51.1)
Requirement already satisfied: tqdm>=4.65.0 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
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5)) (4.67.3)
Requirement already satisfied: overrides>=7.3.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (7.7.0)
Requirement already satisfied: importlib-resources in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (6.5.2)
Requirement already satisfied: grpcio>=1.58.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (1.76.0)
Requirement already satisfied: bcrypt>=4.0.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (5.0.0)
Requirement already satisfied: typer>=0.9.0 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (0.21.1)
Requirement already satisfied: kubernetes>=28.1.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (35.0.0)
Requirement already satisfied: mmh3>=4.0.1 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (5.2.0)
Requirement already satisfied: orjson>=3.9.12 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (3.11.7)
Requirement already satisfied: httpx>=0.27.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (0.28.1)
Requirement already satisfied: rich>=10.11.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (14.3.2)
Requirement already satisfied: jsonschema>=4.19.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (4.26.0)
Requirement already satisfied: huggingface-hub>=0.33.4 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-huggingface==0.3.1->-r /Users/ryan/Developer/naturalist-

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companion/requirements-target-common.txt (line 7)) (1.4.0)
Requirement already satisfied: transformers<6.0.0,>=4.41.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from sentence-transformers==5.2.2->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 8)) (5.1.0)
Requirement already satisfied: scikit-learn in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from sentence-
transformers==5.2.2->-r /Users/ryan/Developer/naturalist-companion/requirements-
target-common.txt (line 8)) (1.8.0)
Requirement already satisfied: scipy in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from sentence-
transformers==5.2.2->-r /Users/ryan/Developer/naturalist-companion/requirements-
target-common.txt (line 8)) (1.17.0)
Requirement already satisfied: filelock in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from torch==2.9.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
9)) (3.20.3)
Requirement already satisfied: setuptools in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from torch==2.9.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
9)) (80.10.2)
Requirement already satisfied: sympy>=1.13.3 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from torch==2.9.1->-r /Users/ryan/Developer/naturalist-companion/requirements-
target-common.txt (line 9)) (1.14.0)
Requirement already satisfied: networkx>=2.5.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from torch==2.9.1->-r /Users/ryan/Developer/naturalist-companion/requirements-
target-common.txt (line 9)) (3.6.1)
Requirement already satisfied: fsspec>=0.8.5 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from torch==2.9.1->-r /Users/ryan/Developer/naturalist-companion/requirements-
target-common.txt (line 9)) (2026.2.0)
Requirement already satisfied: ollama<1.0.0,>=0.5.3 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langchain-ollama==0.3.10->-r /Users/ryan/Developer/naturalist-
companion/requirements-ollama.txt (line 3)) (0.6.1)
Requirement already satisfied: aiohappyeyeballs>=2.5.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from aiohttp<4.0.0,>=3.8.3->langchain-community==0.3.31->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
3)) (2.6.1)
Requirement already satisfied: aiosignal>=1.4.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from aiohttp<4.0.0,>=3.8.3->langchain-community==0.3.31->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
3)) (1.4.0)
Requirement already satisfied: attrs>=17.3.0 in
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/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from aiohttp<4.0.0,>=3.8.3->langchain-community==0.3.31->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
3)) (25.4.0)
Requirement already satisfied: frozenlist>=1.1.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from aiohttp<4.0.0,>=3.8.3->langchain-community==0.3.31->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
3)) (1.8.0)
Requirement already satisfied: multidict<7.0,>=4.5 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from aiohttp<4.0.0,>=3.8.3->langchain-community==0.3.31->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
3)) (6.7.1)
Requirement already satisfied: propcache>=0.2.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from aiohttp<4.0.0,>=3.8.3->langchain-community==0.3.31->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
3)) (0.4.1)
Requirement already satisfied: yarl<2.0,>=1.17.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from aiohttp<4.0.0,>=3.8.3->langchain-community==0.3.31->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
3)) (1.22.0)
Requirement already satisfied: marshmallow<4.0.0,>=3.18.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from dataclasses-json<0.7.0,>=0.6.7->langchain-community==0.3.31->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
3)) (3.26.2)
Requirement already satisfied: typing-inspect<1,>=0.4.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from dataclasses-json<0.7.0,>=0.6.7->langchain-community==0.3.31->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
3)) (0.9.0)
Requirement already satisfied: jsonpointer>=1.9 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jsonpatch<2.0.0,>=1.33.0->langchain-core==0.3.83->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
2)) (3.0.0)
Requirement already satisfied: ormsgpack>=1.10.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langgraph-checkpoint<3.0.0,>=2.1.0->langgraph==0.5.3->-r
/Users/ryan/Developer/naturalist-companion/requirements.txt (line 2)) (1.12.2)
Requirement already satisfied: requests-toolbelt>=1.0.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langsmith>=0.1.17->langchain==0.3.27->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 1)) (1.0.0)
Requirement already satisfied: zstandard>=0.23.0 in
```

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/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from langsmith>=0.1.17->langchain==0.3.27->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 1)) (0.25.0)
Requirement already satisfied: anyio in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
httpx>=0.27.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (4.12.1)
Requirement already satisfied: certifi in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
httpx>=0.27.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (2026.1.4)
Requirement already satisfied: httpcore==1.* in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from httpx>=0.27.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (1.0.9)
Requirement already satisfied: idna in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
httpx>=0.27.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (3.11)
Requirement already satisfied: h11>=0.16 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
httpcore==1.*->httpx>=0.27.0->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (0.16.0)
Requirement already satisfied: six>=1.5 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
posthog<6.0.0,>=2.4.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (1.17.0)
Requirement already satisfied: python-dateutil>=2.2 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from posthog<6.0.0,>=2.4.0->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (2.9.0.post0)
Requirement already satisfied: backoff>=1.10.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from posthog<6.0.0,>=2.4.0->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (2.2.1)
Requirement already satisfied: distro>=1.5.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from posthog<6.0.0,>=2.4.0->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (1.9.0)
Requirement already satisfied: annotated-types>=0.6.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from pydantic>=2.7.4->langgraph==0.5.3->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 2)) (0.7.0)
Requirement already satisfied: pydantic-core==2.41.5 in
```

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/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from pydantic>=2.7.4->langgraph==0.5.3->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 2)) (2.41.5)
Requirement already satisfied: typing-inspection>=0.4.2 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from pydantic>=2.7.4->langgraph==0.5.3->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 2)) (0.4.2)
Requirement already satisfied: charset_normalizer<4,>=2 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from requests<3.0.0,>=2.0.0->wikipedia==1.4.0->-r
/Users/ryan/Developer/naturalist-companion/requirements.txt (line 4)) (3.4.4)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from requests<3.0.0,>=2.0.0->wikipedia==1.4.0->-r
/Users/ryan/Developer/naturalist-companion/requirements.txt (line 4)) (2.6.3)
Requirement already satisfied: regex!=2019.12.17 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from transformers<6.0.0,>=4.41.0->sentence-transformers==5.2.2->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
8)) (2026.1.15)
Requirement already satisfied: typer-slim in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
transformers<6.0.0,>=4.41.0->sentence-transformers==5.2.2->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
8)) (0.21.1)
Requirement already satisfied: safetensors>=0.4.3 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from transformers<6.0.0,>=4.41.0->sentence-transformers==5.2.2->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
8)) (0.7.0)
Requirement already satisfied: hf-xet<2.0.0,>=1.2.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from huggingface-hub>=0.33.4->langchain-huggingface==0.3.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
7)) (1.2.0)
Requirement already satisfied: shellingham in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from huggingface-
hub>=0.33.4->langchain-huggingface==0.3.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 7)) (1.5.4)
Requirement already satisfied: mypy-extensions>=0.3.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from typing-inspect<1,>=0.4.0->dataclasses-json<0.7.0,>=0.6.7->langchain-
community==0.3.31->-r /Users/ryan/Developer/naturalist-companion/requirements-
target-common.txt (line 3)) (1.1.0)
Requirement already satisfied: async-lru>=1.0.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-
dev.txt (line 1)) (2.1.0)
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Requirement already satisfied: jupyter-core in /Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages (from jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))  
(5.9.1)  
Requirement already satisfied: jupyter-lsp>=2.0.0 in  
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages  
(from jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1)) (2.3.0)  
Requirement already satisfied: jupyter-server<3,>=2.4.0 in  
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages  
(from jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1)) (2.17.0)  
Requirement already satisfied: jupyterlab-server<3,>=2.28.0 in  
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages  
(from jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1)) (2.28.0)  
Requirement already satisfied: notebook-shim>=0.2 in  
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages  
(from jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1)) (0.2.4)  
Requirement already satisfied: tornado>=6.2.0 in  
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages  
(from jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1)) (6.5.4)  
Requirement already satisfied: traitlets in /Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages (from jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))  
(5.14.3)  
Requirement already satisfied: argon2-cffi>=21.1 in  
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages  
(from jupyter-server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1)) (25.1.0)  
Requirement already satisfied: jupyter-client>=7.4.4 in  
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages  
(from jupyter-server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1)) (8.8.0)  
Requirement already satisfied: jupyter-events>=0.11.0 in  
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages  
(from jupyter-server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1)) (0.12.0)  
Requirement already satisfied: jupyter-server-terminals>=0.4.4 in  
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages  
(from jupyter-server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1)) (0.5.4)  
Requirement already satisfied: nbconvert>=6.4.4 in  
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages  
(from jupyter-server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1)) (7.17.0)
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Requirement already satisfied: nbformat>=5.3.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jupyter-server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (5.10.4)
Requirement already satisfied: prometheus-client>=0.9 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jupyter-server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (0.24.1)
Requirement already satisfied: pyzmq>=24 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from jupyter-
server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (27.1.0)
Requirement already satisfied: send2trash>=1.8.2 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jupyter-server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (2.1.0)
Requirement already satisfied: terminado>=0.8.3 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jupyter-server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (0.18.1)
Requirement already satisfied: websocket-client>=1.7 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jupyter-server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (1.9.0)
Requirement already satisfied: babel>=2.10 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from jupyterlab-
server<3,>=2.28.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (2.18.0)
Requirement already satisfied: json5>=0.9.0 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from jupyterlab-
server<3,>=2.28.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (0.13.0)
Requirement already satisfied: appnope>=0.1.2 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipykernel->-r /Users/ryan/Developer/naturalist-companion/requirements-
dev.txt (line 2)) (0.1.4)
Requirement already satisfied: comm>=0.1.1 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from ipykernel->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 2))
(0.2.3)
Requirement already satisfied: debugpy>=1.6.5 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipykernel->-r /Users/ryan/Developer/naturalist-companion/requirements-
dev.txt (line 2)) (1.8.20)
Requirement already satisfied: ipython>=7.23.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipykernel->-r /Users/ryan/Developer/naturalist-companion/requirements-
dev.txt (line 2)) (9.10.0)
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Requirement already satisfied: matplotlib-inline>=0.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipykernel->-r /Users/ryan/Developer/naturalist-companion/requirements-
dev.txt (line 2)) (0.2.1)
Requirement already satisfied: nest-asyncio>=1.4 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipykernel->-r /Users/ryan/Developer/naturalist-companion/requirements-
dev.txt (line 2)) (1.6.0)
Requirement already satisfied: psutil>=5.7 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from ipykernel->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 2))
(7.2.2)
Requirement already satisfied: widgetsnbextension~=4.0.14 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipywidgets->-r /Users/ryan/Developer/naturalist-companion/requirements-
dev.txt (line 3)) (4.0.15)
Requirement already satisfied: jupyterlab_widgets~=3.0.15 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipywidgets->-r /Users/ryan/Developer/naturalist-companion/requirements-
dev.txt (line 3)) (3.0.16)
Requirement already satisfied: argon2-cffi-bindings in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from argon2-cffi>=21.1->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(25.1.0)
Requirement already satisfied: pyproject_hooks in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from build>=1.0.3->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (1.2.0)
Requirement already satisfied: decorator>=4.3.2 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipython>=7.23.1->ipykernel->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 2)) (5.2.1)
Requirement already satisfied: ipython-pygments-lexers>=1.0.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipython>=7.23.1->ipykernel->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 2)) (1.1.1)
Requirement already satisfied: jedi>=0.18.1 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
ipython>=7.23.1->ipykernel->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 2)) (0.19.2)
Requirement already satisfied: pexpect>4.3 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
ipython>=7.23.1->ipykernel->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 2)) (4.9.0)
Requirement already satisfied: prompt_toolkit<3.1.0,>=3.0.41 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipython>=7.23.1->ipykernel->-r /Users/ryan/Developer/naturalist-
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companion/requirements-dev.txt (line 2)) (3.0.52)
Requirement already satisfied: pygments>=2.11.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipython>=7.23.1->ipykernel->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 2)) (2.19.2)
Requirement already satisfied: stack_data>=0.6.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from ipython>=7.23.1->ipykernel->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 2)) (0.6.3)
Requirement already satisfied: wctwidth in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
prompt_toolkit<3.1.0,>=3.0.41->ipython>=7.23.1->ipykernel->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 2))
(0.5.3)
Requirement already satisfied: parso<0.9.0,>=0.8.4 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jedi>=0.18.1->ipython>=7.23.1->ipykernel->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 2))
(0.8.5)
Requirement already satisfied: jsonschema-specifications>=2023.03.6 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jsonschema>=4.19.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (2025.9.1)
Requirement already satisfied: referencing>=0.28.4 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jsonschema>=4.19.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (0.37.0)
Requirement already satisfied: rpds-py>=0.25.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jsonschema>=4.19.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (0.30.0)
Requirement already satisfied: platformdirs>=2.5 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jupyter-core->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (4.5.1)
Requirement already satisfied: python-json-logger>=2.0.4 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jupyter-events>=0.11.0->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(4.0.0)
Requirement already satisfied: rfc3339-validator in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jupyter-events>=0.11.0->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(0.1.4)
Requirement already satisfied: rfc3986-validator>=0.1.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jupyter-events>=0.11.0->jupyter-server<3,>=2.4.0->jupyterlab->-r
```

```
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(0.1.1)
Requirement already satisfied: fqdn in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from jsonschema[format-
nongpl]>=4.18.0->jupyter-events>=0.11.0->jupyter-
server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (1.5.1)
Requirement already satisfied: isoduration in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from jsonschema[format-
nongpl]>=4.18.0->jupyter-events>=0.11.0->jupyter-
server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (20.11.0)
Requirement already satisfied: rfc3987-syntax>=1.1.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jsonschema[format-nongpl]>=4.18.0->jupyter-events>=0.11.0->jupyter-
server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (1.1.0)
Requirement already satisfied: uri-template in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from jsonschema[format-
nongpl]>=4.18.0->jupyter-events>=0.11.0->jupyter-
server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (1.3.0)
Requirement already satisfied: webcolors>=24.6.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from jsonschema[format-nongpl]>=4.18.0->jupyter-events>=0.11.0->jupyter-
server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (25.10.0)
Requirement already satisfied: requests-oauthlib in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from kubernetes>=28.1.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (2.0.0)
Requirement already satisfied: durationpy>=0.7 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from kubernetes>=28.1.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (0.10)
Requirement already satisfied: bleach!=5.0.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from bleach[css]!=5.0.0->nbconvert>=6.4.4->jupyter-
server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (6.3.0)
Requirement already satisfied: defusedxml in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from nbconvert>=6.4.4->jupyter-
server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (0.7.1)
Requirement already satisfied: jupyterlab-pygments in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
```

(0.3.0)
Requirement already satisfied: mistune<4,>=2.0.3 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(3.2.0)
Requirement already satisfied: nbclient>=0.5.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(0.10.4)
Requirement already satisfied: pandocfilters>=1.4.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from nbconvert>=6.4.4->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(1.5.1)
Requirement already satisfied: webencodings in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
bleach!=5.0.0->bleach[css]!=5.0.0->nbconvert>=6.4.4->jupyter-
server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (0.5.1)
Requirement already satisfied: tinyccs2<1.5,>=1.1.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from bleach[css]!=5.0.0->nbconvert>=6.4.4->jupyter-
server<3,>=2.4.0->jupyterlab->-r /Users/ryan/Developer/naturalist-
companion/requirements-dev.txt (line 1)) (1.4.0)
Requirement already satisfied: fastjsonschema>=2.15 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from nbformat>=5.3.0->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(2.21.2)
Requirement already satisfied: flatbuffers in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
onnxruntime>=1.14.1->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (25.12.19)
Requirement already satisfied: protobuf in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
onnxruntime>=1.14.1->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (6.33.5)
Requirement already satisfied: importlib-metadata<8.8.0,>=6.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from opentelemetry-api>=1.2.0->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (8.7.1)
Requirement already satisfied: zipp>=3.20 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from importlib-
metadata<8.8.0,>=6.0->opentelemetry-api>=1.2.0->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line

5)) (3.23.0)
Requirement already satisfied: googleapis-common-protos~=1.57 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from opentelemetry-exporter-otlp-proto-grpc>=1.2.0->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (1.72.0)
Requirement already satisfied: opentelemetry-exporter-otlp-proto-common==1.39.1
in /Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from opentelemetry-exporter-otlp-proto-grpc>=1.2.0->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (1.39.1)
Requirement already satisfied: opentelemetry-proto==1.39.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from opentelemetry-exporter-otlp-proto-grpc>=1.2.0->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (1.39.1)
Requirement already satisfied: opentelemetry-semantic-conventions==0.60b1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from opentelemetry-sdk>=1.2.0->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (0.60b1)
Requirement already satisfied: ptyprocess>=0.5 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from pexpect>4.3->ipython>=7.23.1->ipykernel->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 2))
(0.7.0)
Requirement already satisfied: lark>=1.2.2 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
rfc3987-syntax>=1.1.0->jsonschema[format-nongpl]>=4.18.0->jupyter-
events>=0.11.0->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(1.3.1)
Requirement already satisfied: markdown-it-py>=2.2.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from rich>=10.11.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (4.0.0)
Requirement already satisfied: mdurl~0.1 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from markdown-it-
py>=2.2.0->rich>=10.11.0->chromadb==1.4.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 5)) (0.1.2)
Requirement already satisfied: executing>=1.2.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from stack_data>=0.6.0->ipython>=7.23.1->ipykernel->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 2))
(2.2.1)
Requirement already satisfied: asttokens>=2.1.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from stack_data>=0.6.0->ipython>=7.23.1->ipykernel->-r

```
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 2))
(3.0.1)
Requirement already satisfied: pure-eval in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
stack_data>=0.6.0->ipython>=7.23.1->ipykernel->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 2))
(0.2.3)
Requirement already satisfied: mpmath<1.4,>=1.1.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from sympy>=1.13.3->torch==2.9.1->-r /Users/ryan/Developer/naturalist-
companion/requirements-target-common.txt (line 9)) (1.3.0)
Requirement already satisfied: hptools>=0.6.3 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from uvicorn[standard]>=0.18.3->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (0.7.1)
Requirement already satisfied: uvloop>=0.15.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from uvicorn[standard]>=0.18.3->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (0.22.1)
Requirement already satisfied: watchfiles>=0.13 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from uvicorn[standard]>=0.18.3->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (1.1.1)
Requirement already satisfied: websockets>=10.4 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from uvicorn[standard]>=0.18.3->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (15.0.1)
Requirement already satisfied: cffi>=1.0.1 in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from argon2-cffi-
bindings->argon2-cffi>=21.1->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(2.0.0)
Requirement already satisfied: pycparser in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from cffi>=1.0.1->argon2-cffi-
bindings->argon2-cffi>=21.1->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1)) (3.0)
Requirement already satisfied: soupsieve>=1.6.1 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from beautifulsoup4->wikipedia==1.4.0->-r /Users/ryan/Developer/naturalist-
companion/requirements.txt (line 4)) (2.8.3)
Requirement already satisfied: arrow>=0.15.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from isoduration->jsonschema[format-nongpl]>=4.18.0->jupyter-
events>=0.11.0->jupyter-server<3,>=2.4.0->jupyterlab->-r
```

```

/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(1.4.0)
Requirement already satisfied: tzdata in /Users/ryan/Developer/naturalist-
companion/.venv/lib/python3.12/site-packages (from
arrow>=0.15.0->isoduration->jsonschema[format-nongpl]>=4.18.0->jupyter-
events>=0.11.0->jupyter-server<3,>=2.4.0->jupyterlab->-r
/Users/ryan/Developer/naturalist-companion/requirements-dev.txt (line 1))
(2025.3)
Requirement already satisfied: oauthlib>=3.0.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from requests-oauthlib->kubernetes>=28.1.0->chromadb==1.4.1->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
5)) (3.3.1)
Requirement already satisfied: joblib>=1.3.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from scikit-learn->sentence-transformers==5.2.2->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
8)) (1.5.3)
Requirement already satisfied: threadpoolctl>=3.2.0 in
/Users/ryan/Developer/naturalist-companion/.venv/lib/python3.12/site-packages
(from scikit-learn->sentence-transformers==5.2.2->-r
/Users/ryan/Developer/naturalist-companion/requirements-target-common.txt (line
8)) (3.6.0)
Note: you may need to restart the kernel to use updated packages.

```

```
[16]: import importlib
import json
import re
import os
import sys
from pathlib import Path
from typing import Literal
import warnings
from threading import Event, Thread
from IPython.display import Image, Markdown, display
from time import perf_counter
```

1.2.3 Dependency Preflight (Fail Fast)

```
[17]: def _candidate_src_paths():
    candidates = []

    # Optional explicit override.
    env_src = os.environ.get("NATURALIST_COMPANION_SRC", "").strip()
    if env_src:
        candidates.append(Path(env_src))
```

```

        cwd = Path.cwd()
        candidates.extend([
            cwd / "src",
            cwd.parent / "src",
            cwd.parent.parent / "src",
        ])

        # Optional scan for repository-style checkouts.
        repos_root = Path("/Workspace/Repos")
        if repos_root.exists():
            for pkg_dir in repos_root.glob("*/*/src/naturalist_companion"):
                candidates.append(pkg_dir.parent)

        deduped = []
        seen = set()
        for item in candidates:
            key = str(item)
            if key in seen:
                continue
            seen.add(key)
            deduped.append(item)
        return deduped

    for src_path in _candidate_src_paths():
        if (src_path / "naturalist_companion").exists() and str(src_path) not in sys.path:
            sys.path.insert(0, str(src_path))
            break

CHECKS = [
    ("FAISS backend", ["faiss"]),
    ("LangGraph runtime", ["langgraph"]),
    ("Wikipedia loader module", ["langchain_community.document_loaders",
        "langchain.document_loaders"]),
    ("Text splitter module", ["langchain_text_splitters", "langchain.
        text_splitter"]),
    ("LangChain vectorstore module", ["langchain_community.vectorstores"]),
    ("LangChain in-memory docstore module", ["langchain_community.docstore.
        in_memory"]),
    ("Ollama integration", ["langchain_ollama"]),
    ("Naturalist stategraph module", ["naturalist_companion.
        stategraph_shared"]),
]
resolved = {}
missing = []

```

```

for label, module_candidates in CHECKS:
    matched = None
    last_error = None
    for module_name in module_candidates:
        try:
            importlib.import_module(module_name)
            matched = module_name
            break
        except ImportError as import_error:
            last_error = f"type(import_error).__name__: {import_error}"

    if matched is not None:
        resolved[label] = matched
    else:
        missing.append((label, module_candidates, last_error))

if missing:
    non_stategraph_missing = [m for m in missing if m[0] != "Naturalist"
                               ↵stategraph module"]
    if non_stategraph_missing:
        missing = non_stategraph_missing

    lines = ["[preflight] Missing required notebook dependencies:"]
    for label, module_candidates, last_error in missing:
        lines.append(f"- {label}: expected one of {', '.
                     ↵join(module_candidates)}")
        if last_error:
            lines.append(f"  last error: {last_error}")

    lines.append("")
    lines.append("Run the install cell above, restart the kernel, and retry.")
    lines.append("Install hint: %pip install -U -r ../requirements-ollama-dev.
                 ↵txt")
    lines.append("Set NATURALIST_COMPANION_SRC to your repo src path if needed.
                 ↵")
    raise ModuleNotFoundError("\n".join(lines))

print("[preflight] Dependency check passed.")
for label, module_name in resolved.items():
    print(f"  - {label}: {module_name}")

```

[preflight] Dependency check passed.

- FAISS backend: faiss
- LangGraph runtime: langgraph
- Wikipedia loader module: langchain_community.document_loaders
- Text splitter module: langchain_text_splitters

- LangChain vectorstore module: langchain_community.vectorstores
- LangChain in-memory docstore module: langchain_community.docstore.in_memory
- Ollama integration: langchain_ollama
- Naturalist stategraph module: naturalist_companion.stategraph_shared

1.2.4 Notebook Imports + Runtime Config

```
[18]: # Mitigate common macOS OpenMP duplicate-library crashes in notebook kernels.
os.environ.setdefault("KMP_DUPLICATE_LIB_OK", "TRUE")

# Silence noisy tqdm widget warning in IDE notebooks when rich progress widgets
# are unavailable.
warnings.filterwarnings("ignore", message=".*IPProgress not found.*")

# LangChain moved WikipediaLoader in newer releases; keep backward
# compatibility.
try:
    from langchain_community.document_loaders import WikipediaLoader
except ImportError:
    from langchain.document_loaders import WikipediaLoader

try:
    from langchain_text_splitters import RecursiveCharacterTextSplitter
except ImportError:
    from langchain.text_splitter import RecursiveCharacterTextSplitter

from langchain_community.vectorstores import FAISS
from langchain_ollama import ChatOllama, OllamaEmbeddings

def _start_heartbeat(task_label: str, every_s: float = 8.0):
    stop = Event()

    def _run():
        elapsed = 0.0
        while not stop.wait(every_s):
            elapsed += every_s
            print(f"[{task_label}] still running... {elapsed:.0f}s elapsed")

    thread = Thread(target=_run, daemon=True)
    thread.start()
    return stop

from naturalist_companion.wikipedia_tools import_
    display_openstreetmap_for_pages, display_wikipedia_images_for_pages
```

```

try:
    from langchain_core.documents import Document
except ImportError:
    from langchain.schema import Document

from naturalist_companion.fallback_data import fallback_wiki_pages

STATEGRAPH_AVAILABLE = False
_stategraph_import_error = None
try:
    from naturalist_companion.stategraph_shared import (
        build_stategraph_app,
        run_i81_eval_harness,
        run_stategraph,
    )
    STATEGRAPH_AVAILABLE = True
except Exception as stategraph_import_error:
    _stategraph_import_error = stategraph_import_error
    print(f"[stategraph] import error: {type(stategraph_import_error).__name__}:\n"
          f"↳ {stategraph_import_error}")
    print("[stategraph] StateGraph cells can be skipped until this import works.\n"
          f"↳")
    print()

def _show_ollama_status() -> None:
    base_url = os.environ.get("OLLAMA_BASE_URL", "http://localhost:11434").
    strip()
    print(f"[env] Ollama base URL: {base_url}")
    print("[env] Verify local models with: `ollama list`")

def _raise_ollama_hint(stage: str, model: str, base_url: str, error: Exception) -> None:
    message = str(error)
    hints = [
        f"[{stage}] Ollama call failed for model={model!r} at\n"
        f"base_url={base_url!r}.",
        f"Underlying error: {message}",
    ]
    lower_msg = message.lower()
    if "connection" in lower_msg or "refused" in lower_msg or "timed out" in
    lower_msg:
        hints.append("Ensure Ollama is running and reachable: `ollama serve`.")

```

```

    if "not found" in lower_msg or "pull" in lower_msg:
        hints.append(f"Ensure the model exists locally: `ollama pull {model}`.")

    raise RuntimeError("\n".join(hints)) from error

_show_ollama_status()

```

[env] Ollama base URL: http://localhost:11434
[env] Verify local models with: `ollama list`

1.2.5 Config (Define LLMs, Embeddings, Vector Store, Data Loader specs)

```

[19]: # DataLoader Config
query_terms = [
    "roadcut",
    "geology",
    "sedimentary rock",
    "stratigraphy",
]
max_docs = 12 # Realistic retrieval setting for richer context.

# Stage 2 chunking + batching controls (keep small for interactive runs).
chunk_size = 1200
chunk_overlap = 150
embedding_batch_size = 8

# Retriever Config
k = 4
EMBEDDING_MODEL = os.environ.get("OLLAMA_EMBEDDING_MODEL", "nomic-embed-text")
OLLAMA_BASE_URL = os.environ.get("OLLAMA_BASE_URL", "http://localhost:11434")

# LLM Config
LLM_MODEL = os.environ.get("OLLAMA_LLM_MODEL", "llama3.1:8b")
TEMPERATURE = 0.25

# Response style controls (Roadside Geology audience: curious drivers, ↴ practical field learners).
RESPONSE_TONE = "field-guide"
MAX_BULLETS_PER_SECTION = 4

# Local artifact settings
FAISS_NAMESPACE = "anc_ollama"

```

```

# StateGraph Config
STATEGRAPH_PROVIDER: Literal["ollama"] = "ollama"
STATEGRAPH_LIVE_MAX_DOCS = 16
STATEGRAPH_COMMON_CONFIG = {
    "max_retrieval_attempts": 3,
    "citation_coverage_threshold": 0.80,
    "runtime_mode": "realistic",
    "llm_temperature": TEMPERATURE,
    "llm_model": LLM_MODEL,
    "ollama_base_url": OLLAMA_BASE_URL,
    "live_max_docs": STATEGRAPH_LIVE_MAX_DOCS,
}
STATEGRAPH_RUN_CONFIG = {"artifact_root": "out/stategraph/notebook_runs", ↵
    **STATEGRAPH_COMMON_CONFIG}
STATEGRAPH_EVAL_CONFIG = {"artifact_root": "out/stategraph/notebook_eval", ↵
    **STATEGRAPH_COMMON_CONFIG}

```

1.3 Query Prompt (Edit This Cell)

Use the next code cell to set the active question(s).

Question types this notebook is designed for: - Detour geology: legal pull-offs or short walks near a route segment - Safety-first prompts: where to stop and what to avoid roadside - Route constraints: city/exit anchors plus max detour minutes - Beginner field interpretation: what visual clues to look for and why they matter

Tip: Include your nearest city or exit and your max detour time to improve stop recommendations.

```
[20]: example_question = "I am on I-81 near Hagerstown with a 30-minute detour. Where ↵
    ↵can I safely stop to observe folded Valley-and-Ridge strata, and what ↵
    ↵exactly should I look for?" ↵

example_questions = [
    "I am driving I-81 near Bristol, TN. Give me two legal pull-off stops where ↵
    ↵I can see clear sedimentary layering, and tell me exactly what to look for.", ↵
    "Near I-81 between Winchester and Strasbourg, where can I safely stop to ↵
    ↵see Valley-and-Ridge structure, and what field clues confirm folding?", ↵
    "I have 45 minutes near Hagerstown, MD. What roadside geology stop gives ↵
    ↵the best payoff for a beginner, and what story does the outcrop tell?", ↵
    "Along I-81 in the Shenandoah Valley, point me to a short-walk stop to ↵
    ↵compare rock type and landform, then explain why that match matters.", ↵
    "On an I-81 drive day, suggest one stop where I can observe evidence of ↵
    ↵ancient seas or sediment transport, with specific visual clues.", ↵
]
```

```

# StateGraph run can use the same prompt by default; edit independently if desired.
stategraph_question = example_question

def _parse_place_query_list(raw: str, max_items: int = 6) -> list[str]:
    text = str(raw or "").strip()
    if not text:
        return []
    match = re.search(r"\[\s\S*\]", text)
    if match:
        text = match.group(0)
    try:
        data = json.loads(text)
    except json.JSONDecodeError:
        data = [ln.strip(" -•\t") for ln in text.splitlines() if ln.strip()]

    out: list[str] = []
    for item in data if isinstance(data, list) else []:
        value = str(item or "").strip()
        if not value:
            continue
        low = value.lower()
        if any(token in low for token in ("interstate", "highway", "i-81", "route")):
            continue
        if value not in out:
            out.append(value)
        if len(out) >= int(max_items):
            break
    return out

def _generate_place_image_queries_with_model(question: str, max_items: int = 6) -> list[str]:
    prompt = (
        "Return only JSON: an array of concise Wikipedia search queries for "
        "NATURAL LANDSCAPES "
        "near this route question. Exclude highways, interstates, and city-only "
        "queries. "
        "Prefer valleys, ridges, mountains, parks, overlooks, and geologic "
        "landforms. "
        f"Question: {question}"
    )
    try:
        planner = ChatOllama(model=LLM_MODEL, base_url=OLLAMA_BASE_URL,
        temperature=min(0.3, float(TEMPERATURE)))

```

```

        response = planner.invoke(prompt)
        raw = getattr(response, "content", response)
        places = _parse_place_query_list(raw, max_items=max_items)
        if places:
            return places
    except Exception as query_error:
        print(f"[query] place query generation fallback: {type(query_error)}.
        ↵__name__: {query_error}")

    return [
        "Shenandoah Valley overlooks",
        "Blue Ridge Mountains viewpoints",
        "Appalachian Valley and Ridge outcrops",
        "Catoctin Mountain Park geology",
        "Great North Mountain ridge overlook",
    ][: max(1, int(max_items))]

place_image_queries =_
↪_generate_place_image_queries_with_model(example_question, max_items=6)
print("[query] place_image_queries:")
for query_idx, query_text in enumerate(place_image_queries, start=1):
    print(f" {query_idx}. {query_text}")

```

[query] place_image_queries:

1. Here is an array of concise Wikipedia search queries for NATURAL LANDSCAPES near your route:
2. * "Valley-and-Ridge Province"
3. * "Folded Mountains"
4. * "Geologic Formations in Maryland"
5. * "Parks near Hagerstown, MD"
6. * "Ridges of the Appalachian Mountains"

1.3.1 Stage 1/3: Wikipedia Data Load

```
[21]: print("[stage 1/3] Starting document load (real Wikipedia first; fallback on_
↪problems)...")

query = " ".join(query_terms) if isinstance(query_terms, list) else query_terms
print(f"[stage 1/3] query={query!r}, max_docs={max_docs}")

docs = []
data_source = "real_wikipedia"
fallback_reason = None

stage1_heartbeat = _start_heartbeat("stage 1/3 wikipedia load", every_s=8.0)
t0 = perf_counter()
try:
```

```

try:
    docs = WikipediaLoader(query=query, load_max_docs=max_docs).load()
except Exception as load_error:
    fallback_reason = f"{type(load_error).__name__}: {load_error}"
    docs = []
finally:
    stage1_heartbeat.set()
t1 = perf_counter()

if docs:
    data_source = "real_wikipedia"
else:
    data_source = "fallback_data"
    if fallback_reason is None:
        fallback_reason = "WikipediaLoader returned 0 documents."

pages = fallback_wiki_pages()
docs = [
    Document(
        page_content=f"{str(page.get('summary') or '')}.
{str(page.get('content') or '').strip()}.strip(),
        metadata={
            "title": str(page.get("title") or f"fallback_page_{pageid}"),
            "source": str(page.get("url") or ""),
            "pageid": int(page.get("pageid") or pageid),
            "data_source": "fallback_data",
        },
    )
    for pageid, page in pages.items()
]

print(f"[stage 1/3] Loaded {len(docs)} document(s) in {t1 - t0:.2f}s")
print(f"[stage 1/3] data_source={data_source}")
if data_source == "fallback_data":
    print(f"[stage 1/3] FALBACK ACTIVE: {fallback_reason}")
else:
    print("[stage 1/3] Real Wikipedia data loaded successfully.")

if not docs:
    raise RuntimeError("No documents available from real or fallback data.
    Check notebook environment and retry.")

print("[stage 1/3] Sample titles:")
for sample_idx, sample_doc in enumerate(docs[:3], start=1):
    sample_title = str((sample_doc.metadata or {}).get("title") or
f"doc_{sample_idx}")
    sample_source = str((sample_doc.metadata or {}).get("source") or "n/a")

```

```

print(f" {sample_idx}. {sample_title} ({sample_source})")

print("[stage 1/3] Wikipedia image previews from loaded pages...")
display_wikipedia_images_for_pages(docs, max_images=min(3, len(docs)), prefer_landscape=True, route_hint=example_question)

print("[stage 1/3] Wikipedia image previews near place queries...")
display_wikipedia_images_for_pages(place_image_queries, max_images=min(5, len(place_image_queries)), prefer_landscape=True, route_hint=example_question)
print("[stage 1/3] OpenStreetMap previews for landscape points...")
display_openstreetmap_for_pages(place_image_queries or docs, max_points=10, prefer_landscape=True, route_hint=example_question)

```

[stage 1/3] Starting document load (real Wikipedia first; fallback on problems)...
[stage 1/3] query='roadcut geology sedimentary rock stratigraphy', max_docs=12
[stage 1/3 wikipedia load] still running... 8s elapsed
[stage 1/3] Loaded 12 document(s) in 8.90s
[stage 1/3] data_source=real_wikipedia
[stage 1/3] Real Wikipedia data loaded successfully.
[stage 1/3] Sample titles:
1. Carboniferous (<https://en.wikipedia.org/wiki/Carboniferous>)
2. Paleomagnetism (<https://en.wikipedia.org/wiki/Paleomagnetism>)
3. Artinskian (<https://en.wikipedia.org/wiki/Artinskian>)
[stage 1/3] Wikipedia image previews from loaded pages...

Wikipedia image preview: Carboniferous rainforest collapse

<IPython.core.display.HTML object>

[Open page](#)

Wikipedia image preview: Appalachian Mountains

<IPython.core.display.HTML object>

[Open page](#)

Wikipedia image preview: Rocky Mountains

<IPython.core.display.HTML object>

[Open page](#)

[stage 1/3] Wikipedia image previews near place queries...
[wiki-images] No thumbnail images found for the selected pages.
[stage 1/3] OpenStreetMap previews for landscape points...

<IPython.core.display.HTML object>

[21]: 1

1.3.2 Stage 2/3: Build + Save FAISS Index, Then Retrieve

```
[22]: if "docs" not in globals() or not docs:
    raise RuntimeError(`docs` not found. Run Stage 1/3 first.)

print(f"[stage 2/3] Building embeddings with model={EMBEDDING_MODEL!r} at_
    ↪base_url={OLLAMA_BASE_URL!r}...")
print(
    f"[stage 2/3] Chunking docs with chunk_size={chunk_size},_
    ↪chunk_overlap={chunk_overlap}, "
    f"embedding_batch_size={embedding_batch_size}"
)

splitter = RecursiveCharacterTextSplitter(chunk_size=chunk_size,_
    ↪chunk_overlap=chunk_overlap)
split_docs = splitter.split_documents(docs)
if not split_docs:
    raise RuntimeError("Chunking produced 0 documents. Adjust chunk_size/
        ↪chunk_overlap and retry.")

total_chars = sum(len(str(d.page_content or "")) for d in split_docs)
print(f"[stage 2/3] Prepared {len(split_docs)} chunk(s),_
    ↪total_chars={total_chars}")

embeddings = OllamaEmbeddings(model=EMBEDDING_MODEL, base_url=OLLAMA_BASE_URL)

batch_size = max(1, int(embedding_batch_size))
vector_store = None

stage2_heartbeat = _start_heartbeat("stage 2/3 embedding/index", every_s=8.0)
t2 = perf_counter()
try:
    try:
        for start in range(0, len(split_docs), batch_size):
            batch = split_docs[start : start + batch_size]
            b0 = perf_counter()
            if vector_store is None:
                vector_store = FAISS.from_documents(batch, embeddings)
            else:
                vector_store.add_documents(batch)
            b1 = perf_counter()

            done = min(start + batch_size, len(split_docs))
            pct = (100.0 * done) / len(split_docs)
            print(
                f"[stage 2/3] Embedded batch {start // batch_size + 1}: "
```

```

        f"{done}/{len(split_docs)} chunks ({pct:.1f}%) in {b1 - b0:.2f}s"
    )
except Exception as embedding_error:
    _raise_ollama_hint("stage 2/3 embedding/index", EMBEDDING_MODEL, OLLAMA_BASE_URL, embedding_error)
finally:
    stage2_heartbeat.set()

t3 = perf_counter()
if vector_store is None:
    raise RuntimeError("Vector store was not created.")

print(f"[stage 2/3] Built FAISS index in {t3 - t2:.2f}s")

faiss_base = os.environ.get("ANC_FAISS_DIR", "").strip()
if faiss_base:
    faiss_dir = (Path(faiss_base).expanduser() / FAISS_NAMESPACE).resolve()
else:
    faiss_dir = (Path.home() / "DATA" / "naturalist-companion" / "faiss" / FAISS_NAMESPACE).resolve()

faiss_dir.mkdir(parents=True, exist_ok=True)
vector_store.save_local(str(faiss_dir))
print(f"[stage 2/3] Saved FAISS index to: {faiss_dir}")

print(f"[stage 2/3] Running similarity search for question={example_question!r}, k=[k]...")
results = vector_store.similarity_search(example_question, k=k)
print(f"[stage 2/3] Retrieved {len(results)} result(s)")

for result_idx, result_doc in enumerate(results, start=1):
    result_title = str((result_doc.metadata or {}).get("title") or f"result_{result_idx}")
    result_source = str((result_doc.metadata or {}).get("source") or "n/a")
    result_snippet = str(result_doc.page_content or "")[:220].replace("\n", " ")
    print(f"  {result_idx}. {result_title} ({result_source})")
    print(f"    {result_snippet}...")

print("[stage 2/3] Wikipedia image previews from retrieved pages...")
display_wikipedia_images_for_pages(results, max_images=min(4, len(results)))

```

[stage 2/3] Building embeddings with model='nomic-embed-text' at
base_url='http://localhost:11434'...
[stage 2/3] Chunking docs with chunk_size=1200, chunk_overlap=150,

```
embedding_batch_size=8
[stage 2/3] Prepared 56 chunk(s), total_chars=43616
[stage 2/3] Embedded batch 1: 8/56 chunks (14.3%) in 0.63s
[stage 2/3] Embedded batch 2: 16/56 chunks (28.6%) in 0.13s
[stage 2/3] Embedded batch 3: 24/56 chunks (42.9%) in 0.12s
[stage 2/3] Embedded batch 4: 32/56 chunks (57.1%) in 0.12s
[stage 2/3] Embedded batch 5: 40/56 chunks (71.4%) in 0.12s
[stage 2/3] Embedded batch 6: 48/56 chunks (85.7%) in 0.10s
[stage 2/3] Embedded batch 7: 56/56 chunks (100.0%) in 0.10s
[stage 2/3] Built FAISS index in 1.31s
[stage 2/3] Saved FAISS index to: /Users/ryan/DATA/naturalist-
companion/faiss/anc_ollama
[stage 2/3] Running similarity search for question='I am on I-81 near Hagerstown
with a 30-minute detour. Where can I safely stop to observe folded Valley-and-
Ridge strata, and what exactly should I look for?', k=4...
[stage 2/3] Retrieved 4 result(s)
1. Paskapoo Formation (https://en.wikipedia.org/wiki/Paskapoo\_Formation)
   == Stratigraphy == Although some early workers included the underlying
Scollard Formation as the lower part of the Paskapoo, the two are now treated
separately. The base of the Paskapoo Formation, designated the Haynes ...
2. Paskapoo Formation (https://en.wikipedia.org/wiki/Paskapoo\_Formation)
   === Distribution === The Paskapoo Formation underlies much of southwestern
Alberta. It is thickest in the foothills of the Canadian Rockies, and thins
eastward to the 112th meridian west in the plains. The formation is ...
3. Marcellus Formation (https://en.wikipedia.org/wiki/Marcellus\_Formation)
   === Outcrops in New York === The Marcellus appears in outcrops along the
northern margin of the formation in central New York. There, the two joint
planes in the Marcellus are nearly at right angles, each making cracks ...
4. Fernie Formation (https://en.wikipedia.org/wiki/Fernie\_Formation)
   == Lithology == The Fernie Formation is composed primarily of brown and
dark gray to black shales that range from massive with conchoidal fracture to
laminated and highly fractured or papery. Phosphatic sandstone and lim...
[stage 2/3] Wikipedia image previews from retrieved pages...
```

Wikipedia image preview: Paskapoo Formation

<IPython.core.display.HTML object>

[Open page](#)

Wikipedia image preview: Marcellus Formation

<IPython.core.display.HTML object>

[Open page](#)

Wikipedia image preview: Fernie Formation

<IPython.core.display.HTML object>

[Open page](#)

[22]: 3

1.3.3 Stage 3/3: Generate Answer with ChatOllama

```
[23]: if "vector_store" not in globals():
    raise RuntimeError(`vector_store` not found. Run Stage 2/3 first.)

print(f"[stage 3/3] Generating answer with model={LLM_MODEL!r} at_
↳base_url={OLLAMA_BASE_URL!r}...")

llm = ChatOllama(model=LLM_MODEL, base_url=OLLAMA_BASE_URL,_
↳temperature=TEMPERATURE)

voice_instructions = f"""
You are writing in a concise Roadside Geology field-guide voice for curious_
↳drivers.

Tone:
- Plainspoken, observant, and practical (not academic).
- Emphasize what can be seen from legal/safe pull-offs or short walks.
- Explain key geology in everyday language, then add one precise term when_
↳useful.
- Include safety and access realism (do not suggest unsafe roadside behavior).

Output format:
1) "Where to stop" (up to {MAX_BULLETS_PER_SECTION} bullets)
2) "What to look for" (up to {MAX_BULLETS_PER_SECTION} bullets)
3) "Why it matters" (2-4 sentences)
4) "Citations" (Wikipedia URLs only)
""".strip()

def _context_for_question(question: str, top_k: int = 2) -> str:
    local_results = vector_store.similarity_search(question, k=max(1, top_k))
    context_lines: list[str] = []
    for context_idx, context_doc in enumerate(local_results, start=1):
        context_title = str((context_doc.metadata or {}).get("title") or_
↳f"result_{context_idx}")
        context_source = str((context_doc.metadata or {}).get("source") or "n/
↳a")
        context_snippet = str(context_doc.page_content or "")[:450].
        replace("\n", " ")
        context_lines.append(f"[{context_idx}] {context_title}_
↳({context_source}) :: {context_snippet}")
    return "\n".join(context_lines)

def answer_question(question: str) -> str:
    context_block = _context_for_question(question, top_k=max(1, k))
```

```

prompt = (
    f"Use only the provided Wikipedia-grounded context when you can.\n\n"
    f"Question: {question}\n\n"
    f"Context:{context_block}\n\n"
    f"Style requirements:\n{voice_instructions}"
)

llm_heartbeat = _start_heartbeat("stage 3/3 llm", every_s=8.0)
started_at = perf_counter()
llm_response = None
try:
    try:
        llm_response = llm.invoke(prompt)
    except Exception as llm_error:
        _raise_ollama_hint("stage 3/3 llm", LLM_MODEL, OLLAMA_BASE_URL, llm_error)
    finally:
        llm_heartbeat.set()
dt = perf_counter() - started_at
print(f"[stage 3/3] LLM response received in {dt:.2f}s")
if llm_response is None:
    raise RuntimeError("LLM did not return a response.")
response_content = getattr(llm_response, "content", llm_response)
return str(response_content)

print(f"[stage 3/3] Primary question:\n- {example_question}")
primary_answer = answer_question(example_question)
print("\nAnswer:\n")
print(primary_answer)

```

[stage 3/3] Generating answer with model='llama3.1:8b' at
base_url='http://localhost:11434'...
[stage 3/3] Primary question:
- I am on I-81 near Hagerstown with a 30-minute detour. Where can I safely stop to observe folded Valley-and-Ridge strata, and what exactly should I look for?
[stage 3/3 llm] still running... 8s elapsed
[stage 3/3] LLM response received in 12.17s

Answer:

Valley-and-Ridge Strata Observation Stop

Given your location on I-81 near Hagerstown with a 30-minute detour, you're likely in the vicinity of the Valley and Ridge Province. Here's where to stop:

* **Stop 1:** Take exit 4A for US-11 toward Hagerstown/Hancock. Look for a safe pull-off or parking area along this route.

- * **Stop 2:** Continue on US-11, then take MD-63 (Old National Pike) north toward the C&O Canal Towpath. Park at one of the designated trailheads.
- * **Stop 3:** If you have time, head to the nearby Antietam National Battlefield. Parking areas are available throughout the park.

When observing the Valley-and-Ridge strata:

- * **Look for alternating layers:** Notice how the rock layers alternate between steeply dipping limestone (or dolostone) and gently dipping sandstone or shale.
- * **Identify the unconformity:** Observe where the older, folded rocks meet the younger, flat-lying sediments. This is a key feature of the Valley-and-Ridge Province.
- * **Notice jointing patterns:** See how the rock layers are broken by joints, which can create unique landforms and outcrops.
- * **Scan for distinctive rock textures:** Pay attention to the different textures and colors of the rocks, such as the characteristic "book-cliff" appearance of some limestones.

The Valley-and-Ridge Province is a critical part of the Appalachian Mountains' geology. The alternating layers of limestone and sandstone or shale are a result of tectonic forces that folded these rocks during the Alleghanian Orogeny, around 300 million years ago. This province's unique geology has shaped the landscape over millions of years.

Citations:

[1] https://en.wikipedia.org/wiki/Paskapoo_Formation
[3] https://en.wikipedia.org/wiki/Marcellus_Formation

1.3.4 Stage 3b/3: Run All Example Questions

```
[24]: if "answer_question" not in globals():
    raise RuntimeError("`answer_question` not found. Run Stage 3/3 first.")

if "example_questions" not in globals() or not example_questions:
    raise RuntimeError("`example_questions` is empty. Check config cell.")

all_answers = []
print(f"[stage 3b/3] Running {len(example_questions)} example question(s)...")

for question_idx, question_text in enumerate(example_questions, start=1):
    print("\n" + "=" * 110)
    print(f"[stage 3b/3] Question {question_idx}/{len(example_questions)}")
    print(question_text)
    print("=" * 110)

    answer_text = answer_question(question_text)
```

```

all_answers.append({"question": question_text, "answer": answer_text})

print("\nResponse:\n")
print(answer_text)

print(f"\n[stage 3b/3] Completed {len(all_answers)} question(s).")

```

[stage 3b/3] Running 5 example question(s)...

=====

[stage 3b/3] Question 1/5

I am driving I-81 near Bristol, TN. Give me two legal pull-off stops where I can see clear sedimentary layering, and tell me exactly what to look for.

[stage 3/3 llm] still running... 8s elapsed

[stage 3/3] LLM response received in 9.50s

Response:

Stop and Explore: Sedimentary Layering along I-81

Where to Stop:

- * **Conococheague Formation**: Look for roadcuts near mile marker 20 of I-70, just north of Hagerstown, Maryland. This is a safe and accessible spot with clear views.
- * **Fernie Formation**: A good place to stop is at the Fernie River Road (VA-91) exit off I-81 in Virginia. You can observe the exposed layers from the roadside or take a short walk.

What to Look For:

- * **Conococheague Formation**:
 - * Vertical bedding: The rock layers are nearly vertical, which indicates that they were deposited quickly.
 - * Limestone and dolostone: These rocks are formed from ancient marine organisms and have a characteristic "conchoidal fracture" when broken.
- * **Fernie Formation**:
 - * Shale layers: Look for dark gray to black shales with conchoidal fracture, indicating rapid deposition in a marine environment.
 - * Phosphatic sandstone and limestone: These rocks are formed from ancient marine organisms and have a distinctive texture.

Why it Matters:

- * The Conococheague Formation provides valuable insights into the geological

history of the region, including the formation of ancient carbonate platforms.
* The Fernie Formation is significant because it contains fossils of ancient marine organisms, which help scientists understand the evolution of life on Earth.

=====

=====

[stage 3b/3] Question 2/5

Near I-81 between Winchester and Strasbourg, where can I safely stop to see Valley-and-Ridge structure, and what field clues confirm folding?

=====

=====

[stage 3/3] LLM response received in 7.89s

Response:

****Valley-and-Ridge Structure near Winchester and Strasbourg****

****Where to stop:****

- * Safe pull-offs along I-81 between Winchester and Strasbourg, Virginia
- * Rest areas or designated parking spots with clear views of the surrounding landscape
- * Short walks from these locations can provide a closer look at the geological features

****What to look for:****

- * A prominent fold in the Earth's crust, visible as a series of hills and valleys
- * Field clues confirming folding include:
 - + Layering of rock units (e.g., sandstone, shale) with different orientations
 - + Presence of faults or fractures that indicate tectonic activity
 - + Changes in rock texture or composition across the fold

****Why it matters:****

The Valley-and-Ridge structure is a classic example of a fold mountain range, formed through tectonic forces pushing up the Earth's crust. This process created a series of hills and valleys, visible from I-81. Understanding this geological feature can provide insights into the region's history and the processes that shaped it.

****Citations:****

https://en.wikipedia.org/wiki/Valley_and_Ridge_Province

=====

=====

[stage 3b/3] Question 3/5

I have 45 minutes near Hagerstown, MD. What roadside geology stop gives the best

payoff for a beginner, and what story does the outcrop tell?

=====

=====

[stage 3/3] LLM response received in 7.68s

Response:

****Roadside Geology Stop: Conococheague Formation****

****Where to stop:****

- * Mile marker 20 of I-70 near Hagerstown, Maryland
- * Look for a large roadcut with nearly vertical bedding
- * Park safely in designated areas and walk to the outcrop (be mindful of traffic)

****What to look for:****

- * Exposed limestone and dolostone layers with visible fossils
- * Shallow marine to tidal deposits on a carbonate platform
- * Bedding planes are nearly vertical, indicating rapid deposition
- * Look for concretions and nodules in the rock

****Why it matters:****

The Conococheague Formation is an important geological unit that provides insights into the region's ancient shallow seas. The exposed outcrops near Hagerstown offer a unique opportunity to observe the formation's characteristics, including its fossil-rich limestone and dolostone layers. This stop is ideal for beginners, as it showcases the basics of sedimentary geology.

****Citations:****

https://en.wikipedia.org/wiki/Conococheague_Formation

=====

=====

[stage 3b/3] Question 4/5

Along I-81 in the Shenandoah Valley, point me to a short-walk stop to compare rock type and landform, then explain why that match matters.

=====

=====

[stage 3/3 llm] still running... 8s elapsed

[stage 3/3] LLM response received in 12.60s

Response:

****Stop and Compare: Shenandoah Valley, Virginia****

- * ****I-81 Exit 247**:** Pull over at the designated rest area near Harrisonburg, VA.
- * ****Route 11**:** Park in a safe spot along this scenic road, which runs

parallel to I-81.

- * **Fort Hill Park**: Take a short walk from the parking lot to explore the park's trails and scenic overlooks.
- * **Shenandoah National Park**: If you have time, drive into the national park and stop at one of the many scenic overlooks.

What to Look For

- * **Rock Type:** Observe the types of rocks exposed in the area. Are they shales, sandstones, or limestones?
- * **Landform:** Note the shape and structure of the landforms around you. Are there any distinctive features like cliffs, valleys, or hills?
- * **Fernie Formation:** Look for evidence of the Fernie Formation, such as dark gray to black shales with conchoidal fracture.
- * **Djupadal Formation:** Keep an eye out for glauconitic sandstone and siltstone, which are characteristic of this formation.

Why it Matters

The match between rock type and landform in the Shenandoah Valley is significant because it provides clues about the region's geological history. The Fernie Formation, with its shales and phosphatic sandstones, suggests a marine or coastal environment during its deposition. In contrast, the Djupadal Formation's glauconitic sandstone and siltstone indicate a more terrestrial setting. By comparing these rock types and landforms, we can gain insights into the region's tectonic evolution and past environments.

Citations

- * [1] Fernie Formation (https://en.wikipedia.org/wiki/Fernie_Formation)
 - * [2] Djupadal Formation (https://en.wikipedia.org/wiki/Djupadal_Formation)
- =====

[stage 3b/3] Question 5/5

On an I-81 drive day, suggest one stop where I can observe evidence of ancient seas or sediment transport, with specific visual clues.

=====

[stage 3/3] LLM response received in 6.88s

Response:

Stop on I-81: Conococheague Formation

- * Where to stop:
 - + Mile marker 20 of I-70 near Hagerstown, Maryland
 - + Roadcuts along various waterways in the area

- + Type section located at Scotland in Franklin County, Pennsylvania (northeast of Chambersburg)
- * What to look for:
 - + Nearly vertical bedding in roadcuts
 - + Exposed limestone and dolostone rocks
 - + Evidence of ancient sea life fossils (e.g., brachiopods, crinoids)
 - + Shallow marine to tidal sedimentary structures

* Why it matters:

The Conococheague Formation is a key example of shallow marine to tidal deposits on a carbonate platform. Observing the nearly vertical bedding and exposed limestone rocks can help you understand how ancient seas shaped the Earth's surface.

Citations:

[1] https://en.wikipedia.org/wiki/Conococheague_Formation

[stage 3b/3] Completed 5 question(s).

1.4 Canonical Workflow Diagram (StateGraph)

StateGraph remains the shared orchestration contract (routing/clarification, retries, quality gate, and final output schema).

1.4.1 Notebook-only workflow (local)

- Refresh partitioned retrieval indexes in a notebook cell:
`refresh_retrieval_partitions(config={"store_root": "out/stategraph_store"}, runtime_mode="realistic", partitions=["corridor_i81"], force=False)`
- Run eval harness in a notebook cell: `run_i81_eval_harness(provider="ollama", config={"runtime_mode": "realistic", "retrieval_backend": "persistent", "store_root": "out/stategraph_store", "artifact_root": "out/stategraph_eval"})`
- Run release gate in a notebook cell before promotion: `run_real_data_release_gate(provider="ollama", config={"runtime_mode": "realistic", "retrieval_backend": "persistent", "store_root": "out/stategraph_store", "artifact_root": "out/stategraph_release_gate"})`
- Use `runtime_mode="deterministic"` when offline or when provider credentials are unavailable.

```
[25]: if STATEGRAPH_AVAILABLE:
    print("[stategraph] Ready: naturalist_companion.stategraph_shared imported in setup cells.")
else:
    display(
        Markdown(
            "**StateGraph module is unavailable in this workspace.**\n\n"
        )
    )
```

```

        "Baseline Ollama stages (Wikipedia -> FAISS -> ChatOllama) still ↴
↳run.\n\n"
    "Set `NATURALIST_COMPANION_SRC` to your repo `src` path if needed, ↴
↳then rerun setup cells."
)
)
if _stategraph_import_error is not None:
    print(f"[stategraph] import error: {type(_stategraph_import_error)}.
↳__name__: {_stategraph_import_error}")

```

[stategraph] Ready: naturalist_companion.stategraph_shared imported in setup cells.

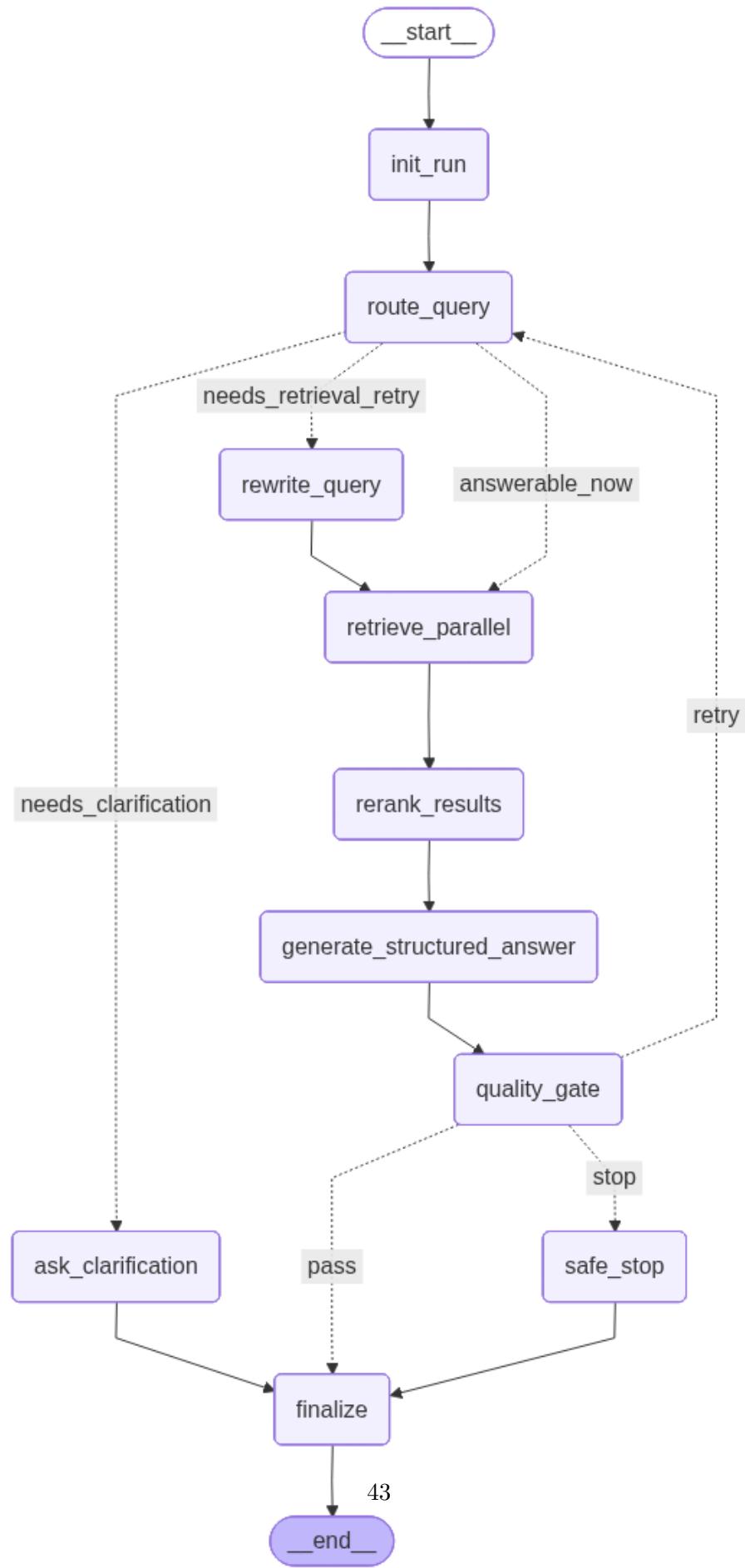
```

[26]: if not STATEGRAPH_AVAILABLE:
    print("[stategraph] Skipping canonical diagram: naturalist_companion not ↴
↳available.")
else:
    provider: Literal["ollama"] = STATEGRAPH_PROVIDER
    app = build_stategraph_app(provider=provider)
    print('Compiled StateGraph successfully for provider:', provider)

    # Render a real image (PNG bytes) instead of plain Mermaid text.
    try:
        png_bytes = app.get_graph().draw_mermaid_png()
        display(Image(data=png_bytes, width=880))
    except Exception as graph_render_error:
        display(Markdown(f'Graph render fallback (text). Error: ↴
↳`{type(graph_render_error).__name__}: {graph_render_error}`'))
        print(app.get_graph().draw_mermaid())

```

Compiled StateGraph successfully for provider: ollama



```
[27]: if not STATEGRAPH_AVAILABLE:
    print("[stategraph] Skipping run_stategraph: naturalist_companion not available.")
else:
    result = run_stategraph(
        stategraph_question,
        provider=STATEGRAPH_PROVIDER,
        config=STATEGRAPH_RUN_CONFIG,
    )
    final_output = result['final_output']
    print('Question:', stategraph_question)
    print('Provider:', final_output['provider'])
    print('Route:', final_output['route_decision']['decision'])
    print('Quality passed:', final_output['quality']['passed'])
    quality_reasons = final_output['quality'].get('reasons', [])
    print('Quality reasons:', ', '.join(quality_reasons) if quality_reasons else 'none')
    print('Attempts:', final_output['retrieval_attempts'])
    print('Artifact dir:', result['artifact_dir'])
    print('Response:')
    print(final_output['answer']['response'])
    print('Citation image previews:')
    display_wikipedia_images_for_pages(final_output['answer'].get('citations', []), max_images=4)
```

Question: I am on I-81 near Hagerstown with a 30-minute detour. Where can I safely stop to observe folded Valley-and-Ridge strata, and what exactly should I look for?

Provider: ollama

Route: answerable_now

Quality passed: True

Quality reasons: none

Attempts: 0

Artifact dir: out/stategraph/notebook_runs/ollama/run_20260206T225919_74c940ea

Response:

Based on the context, it appears that you are looking for a location to observe folded Valley-and-Ridge strata along I-81 near Hagerstown. However, none of the provided information mentions the specific geology or locations associated with I-81 in this area.

The text only discusses the route and auxiliary highways of I-81, but does not provide any information about its geological features. Therefore, I must conclude that there is no clear evidence to suggest where you can safely stop to observe folded Valley-and-Ridge strata along I-81 near Hagerstown.

If you are looking for a detour to observe this geology, I would recommend consulting a local or regional guidebook or geological map that specifically addresses the geology of the area. Alternatively, you may want to consider stopping at a nearby rest stop or park with marked overlooks and trails that can provide access to safe viewing areas.

Use only legal pull-offs and marked overlooks. Do not stand in travel lanes or cross active traffic for photos.

Citation image previews:

[Wikipedia image preview: Interstate 80](#)

<IPython.core.display.HTML object>

[Open page](#)

[Wikipedia image preview: Interstate 81](#)

<IPython.core.display.HTML object>

[Open page](#)

```
[28]: if not STATEGRAPH_AVAILABLE:
    print("[stategraph] Skipping eval harness: naturalist_companion not_
         ↪available.")
else:
    report = run_i81_eval_harness(
        provider=STATEGRAPH_PROVIDER,
        config=STATEGRAPH_EVAL_CONFIG,
    )
    print(report['summary'])
    print(report['artifact_root'])

{'provider': 'ollama', 'eval_id': 'eval_20260206T225919Z', 'question_count': 20,
 'avg_latency_ms': 28.32, 'median_latency_ms': 24.48, 'citation_validity_pct':
 100.0, 'pass_rate_pct': 100.0, 'pass_count': 20, 'fail_count': 0}
/Users/ryan/Developer/naturalist-companion/notebooks/out/stategraph/notebook_eva
l/ollama/eval_runs/eval_20260206T225919Z
```