DAgger and HG-DAgger

HG-DAgger: Interactive Imitation Learning with Human Experts

Michael Kelly, Chelsea Sidrane, Katherine Driggs-Campbell, Mykel J. Kochenderfer · Stanford / UIUC · ICRA 2019



A Reduction of Imitation Learning and Structured Prediction to No-Regret Online Learning

Stéphane Ross, Geoffrey J. Gordon, J. Andrew Bagnell · CMU · AISTATS 2011

Pavel Bushuyeu · University of Hawai‘i at Mānoa · November 2026

Why copying a good example can fail



Example from our household-robot project

Demo: the can is in the hand.

Missed grasp: the hand is empty.

What should the robot do now?

Mistakes create new situations

Teaching from the robot’s mistakes

Method	Who controls?	New examples
Copy demonstrations	Person does the task	Successful actions
DAgger	Robot practices	Expert answers at each step
HG-DAgger	Person takes over when needed	Only the human takeover

Practice. Correct. Keep the examples. Train again.

What each paper adds

DAgger

Collect examples where the robot gets stuck.

Keep the old examples and add corrections.

Repeat with the improved controller.

HG-DAgger

Let the person choose when to take over.

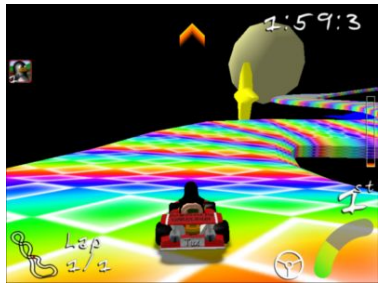
Give them full control while correcting.

Takeovers also help estimate risky situations.

Games and obstacle avoidance

DAgger: Super Tux Kart

0 falls per lap
after 15 rounds of practice



Ross et al., Section 5.1 and Fig. 2

HG-DAgger: physical car

Method	Hits	Off-road
Cloning	1	6
DAgger	1	1
HG-DAgger	0	0

First 5,000 control samples, not 5,000 separate drives.
Physical car, simulated obstacles. Kelly et al., Table II.

Useful corrections need clear control

The robot’s problem

“I missed the can.
What should I do now?”

The teacher’s problem

“When I move my hand,
does the robot follow?”

HG-DAgger gives the person full control during a correction.

Limits of the evidence

DAgger

A teacher must supply many corrections.

Practice and retraining take time.

A learning robot can make unsafe mistakes.

HG-DAgger

A person must notice trouble in time.

The real-car test was small.

No user study isolated the effect of control or delay.

A VR experiment on taking control

Does a clear handover help people teach a robot?

Try two interfaces
Person takes full control
Person shares control with the robot
Repeat with more or less delay

Measure
Did the correction work?
How long did it take?
How hard did it feel?

AI use: drafting and slide construction; claims checked against both papers.