A Study of LLMs' Preferences for Libraries and Programming Languages

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Motivation

→ Code-generation benchmarks mostly ask: does it work?

→ But LLMs also make hidden design choices: which library? which language? safe, efficient or maintainable?

→ LLMs are generating an increasing share of software!

→ When users omit technical details, ***LLMs can silently steer technology adoption.***

Methodology

→ Studied 8 diverse production-grade LLMs.

→ Measured library and language choice in two settings: benchmark tasks and project initialisation.

→ What do LLMs use when the technology is not specified?

→ Do LLMs' natural language recommendations match what they actually use when generating code?

LLMs don't just generate code — they shape software ecosystems. But their defaults favour familiarity over suitability, with consequences for security, performance, and open-source diversity.

Library Findings

→ The same few libraries dominate usage. Up to ***45% of NumPy usage diverges*** from ground-truth solutions.

→ Each LLM used only 32–39 distinct libraries across hundreds of varied tasks.

→ Across tasks, ***LLMs strongly favour older defaults over high-momentum alternatives***: pandas over Polars, Flask over FastAPI, Dask over Ray/Celery.

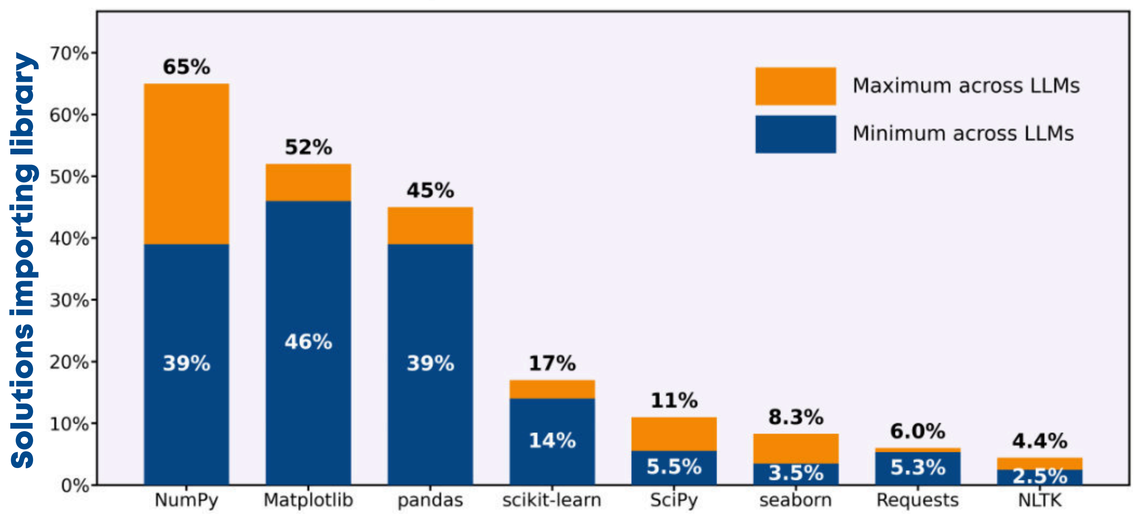
Language Findings

→ ***Python dominates*** generated solutions across all models, accounting for 90–97% of benchmark task solutions.

→ Even in performance-critical project prompts, Python remains the most-used language in 58% of cases.

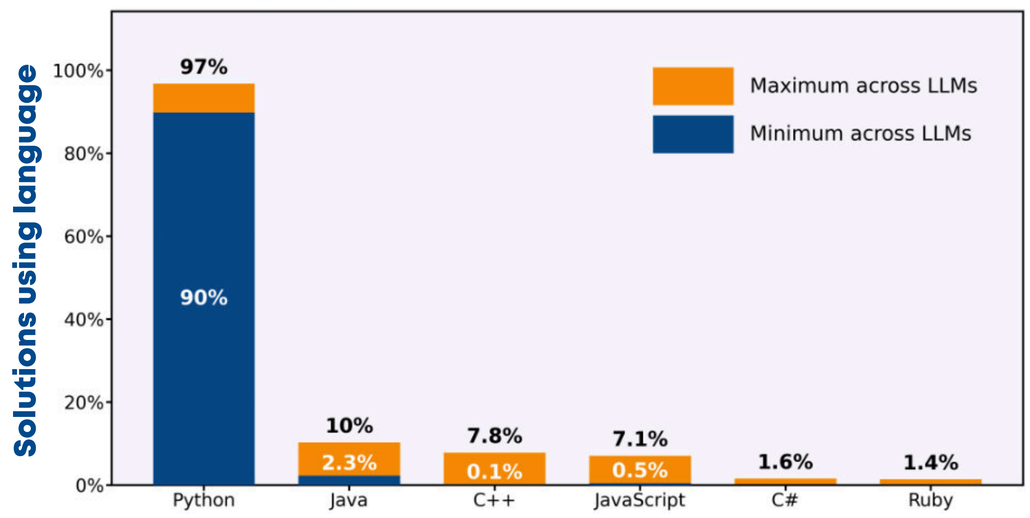
→ LLMs ***consistently contradict their own recommendations*** for new projects, rarely choosing languages such as C, C++, Go, or Rust, even when they may be more appropriate.

Libraries imported for benchmark tasks



(all other libraries are imported in less than 2% of solutions)

Languages used for benchmark tasks



(all other languages are used in less than 1% of solutions)

1. Security threat.
Suboptimal defaults can steer production systems toward unsafe or inefficient implementation choices.

2. Ecosystem impact.
LLM preferences may reinforce dominant libraries, reducing visibility for emerging open-source tools.

3. Evaluation gap.
Code evaluation should measure whether technology choices fit the task, not just whether code runs.

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