- 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, …

- 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
n
(optimized
assembly
impl.)

Counter-example