



FOSS4G PH

**AI Assistants: Help me get started with QGIS!
feat: How to ask smart questions**

2/15/2024

By: Ian Panganiban



Hello, I'm Ian!

- from the Philippines
- Co-founder and CTO of Ausome Co.
- ML Engineer at OpenSolar
- geomatics engineer by education
- experience in energy, agriculture, unstructured data, geospatial platforms
- volunteer of FOSS4GPH
- owns a blog (www.lkpanganiban.com)
- Solutions developer, DevOps, software/ML/geomatics engineer

 @lkpanganiban

 lkpanganiban
 /ian-panganiban/



Outline

- Objectives
- Background (QGIS, LLMs)
- AI Assistants with QGIS
- Prompt Engineering: Asking Smart Questions
- Extras



Some Disclaimers...

This talk will not..

- into the "specifics" of LLMs (math, architecture, performance, etc)
- replace how you do traditional research (looking up forums, documentation, blogposts, etc)
- introduction to QGIS

Objectives

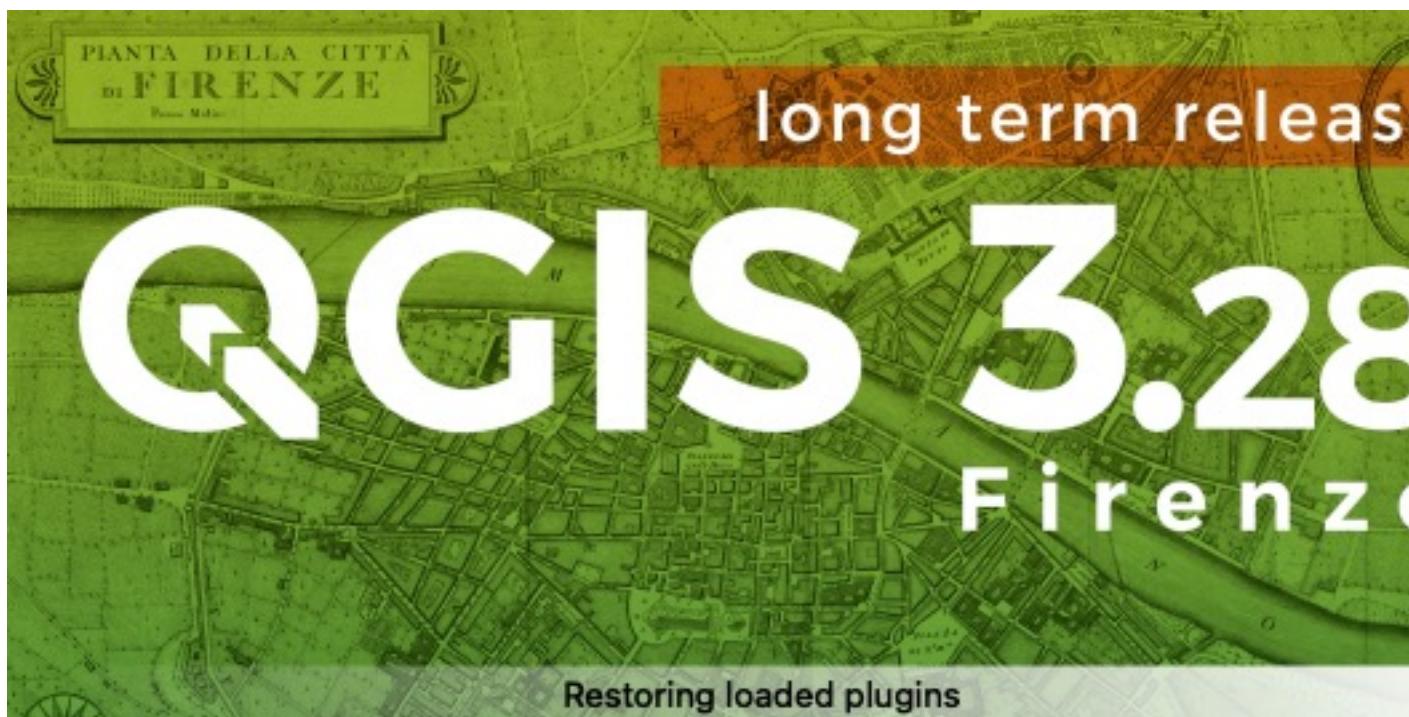
This talk will...

- Introduce how to use LLMs or AI assistants effectively with the context of QGIS
- Tackle how to ask smart questions in the context of QGIS and geo
- Building a mental framework in learning

Background (QGIS)

What is QGIS?

popular, open-source Geographic Information System (GIS) software that allows users to create, edit, visualize, and analyze geospatial data. It supports various data formats and provides a wide range of tools for geospatial analysis and mapping. QGIS is available for multiple platforms, including Windows, macOS, and Linux.

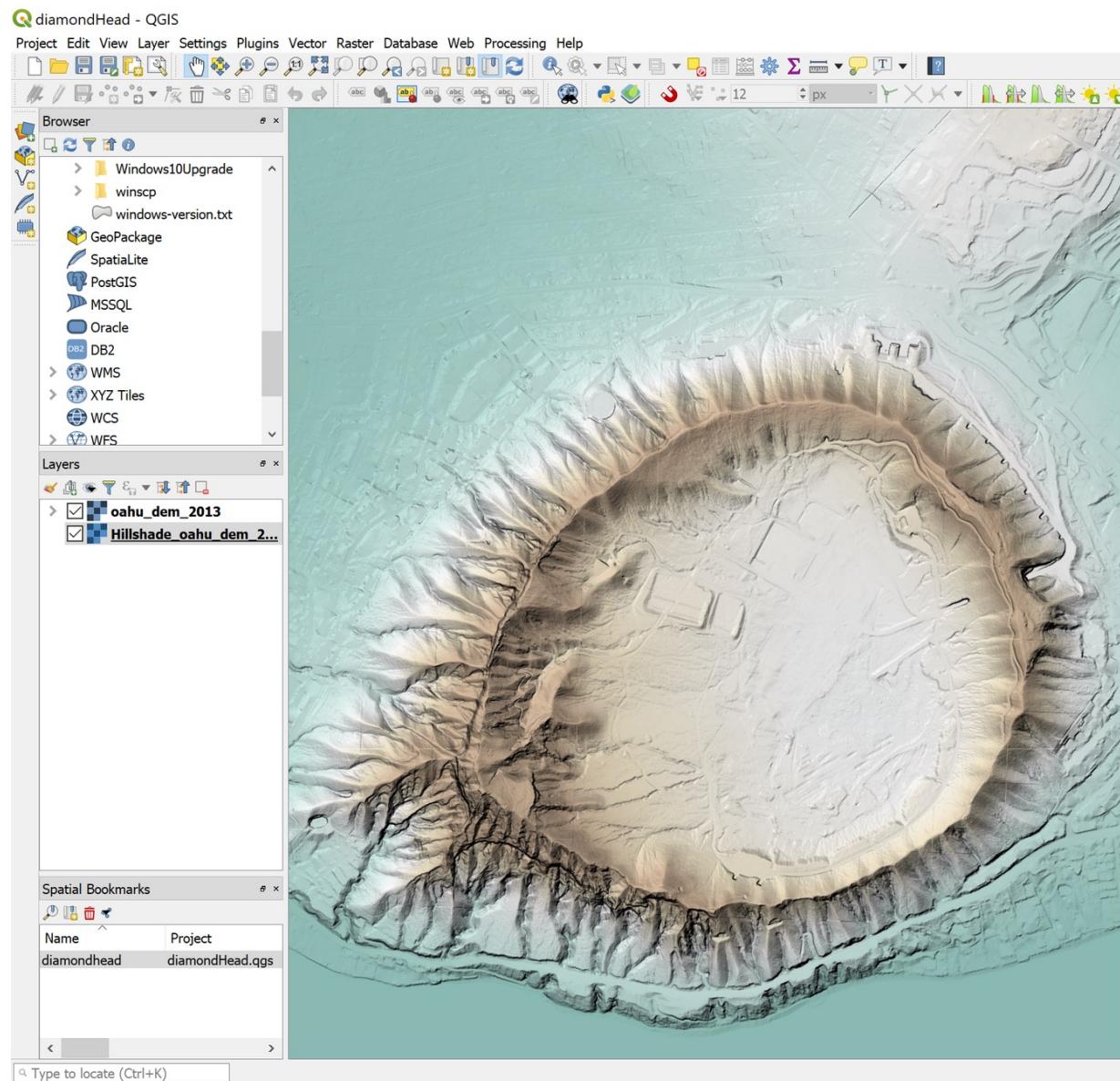


The screenshot shows the GitHub repository page for QGIS. The repository name is "qgis / QGIS". The page displays the following information:

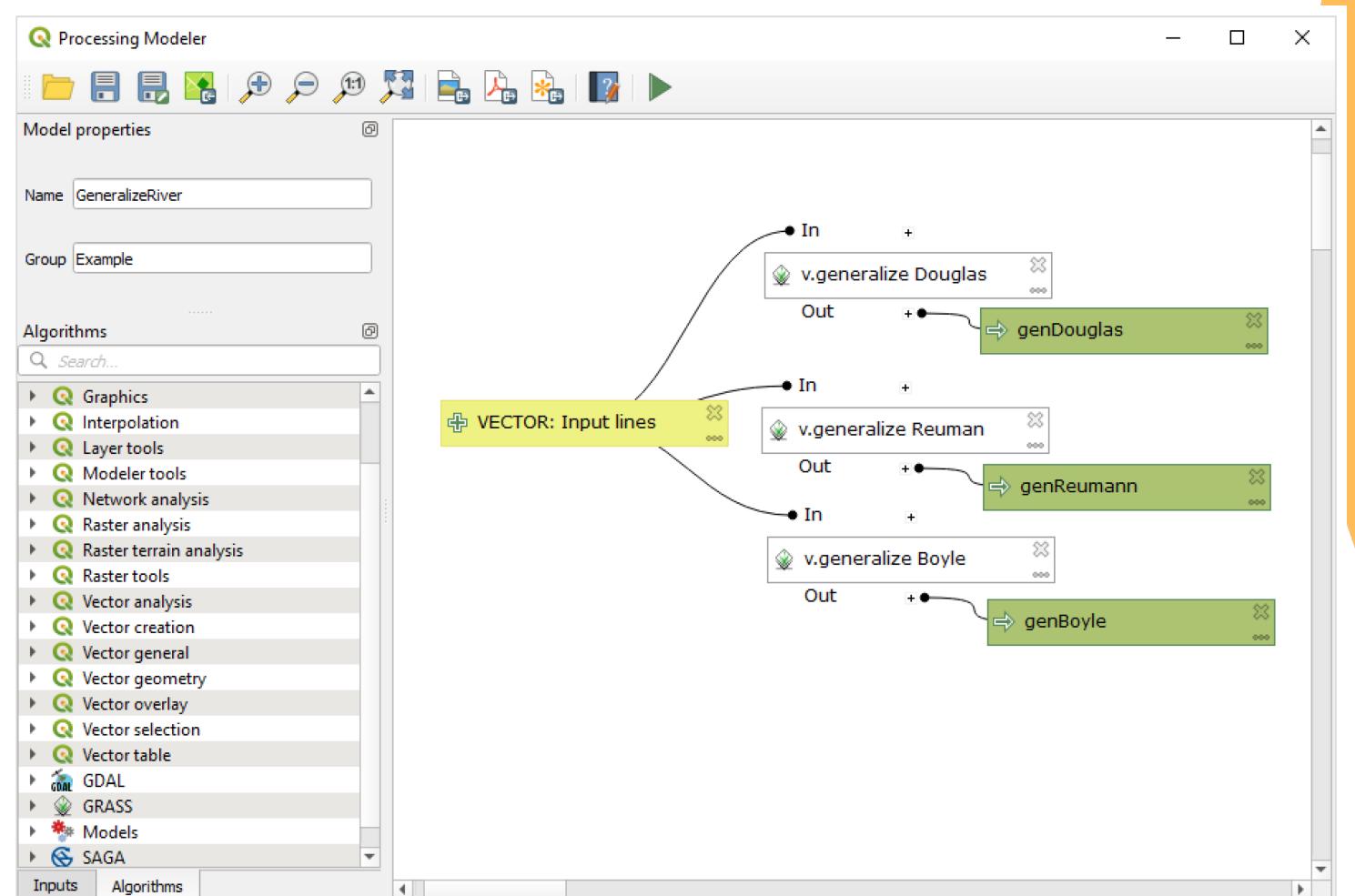
- Code**: Issues (4.3k), Pull requests (47), Actions, Wiki, Security, Insights.
- QGIS Public**: Sponsor, Watch 352, Fork 2.8k, Starred 9.3k.
- master**: Go to file, +, Code.
- Commits** (Recent):
 - nyaldawson Add some... · 4 hours ago · 85,144 Commits
 - .ci Add some tolerance to test · 4 hours ago
 - .docker Run Qt 6 tests on Fedora ... · 2 days ago
 - .github Run Qt 6 tests on Fedora ... · 2 days ago
 - .tx adapt to new transifex clie... · last year
 - cmake Add basic find Icms2 mod... · 3 days ago
 - cmake_templates Make building PDF4Qt opt... · 3 days ago
 - debian debian packaging: · 5 days ago
 - doc Create QgsWebEnginePag... · 3 days ago
 - editors svg file reduced with svgc... · 4 years ago
- About**:
 - QGIS is a free, open source, cross platform (lin/win/mac) geographical information system (GIS)
 - [qgis.org](#)
 - [Readme](#)
 - [GPL-2.0 license](#)
 - [Code of conduct](#)
 - [Security policy](#)
 - [Activity](#)
 - [Custom properties](#)
 - 9.3k stars
 - 352 watching
 - 2.8k forks
- [Report repository](#)

Background (QGIS)

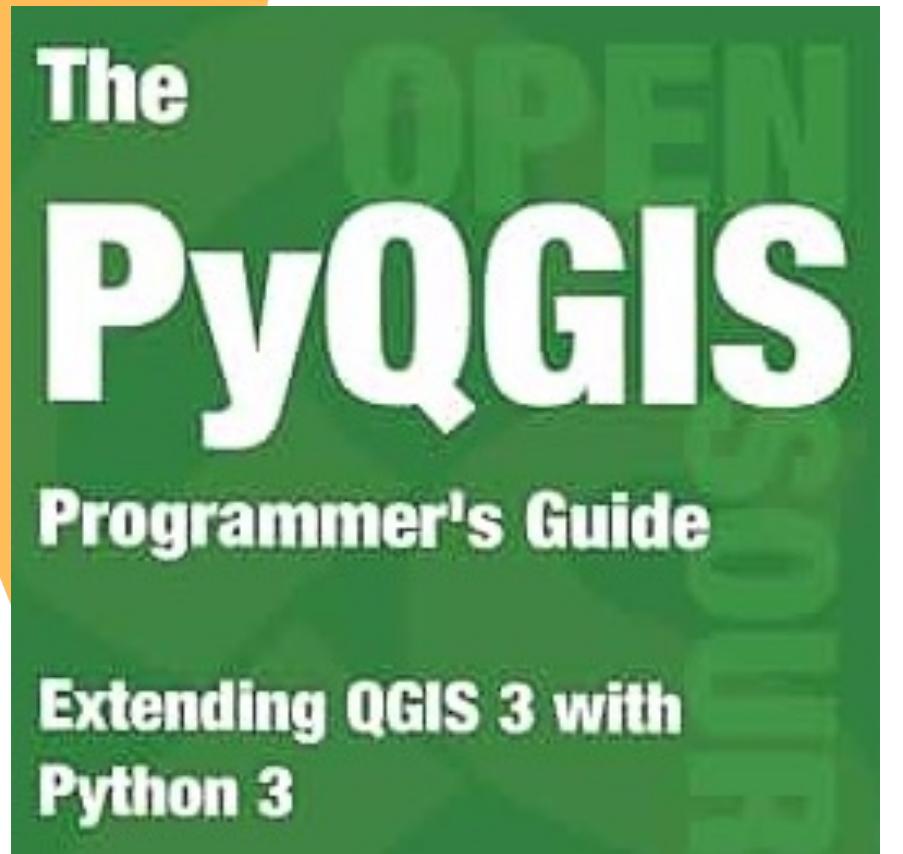
What can you do with QGIS?



Visualize



Process

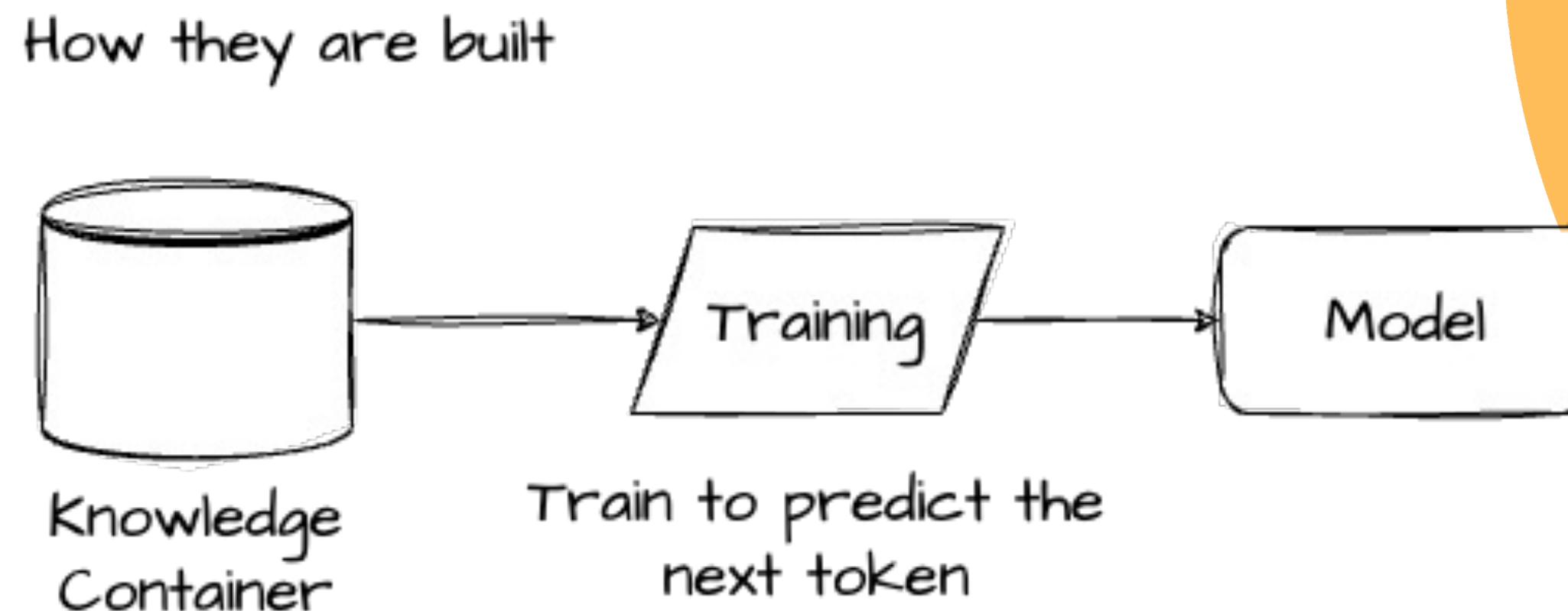


Develop

Background (LLMs)

What are LLMs?

A Large Language Model (LLM) is a type of artificial intelligence (AI) algorithm that uses deep learning techniques and large datasets to understand, summarize, generate, and predict new content.



Background (LLMs)

Well Known LLM services

ChatGPT

Examples	Capabilities	Limitations
"Explain quantum computing in simple terms"	Remembers what user said earlier in the conversation	May occasionally generate incorrect information
"Got any creative ideas for a 10 year old's birthday?"	Allows user to provide follow-up corrections	May occasionally produce harmful instructions or biased content
"How do I make an HTTP request"	Trained to decline inappropriate	

Copilot

Your everyday AI companion

Organize the last ten years of worldwide volcanic activity into a table
Create a poster for an outdoor music festival, retro style, no text
What are the top three vehicles for a family of six on a budget?

Copilot uses AI. Check for mistakes. [Terms](#) | [Privacy](#) | [FAQs](#)

Choose a conversation style
More Creative More Balanced More Precise

Gemini

Hello, Ian.
How can I help you today?

Flights to Tokyo and Seoul, and things to do	Give me tips to help care for a tricky plant	Explain the following code step-by-step in detail	Help write SQL to generate a report
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Your conversations are processed by human reviewers to improve the technologies powering Gemini Apps. Don't enter anything you wouldn't want reviewed or used.

[How it works](#) [Dismiss](#)

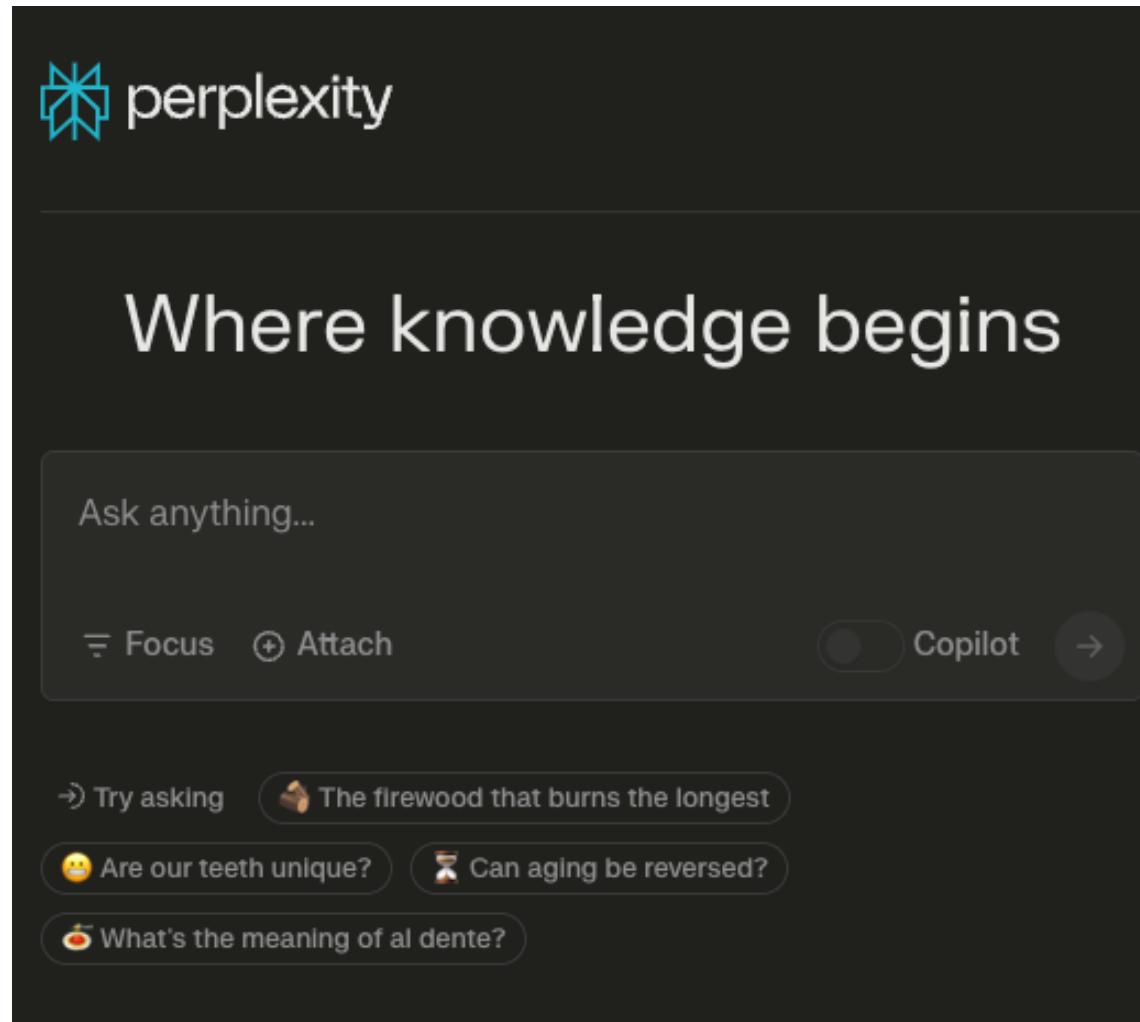
ChatGPT

Copilot

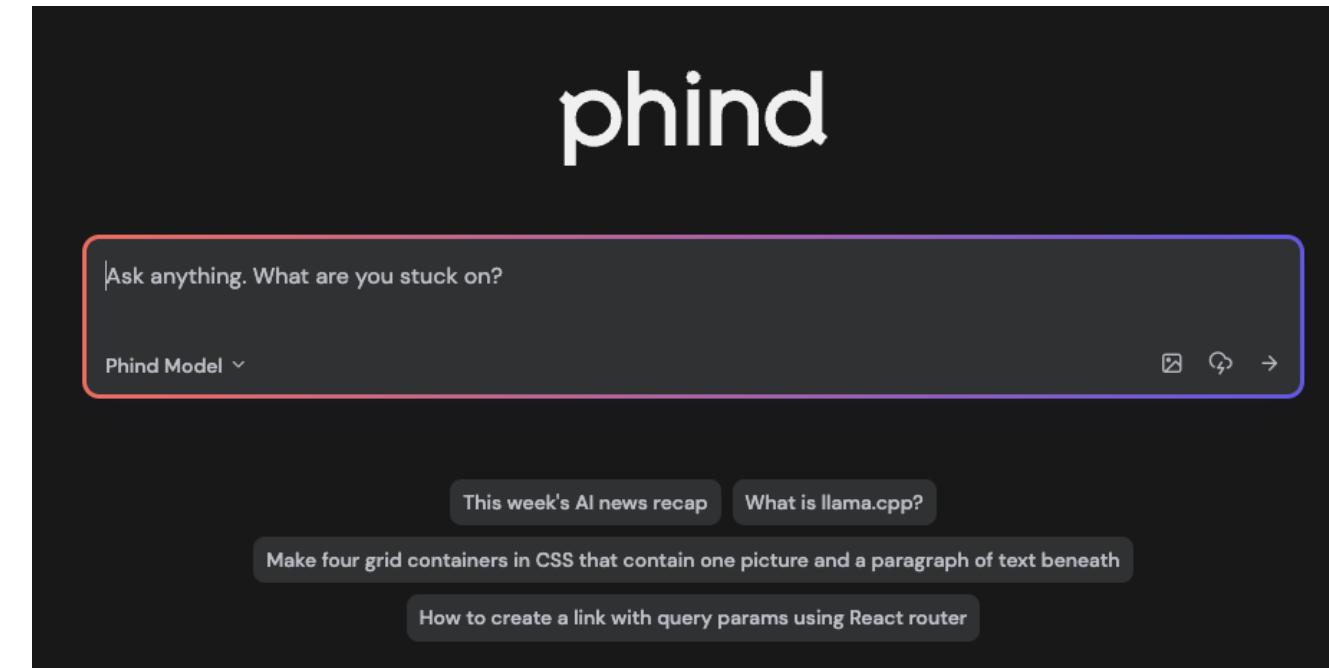
Gemini

Background (LLMs)

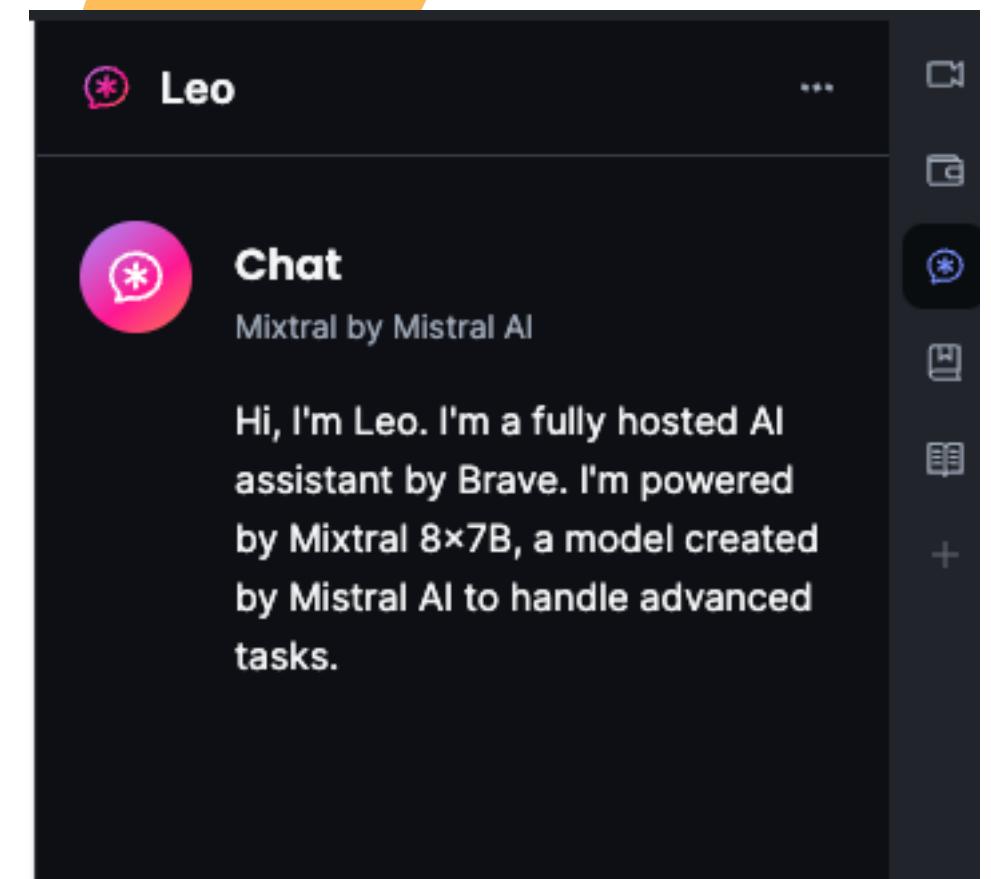
Lesser Known LLM Services



Perplexity



phind



Leo by Brave

LLMs with QGIS & QGIS with LLMs

Asking a question: What is QGIS?

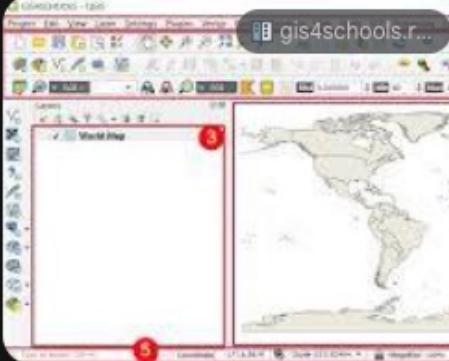
 QGIS is a free and open-source geographic information system (GIS) that allows users to create, edit, visualize, and analyze spatial data. It is compatible with various data formats and can be used for a wide range of applications, including environmental analysis, urban planning, and natural resource management. You can learn more and download QGIS at <https://qgis.org/>.

Suggested follow-ups

[Summarize this page](#)

[Suggest questions...](#)

QGIS, also known as Quantum GIS, is a free and open-source geographic information system (GIS) software. It is a powerful tool that allows users to view, edit, analyze, and create maps. QGIS is available for Windows, macOS, and Linux.



QGIS software interface

Here are some of the key features of QGIS:

- View and edit geospatial data:** QGIS supports a wide variety of vector and raster data formats, including shapefiles, GeoTIFFs, and KML files. Users can add, remove, and edit features in these layers.
- Analyze geospatial data:** QGIS includes a number of tools for analyzing geospatial data, such as spatial join, buffer, and dissolve. Users can also create custom geoprocessing models using Python.
- Create maps:** QGIS provides a variety of tools for creating maps, including layout tools, labeling tools, and symbology tools. Users can create professional-quality maps for print, web, or mobile devices.

Leo

Gemini

 ChatGPT

QGIS, short for Quantum GIS, is a free and open-source geographic information system (GIS) software application. It allows users to create, edit, visualize, analyze, and publish geospatial information on a wide range of platforms. QGIS is widely used by professionals and enthusiasts alike for tasks such as creating maps, spatial analysis, georeferencing, and data visualization.

Some key features of QGIS include:

- Data Management:** QGIS supports various data formats, including shapefiles, GeoTIFF, PostGIS, and many others. It can handle both vector and raster data.
- Mapping:** Users can create maps with multiple layers, customize symbology, labels, and layout to produce professional-quality maps.
- Geoprocessing:** QGIS provides a wide range of tools for spatial analysis, including buffering, spatial queries, interpolation, and overlay analysis.

ChatGPT

LLMs with QGIS & QGIS with LLMs

Coding: Create a PyQGIS script to intersect 2 vectors

```
# Import necessary modules
from qgis.core import QgsVectorLayer, QgsProject, QgsProcessing, QgsProcessingAlgorithm,
QgsProcessingMultiStepFeedback, QgsProcessingOutputLayerDefinition,
QgsProcessingOutputVectorLayer, QgsProcessingFeatureSource, QgsProcessingFeatureSink

# Initialize processing and feedback objects
processing = QgsProcessing()
feedback = QgsProcessingMultiStepFeedback(10)

# Define the input vector layers
vector_layer1 = QgsProcessingFeatureSource('vector_layer1', feedback)
vector_layer2 = QgsProcessingFeatureSource('vector_layer2', feedback)

# Define the output layer
output_layer = QgsProcessingOutputVectorLayer('intersection', 'Intersection',
vector_layer1.fields())

# Define the intersection algorithm
intersect = processing.getAlgorithm('qgis:intersection')
parameters = {'INPUT': vector_layer1, 'INPUT_2': vector_layer2, 'OVERLAY': None, 'OUTPUT':
output_layer}
result = processing.runAlgorithm(intersect, parameters, feedback=feedback, context=None,
is_child_algorithm=True)

# Add the output layer to the project
QgsProject.instance().addMapLayer(result['OUTPUT'])
```

```
# Get the active layers
layer1 = iface.activeLayer()
layer2 = iface.activeLayer().next() # Assuming second active layer is the other ve

# Check if both layers are vector layers
if not layer1.geometryType() == QgsWkbTypes.LineGeometry or not layer2.geometryType()
    print("Both layers need to be vector layers!")
    exit()

# Create a new memory layer for the intersection
intersection_layer = QgsVectorLayer("LineString?crs=" + layer1.crs().description(), "Intersection", "memory")

# Get the provider and add attributes from both layers
provider = intersection_layer.dataProvider()
provider.addAttributes([
    QgsField("id", QVariant.Int),
    QgsField("layer1_attr", layer1.fields()[0].typeName(), layer1.fields()[0].name()),
    QgsField("layer2_attr", layer2.fields()[0].typeName(), layer2.fields()[0].name())
])
intersection_layer.updateFields()

# Iterate through features in both layers
features1 = layer1.getFeatures()
features2 = layer2.getFeatures()

for feature1 in features1:
    for feature2 in features2:
        # Perform intersection between geometries
        intersection = feature1.geometry().intersection(feature2.geometry())

        # Check if there is an actual intersection
        if intersection.isEmpty():
            continue

        # Create a new feature with attributes and geometry
        new_feature = QgsFeature(intersection_layer.fields())
        new_feature.setAttributes([
            feature1.id(),
            feature2.id(),
            intersection.wkbType(),
            intersection.length(),
            intersection.asWkt()
        ])
        intersection_layer.addFeature(new_feature)
```

```
python

import os
from qgis.core import QgsVectorLayer, QgsProject, QgsVectorFileWriter
from qgis.analysis import QgsGeometryAnalyzer

# Path to input vector layers
input_layer1_path = '/path/to/input/layer1.shp'
input_layer2_path = '/path/to/input/layer2.shp'

# Load vector layers
layer1 = QgsVectorLayer(input_layer1_path, 'Layer 1', 'ogr')
layer2 = QgsVectorLayer(input_layer2_path, 'Layer 2', 'ogr')

if not layer1.isValid() or not layer2.isValid():
    print("Error: One or both input layers are invalid.")
    exit()

# Output path for intersected layer
output_path = '/path/to/output/intersected.shp'

# Intersect layers
intersections = QgsGeometryAnalyzer().intersection(layer1, layer2, output_path)

if intersections is False:
    print("Error occurred during intersection.")
else:
    print("Intersection completed successfully.")
```

Leo

Gemini

ChatGPT

LLMs with QGIS & QGIS with LLMs

When to use LLM?

- Getting Started or How To's
- When you are blocked in your thought trail (stuck)
- Troubleshooting (what went wrong)
- Creating templates or outlines

Background (LLMs)

Limitation of LLMs Services (Caution)

- Hallucination (make stuff up)
- Context Limitation

Always verify the answer of LLMs don't just copy and paste!



Prompt Engineering

What is prompt engineering?

The process of guiding generative artificial intelligence (generative AI) solutions to generate desired outputs by choosing appropriate formats, phrases, words, and symbols that provide detailed instructions to the AI 2. It involves creating input texts that lead generative AI to interact more meaningfully with users, ensuring that the AI produces high-quality and relevant content

How To Ask Questions The Smart Way

Eric Steven Raymond

[Thrysus Enterprises](#)

<esr@thrysus.com>

Rick Moen

<respond-auto@linuxmafia.com>

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How to ask smart questions

Before you ask a question

Before You Ask

Before asking a technical question by e-mail, or in a newsgroup, or on a website chat board, do the following:

1. Try to find an answer by searching the archives of the forum or mailing list you plan to post to.
2. Try to find an answer by searching the Web.
3. Try to find an answer by reading the manual.
4. Try to find an answer by reading a FAQ.
5. Try to find an answer by inspection or experimentation.
6. Try to find an answer by asking a skilled friend.
7. If you're a programmer, try to find an answer by reading the source code.

How to ask smart questions

Usual questions

- Hello, where can I get data X of the PH?
- I like to ask why this error comes up when generating file A. It says it has error X. Much appreciated thanks!
- Please help me, what is wrong with this? It has an error when I run this task. Anything wrong with my data?

How to ask smart questions

Good vs Bad Questions

Stupid: Where can I find out stuff about the Foonly Flurbomatic?

This question just begs for "[STFW](#)" as a reply.

Smart: I used Google to try to find "Foonly Flurbomatic 2600" on the Web, but I got no useful hits. Can I get a pointer to programming information on this device?

This one has already STFWed, and sounds like there might be a real problem.

Stupid: I can't get the code from project foo to compile. Why is it broken?

The querent assumes that somebody else screwed up. Arrogant git...

Smart: The code from project foo doesn't compile under Nulix version 6.2. I've read the FAQ, but it doesn't have anything in it about Nulix-related problems. Here's a transcript of my compilation attempt; is it something I did?

The querent has specified the environment, read the FAQ, is showing the error, and is not assuming his problems are someone else's fault. This one might be worth some attention.

Stupid: I'm having problems with my motherboard. Can anybody help?

J. Random Hacker's response to this is likely to be "Right. Do you need burping and diapering, too?" followed by a punch of the delete key.

Smart: I tried X, Y, and Z on the S2464 motherboard. When that didn't work, I tried A, B, and C. Note the curious symptom when I tried C. Obviously the florbish is grommicking, but the results aren't what one might expect. Wha

This person, on the other hand, seems worthy of an answer. He/she has exhibited problem-solving intelligence rather than passively waiting for an answer to drop from on high.

How to ask smart questions

Guidelines in asking a question

Be precise and informative about your problem

- Describe the symptoms of your problem or bug carefully and clearly.
- Describe the environment in which it occurs (machine, OS, application, whatever). Provide your vendor's distribution and release level (e.g.: "Fedora Core 7", "Slackware 9.1", etc.).
- Describe the research you did to try and understand the problem before you asked the question.
- Describe the diagnostic steps you took to try and pin down the problem yourself before you asked the question.
- Describe any possibly relevant recent changes in your computer or software configuration.
- If at all possible, provide a way to *reproduce the problem in a controlled environment*.

How to ask smart questions

Template of asking a “smart” question...

- I am currently doing X but I am stuck at step 5. I have tried doing A, B, and C but these don't work due to 1, 2, and 3. Any suggestions on how to proceed?
- Where can I get data X with requirements D,E and F? I will use data X to do task A. I have already asked provider or people 1, 2, and 3 but there are no response.

How to ask smart questions

Prompt Engineering Guide

- Prompt engineering is the same as how to ask smart question. It is your ability to explain and communicate the problem to a machine. This is similar to how “coding” works in a sense where you need to break the problem down into small pieces and asking the “smart” question.

Extras

LLMs

- Perplexity: Search
- Phind: Code troubleshooting
- Codeium: Code refactoring and unit test building
- ChatGPT (GPT3.5): Human responses (email)
- Bing Chat: Image Generation
- Open Chat: Run Local

QGIS

- [QGIS Tutorial](#)
- [QGIS Documentation](#)
- SFTW and RTFM
- [QGPT](#)

Final Thoughts

About QGIS and LLMs

- LLMs don't replace documentations
- Learn how to "search"
- Develop a knowledge tree
- Poke and explore QGIS
- Try to replicate papers or blogposts



FOSS4G PH

**AI Assistants: Help me get started with QGIS!
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