

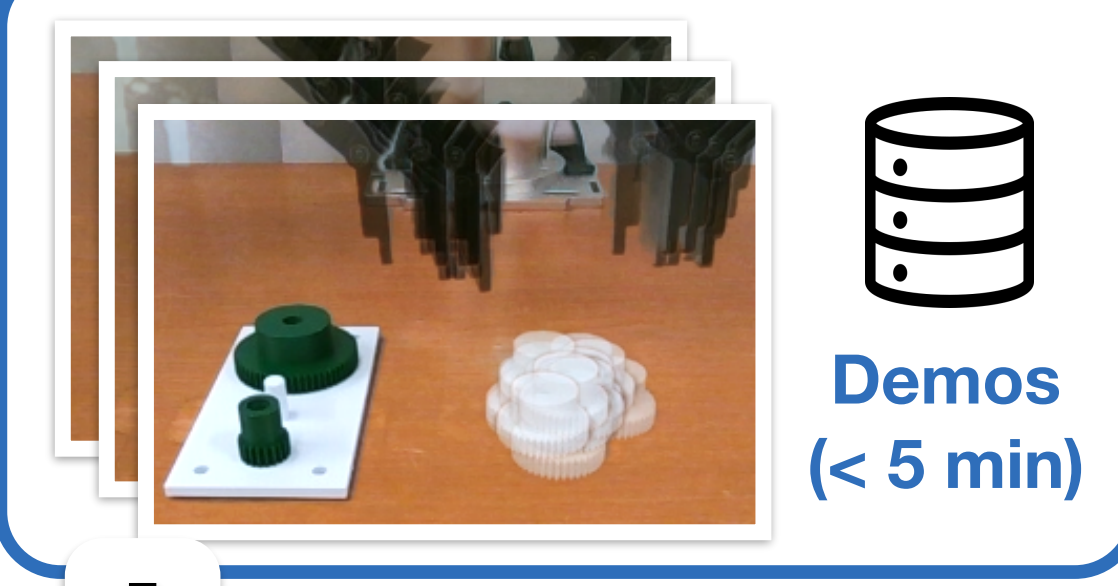
Motivation

- Fine-grained teleoperation is **slow**, **error-prone**, and **frustrating** even for experts.
- Shared autonomy may improve teleoperation, but requires a **faithful human model**.

Contributions

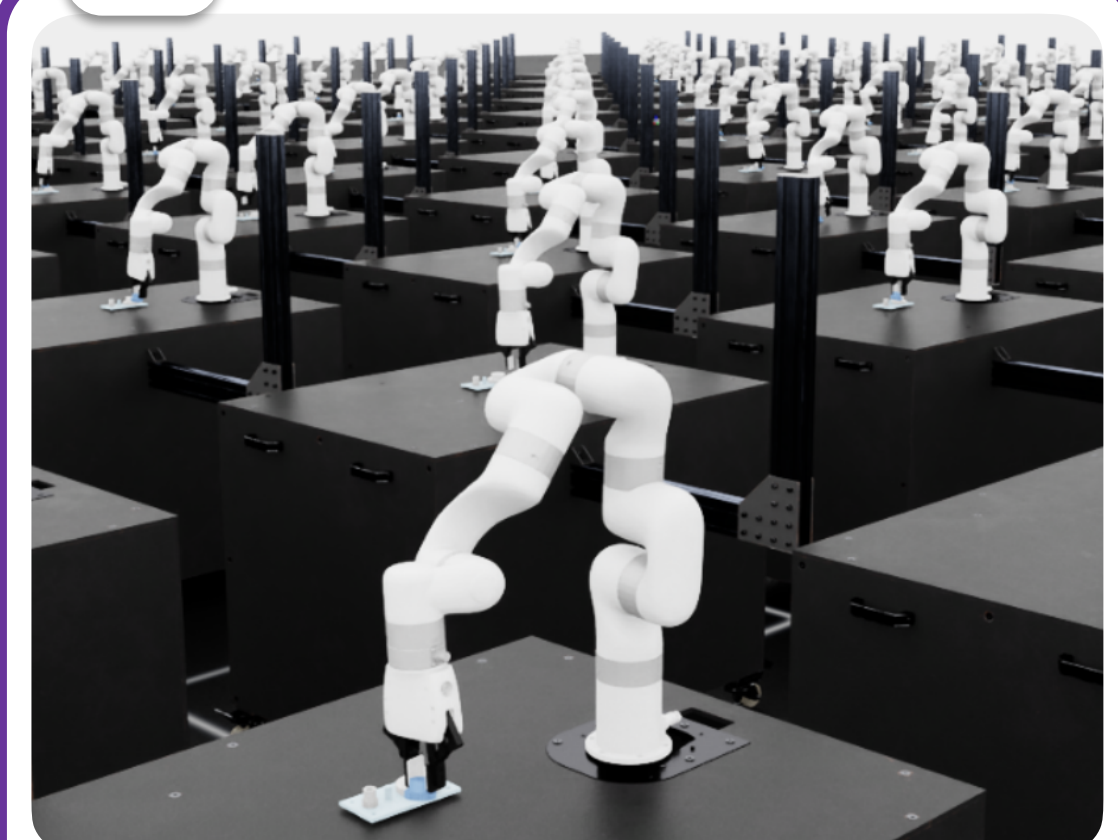
- Enables fine-grained, contact-rich teleoperation for **novices**.
- A copilot learned from **<5min of teleoperation data**.
- Higher quality demonstrations** for downstream imitation learning.

Real World Data



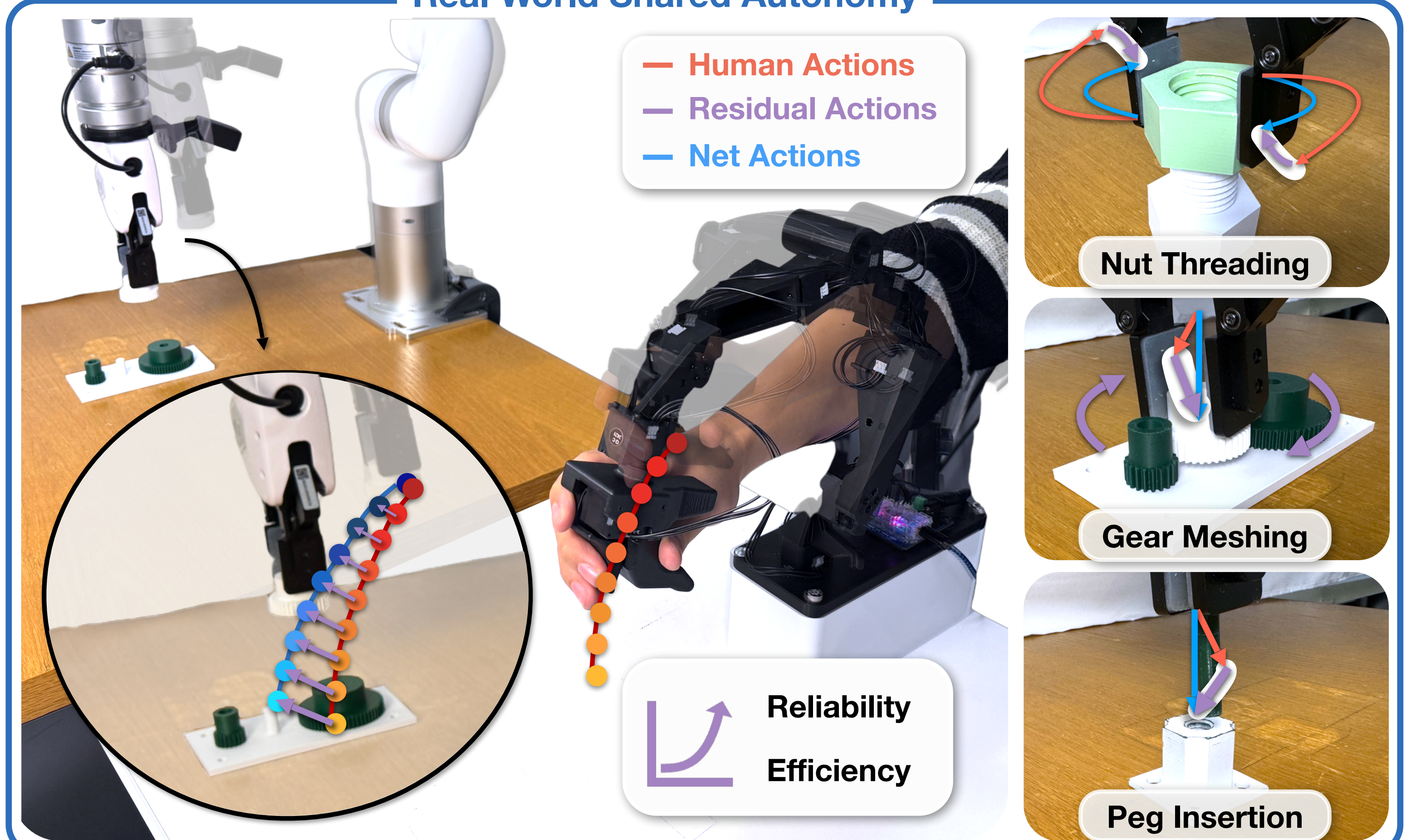
Human Surrogate

Simulation



Train Residual Copilot

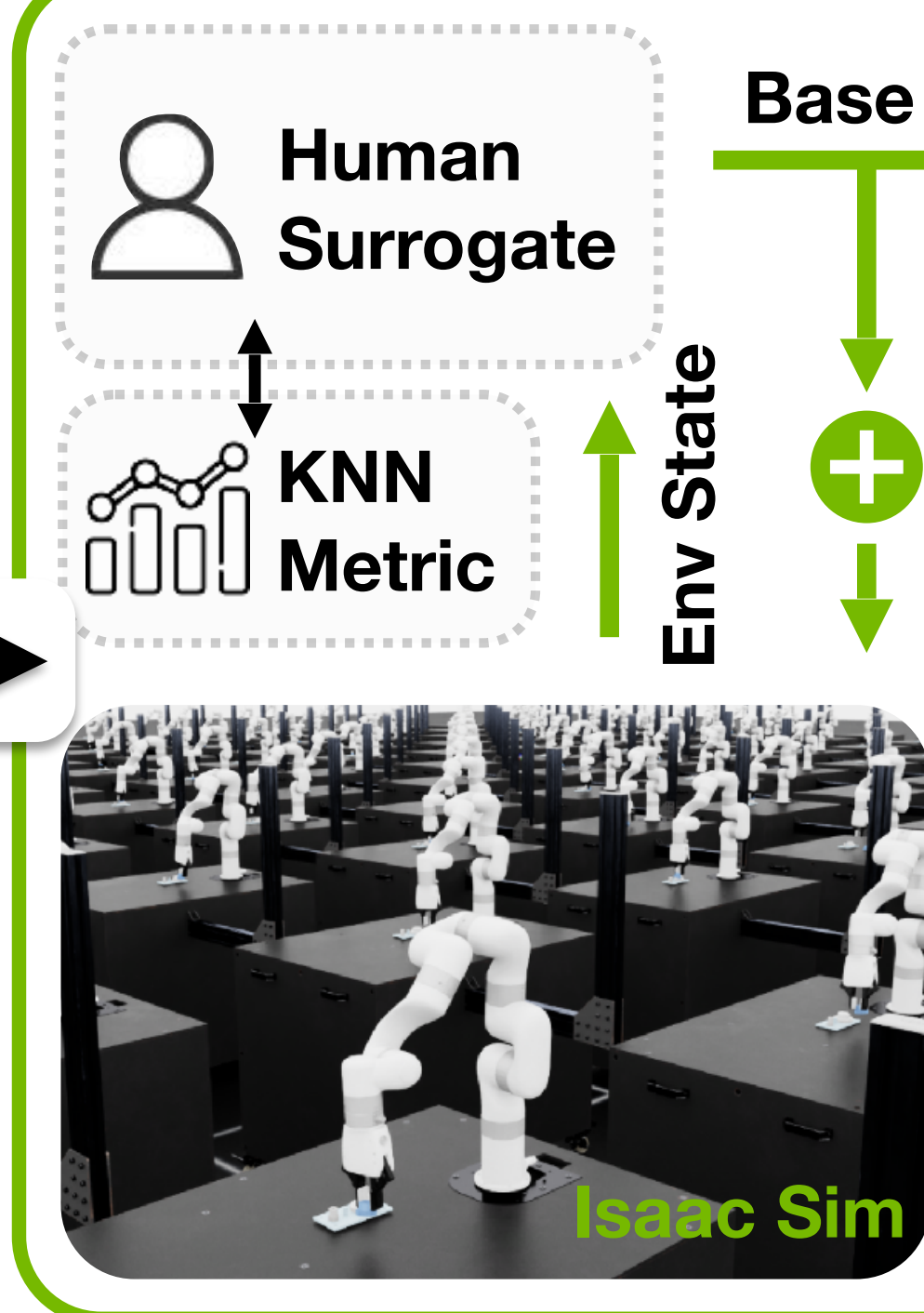
Real World Shared Autonomy



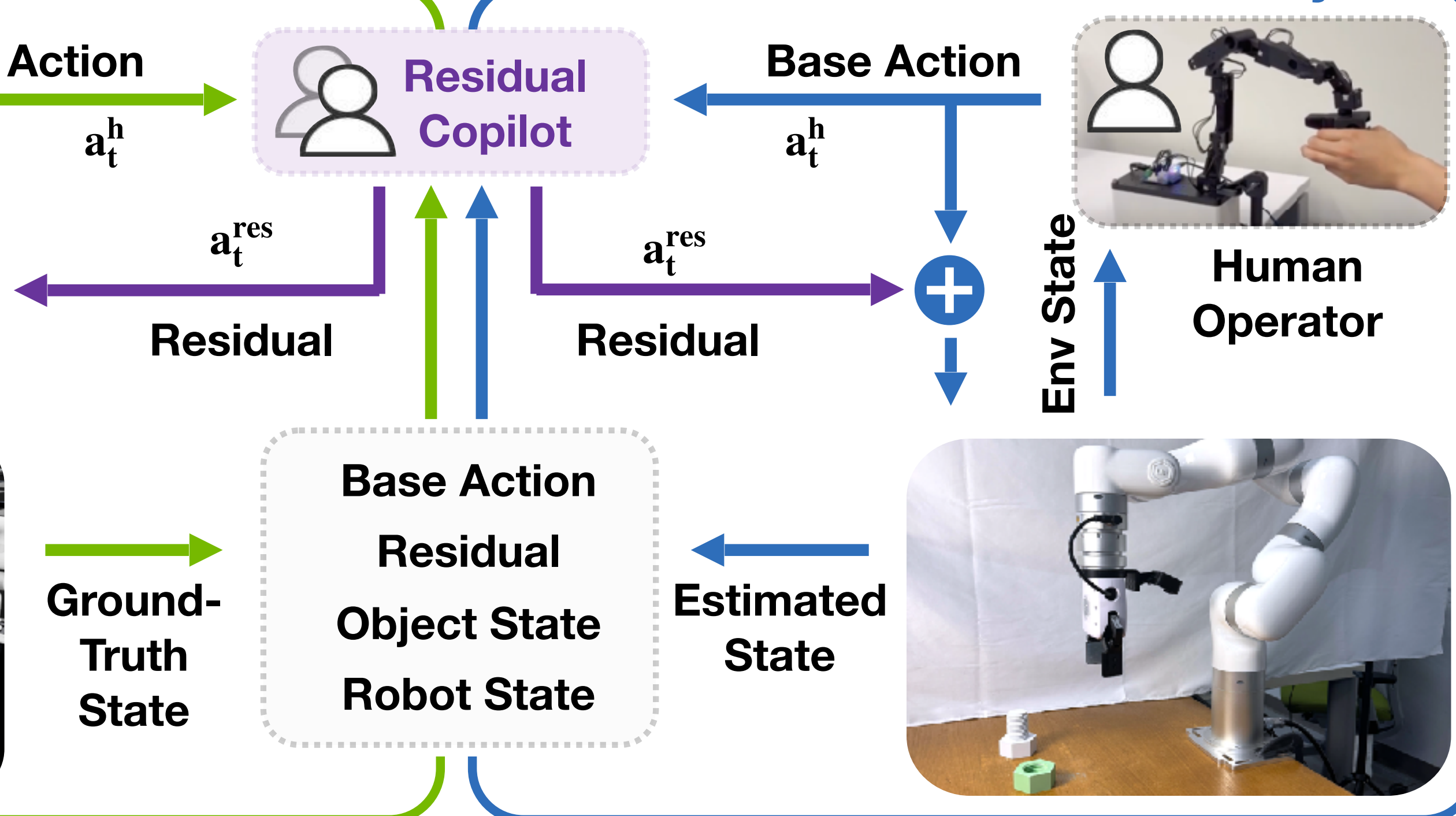
Real World



Simulation



Real World Shared Autonomy



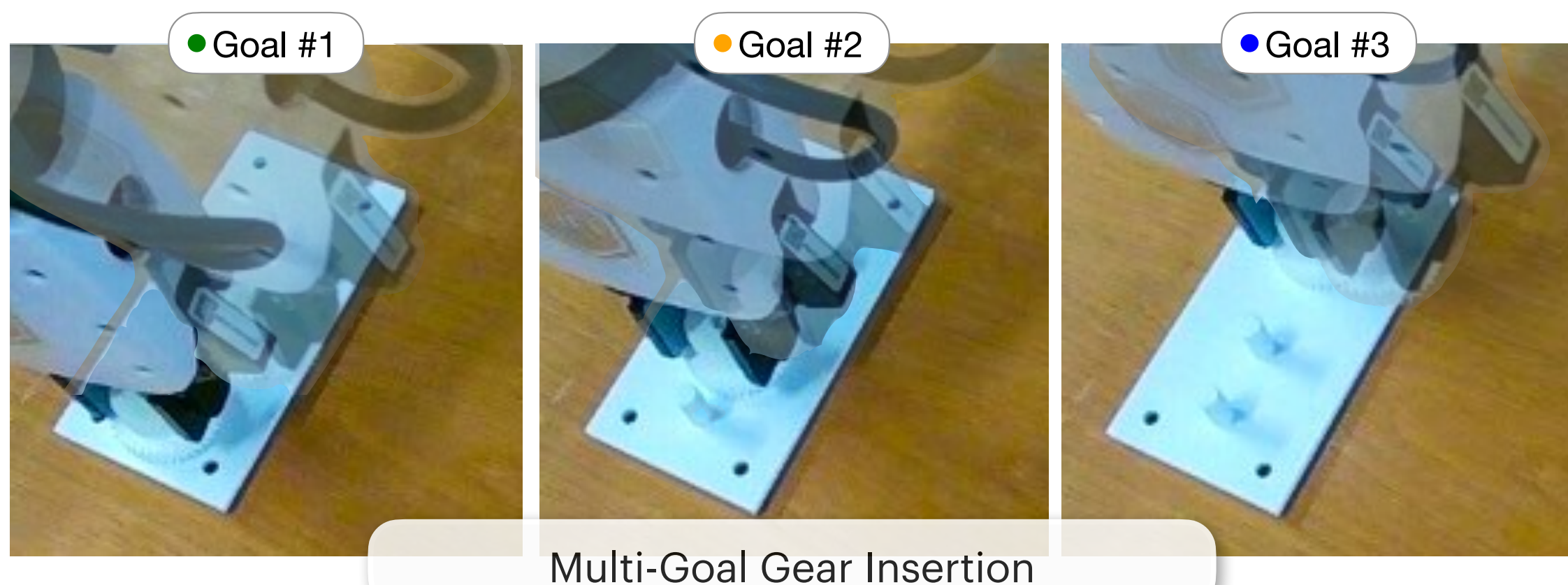
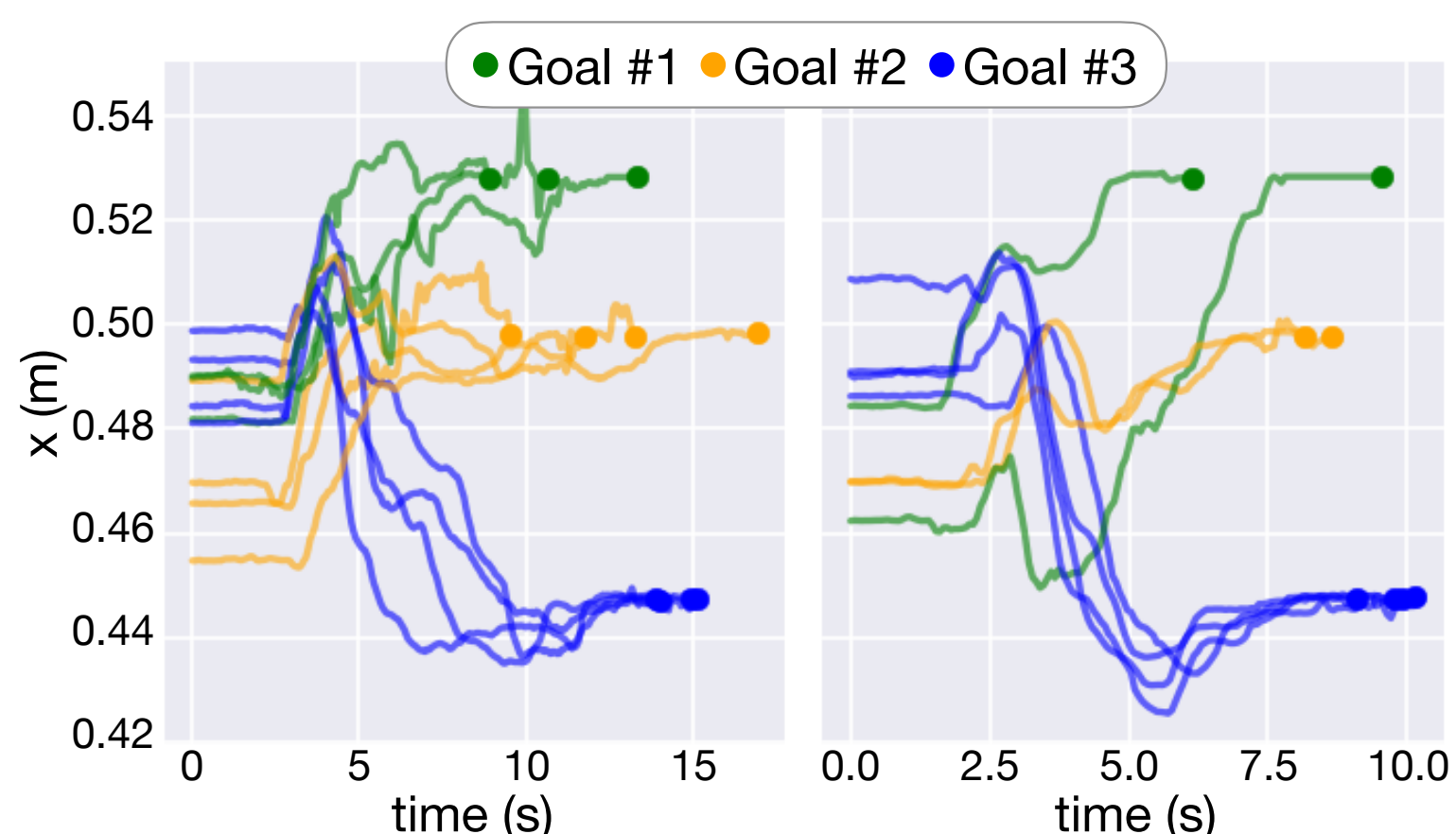
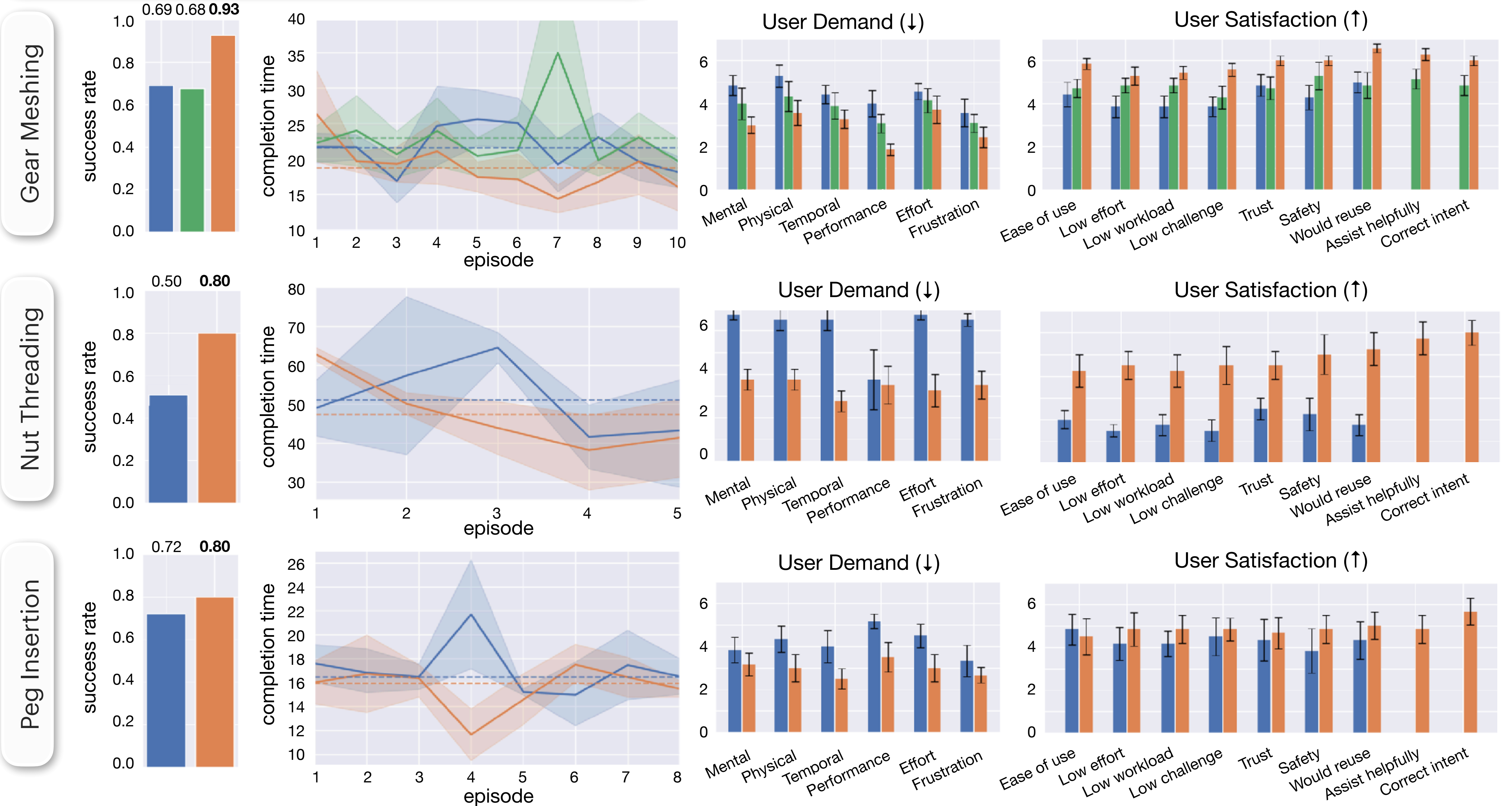
Method

- A real-to-sim-to-real shared autonomy framework that
- builds a lightweight **kNN human surrogate** from minimal teleoperation data
 - trains a **residual copilot** in simulation
 - provides **low-level assistance** to human operators in real

Results: User Study

- Objectively, copilot assistance **improves success rate** and **reduces completion time**.
- Subjectively, copilot assistance **reduces user burden** and **improves satisfaction**.

■ Teleop ■ Residual BC ■ Residual Copilot (Ours)



Results: Preserves Intent

- Copilot assistance preserves **spatial** (position goal) and **temporal** (speed) intent

