AI for Formalization

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Tools

- **LeanSearch**: leansearch.net
- **Loogle**: loogle.lean-lang.org
- **mathlib docs**: leanprover-community.github.io/mathlib4_docs/Mathlib
- **LLMs / agents**:
  - GitHub Copilot
  - Gemini 3 Pro, ChatGPT 5.2, Claude 4.5 Opus
  - LeanBridge, Numina-Lean-Agent (lean-lsp-mcp)

Workflow

1. Start from an **informal** theorem statement.
2. Use LLMs / agentsto:
   - clarify definitions and hypotheses,
   - draft formal statements,
3. Search in **mathlib** and Zulip for:
   - prior formalizations.
4. Write a **formal** Lean statement
5. Iterate (2)–(4) until the statement aligns the intended theorem.

Example

Theorem: Let $\mathcal{C}$ and $\mathcal{D}$ be two categories. Let $F : \mathcal{C} \to \mathcal{D}$ be a functor. Then F has a quasi-inverse if and only if

- F is fully faithful;
- F is essentially surjective.

Thanks !