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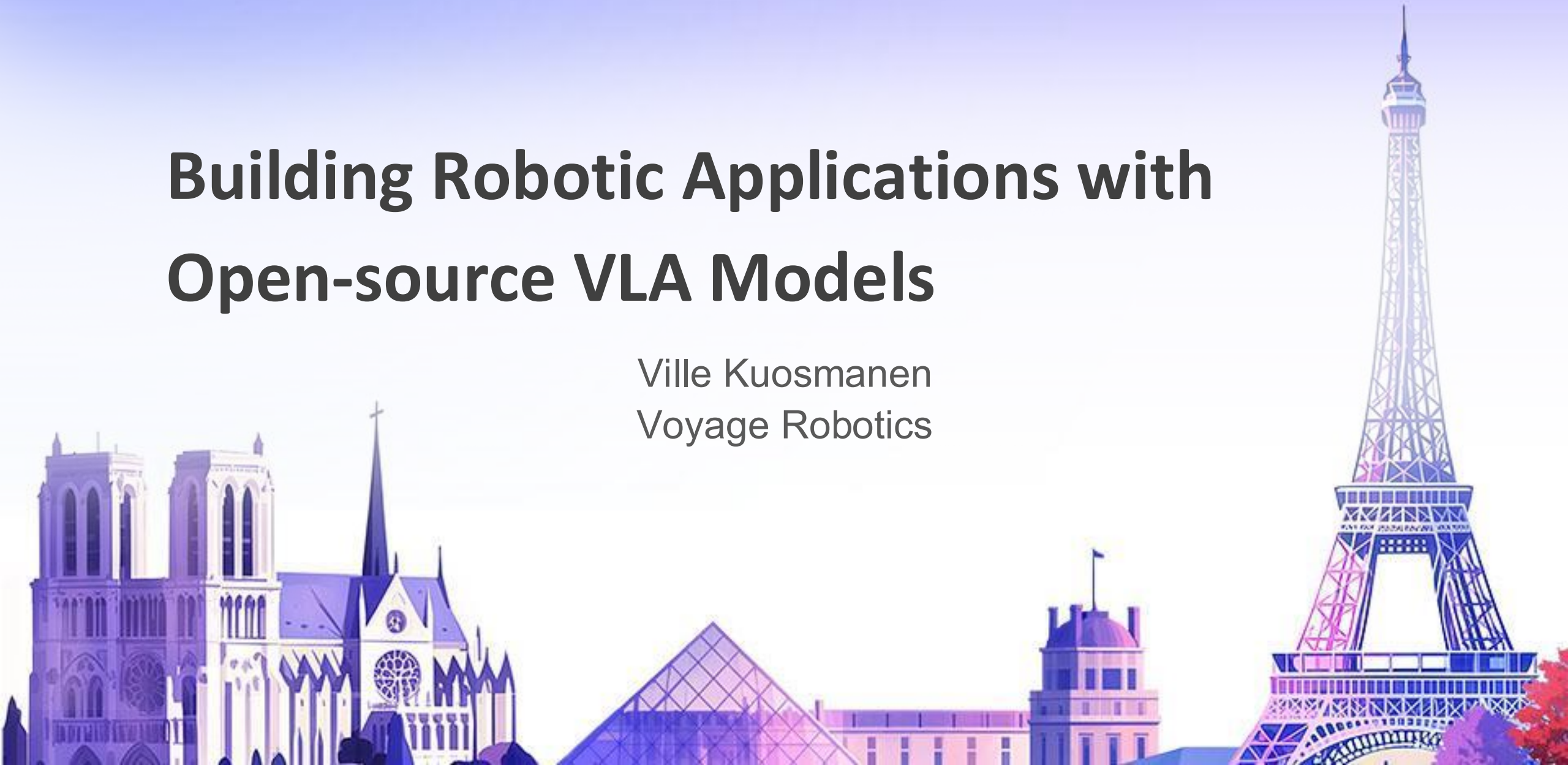
Building Robotic Applications with Open-source VLA Models

Ville Kuosmanen
Voyage Robotics




Cook Shrimp
(autonomous)
Stanford


Ville
@VilleKuosmanen · Jul 29, 2024
Promote
I bought a robot
13
12
238
16K

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Ville @VilleKuosmanen · Jul 29, 2024
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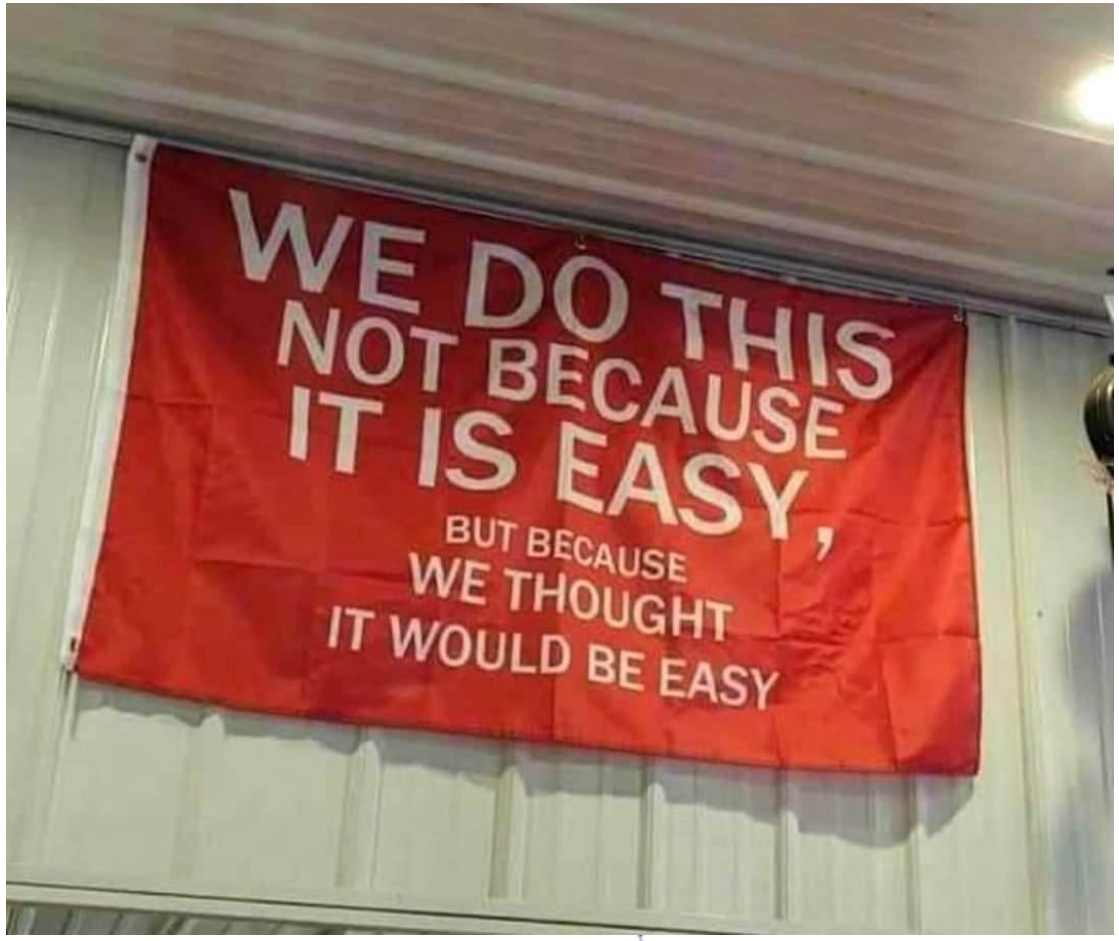
WE DO THIS
NOT BECAUSE
IT IS EASY,
BUT BECAUSE
WE THOUGHT
IT WOULD BE EASY

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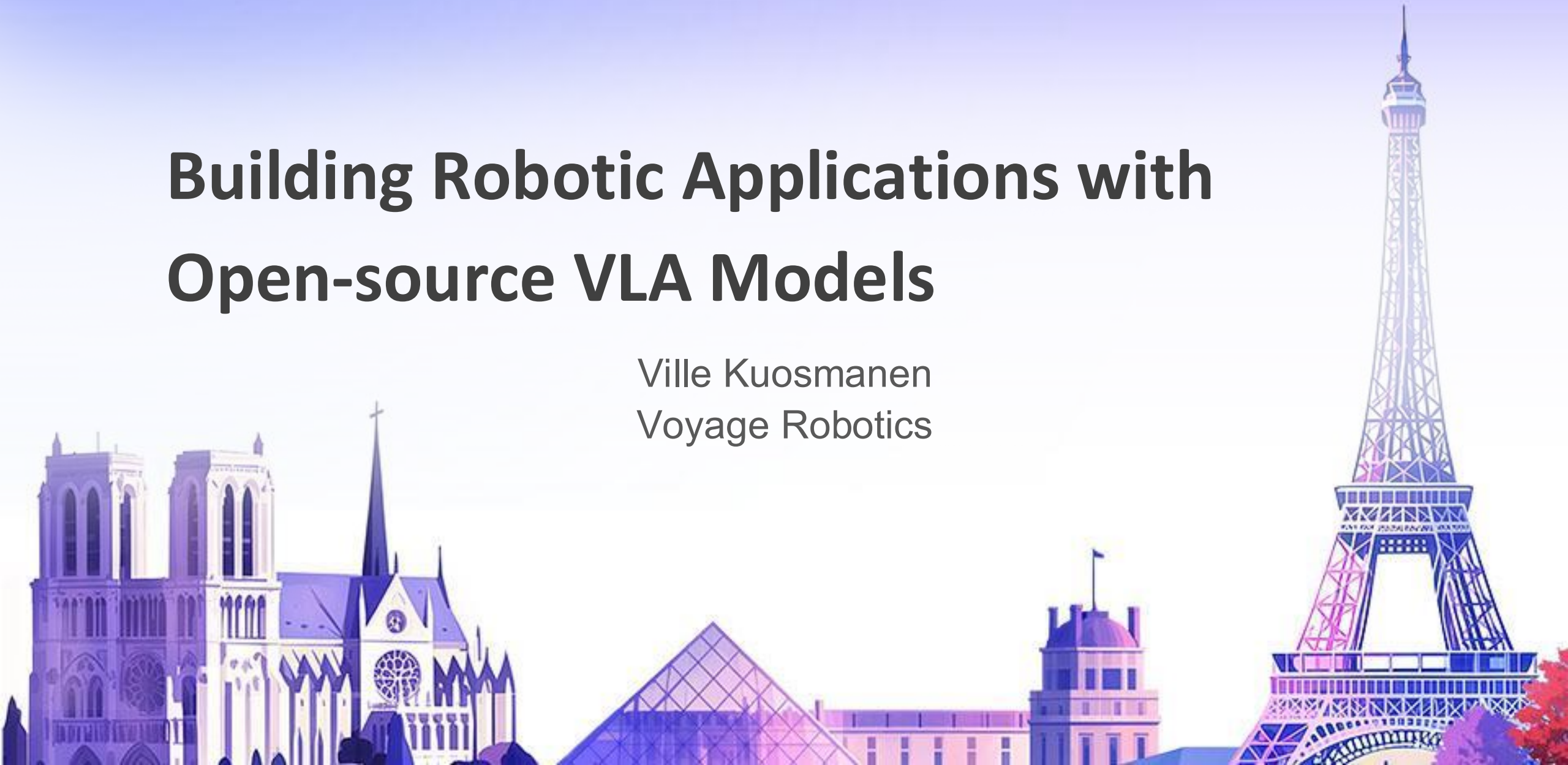

Engineered systems to end-to-end learning

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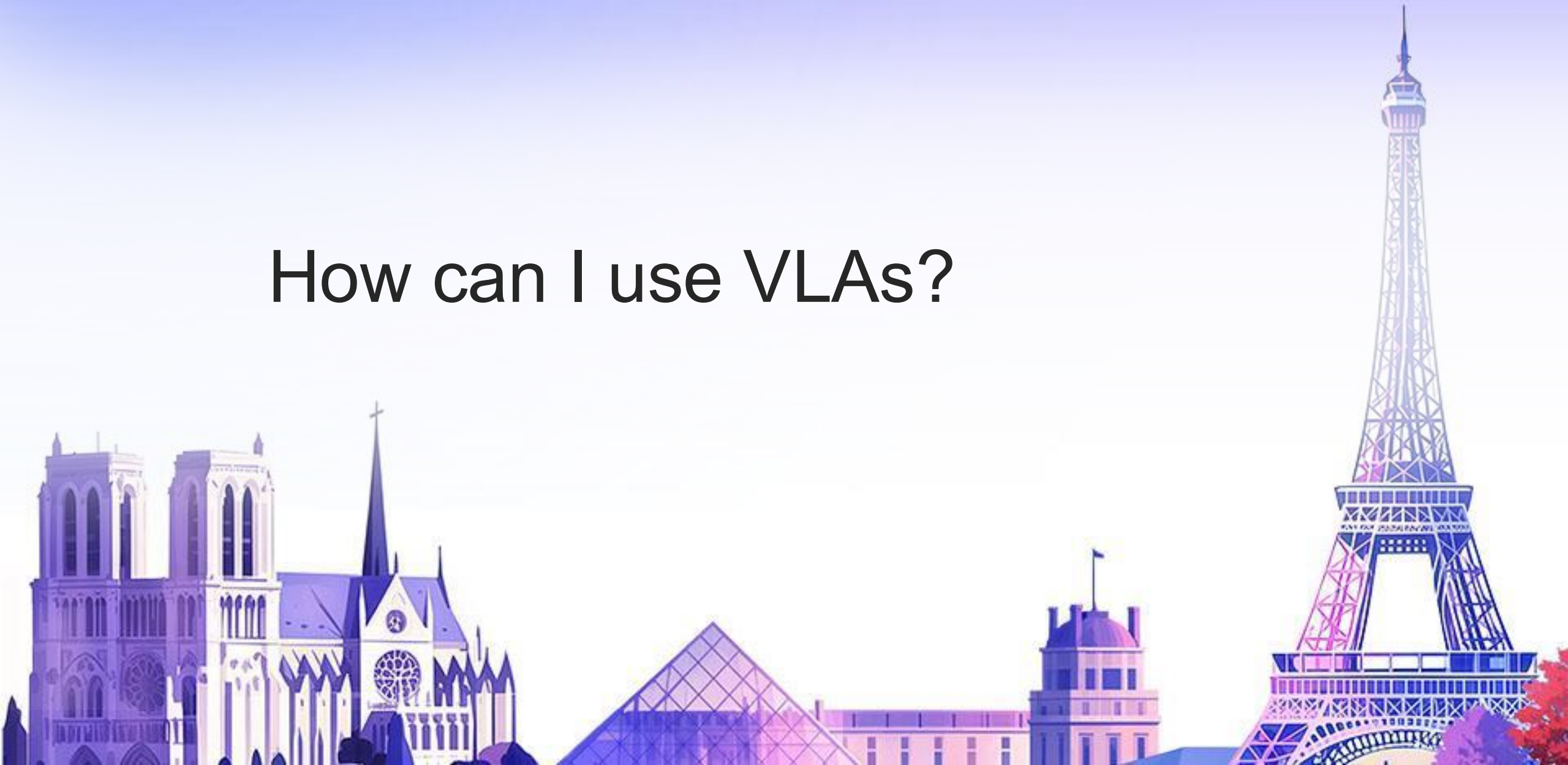
E2e learning is eating robotics

How can I use VLAs?



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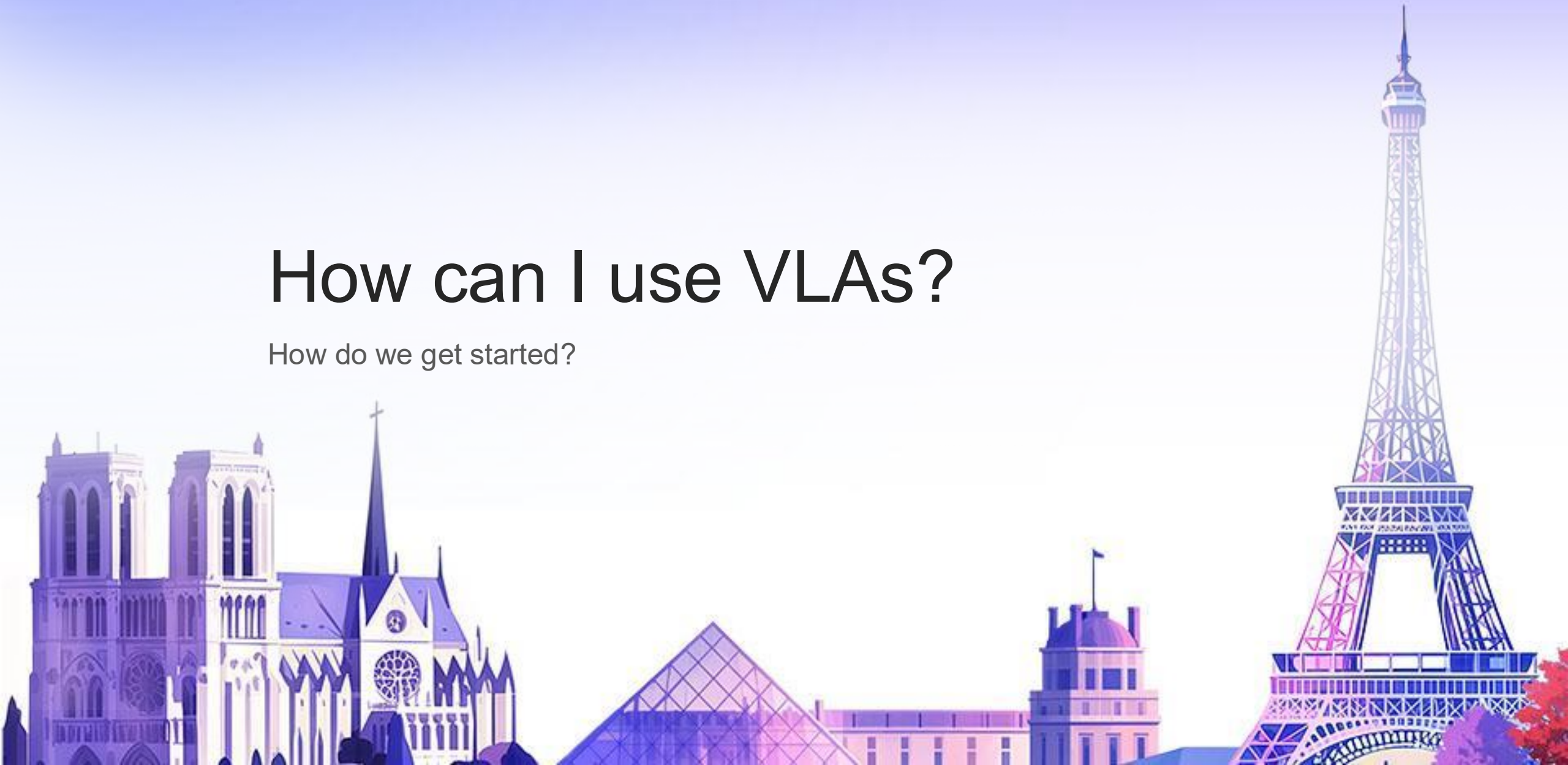
How can I use VLAs?

How do we get started?



First we need a robot 🤖

AI robotics is Python-driven

AI robotics is Python-driven

LeRobot

Fine-tuning VLAs

- Today’s VLAs don’t work zero-shot
- We need to **fine-tune** a pre-trained model with our own data

OS VLAs to choose from

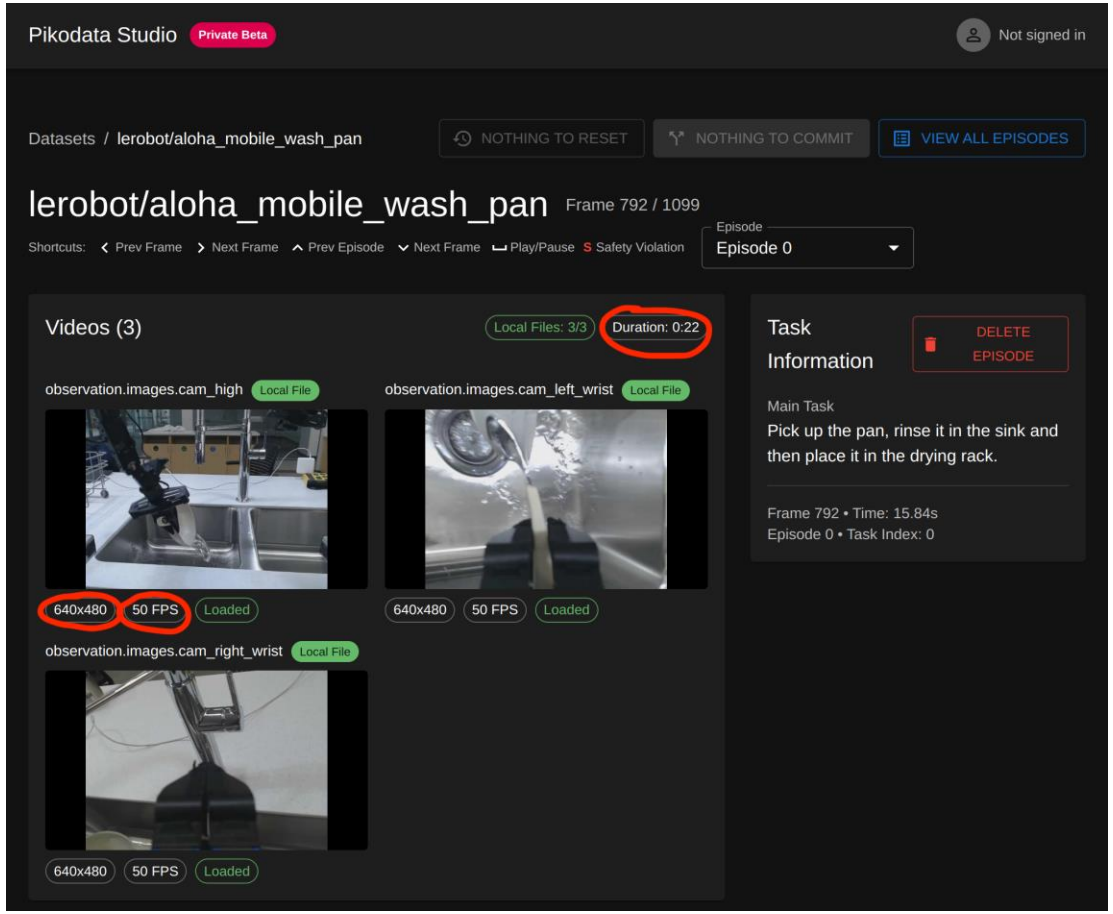
- Pi0 π
- GR00T N1
- RDT

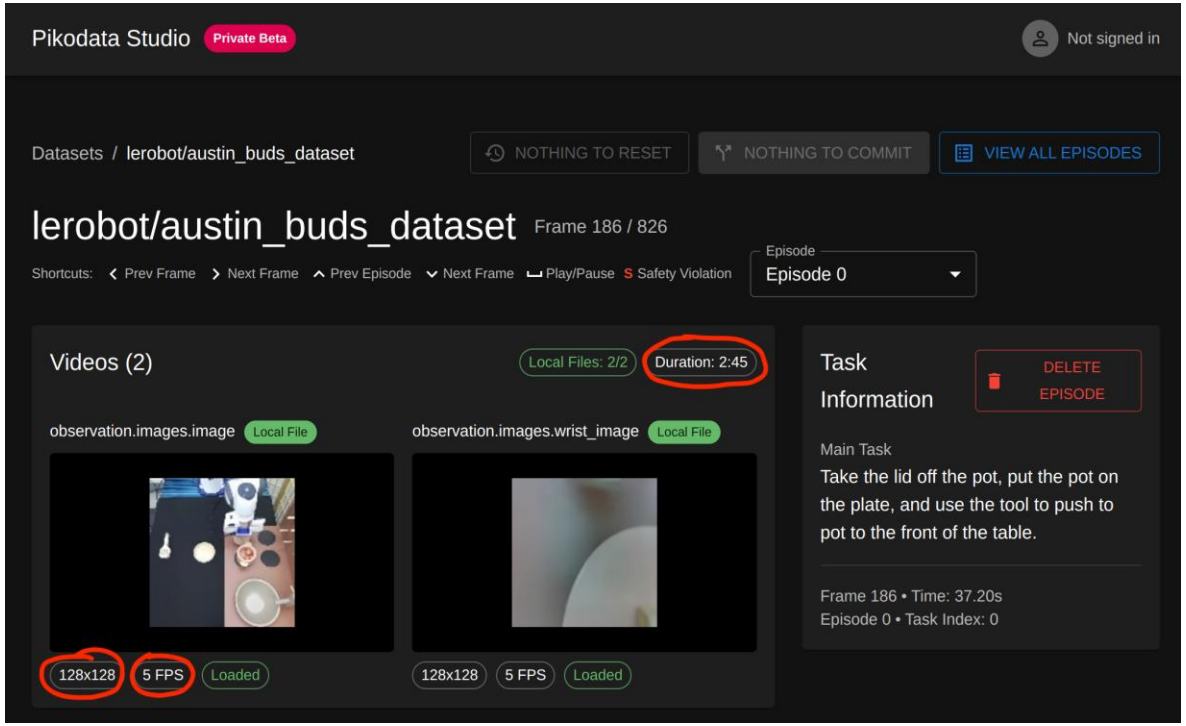
(many others…)

Robotics is a data problem

Robot data is highly valuable 🤑

Robot data is highly valuable 🤑





Characteristics of good robotics datasets

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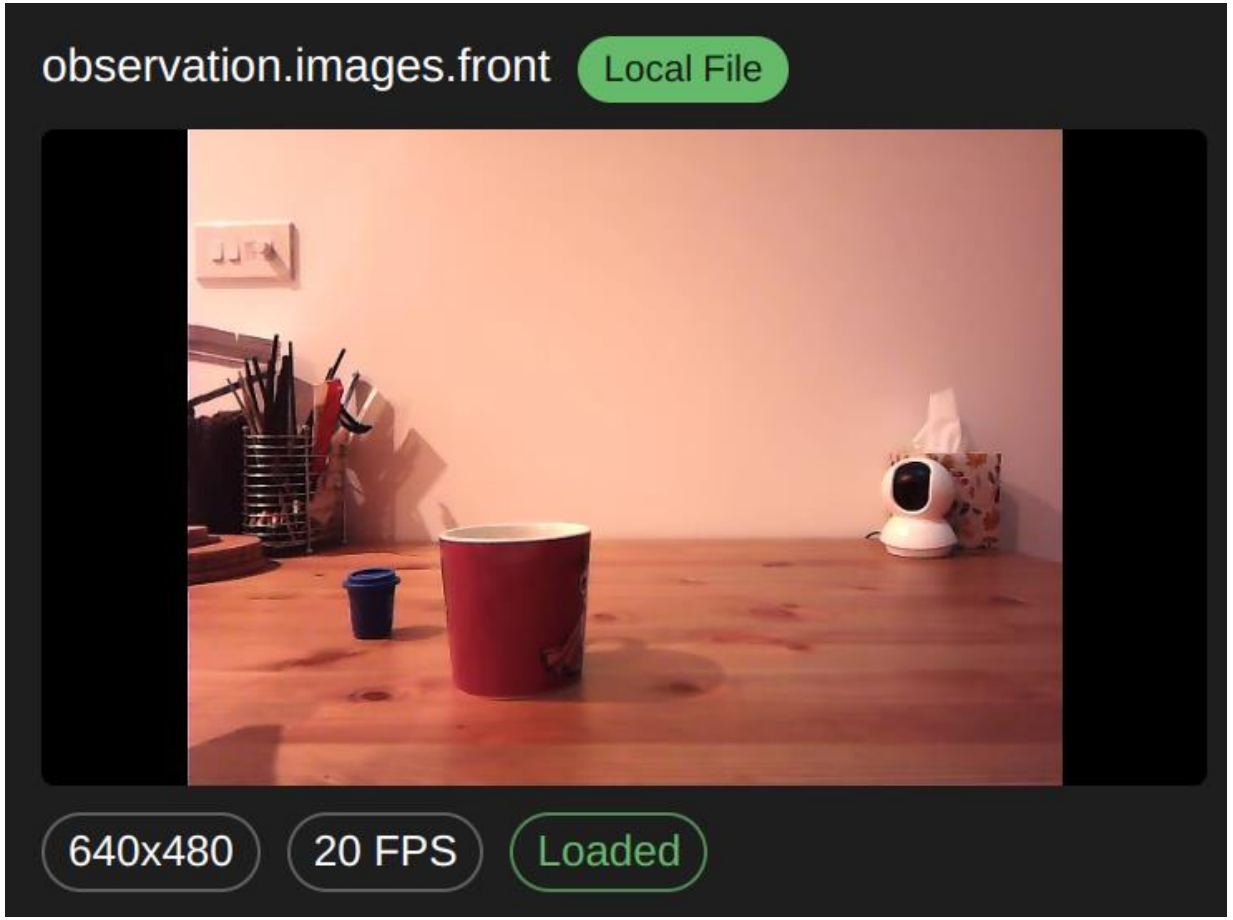
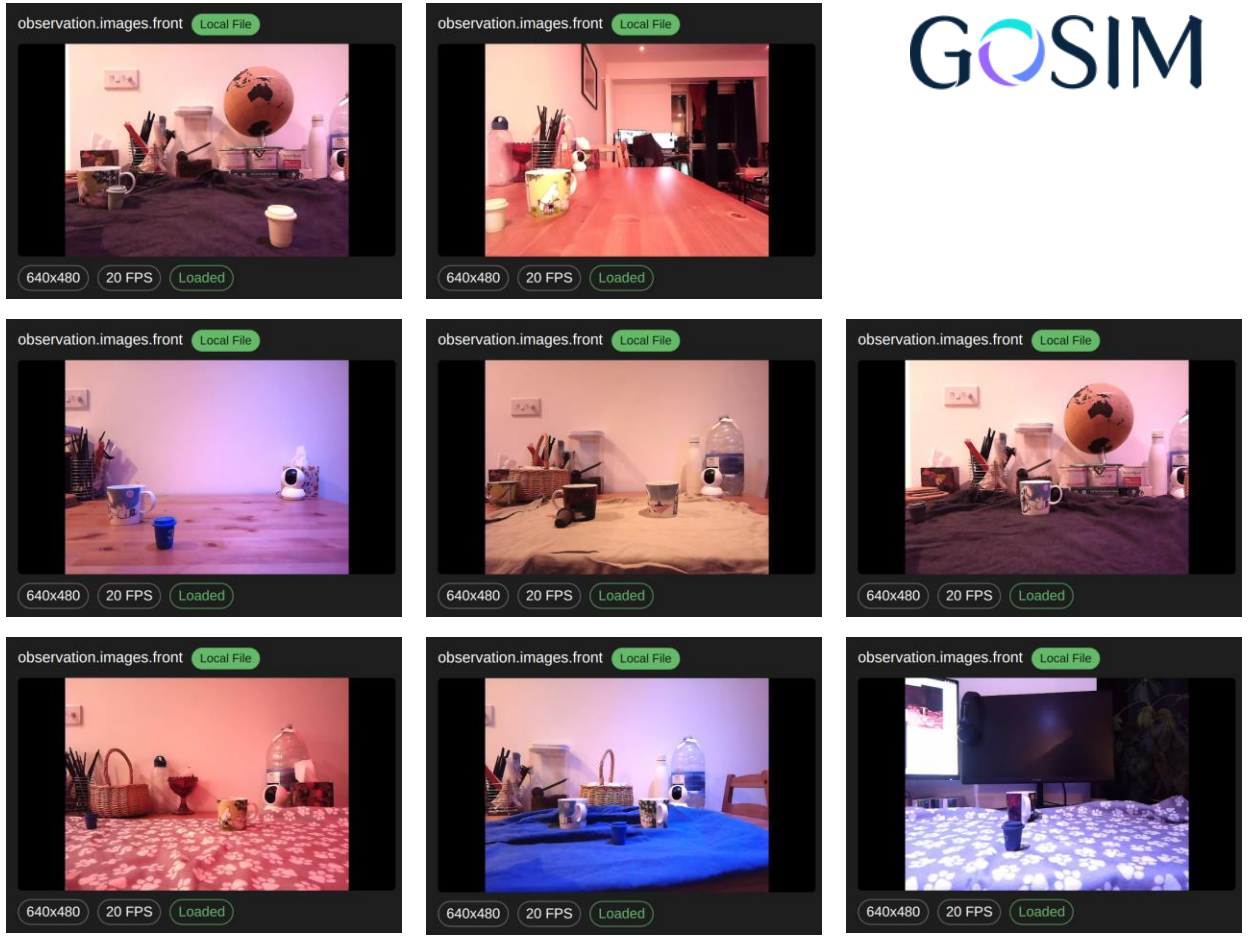
- High resolution (640 x 480 or better)
- High FPS (20 or better)
- Consistent FPS, no lag or frozen frames
- Fast movements
- Stable movements, no shaking
- Target objects visible in frames
- Human controller not visible in frames
- Wrist cameras showing manipulated object
- Not too dark

Data diversity





Metrics for dataset quality

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- Value-order correlation

[1]Google DeepMind [2]University of Pennsylvania [3]Stanford University

- Demo-SCORE

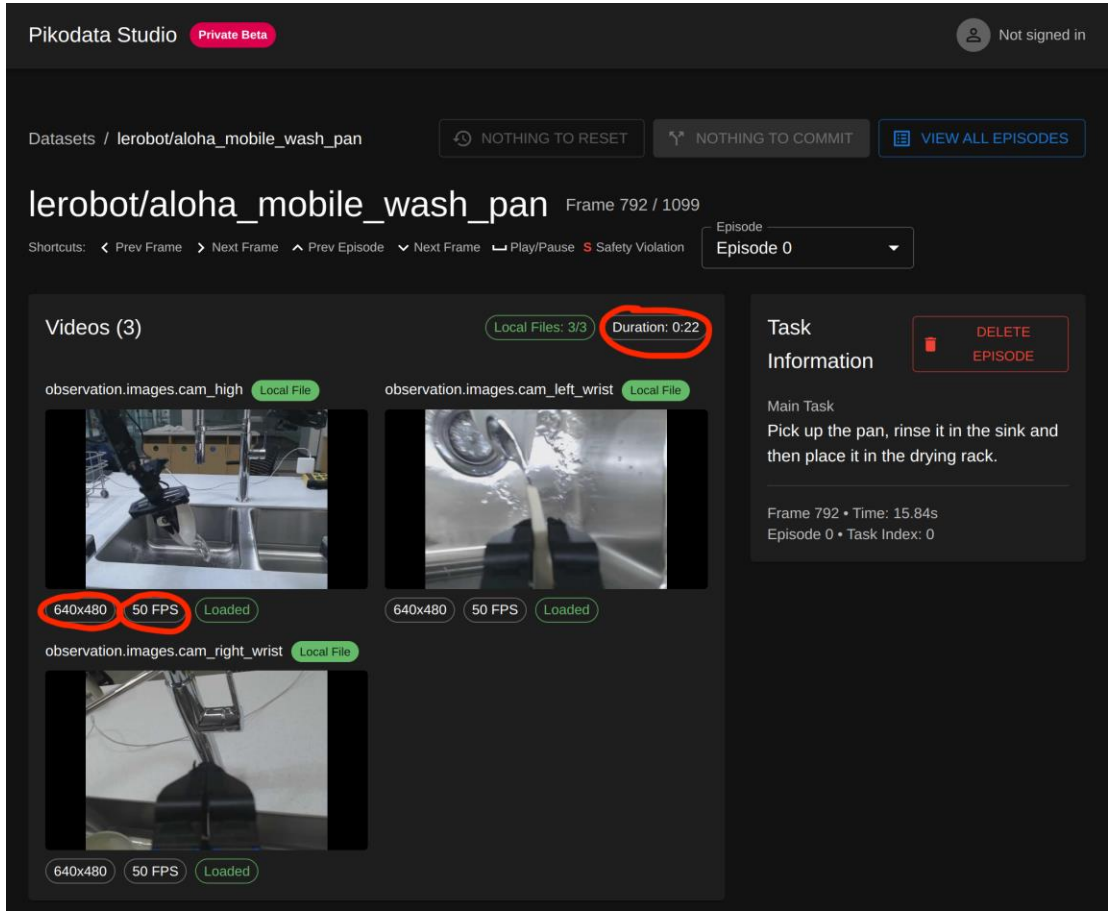
Stanford University

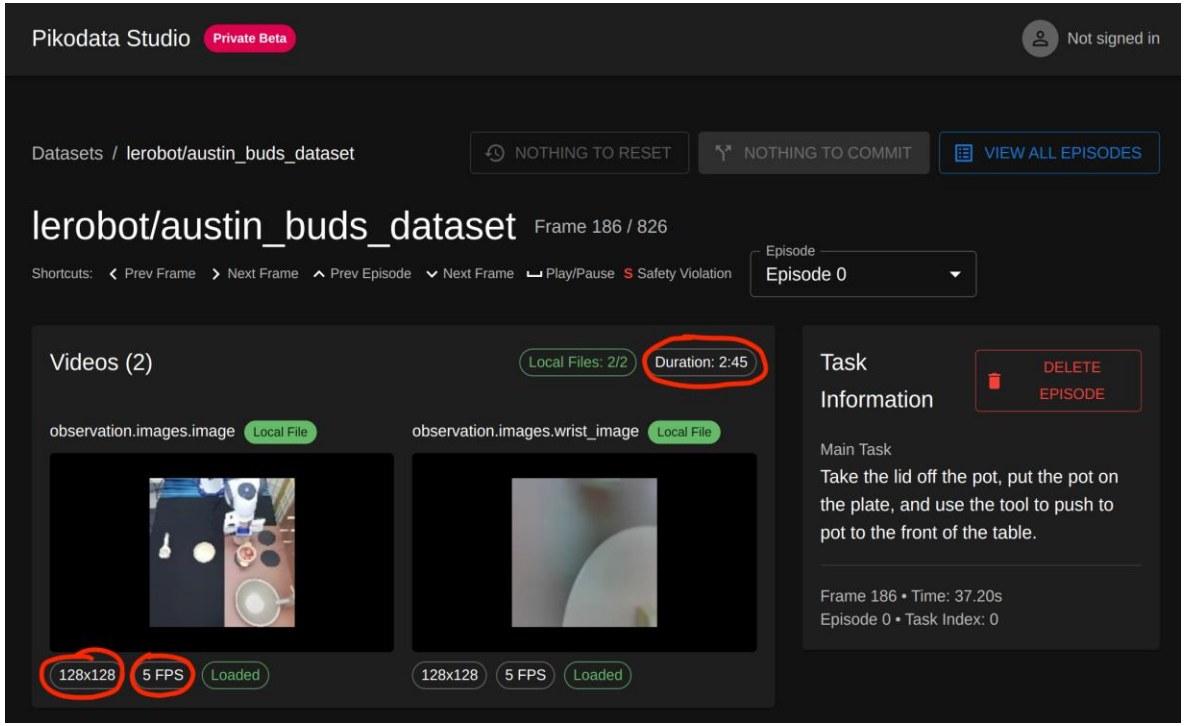
Dataset	Avg. VOC
RT-1 [5]	0.74
Dobb-E [54]	0.53
Bridge [62]	0.51
QT-OPT [28]	0.19
DROID [30]	-0.01
RoboNet [12]	-0.85

Table 1 | Average Value-Order Correlation (VOC) scores on selected OXE datasets. As shown, demonstration datasets with un-occluded camera views generally have high scores. In contrast, exploration datasets have low scores.

Robotics is a data problem

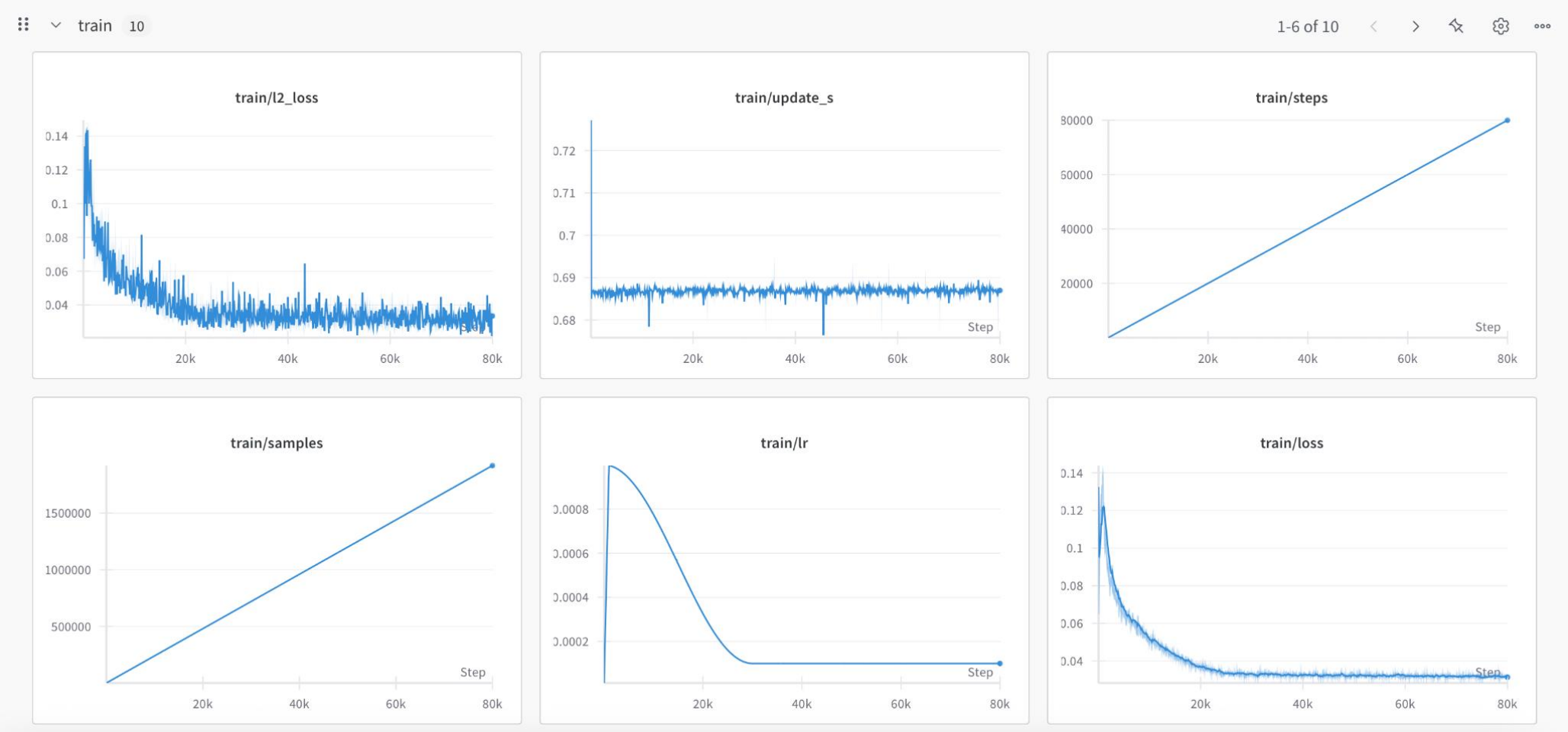
Robot data is highly valuable 🤑





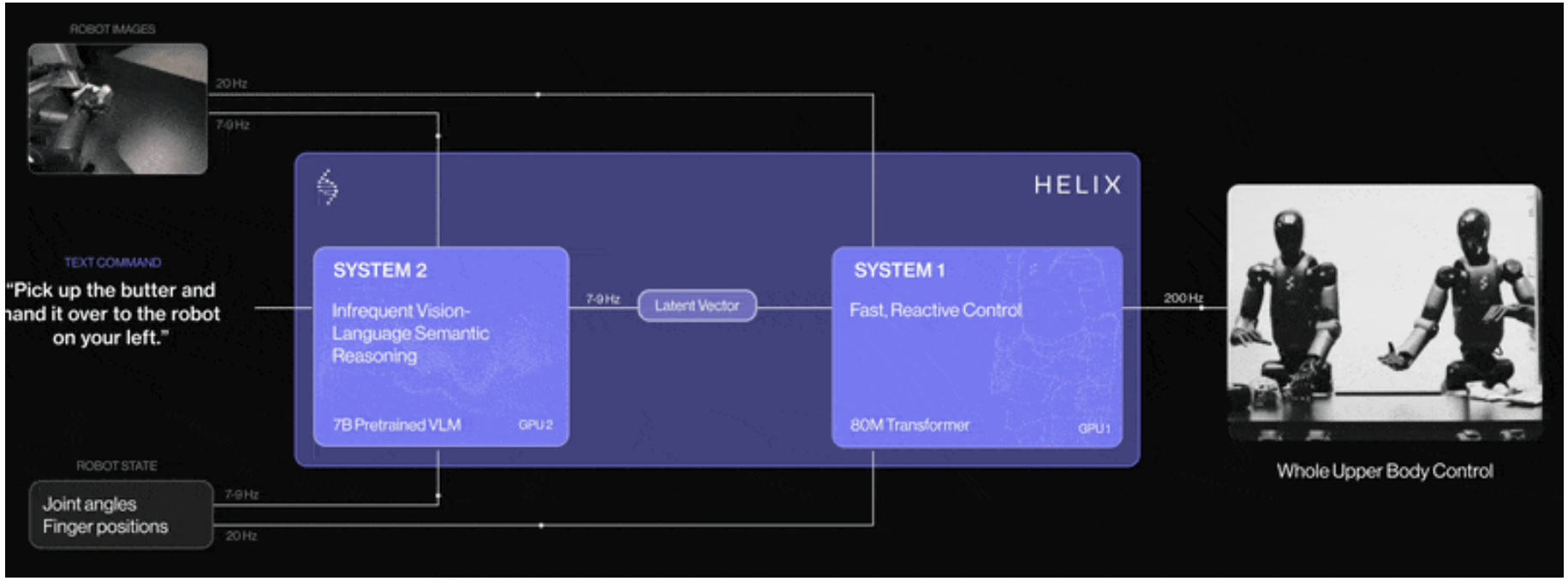
Training and inference

Training on the cloud



Inference

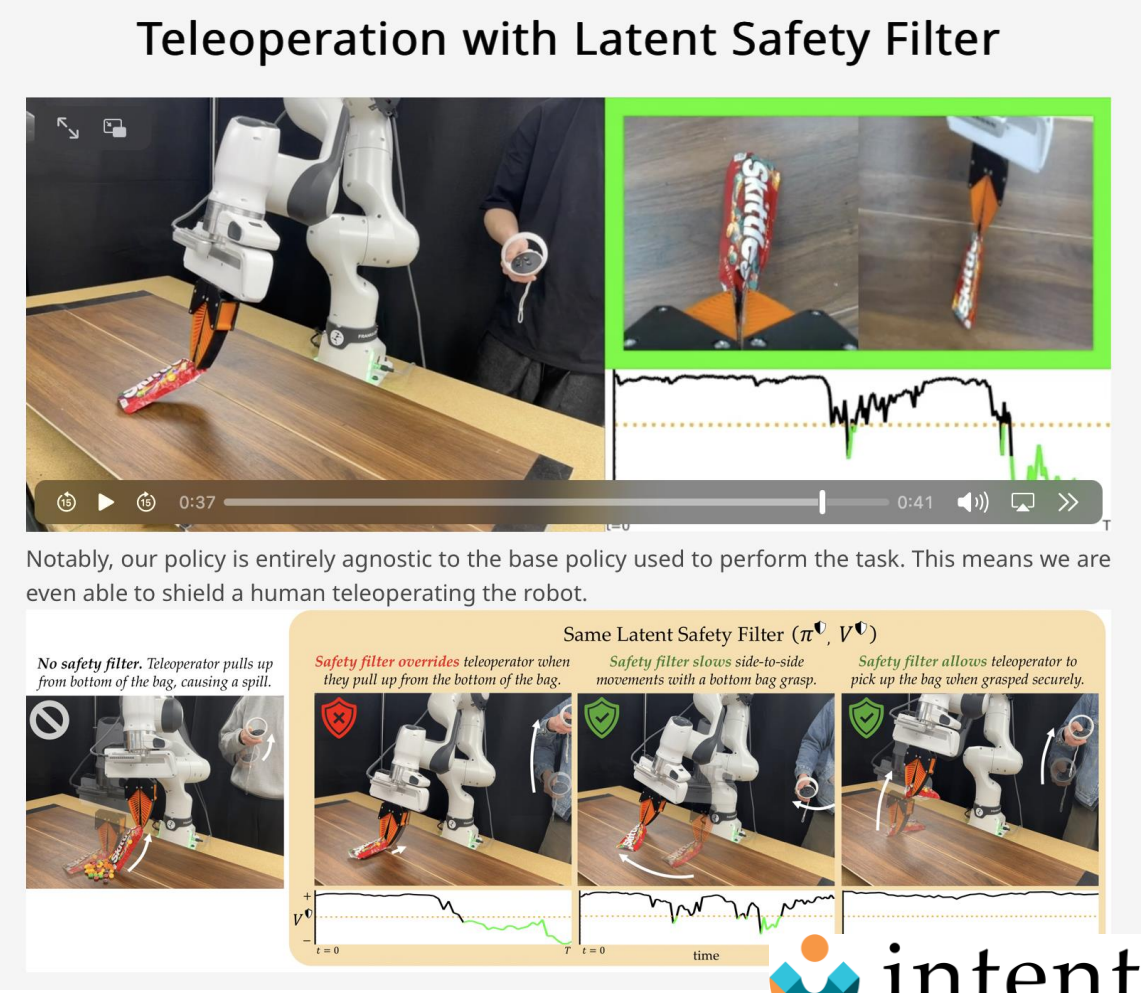
- We can ask a VLM model to prompt our VLA with a short term instruction



Pi0 demo

Supporting the VLA model

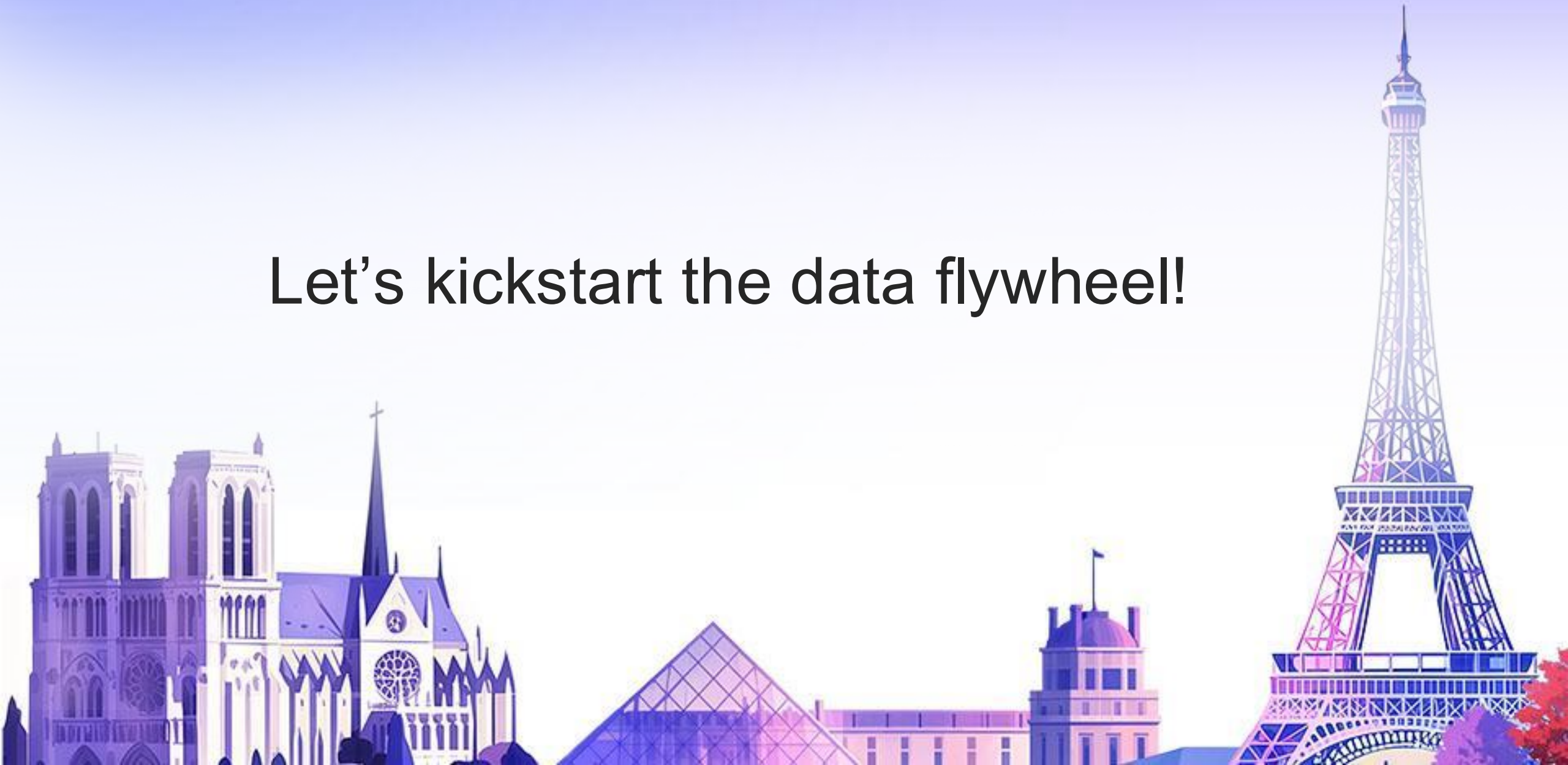
- Unable to tell when rollout is a success or failure
  - Use VLM to detect success / failure
- Safety and error detection
  - Augment imperfect model with human interventions



Verdict

- All major components of the VLA stack are open source
- Your job is to combine them
  - “Robotics is an integration problem”
- Real deployments produce real data…

Let’s kickstart the data flywheel!



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THANK YOU