Self-hosting AI LLMs – a beginners guide

Nick Burch

Berlin Buzzwords 2025

Nick Burch

Director of Engineering

SAIBLE

Nick Burch

@Gagravarr

@nick@social.earth.li

Slides, Links

github.com/Gagravarr/BBuzz2025-SelfHostedLLMs

Introduction

Introduction

- Models - where to find them, picking one
- Software - what to use, where to find
- Problems - what to be aware of
- Building Solutions
- Hardware
- Demo!

Models

Models

Where to get them?

Where to get them?

Not on Github!

Where to get them?

Hugging Face

Where to get them?

Hugging Face

- Bit like Github for models
  - Discussion
  - Forks
  - Storage
  - Hosting
- Datasets for Fine-Tuning
- (And datasets for training)
- Over 1 million models!

Where to get them?

Hugging Face

- Many big models have their own hosting too
- You won't always download from Hugging Face
- But it's where to find most of the community
- Like GitHub, but for the models

Models

Size?

Parameters?

Quantisation?

Context Window? Tokens?

Model Size

Parameters

- Parameters - often measured in Billions
- Roughly - how much information it holds
- More means the model will be larger!
- So needs more memory / GPUs etc
- (Plus also disk space!)
- Languages / multimodal affects this too
- Bigger isn't always better! Especially for local
- **1B - 7B** typical for locally run models

Model Size

Quantisation

- Quantisation - fidelity of weights and activations
- Roughly - how many decimal places on the numbers
- Lower quantisation can dramatically reduce size
- So less disk space, but especially less memory!
- But - very low weights might be zero'd
- But - differences between "nearly the same" lost

Model Size

Context Window / Token Limits

- eg 32k output
- eg 16k context window
- Context Window - how long until the model forgets what went before?
- Output Context - how long a response can it generate?
- Models "forget" things out of the context window
- Summarising / re-prompting helps, but doesn't fix
- Longer is often slower and/or more memory...

Models

Evaluation?

Rankings?

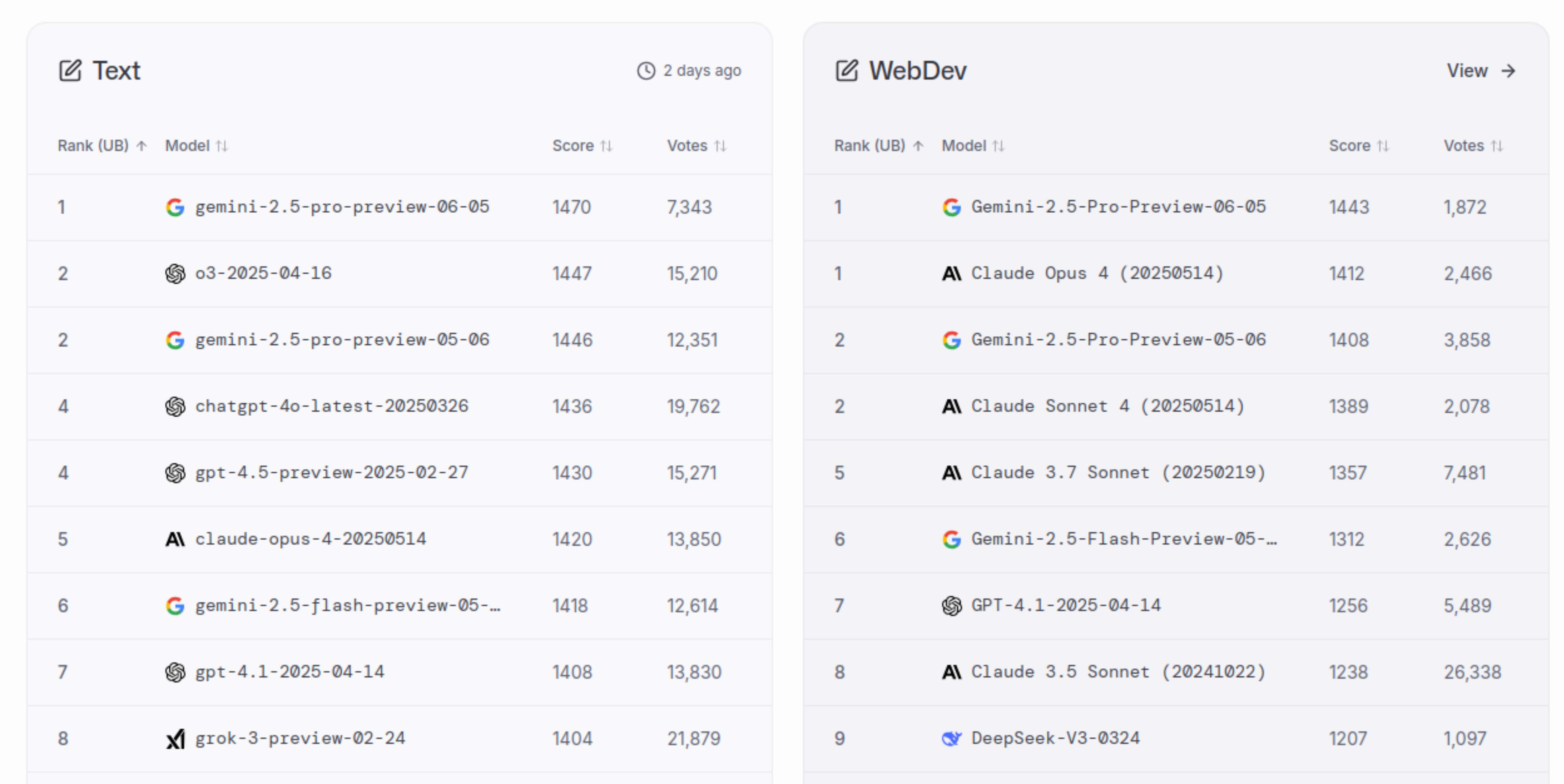
Model Evaluation

- For some things, you can run a set of prompts and check answers
- As with all things AI - need some ground truth!
- But a lot of it comes down to "vibes"
- Try a bunch of stuff, and take a guess!
- Even the big providers don't have a science here...

Model Evaluation / Rankings

- Bit like benchmarks, often they pick one they win on!
- LM Arena - lots of humans testing
- OpenRouter - rankings on different aspects
- But model providers sometimes cheat on the version posted to these sites...
- Can be a good way to try a bunch of different ones out easily/cheaply!

Model Evaluation / Rankings



Text

2 days ago

Rank (UB) ↑	Model ⇅	Score ⇅	Votes ⇅
1	gemini-2.5-pro-preview-06-05	1470	7,343
2	o3-2025-04-16	1447	15,210
2	gemini-2.5-pro-preview-05-06	1446	12,351
4	chatgpt-4o-latest-20250326	1436	19,762
4	gpt-4.5-preview-2025-02-27	1430	15,271
5	claude-opus-4-20250514	1420	13,850
6	gemini-2.5-flash-preview-05-...	1418	12,614
7	gpt-4.1-2025-04-14	1408	13,830
8	grok-3-preview-02-24	1404	21,879

WebDev

View →

Rank (UB) ↑	Model ⇅	Score ⇅	Votes ⇅
1	Gemini-2.5-Pro-Preview-06-05	1443	1,872
1	Claude Opus 4 (20250514)	1412	2,466
2	Gemini-2.5-Pro-Preview-05-06	1408	3,858
2	Claude Sonnet 4 (20250514)	1389	2,078
5	Claude 3.7 Sonnet (20250219)	1357	7,481
6	Gemini-2.5-Flash-Preview-05-...	1312	2,626
7	GPT-4.1-2025-04-14	1256	5,489
8	Claude 3.5 Sonnet (20241022)	1238	26,338
9	DeepSeek-V3-0324	1207	1,097

"Best Model"

- There is no "overall" best model
- You'll need to test for your own problem space
- Consider memory use, speed, context windows etc
- Consider accuracy, false positives and negatives etc
- Fine tuning can help!

Software

AKA How to run your models locally

Software - mostly llama

Facebook Llama came first!

Most other LLM models also supported

llama.cpp

- Fast CPU loading and execution
- Many GPUs supported
- But you need to enable GPU support + have libraries!
- Generally new stuff happens here first
- Lots of very cool tricks and techniques
- Lots of control over how things work

ollama

- Based on llama.cpp
- Pre-build binaries for most platforms
- Easy support for downloading models
- REST interface for managing and running
- Stats on most popular modals, and for what
- Common integration for many things (eg Cline)
- Fewer sharp edges, but fewer tuning points than llama.cpp

llm tool/wrapper

from Simon Wilison / Datasette

- CLI tool for interacting with LLMs
- Works with Cloud-hosted LLMs
- Works with local LLMs
- Very easy to switch between models, and cloud vs local
- Aims to be very beginner friendly
- Easy to install/setup and get started
- Plugin interface makes extensions possible

llm tool/wrapper

from Simon Wilison / Datasette

My suggestion for new users!

In General

Try GitHub!

In General

- It's a mixture of C and Python
- Not always from Software Devs
- (Quite often with AI helping write wrappers!)
- Not always following normal build/install patterns
- Often feels like trying to make games run in the early 2000s!

Problems

Prompt Injection

Incorrect Answers

aka Hallucinations

Building Solutions

Turning a Local LLM into something useful!

MCP

Model Context Protocol

MCP

- Way to let an LLM interact with other systems
- eg send email
- eg list / search / read document
- eg write a file
- eg visit a website
- eg interact with an API

MCP

- Can be very cool and powerful
- Current standard way to integrate LLMs

See *Problems* section

And then see it again!

ollama REST API

- Lots of integrations can talk to the ollama REST API
- Fairly well supported pattern
- Only for trusted input / access!

Or just copy!

Follow the interface of one of the big cloud providers

Hardware

Hardware matters

CPUs are slow at this!

Mac Metal

- For most in the room, easiest fast-ish LLM acceleration
- Fairly widely supported
- Often built as standard
- Quite a large speedup

Nvidia

- Big speedups possible
- Widely supported
- Subject to nation-state export controls(!)
- Laptop / Desktop / Docker
- Needs drives / libraries / permissions
- Sometimes feels like 2000s gaming...

AMD

- Fairly good speedups possible
- Less well supported
- Less well documented
- Usually feels like 2000s gaming…

Intel

- Some speedups possible
- Barely supported
- Documentation out-of-date
- Feels like early 2000s linux graphics drivers…
- Consider your hourly rate, and probably by a different laptop!

Huawei

- Ask your Chinese colleagues for help
- Some cool stuff going on!
- But mostly for the Chinese domestic market, for now
- Somewhat - pick your geopolitical poison!

Phones

Phones

You can run LLMs on your phone!

Phones

- It'll probably run all all of *your* phones
- But not on all phones globally...
- Limited memory, storage, speed
- Use a small model, few paramaters and probably quantised
- And maybe something pre-LLM!

Quick Demo

Any Questions?

github.com/Gagravarr/BBuzz2025-SelfHostedLLMs