Real-World Humanoid Control with Transformers

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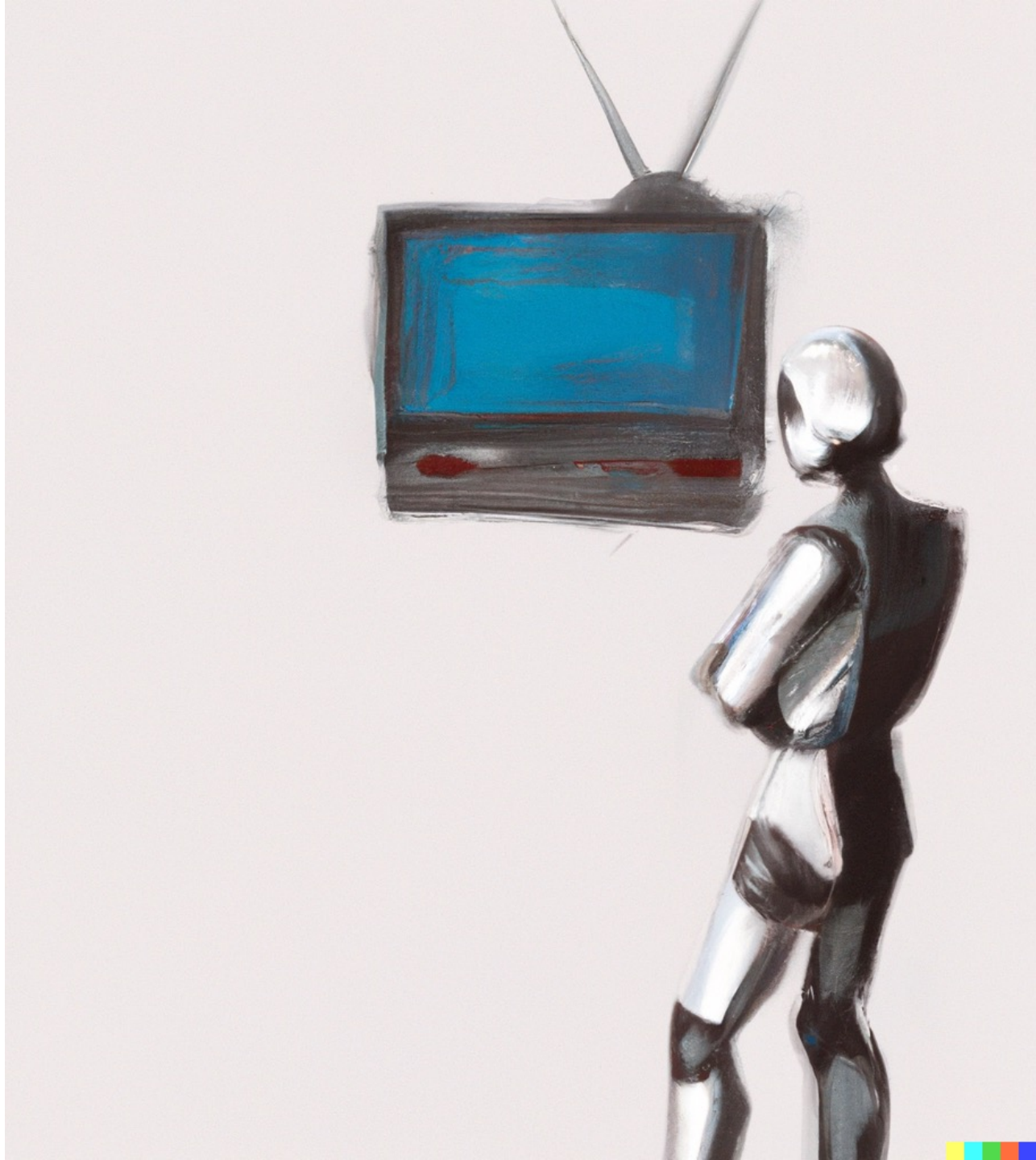
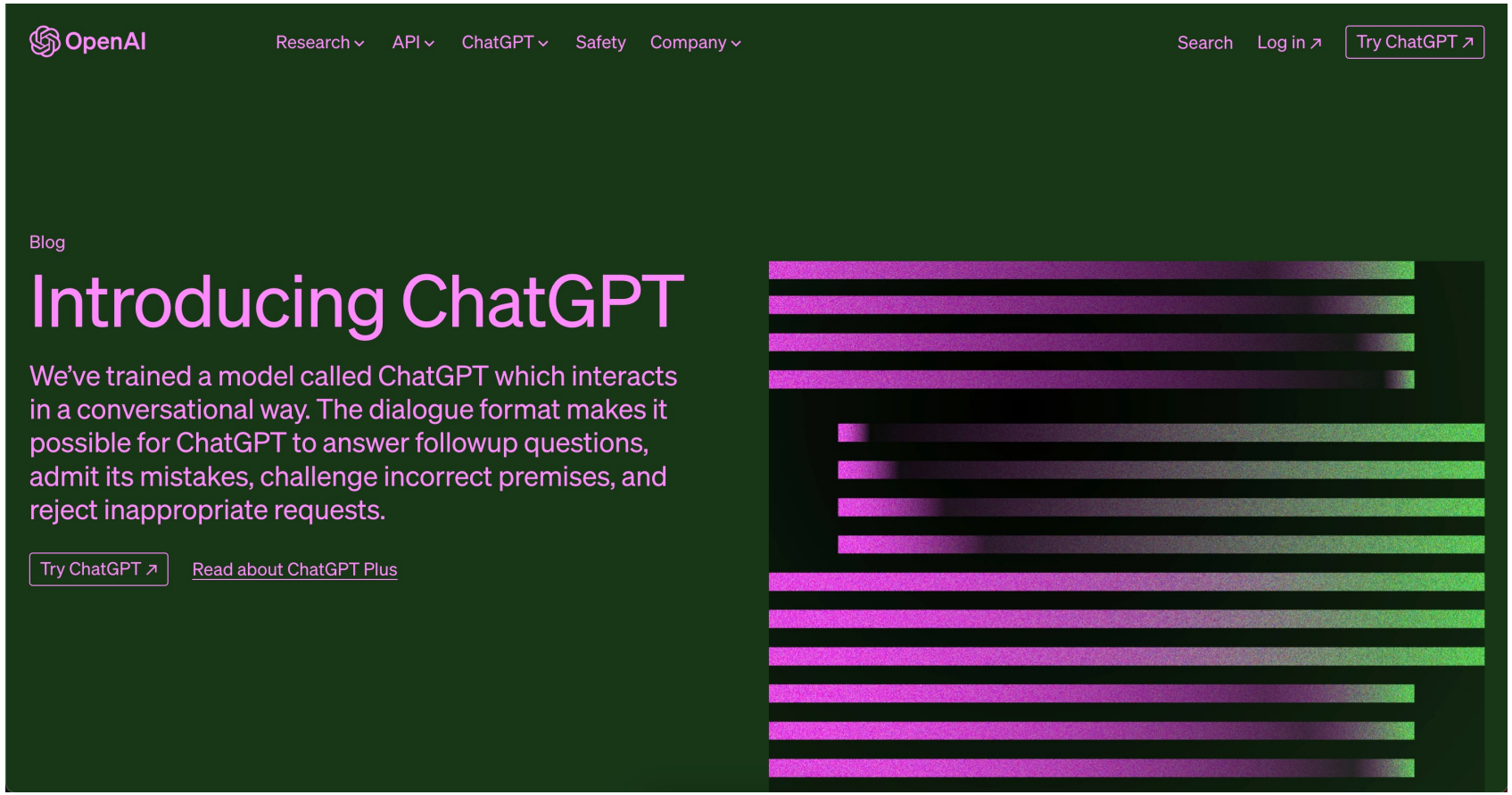


Digital AI is changing the world



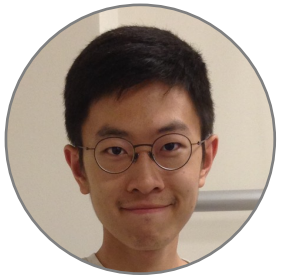
Real-World AI will even more so

What might it look like?

How do we get there?

Real-World Humanoid Locomotion with Reinforcement Learning



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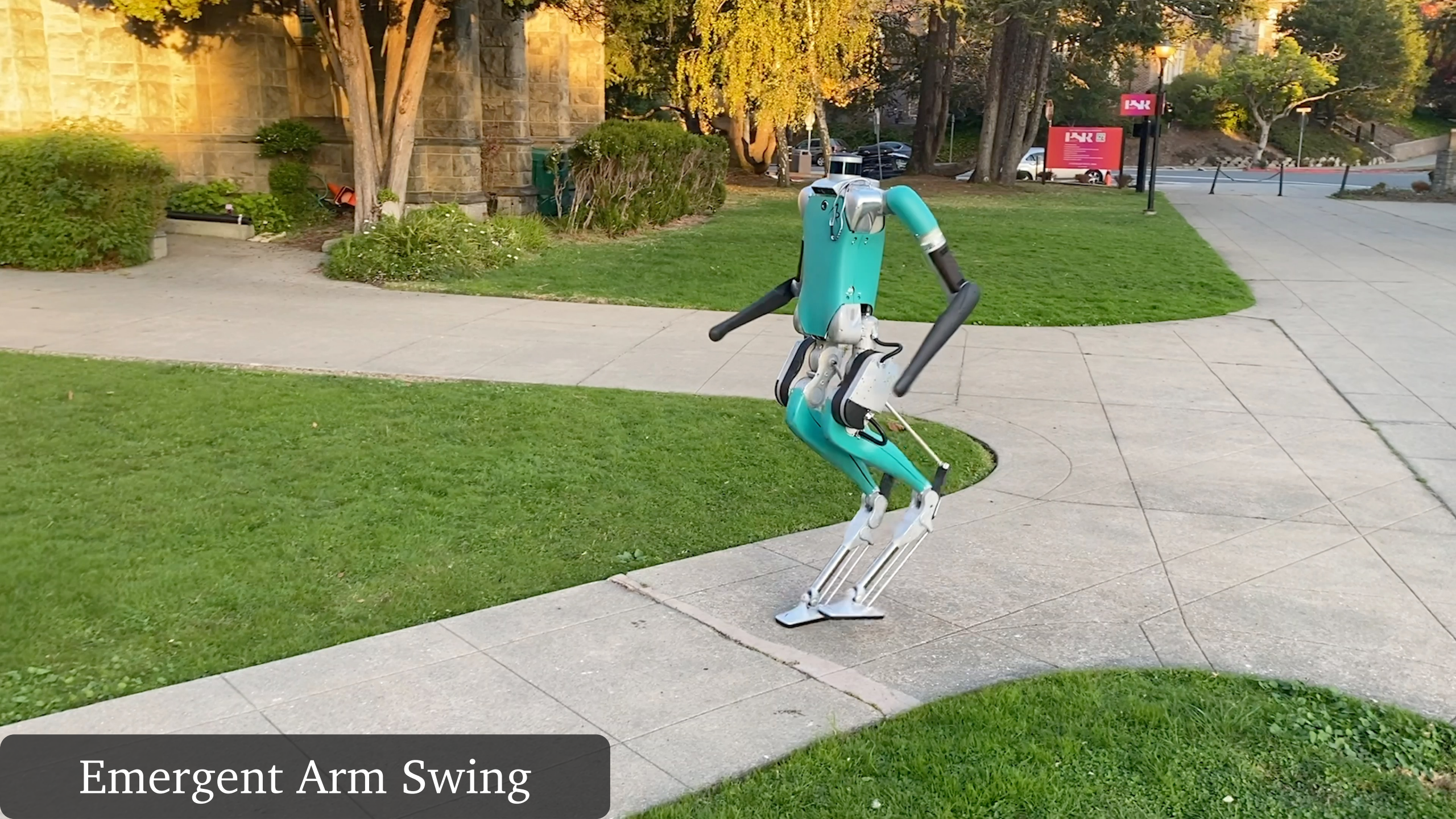
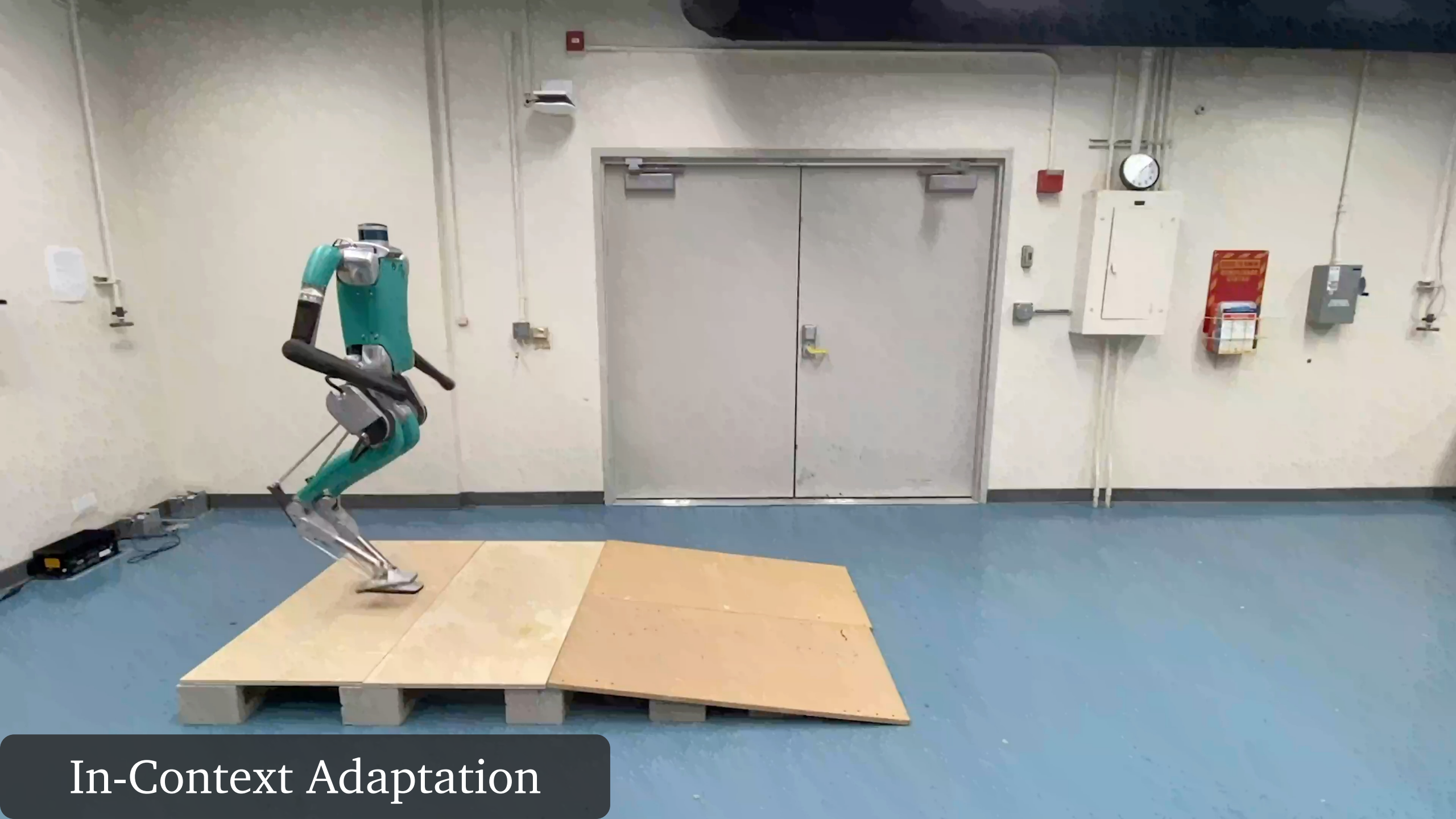
Humanoid Control with Transformers

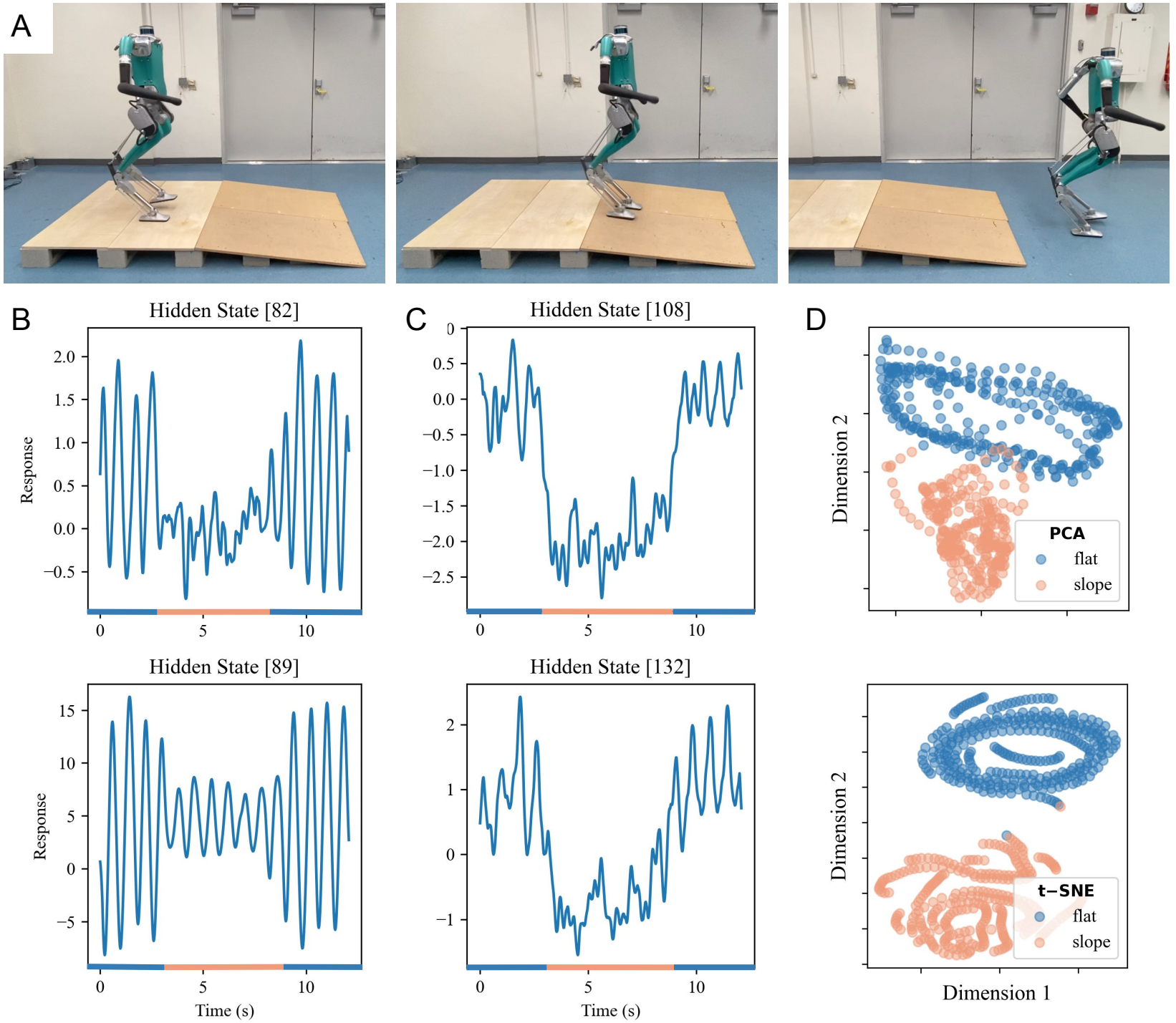

Massively Parallel Training in Simulation


Zero-Shot Transfer to the Real World

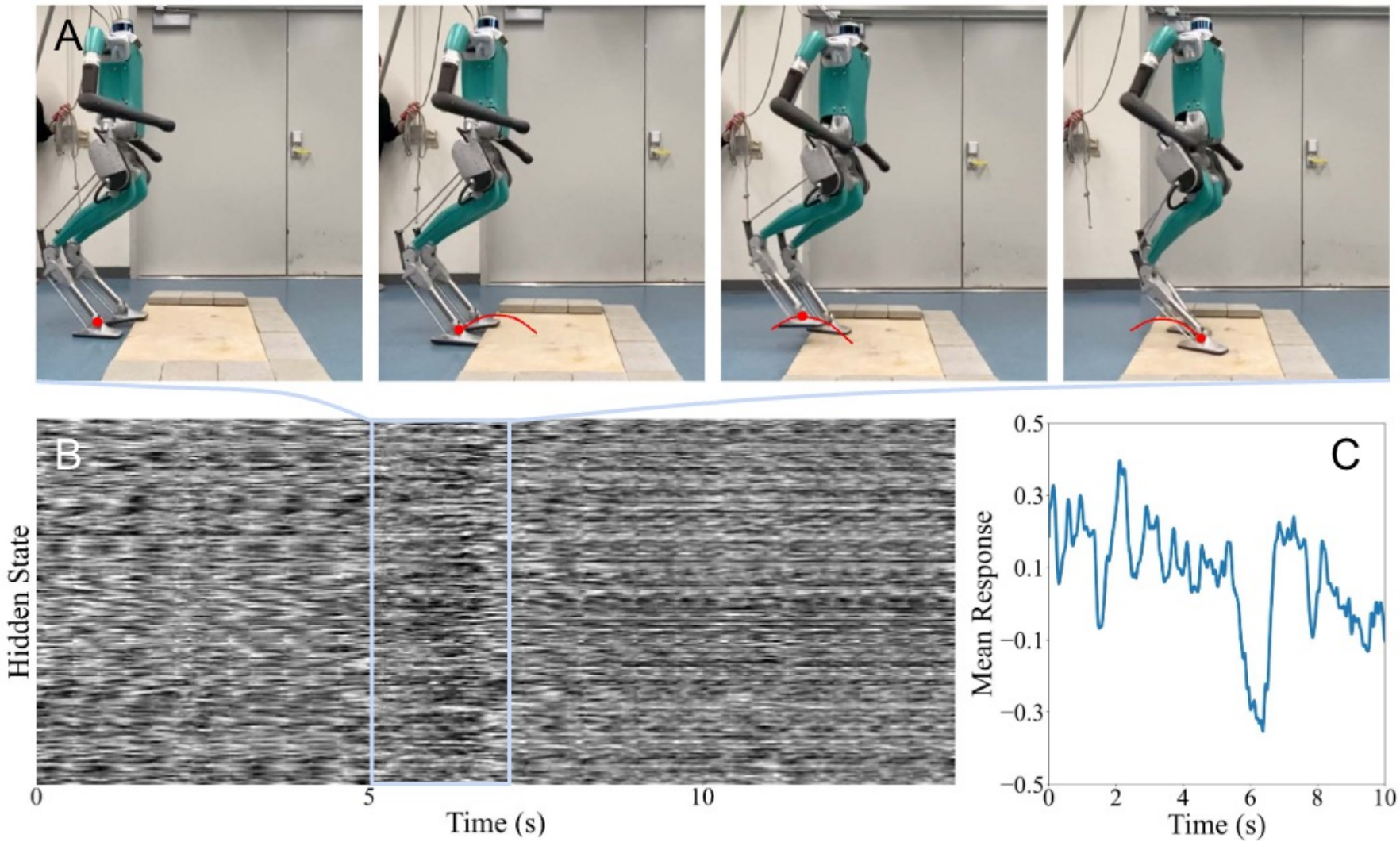
Omnidirectional Walking

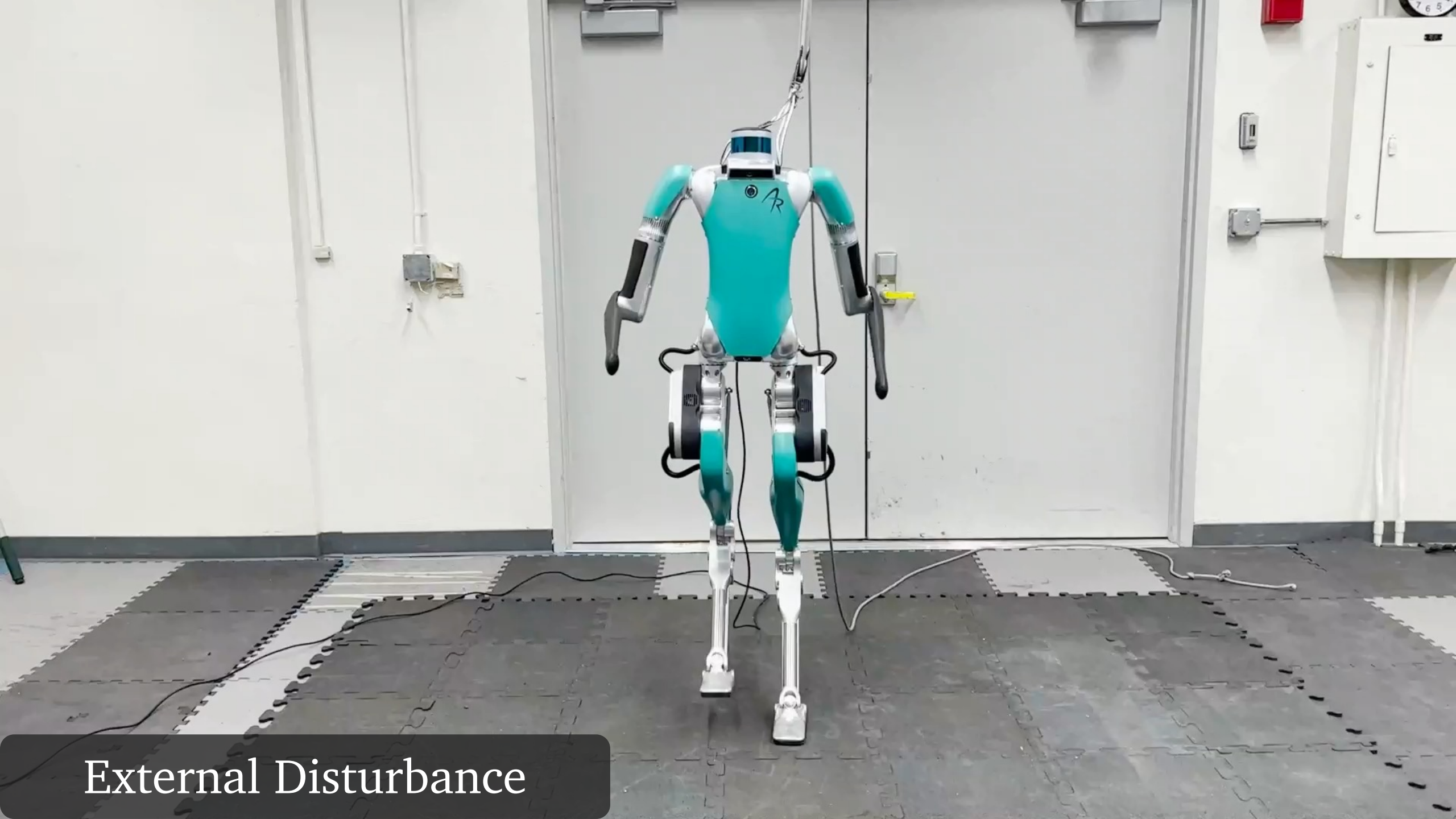

Emergent Arm Swing


In-Context Adaptation


A
B
Hidden State [82]
Response
C
Hidden State [108]
D
Dimension 2
PCA
flat
slope
Hidden State [89]
Response
Hidden State [132]
Time (s)
Time (s)
Dimension 2
t−SNE
flat
slope
Dimension 1


Foot-trapping Recovery


A
B
C
Hidden State
0
5
10
Time (s)
Mean Response
0.5
0.3
0.1
−0.1
−0.3
−0.5
0
2
4
6
8
10
Time (s)


External Disturbance

Takeaways

1. A fully learning-based approach
2. Massively parallel training in simulation
3. In-context adaptation with Transformers
4. Zero-shot transfer to the real world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