IN-CONTEXT LEARNING ENABLES ROBOT ACTION PREDICTION IN LLMS

Tech ID: 33985 / UC Case 2025-112-0

PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

Bridging the gap between linguistic reasoning and physical execution, UC Berkeley researchers have developed a method to enable robotic devices to predict complex actions using in-context learning (ICL). By leveraging the inherent reasoning capabilities of Large Language Models (LLMs), this approach allows a robot to translate natural language instructions into sequential motor actions without the need for task-specific fine-tuning or intensive retraining. The system allows the robot to generalize to new, unseen tasks on the fly. This breakthrough shifts robot programming away from rigid coding toward a more flexible, intuitive interaction where the machine "understands" the intended goal by drawing parallels from the provided examples.

SUGGESTED USES

- Collaborative Industrial Robots (Cobots): Deploying warehouse robots that can switch between packing, sorting, and palletizing roles simply by being shown a few text-based examples of the new task.
- Assistive Home Robotics: Enabling service robots to perform complex household chores, like setting a table or sorting laundry, based on a user's verbal description and a brief set of demonstration steps.
- Rapid Prototyping in Manufacturing: Reducing the downtime required to re-program assembly line arms for small-batch production runs.
- Remote Exploration: Powering autonomous rovers in extraterrestrial or deep-sea environments where communication latency makes traditional "step-by-step" remote control impossible.
- Search and Rescue: Guiding drones or quadrupedal robots through disaster zones where they must adapt to novel obstacles and mission objectives without a pre-loaded map or behavior set.

ADVANTAGES

- Zero Additional Training: Eliminates the computational cost and time delay associated with fine-tuning models for every specific robotic movement or task.
- High Adaptability: Allows robots to handle "out-of-distribution" scenarios—tasks they weren't explicitly designed for—by referencing the provided context.
- Human-Centric Interface: Enables non-experts to "program" robots using natural language and simple demonstrations rather than complex robotics code.
- Reduced Data Requirements: Unlike traditional imitation learning, which requires thousands of trials, ICL can function effectively with only a handful of examples.
- Computational Efficiency: By utilizing the pre-existing logic of LLMs, the system leverages massive amounts of pre-trained data to solve physical coordination problems.

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Pre-Training Auto-Regressive Robotic Models With 4D Representations
- Humanoid Locomotion As Next Token Prediction
- RealWorldPlay: Physical AI In-Situ Revisited
- Llarva: Vision-Action Instruction Tuning Enhances Robot Learning

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OTHER INFORMATION

CATEGORIZED AS

- **Computer**
  - Software
- **Research Tools**
  - Other
- **Engineering**
  - Robotics and Automation

RELATED CASES

2025-112-0

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