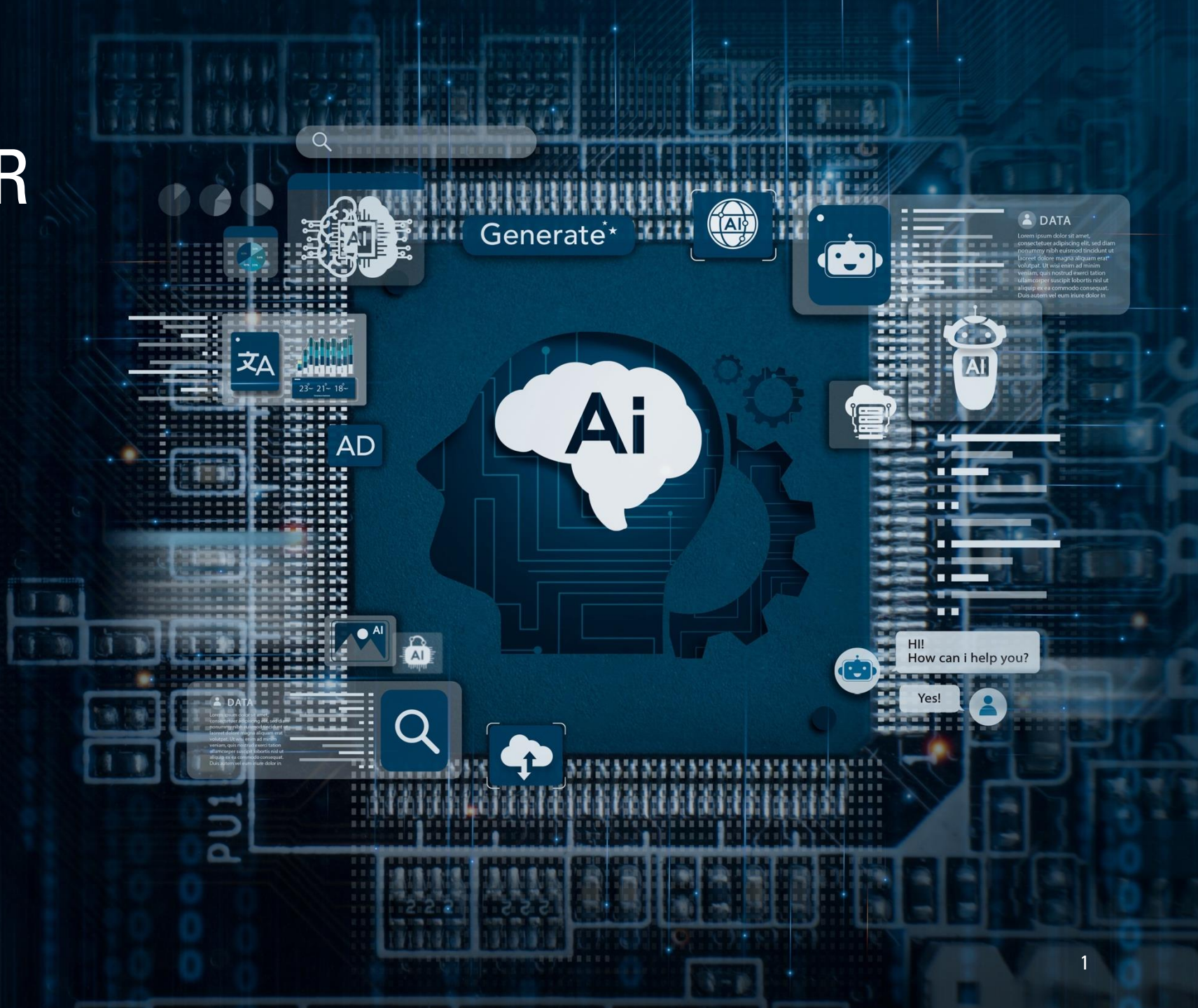


AGENTIC AI FOR SOFTWARE:

FROM SCALE TO TRUST



Abhik Roychoudhury
National University of Singapore

1972

"Hello World" Program
in BCPL/B, before C
Brian Kernighan

94 - 2022

Windows/ Linux
Software as a Service
Huge Code-base, - software model
checking, Linux is 30M in 2022
Internet > Software delivery

2022

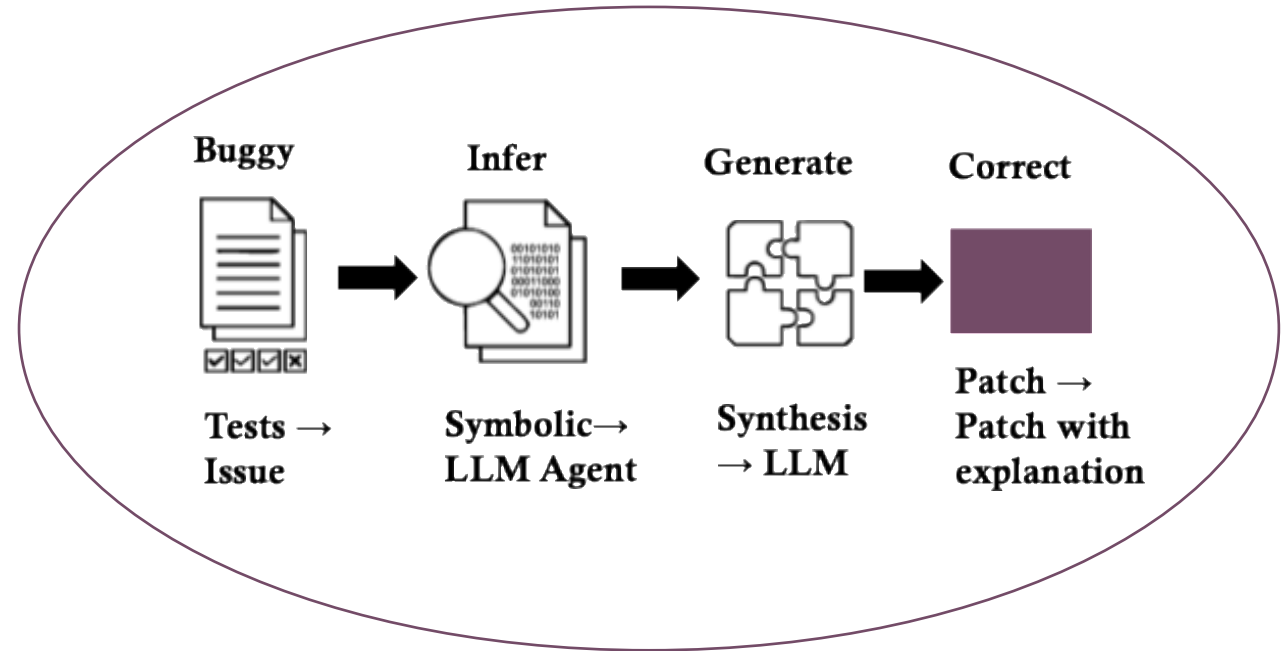
GitHub Copilot
Automatically generated code
integrated – importance of
verification rises.

2025

Year of LLM Agents
Need for verification of auto
generated code integratio

programming at scale

Focus on building larger software systems
Trust is an after-thought !



DREAM: Trusted Automatic Programming

programming with trust

Rapid acceleration of research in
last 3 years !!

VISION



- **Agent capability** – high in certain domains e.g. coding agents
- **Trust in agents** – initial phase, leading to low adoption

Evolution of Software

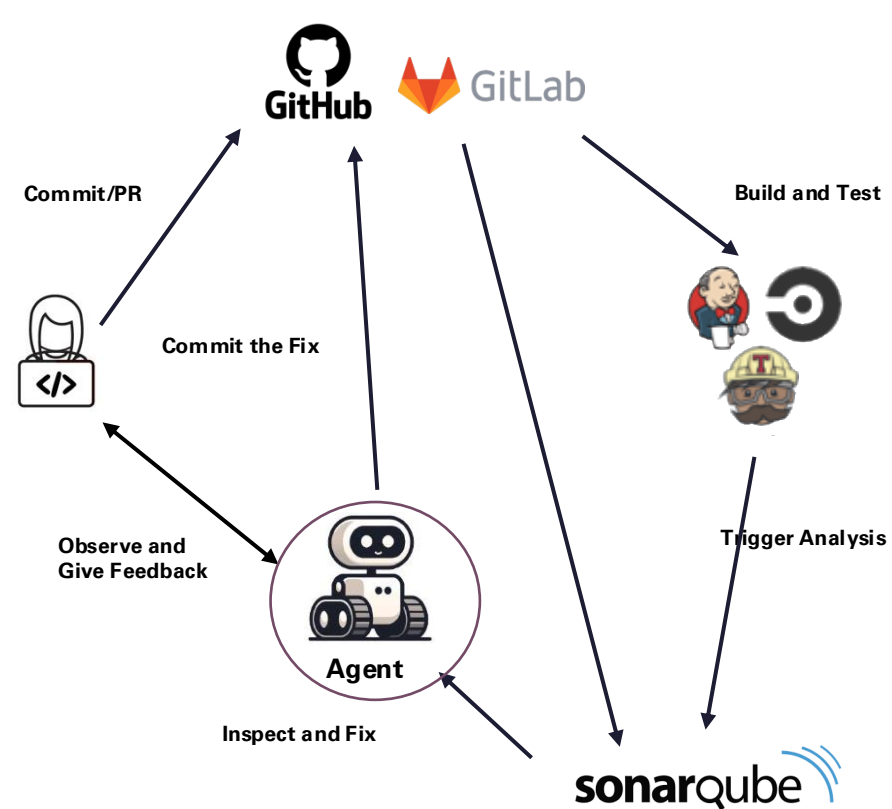


Evolution of Agents



Trusted Coding from anywhere: combine agent / human contributions

AGENTS IN PRODUCTION: TRUST!



- ⚠️ CWE-125: out-of-bounds read
- ⚠️ Generic exceptions should not be thrown



Forbes Innovation News

Usage by many enterprises for code quality.
Generated lot of R&D employment locally via new team in Singapore !

Impacting Society

Fast Company – business and tech magazine ranks it among biggest developments in applied AI, along with GitHub Copilot, ...



DESIGN

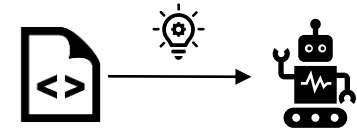
Positioning:

Software oriented viewpoint for trusted agents

Our agents employ these principles from software engineering
Other coding agents simply adapt conventional AI agents !!
Too much uncontrolled autonomy cannot be put in production!

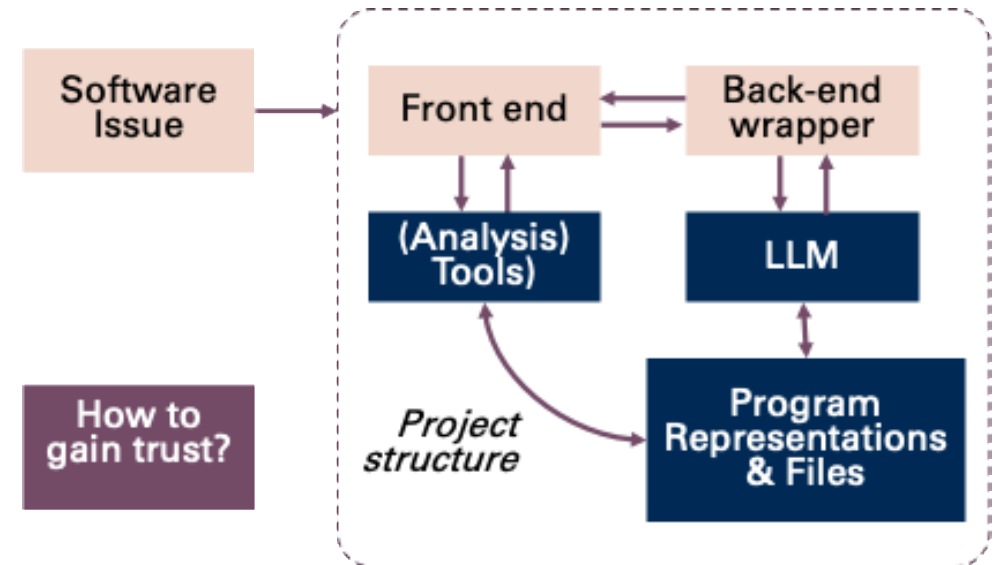
*Beyond Symbolic
Analysis of code
and NLP Analysis
of text*

Interpretation of Program Representation

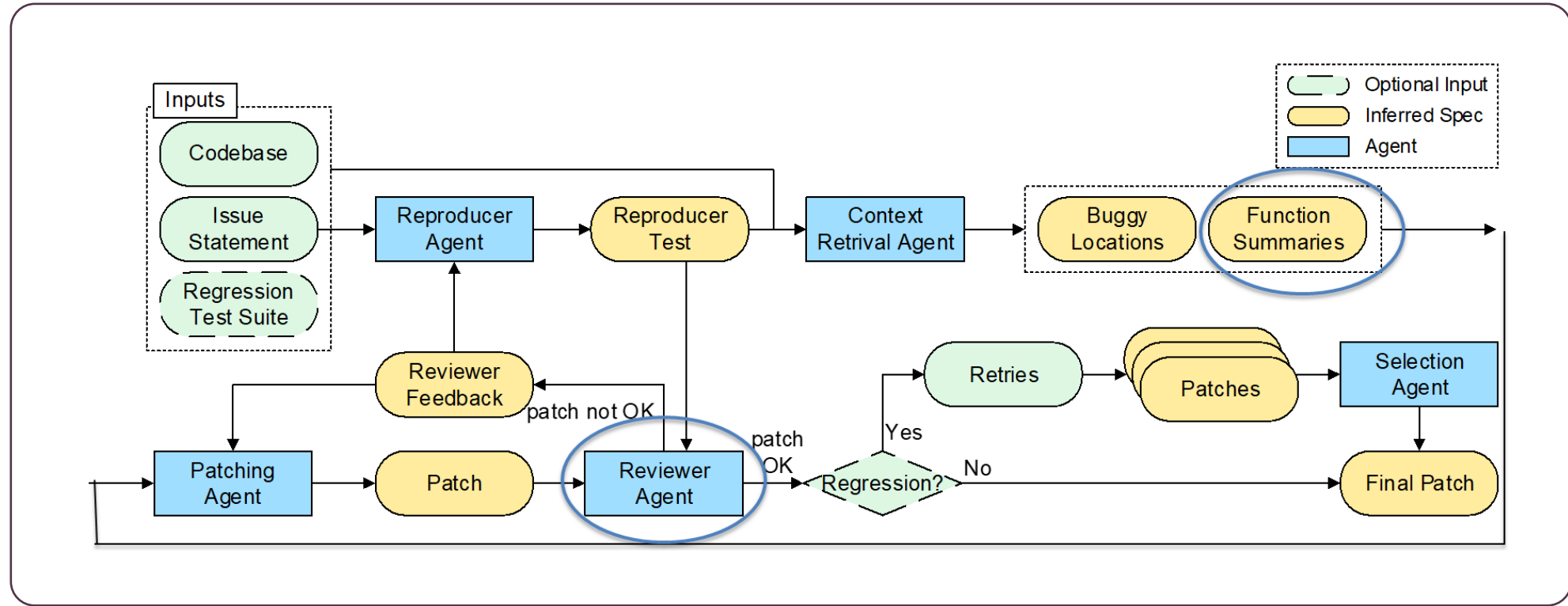


Building trusted agents

- Powerful structured agents: *Trust by design*
- Checking agent output: *Agent powered agent output code validation*

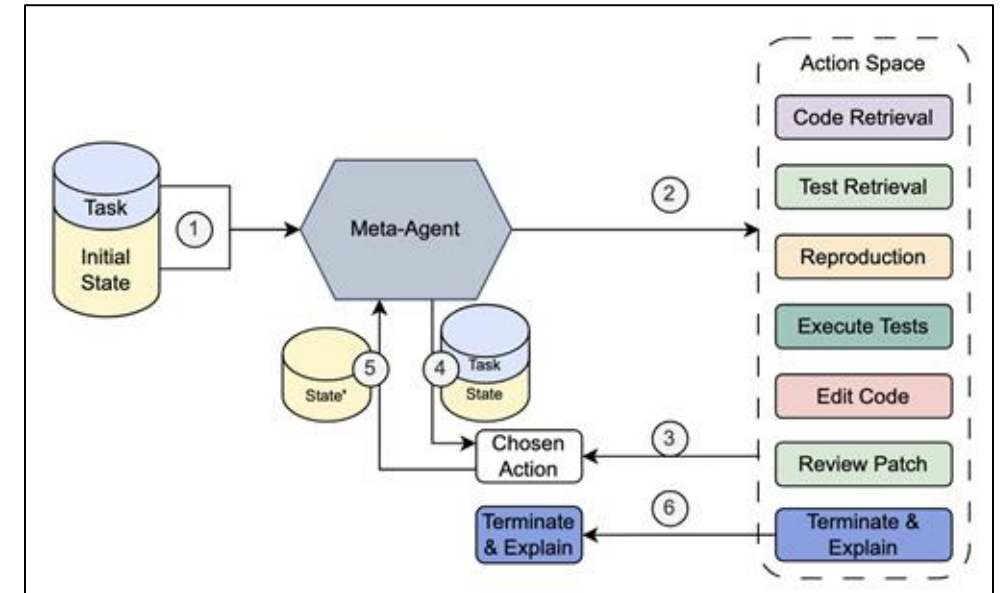
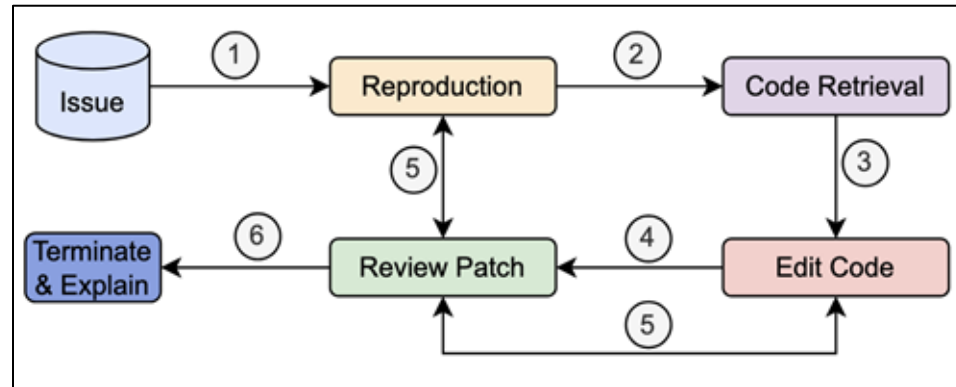


INTENT



AutoCodeRover: Autonomous Program Improvement
SpecRover: Code Intent Extraction via LLMs

UNIFIED SE AGENT !



Architecture exploration
Requirements clarification / enforcement

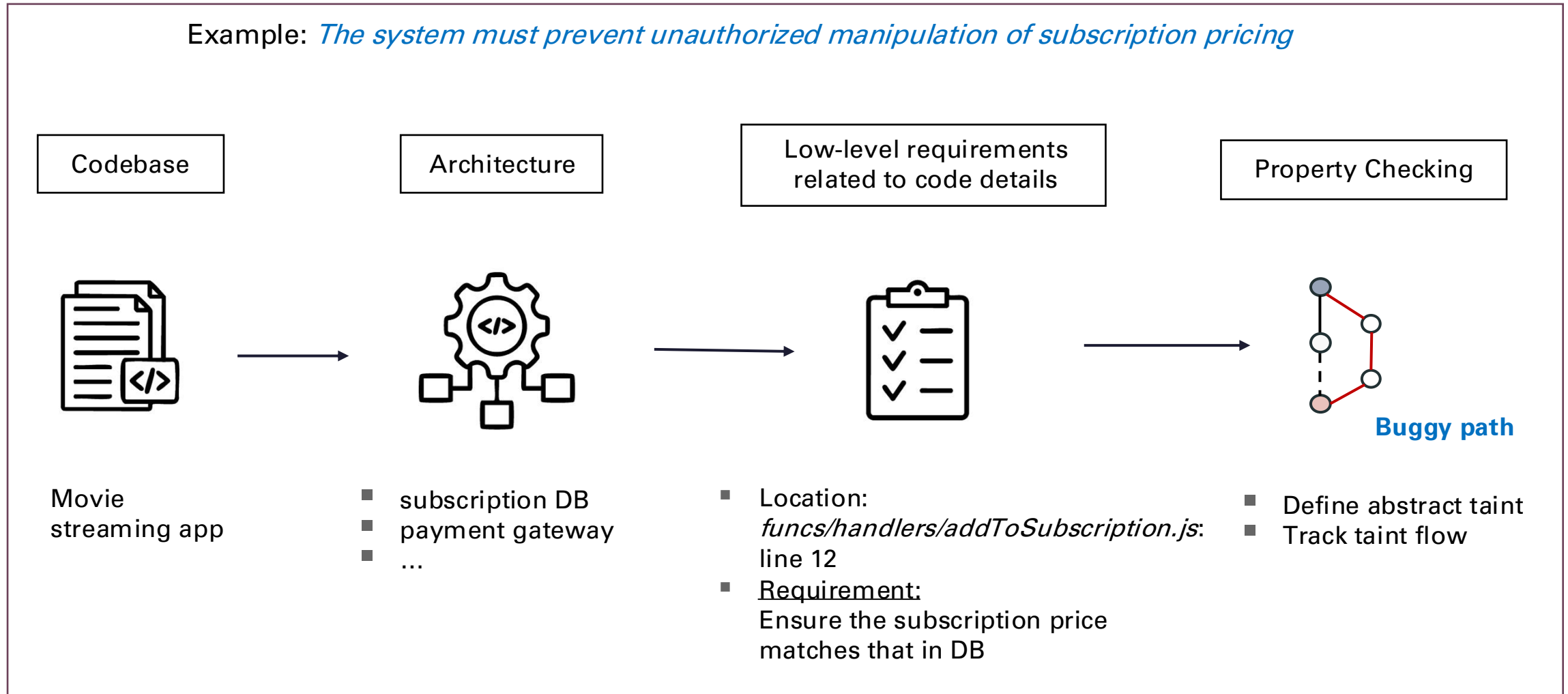
Unified Software Engineering Agent as AI Software Engineer
Not existing in agents with static workplan!

- Issue resolution
- Regression testing
- Code generation
- Test generation
- Partial fix improvement ...

ARCH. EXPLORATION + REQ. CLARIFICATION

Automatically clarify & check high-level policies – enforce them in code – **not existing in other agents.**

Example: *The system must prevent unauthorized manipulation of subscription pricing*

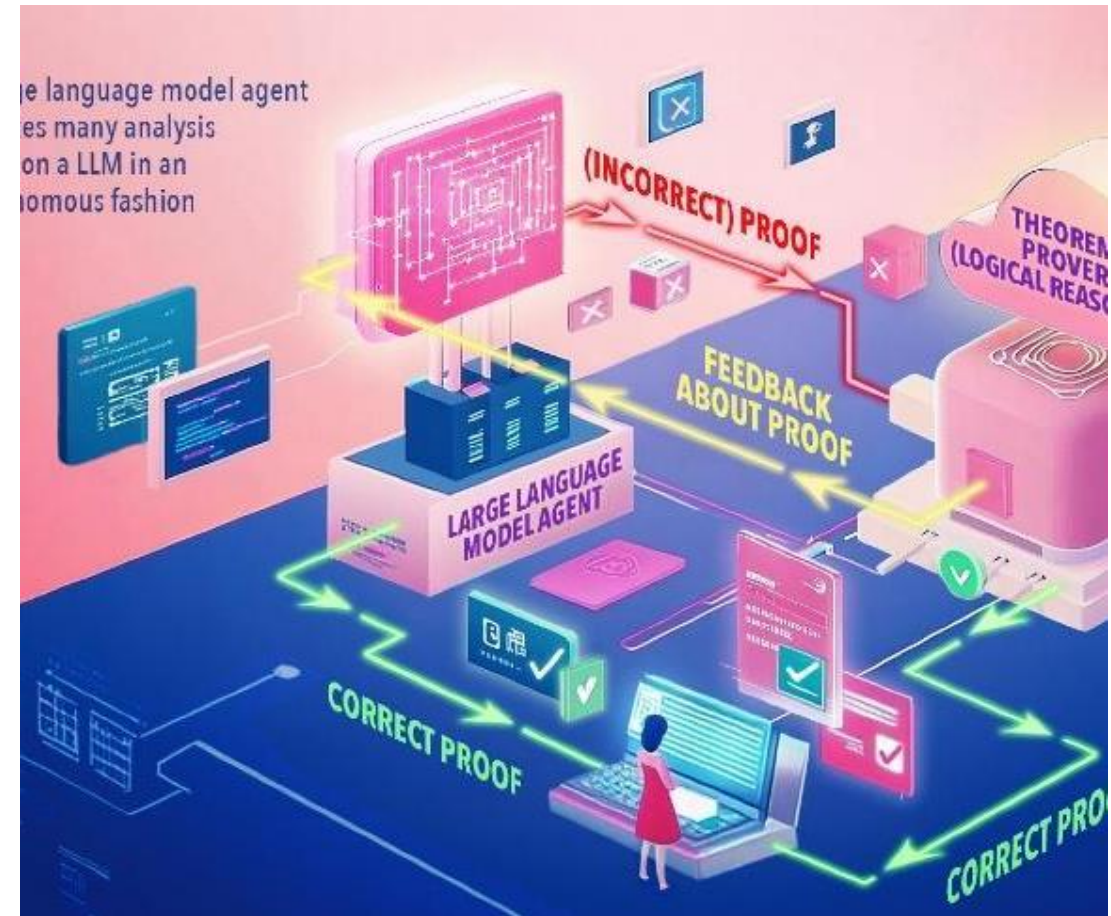


CORRECTNESS PROOFS ?

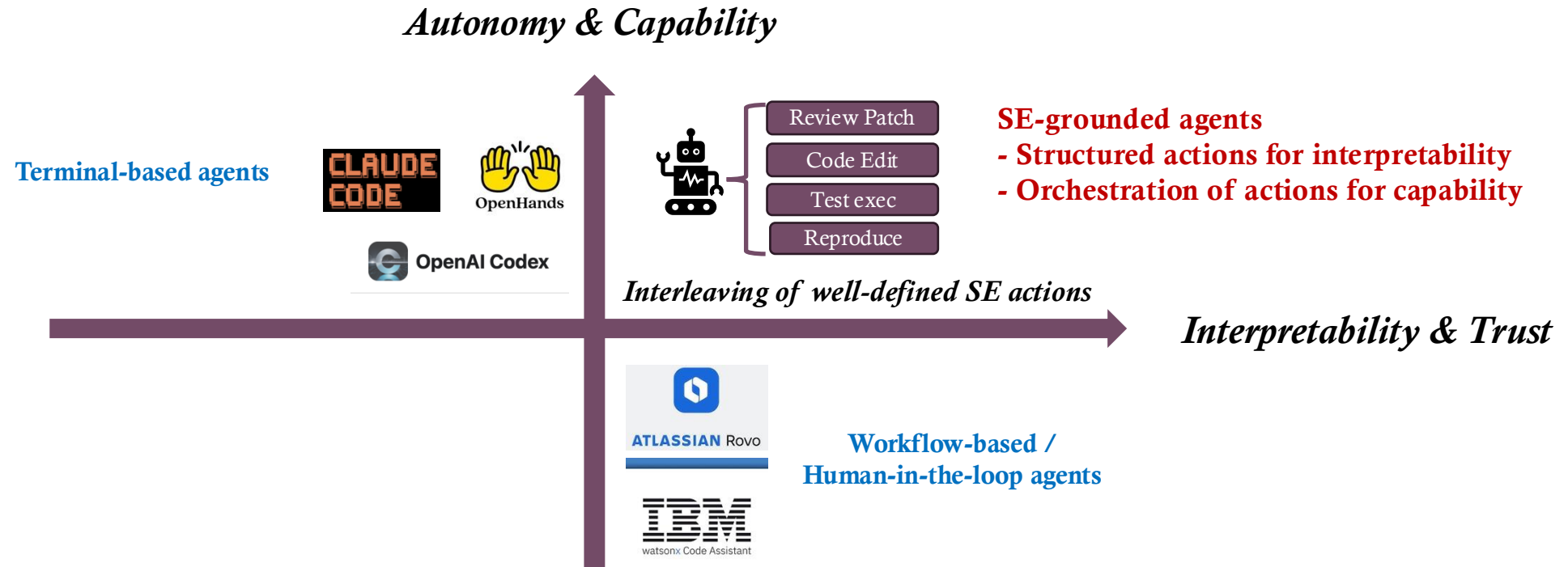
- Automation in software development is overwhelming
- Put agentic AI to task in combating scale for proving program properties
- Automatic verification of automatically generated code!
 - Proof Search Automation exists
 - Lemma discovery is a research frontier

AI for Program Reasoning, 2026-30
NUS & Imperial College London

<https://ai4pr.github.io>



SOFTWARE OF THE FUTURE



**Thought Process about
this research area**



Opinion piece

Agentic AI Software Engineers:
Programming with Trust

Roychoudhury et al.,

Communications of the ACM, May 2026.