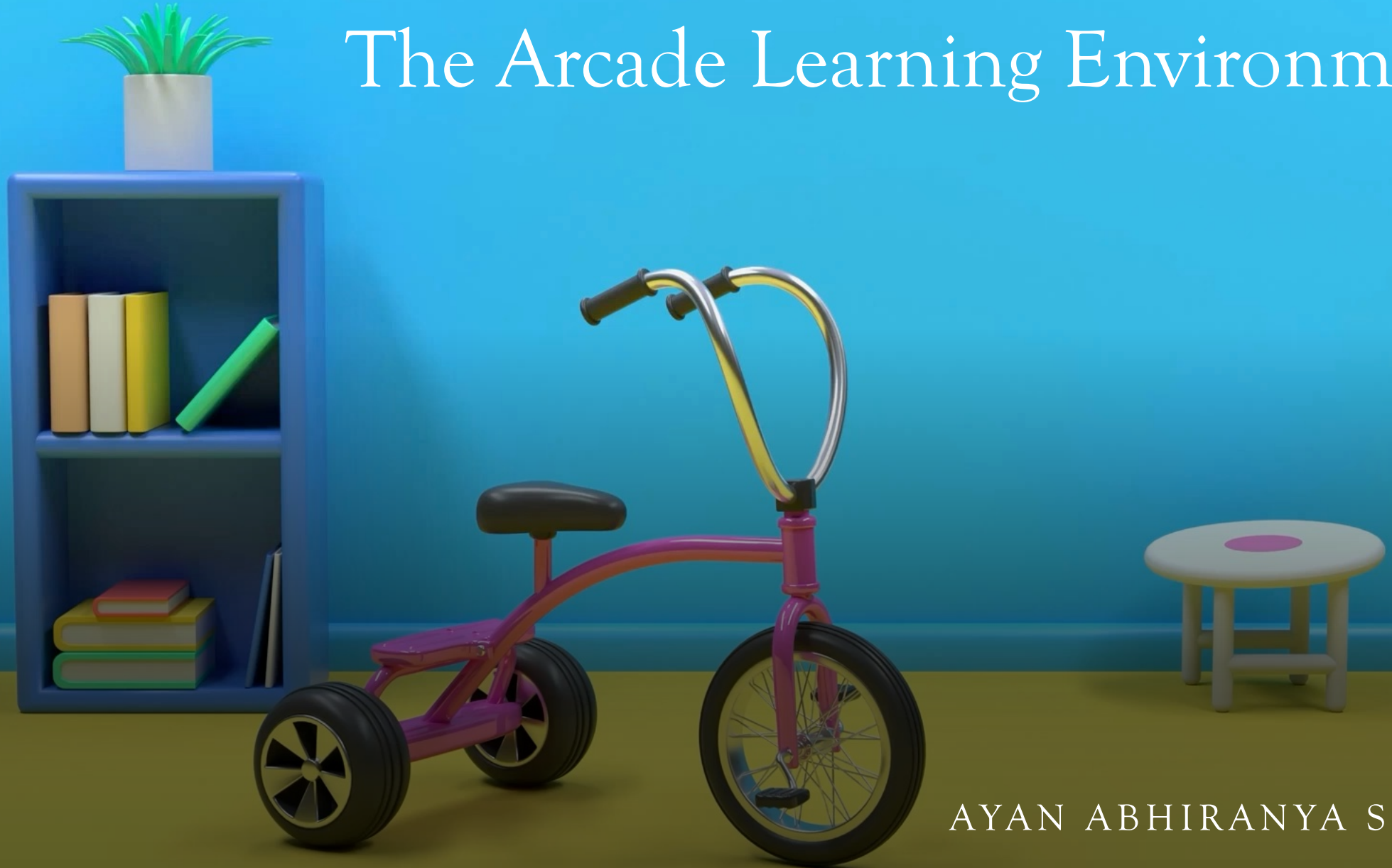# The Arcade Learning Environment

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CS 297

What is the ALE?

The Arcade Learning Environment (ALE) is a framework that enables the development of AI agents for Atari 2600 games.

It is built on top of the Atari 2600 emulator Stella.

There are currently over 50 games currently supported in the ALE.

Stella

- Stella is a multi-platform Atari 2600 VCS emulator released under the GNU General Public License (GPL).

- Originally developed for Linux.

- Has since been ported to other operating systems such as AcornOS, AmigaOS, DOS, FreeBSD, IRIX, OS/2, MacOS, Unix, and Windows.

- Development is still ongoing to perfect the emulator.

More on ALE...

Emulation core uncoupled from rendering and sound generation modules for fast emulation with minimal library dependencies.

Automatic extraction of game score and end-of-game signal for more than 100 Atari 2600 games.

Multi-platform code (compiled and tested under macOS, Windows, and several Linux distributions).

Python bindings through pybind11.

Native support for OpenAI Gym.

Visualization tools.

Python Integration

A deep learning agent, built using the ALE and OpenAI on Python, playing Space Invaders on Stella.

- Install the ale-py package distributed via PyPI:

  pip install ale-py

- Import the ALE in your Python projects with

  from ale_py import ALEInterface

  ale = ALEInterface()

ROM Management

The ALE **does not** distribute ROMs.

OpenAI Gym Integration

- Gym is an open-source Python library for developing and comparing reinforcement learning algorithms by providing a standard API to communicate between learning algorithms and environments.

- Gym's API has since become the field standard for doing this.

- For example, we used env.render() for our version of the FrozenLake environment for deliverable 2.

- To install the base Gym library, use pip install gym.

- To install dependencies for the Atari family of environments, use pip install gym[atari] or use pip install gym[all] to install all dependencies.

- Create the Atari game environment like so –

  env = gym.make('SpaceInvaders-v0')
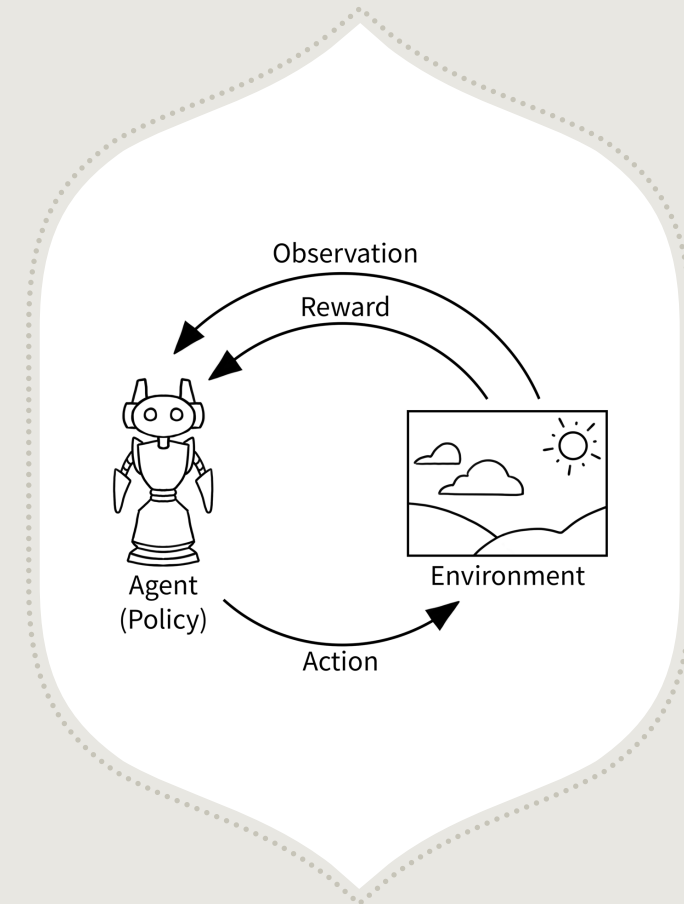
References

- [1]   M. G. Bellemare, Y. Naddaf, J. Veness and M. Bowling. The Arcade Learning Environment: An Evaluation Platform for General Agents, Journal of Artificial Intelligence Research, Volume 47, pages 253-279, 2013.

- [2]   G. Brockman et al., "Openai gym," 2016.

- [3]   https://chloeewang.medium.com/using-deep-reinforcement-learning-to-play-atari-space-invaders-8d5159aa69ed