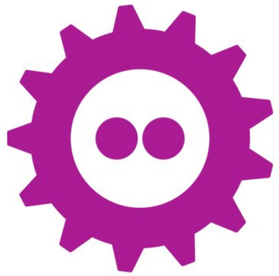
THE ROAD TO OPEN SOURCE GENERAL PURPOSE HUMANOIDS WITH DORA-RS

HAIXUAN XAVIER TAO

FOSDEM 2025 <3



FOSDEM

dora-rs

1ms.ai

pollen robotics

Hugging Face

YOU MAY REMEMBER ME FROM FOSDEM 2024

Full Time Open Source Dev

With my own company called 1ms.ai

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FOSDEM

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🤗 Hugging Face

WHY DO WE NEED HUMANOIDS?

AI IS CHANGING THE WORLD.

ROBOTICS HAVE SUFFERED FOR YEARS OF LACK OF GENERALIZATION THAT AI CAN SOLVE.

BUT, THE ONLY WAY WE CURRENTLY KNOW HOW TO MAKE “ARTIFICIAL INTELLIGENCE” IS BY MIMICKING HUMANS

SO WE WANT TO TEACH AI TO USE ROBOT BY MIMICKING HUMANS

THIS WOULD ENABLE THINGS LIKE HAVING ROBOT COOKING, CLEANING, FOLDING CLOTHES...

HENCE THE HUMANOID

THE TRUTH IS THAT WE DON’T KNOW HOW AI WORKS

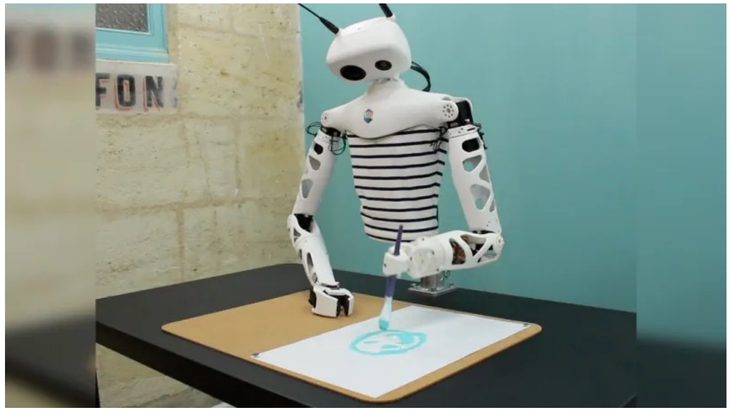
WHAT DEFINES OPEN SOURCE GENERAL PURPOSE HUMANOIDS?

- Open Source AI
  - Model & Training Pipeline & **Maintain**
- Open Source Hardware
  - Customize & Replace & **Maintain**
- Open Source Software
  - Hack & Upgrade & **Maintain**

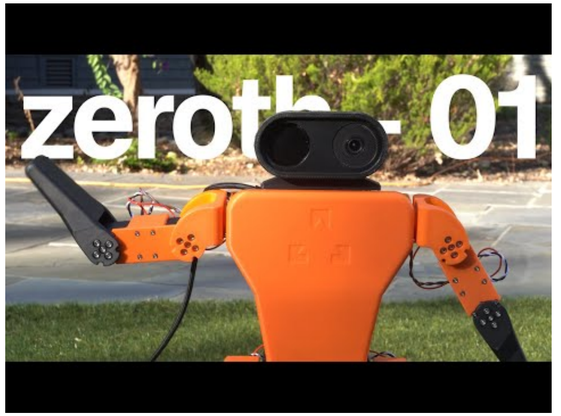
THE MANDALORIAN IS RIGHT, DON’T TRUST DROIDS!

OPEN SOURCE HUMANOIDS HARDWARE?

LeRobot - SO-ARM100



Pollen Robotics - Reachy



Zeroth Both

Trossen Robotics Mobile Aloha

THE OPEN HARDWARE HUMANOID COMMUNITY IS CURRENTLY THRIVING!

OPEN SOURCE AI MODEL IS ALSO HAVING A MOMENT!

deepseek

MISTRAL AI_

Qwen2-VL

Hugging Face

Mobile ALOHA:
Learning Bimanual Mobile Manipulation with Low-Cost Whole-Body Teleoperation

Zipeng Fu*[1], Tony Z. Zhao*[1], Chelsea Finn[1]
*project co-leads, [1]Stanford University
https://mobile-aloha.github.io

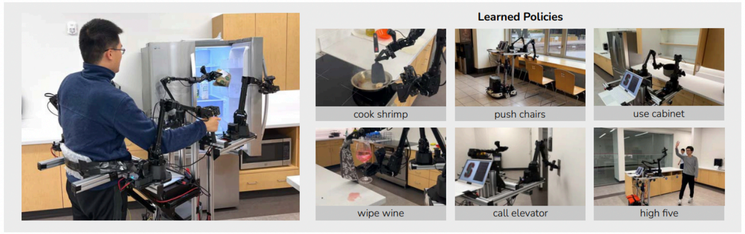
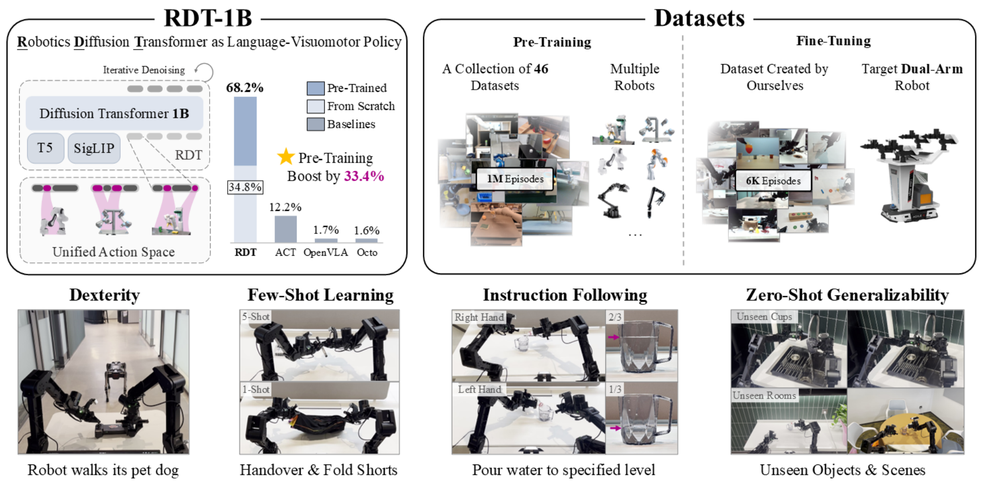


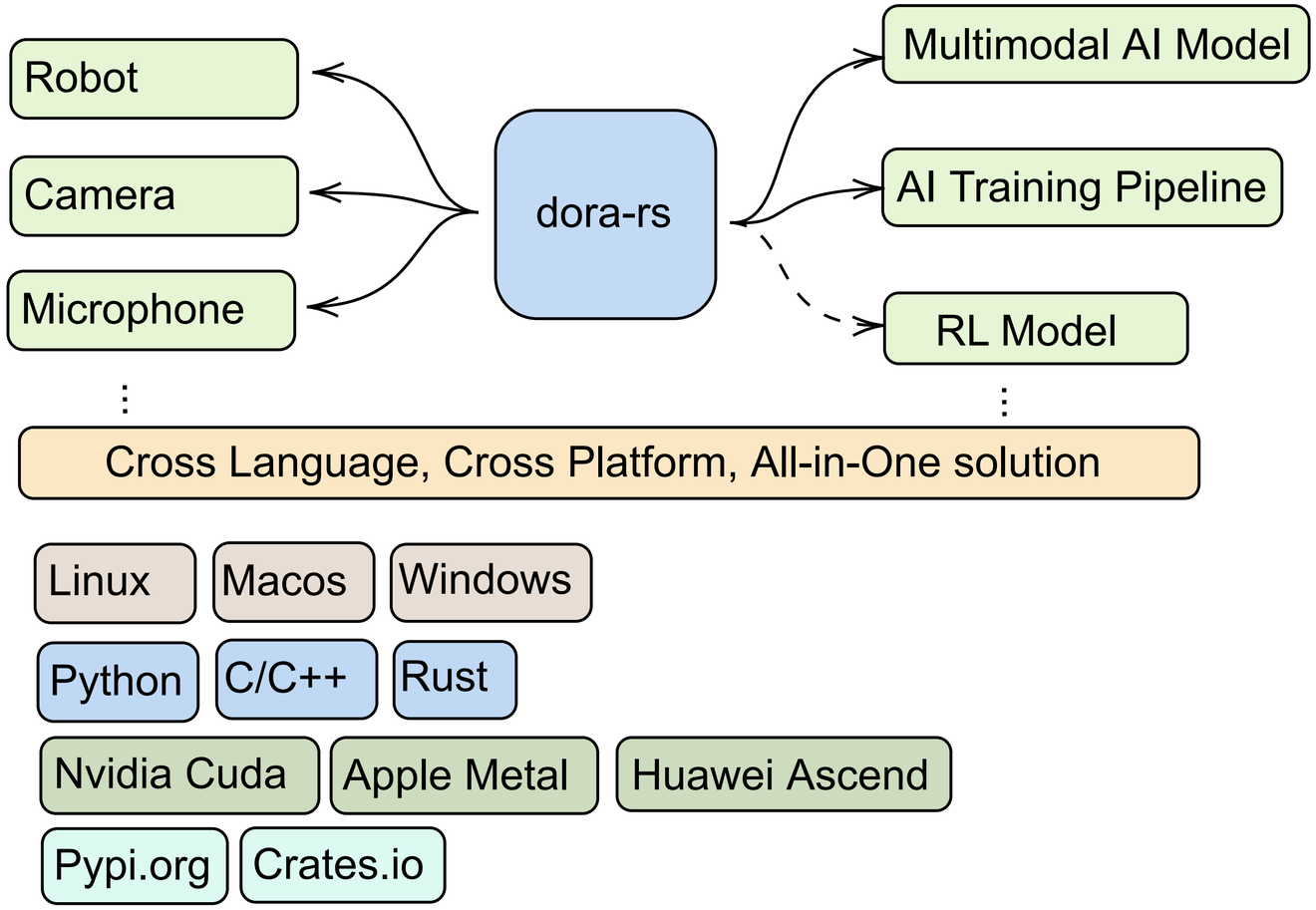
Figure 1: ***Mobile ALOHA*** . We introduce a low-cost mobile manipulation system that is bimanual and supports whole-body teleoperation. The system costs $32k including onboard power and compute. *Left:* A user teleoperates to obtain food from the fridge. *Right: Mobile ALOHA* can perform complex long-horizon tasks with imitation learning.



Robot walks its pet dog | Handover & Fold Shorts | Pour water to specified level | Unseen Objects & Scenes

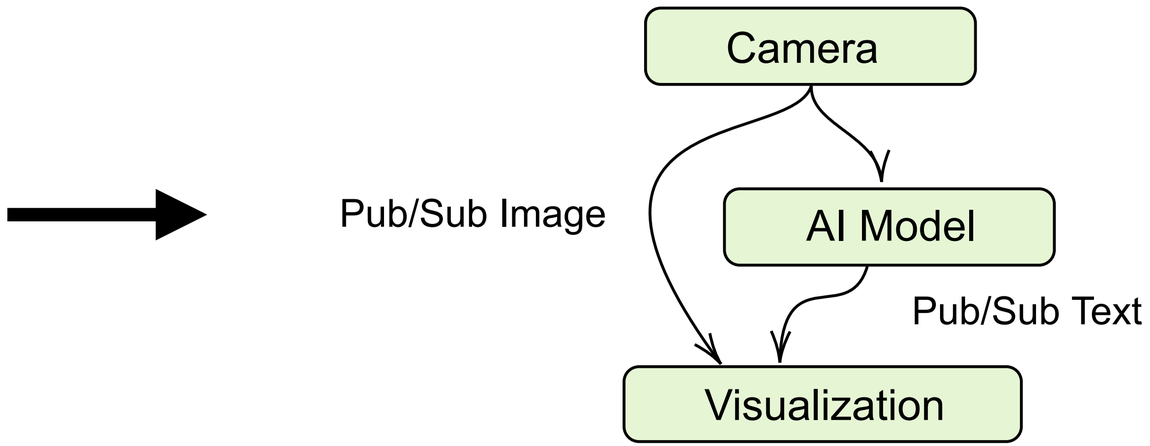
DORA-RS IN 1 SLIDE

- dora-rs is here to bridge the gap between hardware and AI
- We believe there is key requirements of a Dataflow Oriented Robotic Architecture(DORA) to make robotic just work



GRAPH BASED DEFINITION

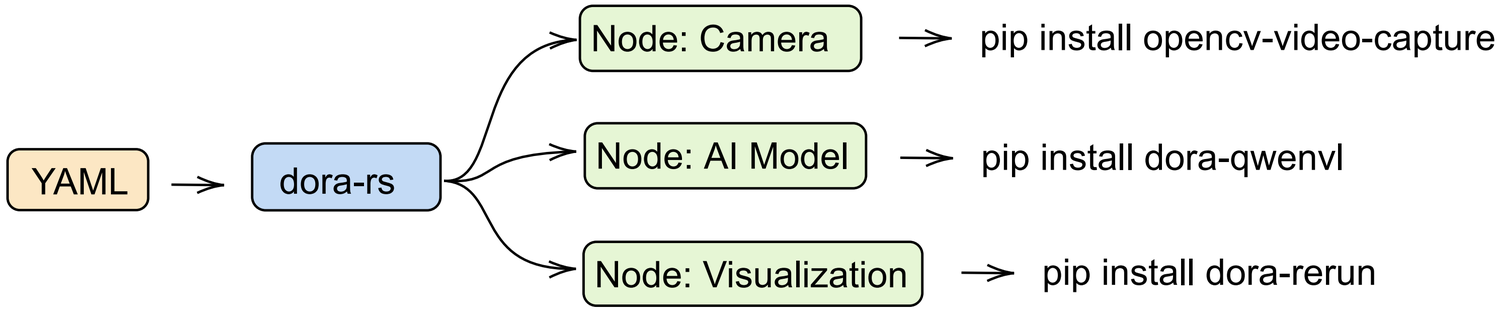
```yaml
nodes:
  - id: camera
    build: pip install opencv-video-capture
    path: opencv-video-capture
    inputs:
      tick: dora/timer/millis/50
    outputs:
      - image

  - id: dora-qwenvl
    build: pip install dora-qwenvl
    path: dora-qwenvl
    inputs:
      image: camera/image
    outputs:
      - text
    env:
      DEFAULT_QUESTION: Describe the image.

  - id: plot
    build: pip install dora-rerun
    path: dora-rerun
    inputs:
      image: camera/image
      text_qwenvl: dora-qwenvl/text
```



HOW DOES DORA DOES IT?

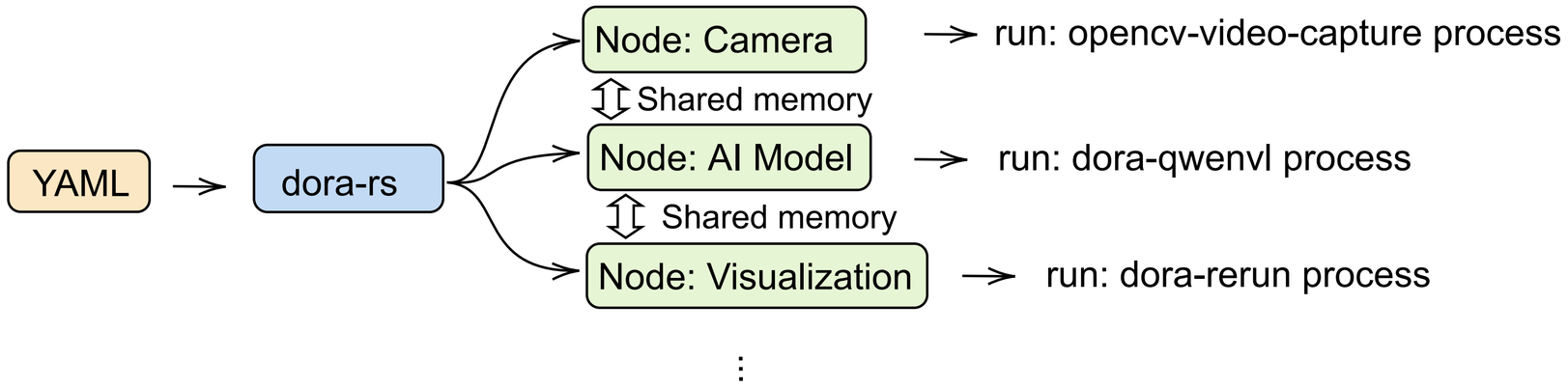
BUILD STEP

$ dora build dataflow.yml



RUN STEP

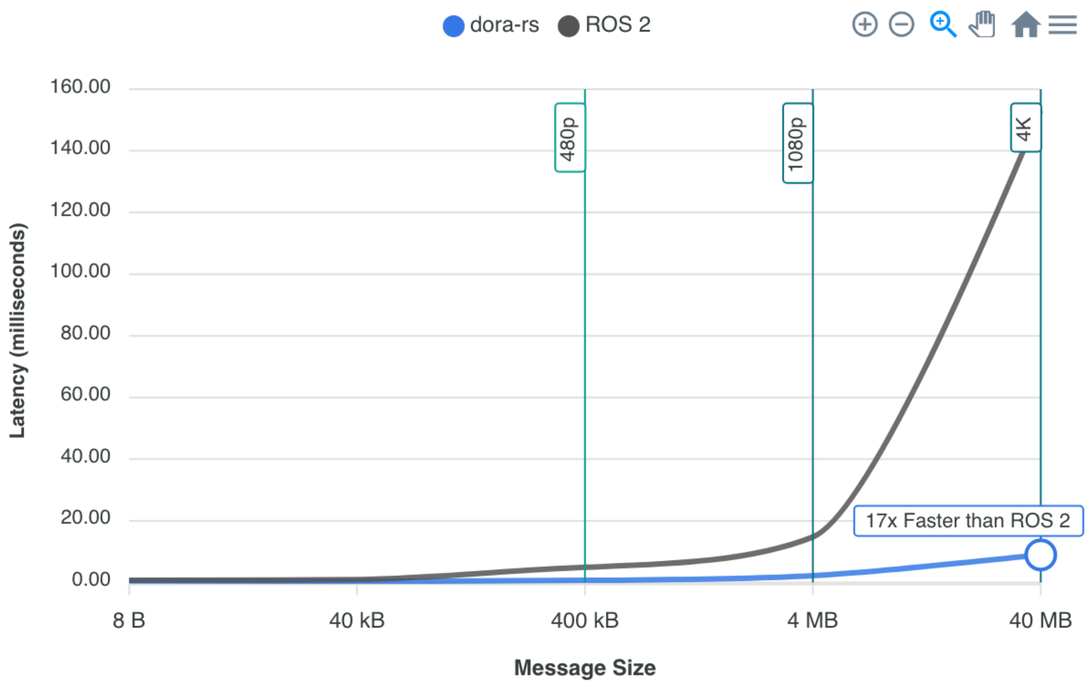
$ dora run dataflow.yml



COMMUNICATION SPEED

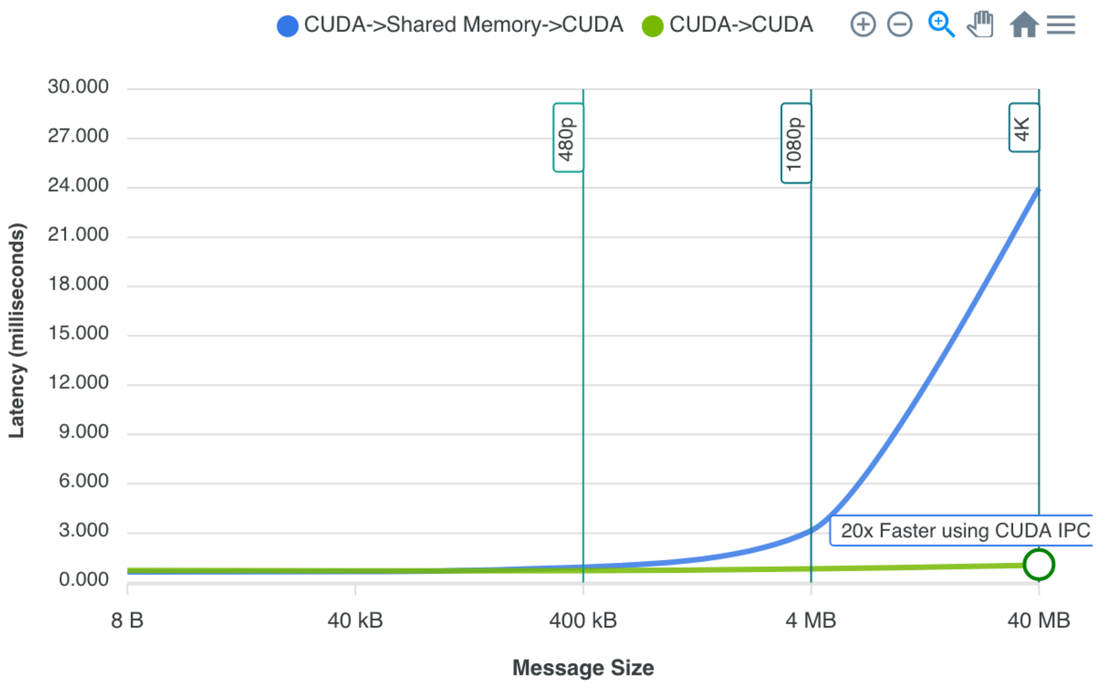
Dora CPU Latency (Lower is better)

Python API | Rust API | C/C++ API

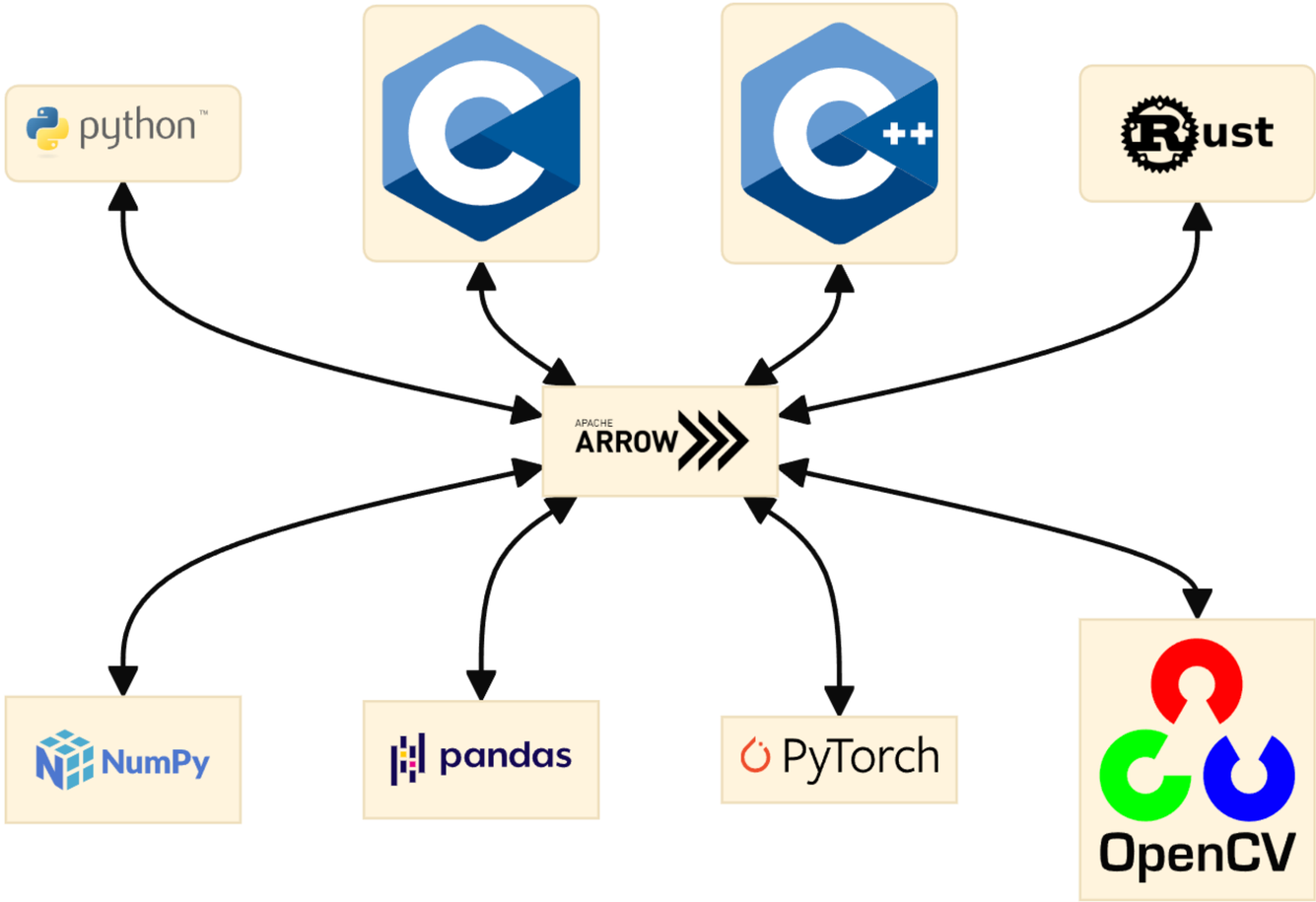


Dora GPU Latency (Lower is better)

PyTorch CUDA

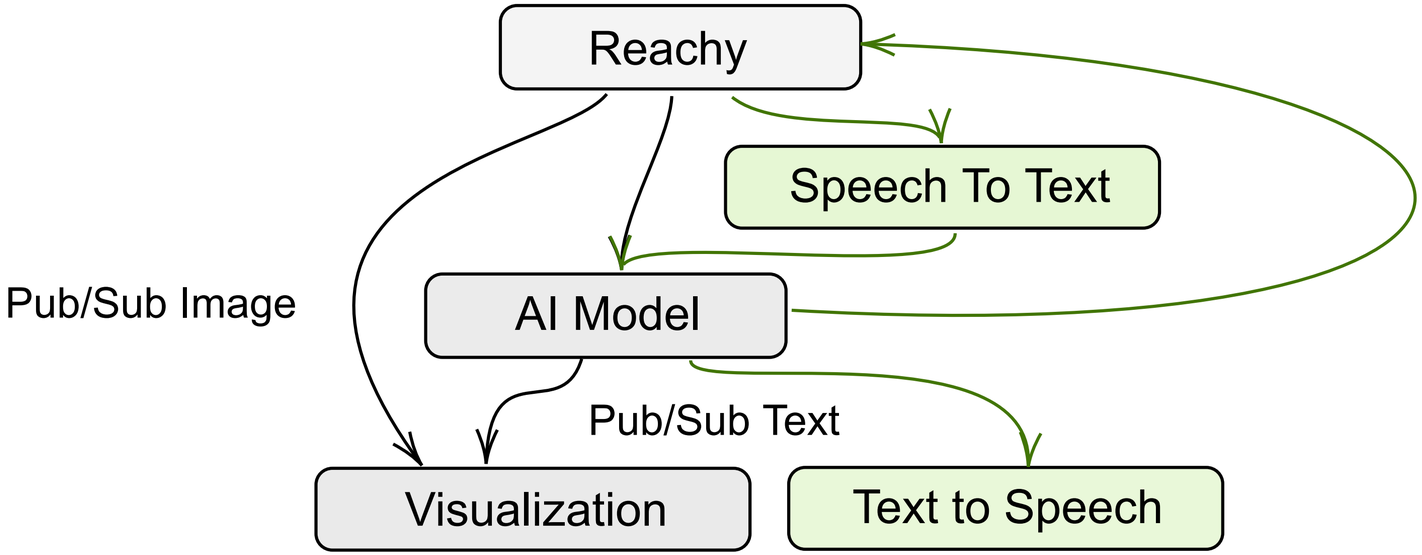


APACHE ARROW FORMAT
ENABLING ZERO-COPY FOR BOTH CPU, GPU, NPU...

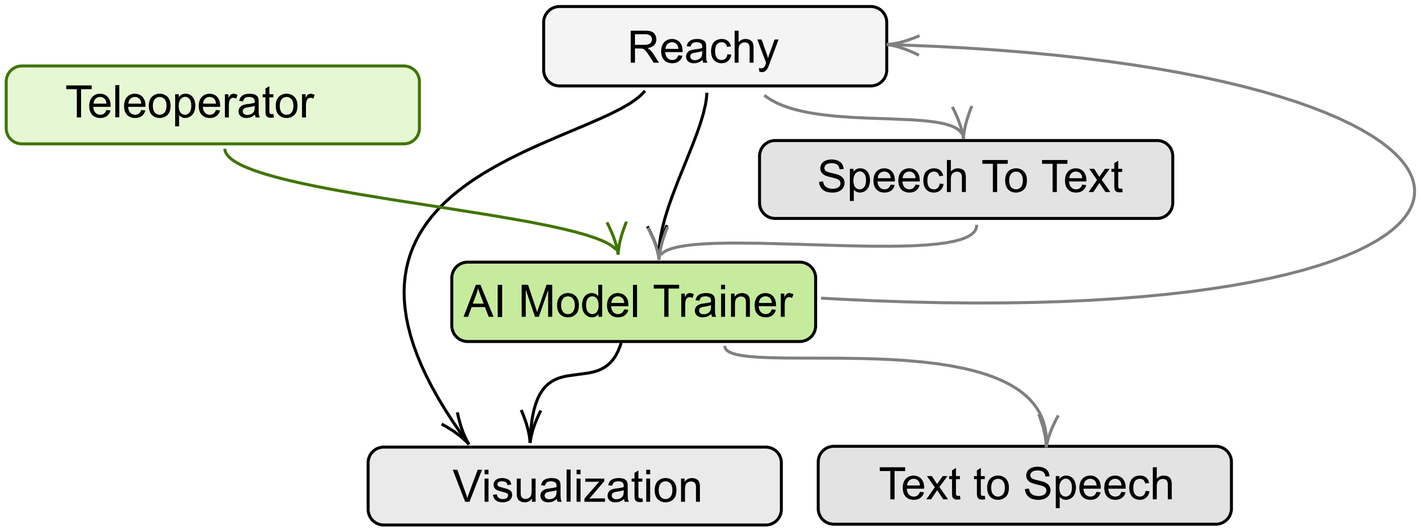


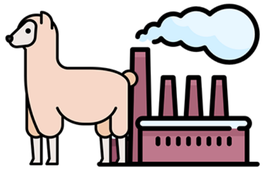
```
nodes:
  - id: reachy
    build: pip install dora-reachy2
    path: dora-reachy2
    inputs:
      tick: dora/timer/millis/50
+      action: dora-qwenvl/action
    outputs:
      - image

+   - id: dora-distil-whisper
+     build: pip install dora-distil-whisper
+     path: dora-distil-whisper
+     inputs:
+       input: dora-vad/audio
+     outputs:
+       - text

  - id: dora-qwenvl
    build: pip install dora-qwenvl
    path: dora-qwenvl
    inputs:
      image: camera/image
+      text: dora-distil-whisper/text
    outputs:
      - text
+      - action

  - id: plot
    build: pip install dora-rerun
    path: dora-rerun
    inputs:
      image: camera/image
      text_qwenvl: dora-qwenvl/text

+   - id: dora-outtetts
+     build: pip install dora-outtetts
+     path: dora-outtetts
+     inputs:
+       text: dora-qwenvl/text
```

DEMO TIME



DATA COLLECTION AND TRAINING CODE CAN BE ADDED SUPER EASILY

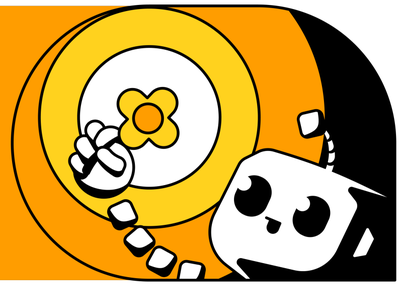


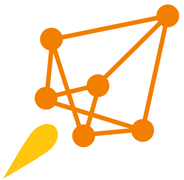


LLaMA-Factory

Easy and Efficient LLM Fine-Tuning

LeRobot



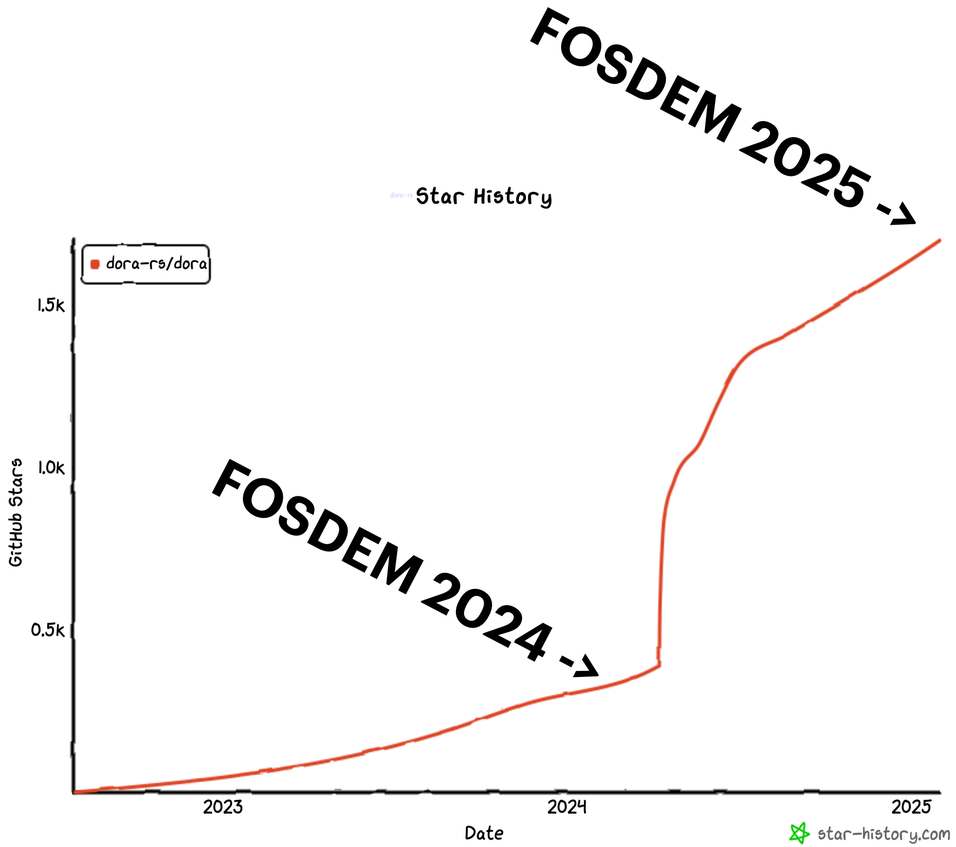


deepspeed

WHAT'S NEXT?

- Adding more models!
- Adding more robots!
- Adding more demos!
- Adding more latency optimization!
- Making dora more mature!

THANKS FOR LISTENING



dora-rs