# FIRE: THE FIRST-YEAR INNOVATION & RESEARCH EXPERIENCE
## CAPITAL ONE MACHINE LEARNING

# Simulated Autonomous Self-Driving with Deep Reinforcement Learning
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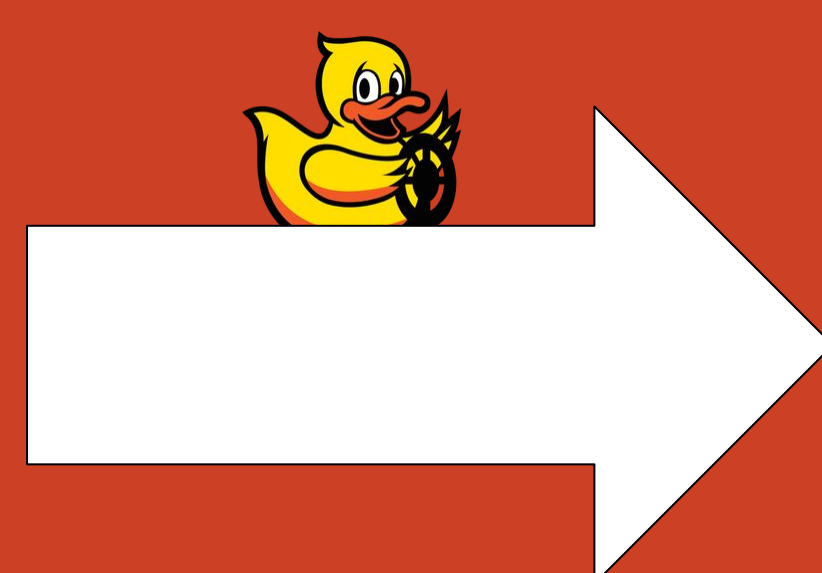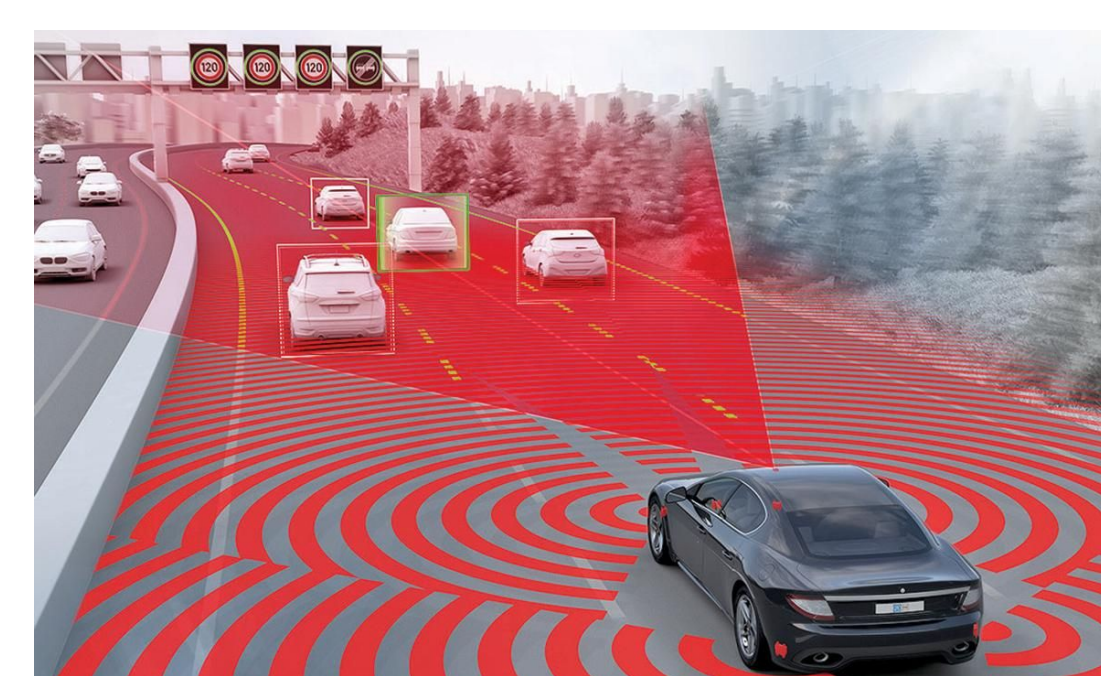
## The Challenge

Train a virtual autonomous vehicle

Deploy in robotic environment



## Reinforcement Learning (RL)



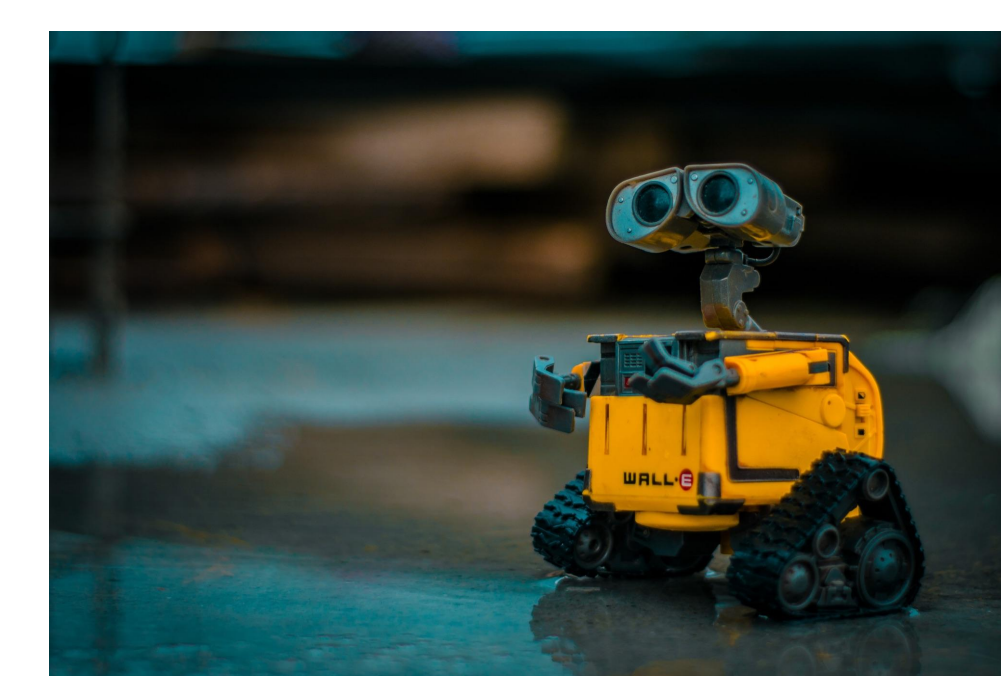State

**1.5** Reward

Agent

Environment

Action $\hat{\mathbf{v}}$
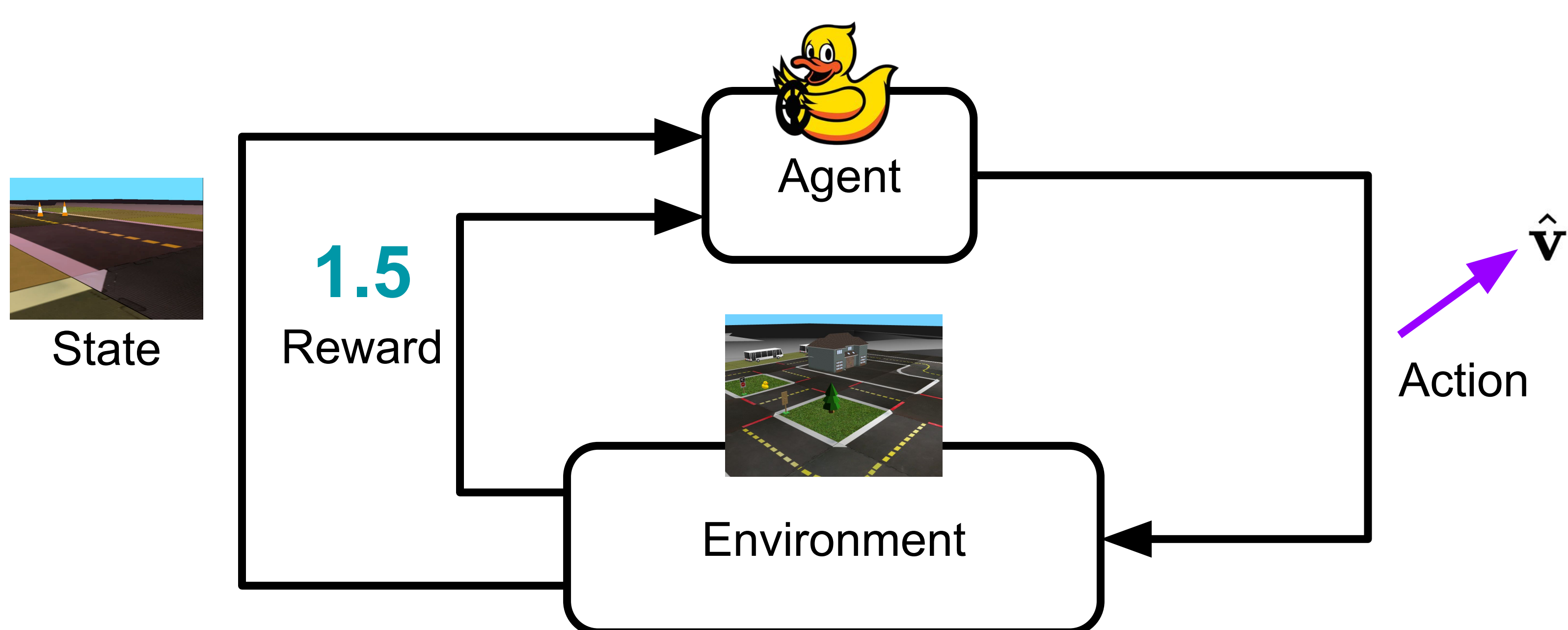
### Applications



Autonomous Driving

Game Playing

Robotic Navigation

## Model Architecture



A Virtual Duckietown Driver View

Driver View Encoder

High-Level Features

Deep RL Model → $\vec{v}$

Agent Action

Identity Decoder → Image Reconstruction

Segmentation Decoder → Segmentation Map, Bounding Boxes

Depth Decoder → Depth Map
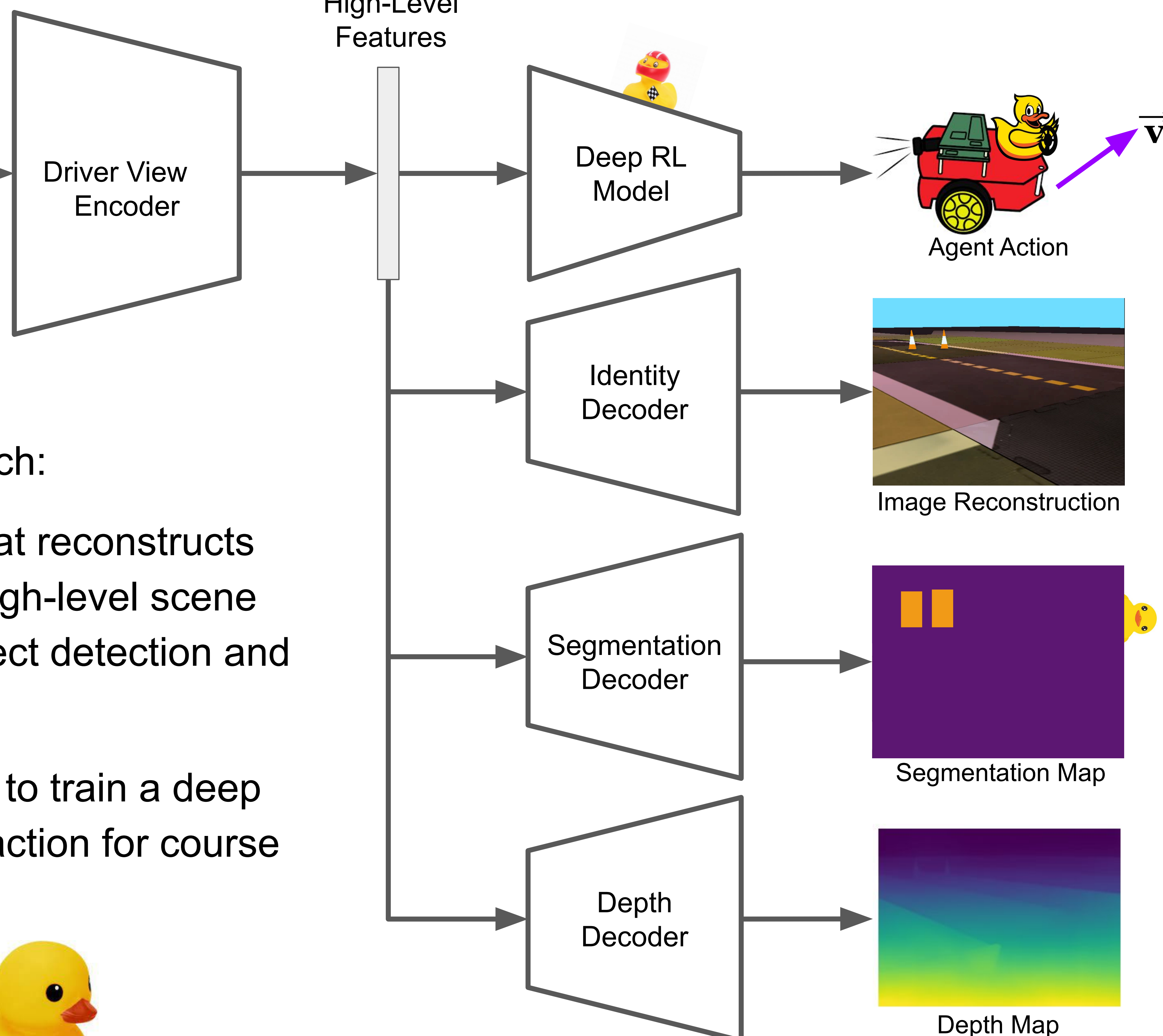
We present a two-step approach:

1. Pretrain an autoencoder that reconstructs the driver view input with high-level scene understanding such as object detection and depth estimation.

2. Use the high-level features to train a deep RL model to take the best action for course nativation.