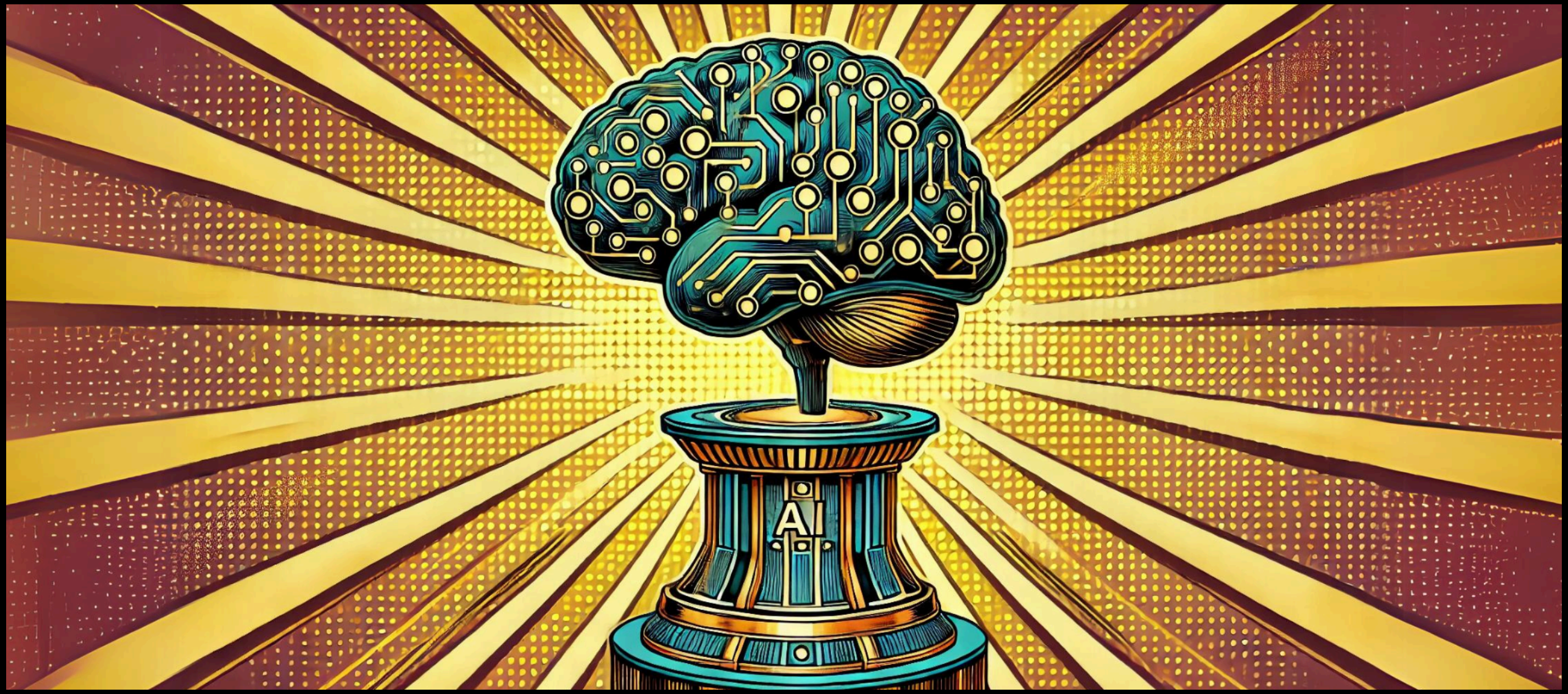
LLM Engineering

MASTER AI & LARGE LANGUAGE MODELS



WEEK 4 DAY 1

An essential week of building expertise

What you can now do

- Confidently code with Frontier Models
- Build a multi-modal AI Assistant with Tools
- Build solutions with open-source LLMs with HuggingFace transformers

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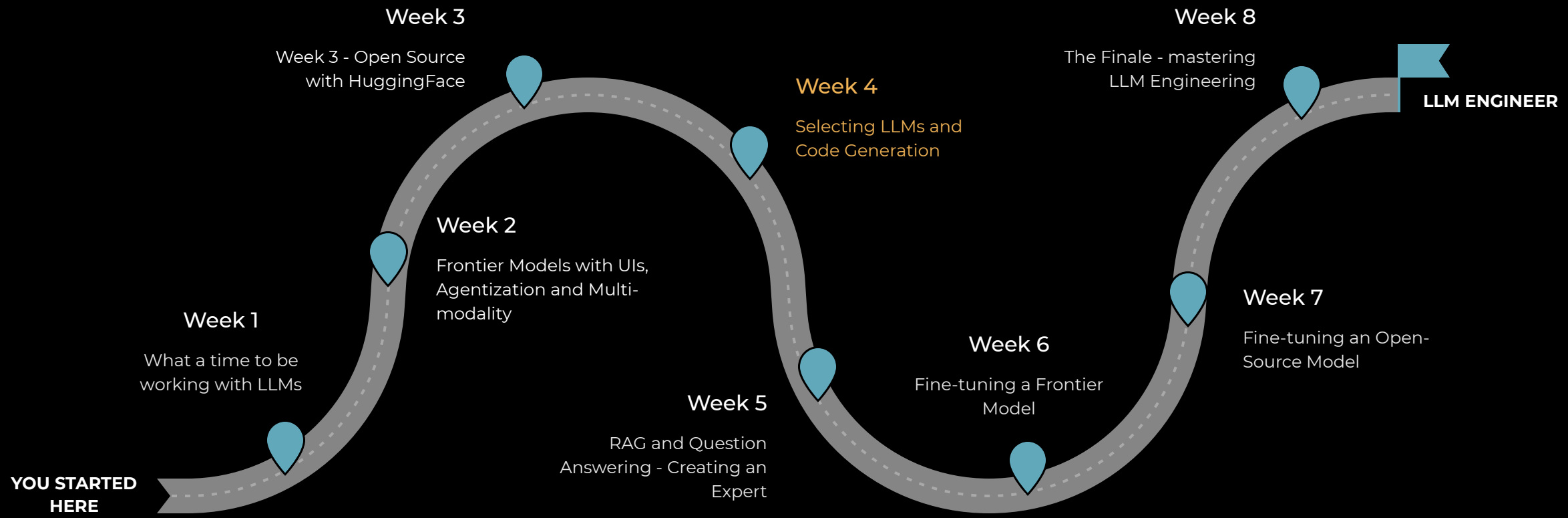
After today you will be able to

- Discuss how to select the right LLM for the task
- Compare LLMs based on their basic attributes and benchmarks
- Use the Open LLM Leaderboard to evaluate LLMs

Reminder of the 8 weeks to mastery



How to compare LLMs

Importantly, LLMs need to be evaluated for suitability **for a given task**

Start with the basics

Parameters

Context length

Pricing

Then look at the results

Benchmarks

Leaderboards

Arenas

COMPARING LLMs

The Basics (1)

Compare the following features of an LLM:

- Open-source or closed
- Release date and knowledge cut-off
- Parameters
- Training tokens
- Context length

COMPARING LLMs

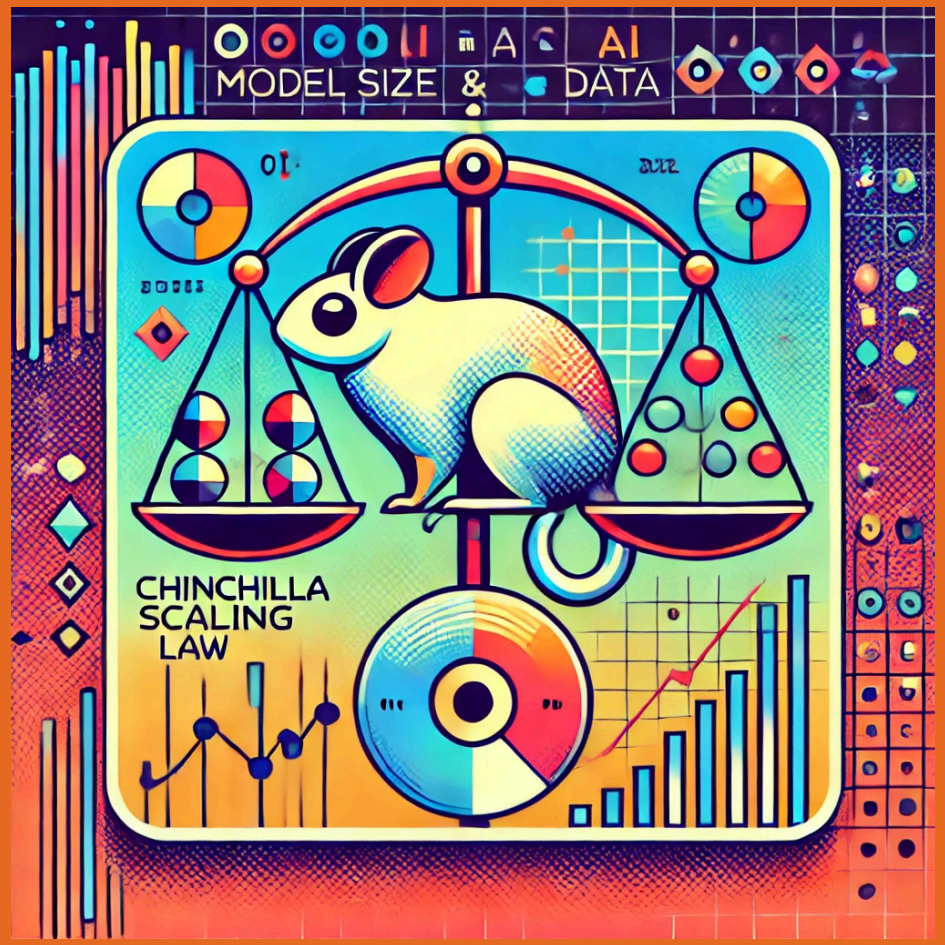
The Basics (2)

Compare the following features of an LLM:

- Inference cost
  API charge, Subscription or Runtime compute
- Training cost
- Build cost
- Time to Market
- Rate limits
- Speed
- Latency
- License

COMPARING LLMs

The Chinchilla Scaling Law



Number of parameters ~ proportional to the number of training tokens

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If you're getting diminishing returns from training with more training data, then this law gives you a rule of thumb for scaling your model

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And vice versa: if you upgrade to a model with double the number of weights, this law indicates your training data requirement

7 common benchmarks that you will often encounter

Benchmark	What's being evaluated	Description
ARC	Reasoning	A benchmark for evaluating scientific reasoning; multiple-choice questions

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GSM8K	Math	Math and word problems taught in elementary and middle schools

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MultiPL-E	Broader Coding	Translation of HumanEval to 18 programming languages

COMPARING LLMs

Limitations of Benchmarks

- Not consistently applied
- Too narrow in scope
- Hard to measure nuanced reasoning
- Training data leakage
- Overfitting

And a new concern, not yet proven

- Frontier LLMs may be aware that they are being evaluated

6 Hard, Next-Level Benchmarks

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GPQA	Graduate Tests	448 expert questions; non-PhD humans score 34% even with web access

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MMLU-PRO	Harder MMLU	A more advanced and cleaned up version of MMLU including choice of 10 answers instead of 4

The HuggingFace Open LLM Leaderboard

- Navigating model types and parameters
- Understanding the benchmarks, finding our models

T	Model	Average ⬆️	IFEval	BBH	MATH Lvl 5	GPQA	MUSR	MMLU-PRO
🟢	Qwen/Qwen2-72B	35.13	38.24	51.86	29.15	19.24	19.73	52.56
🟢	Qwen/Qwen1.5-110B	29.56	34.22	44.28	23.04	13.65	13.71	48.45
🟢	dnhkng/RYS-Phi-3-medium-4k-instruct	28.38	43.91	46.75	11.78	13.98	11.09	42.74
🟢	Qwen/Qwen1.5-32B	26.69	32.97	38.98	26.66	10.63	12.04	38.89
🟢	01-ai/Yi-1.5-34B-32K	26.4	31.19	43.38	13.44	15.1	14.08	41.21
🟢	meta-llama/Meta-Llama-3-70B	26.37	16.03	48.71	16.54	19.69	16.01	41.21
🟩	dnhkng/RYS-Medium	25.94	44.06	47.73	7.78	10.4	8.73	36.96
🟢	meta-llama/Meta-Llama-3.1-70B	25.91	16.84	46.4	16.69	18.34	16.58	40.6
🟢	mistral-community/mixtral-8x22B-v0.3	25.55	25.83	45.73	16.84	17	7.46	40.44

Note: only covers Open Source models - we will look at leaderboards combining open and closed source next time

WEEK 4 DAY 1

40% there

What you can now do

- Code with Frontier Models including AI Assistants with Tools
- Build solutions with open-source LLMs with HuggingFace transformers
- Compare LLMs to identify the right one for the task at hand

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After next week you will be able to

- Navigate the most useful leaderboards to evaluate LLMs
- Give real-world use cases of LLMs solving commercial problems
- Confidently choose LLMs for your projects