

Cornhole: A Widely-Accessible AI Robotics Task

Nate Derbinsky

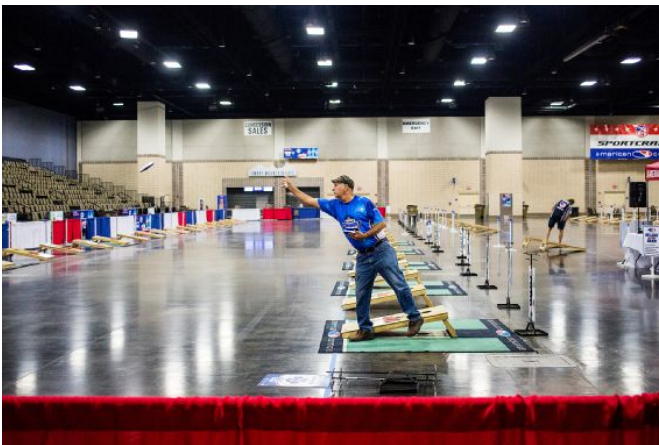
Wentworth Institute of Technology

Tyler M. Frasca

Tufts University



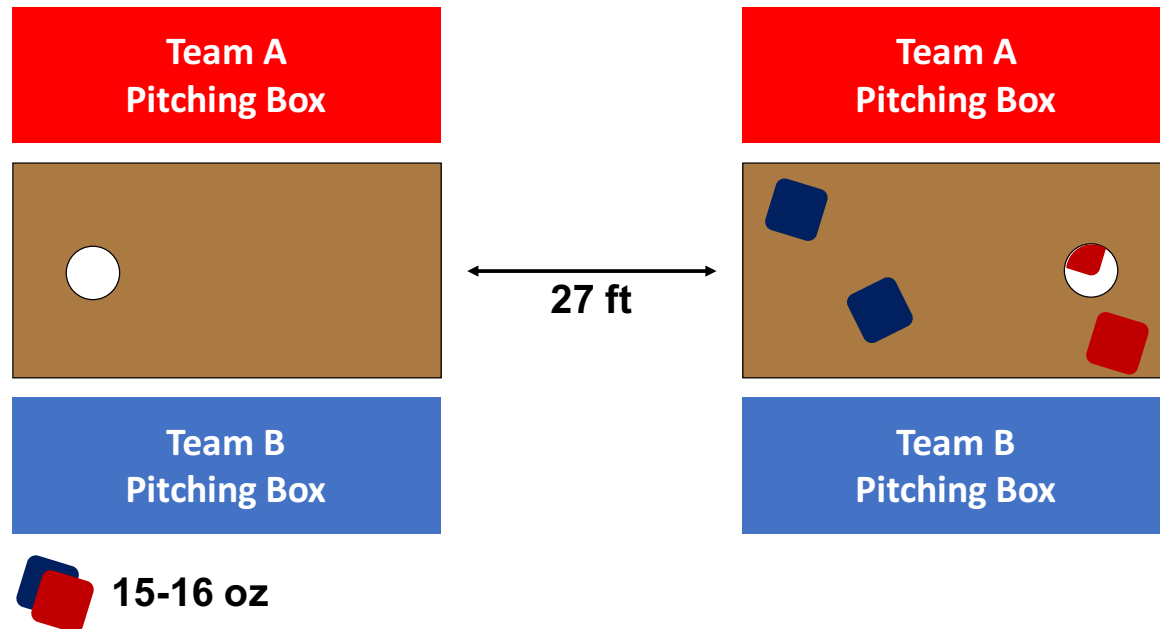
What is Cornhole?



- Players take turns throwing bean bags at angled platforms
- Typically casual, growing competitive presence
 - Amateur board: \$15-60
- **Challenge:** build a robot that can play!



Rules



Alternate throws, score after all bags tossed

- On board (“woody”): 1 point
- Through hole (“cornhole”): 3 points
- Highest scoring team gets difference of scores; first to 21



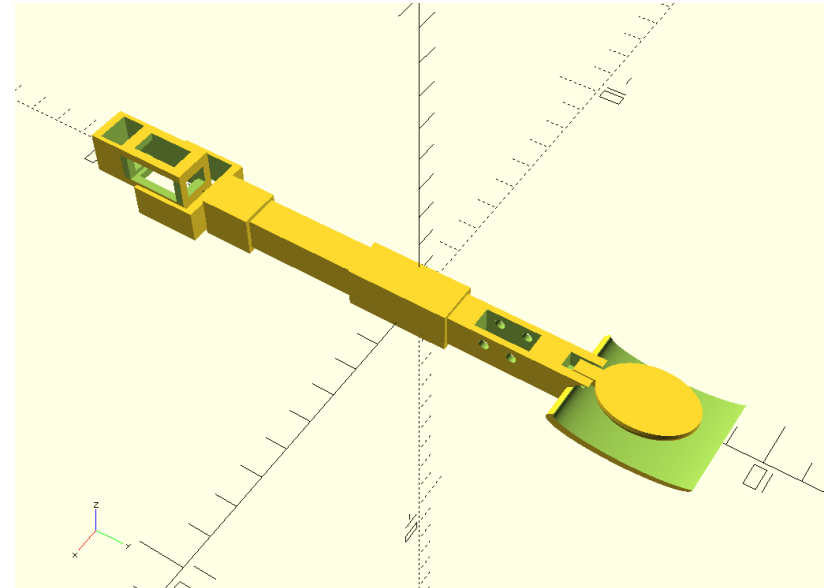
AI Challenges & Progress

- **State estimation**
 - 198-image annotated dataset
 - Automatic Score Keeper (AAAS '17)
- **Robotic Actuation**
 - CHUCK (STL + servos, Arduino + Java client)
- **Environmental/Action Modeling**
- **Decision Making**
- **Adaptation**
 - CHUCK RL (learn distance via TD)



CHUCK

- 3D printed arm
 - 3 servos, Arbotix-M
 - 5-7 ft. range
 - \$200-300 total parts
- Arduino code for serial command interface
 - graspBeanBag
 - throwBeanBag
 - rotateArm
- Start of learning via RL



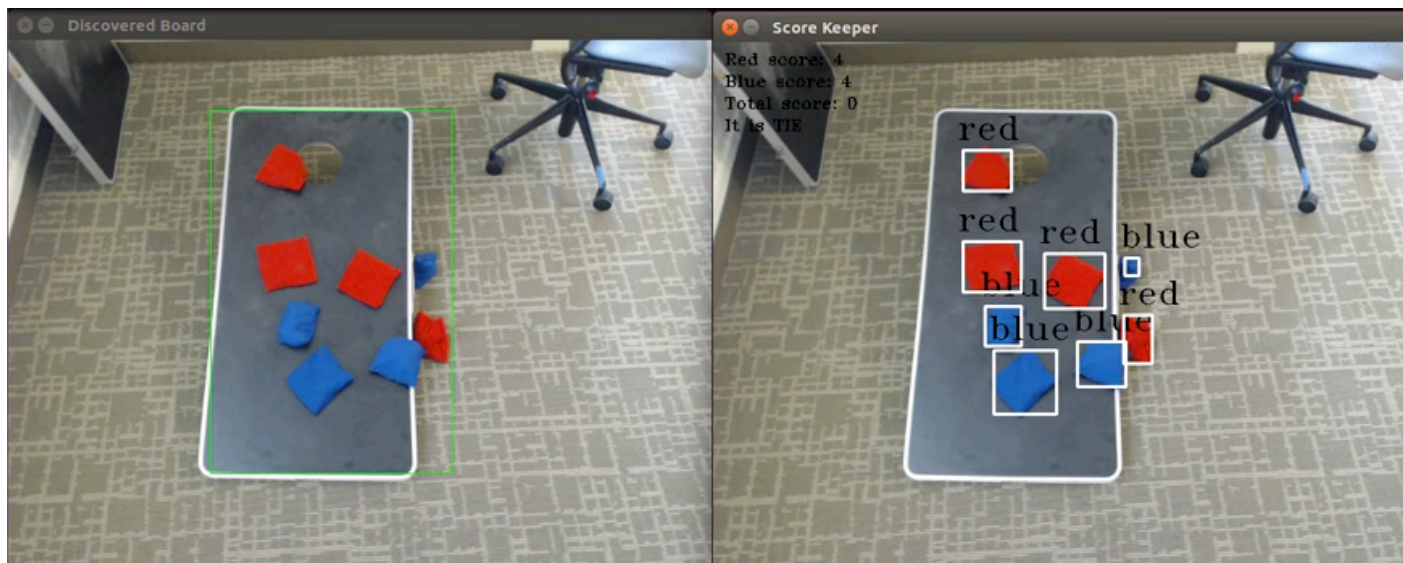
Vision Dataset

- 198 images
- Annotated via JSON
 - Bean Bags
 - AABB
 - Color
 - Off/On/In
 - Board
 - AABB
 - Hole location/radius
- C++ tool for capturing/annotating more images



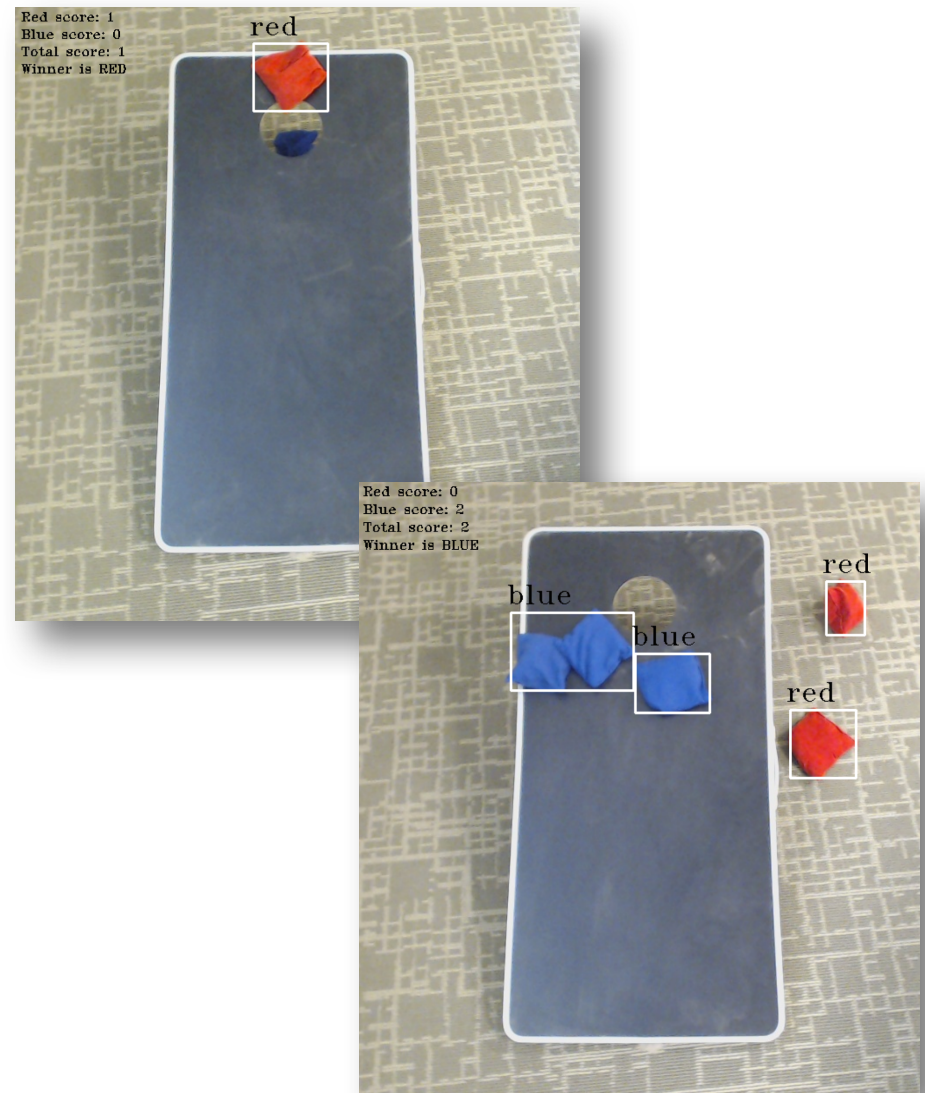
Automatic Score Keeper (AAAS '17)

- OpenCV pipeline for static images
 - 90% color
 - 85% location
- Works with video, motion-detection for scoring a round



Future Plans

- 3D simulator
- Tournament support
 - Bring your own agent!
- Gameplay dataset



Thank You :)
Questions?

<https://github.com/cornhole>

