- Sound equivalence checker
    - A proof guarantees equivalent *observable behaviour* for all inputs (memory state, etc.)

- Translator/Optimizer = Traditional Compiler (e.g., gcc)
    - Application in safety-critical sectors
        - Aerospace, Defence, Nuclear, Energy grids, Automotive, Rail, Financial systems, …
        - Examples of open-source bugs found: https://compiler.ai/bugs/

- Translator/Optimizer = LLM
    - Translation and optimization assistant

- Ultimate goal
    - Superoptimizer (see next page)

Superoptimization

Candidate Solution

Problem
(program
spec)

Inductive Synthesis algorithms, e.g., LLMs

=

Equivalence Checker

Solutio
(optimized
assembly
impl.)

Counter-example