

# Application

## Previous Work

- Counter-Strike Deathmatch with Large-Scale Behavioural Cloning

CSGO's constraints preclude mass-scale on-policy rollouts, and **demand an algorithm efficient in both data and compute**

contributions: 1) Provides a blueprint for building data and compute efficient agents for modern games. 2) Proposes a two-stage behavioural cloning approach. 3) First major work on a modern FPS game, and largest-scale behavioural cloning effort in this genre. 4) Introduces the CSGO environment, and human demonstration datasets, to the AI community.

- Counter-Strike Self-play AI Agent with Object Detection and Imitation Training

Because CS:GO is a fast speed FPS running at 45 frames per second minimum, every decision has to be made real-time for the agent to play the game successfully. Also, FPS games without API support are similar to many real world problems like auto driving cars, security systems and so on in many ways. Without access to large-scale simulations, the AI agent will only get the same information as humans when learning.

## Next Steps

- There are many directions in which our research might be extended, such as applying more advanced methods from imitation learning or offline RL, or integrating with reward-based learning. More ambitiously, there's the challenge of taking on CSGO's full competitive mode
- There are many places to improve in the future. First of all, sound is not taken into consideration by the agent today. Pro players often rely on sound to identify the enemy's position. Next, weapon switch, throw grenades and other utilities are important in real games, which the agent is not trained on today. Finally, training the agent to play 5 v 5 competitive game and learn to collaborate with teammates is both a challenging and interesting next step.

## Image Data

<https://universe.roboflow.com/tim-dantzig-33xil/cs2-derjn/images/M6NI2009maGXMs4VrqqG?queryText=&pageSize=50&startIndex=0&browseQuery=true>

```
flowchart LR
  subgraph nextsteps
    subgraph competitive mode as the goal
      n1(team collaboration & communication)
      n2(utilities like smoke and moli)
      n4(pre-aim)
      n5(prediction on enemy position)
      n3(sound variable)
    end
    end
    subgraph how to
      n6(more training - larger scale) --> n6.1(pro-demos)
      n7(better algorithms) --> n7.1(imitation learning )
    end
    end
  end
```