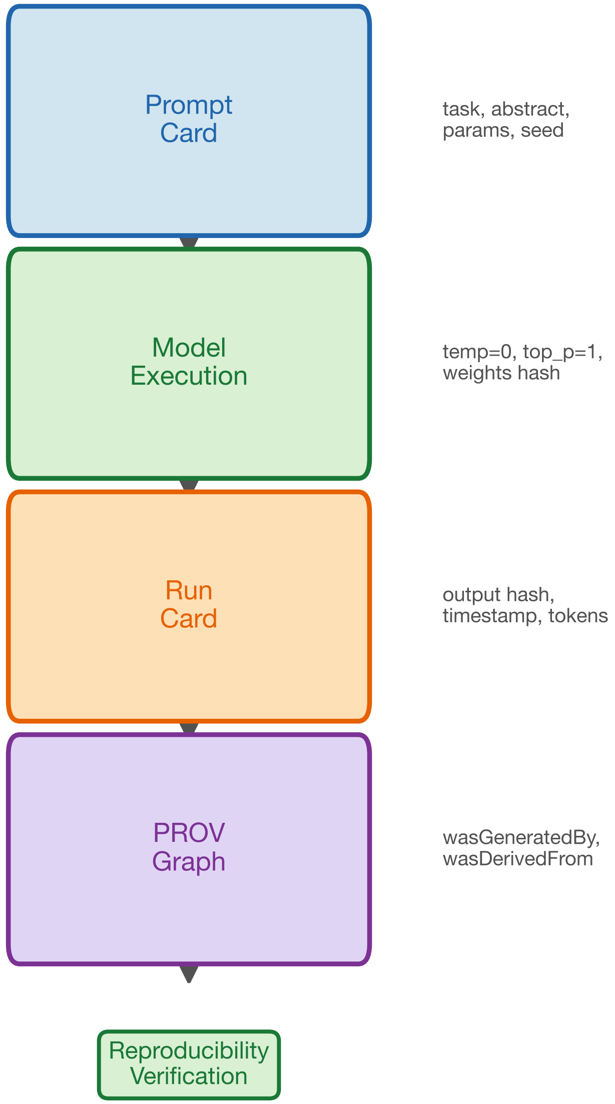
Hidden Non-Determinism in LLM APIs

A Lightweight Provenance Protocol for Reproducible Generative AI Research

Protocol Pipeline



Prompt Card — task, abstract, params, seed

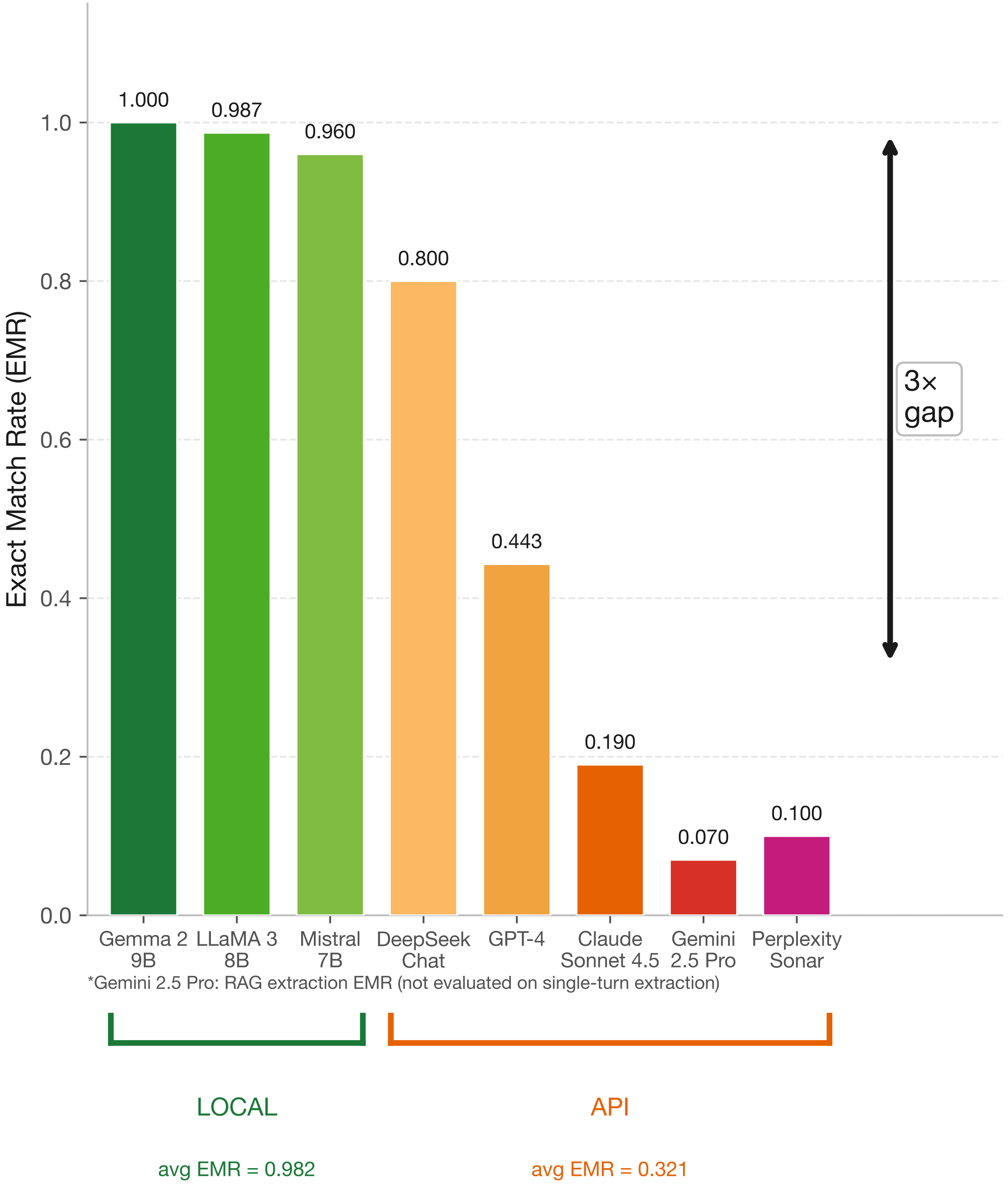
Model Execution — temp=0, top_p=1, weights hash

Run Card — output hash, timestamp, tokens

PROV Graph — wasGeneratedBy, wasDerivedFrom

Reproducibility Verification

Greedy-Decoding Reproducibility (Extraction Task*)



*Gemini 2.5 Pro: RAG extraction EMR (not evaluated on single-turn extraction)

Key Results

4,104 total runs

9 model deployments

4 tasks

7 providers

<1% overhead

Local models reproduce near-perfectly; API outputs vary across identical calls.

github.com/Roverlucas/genai-reproducibility-protocol