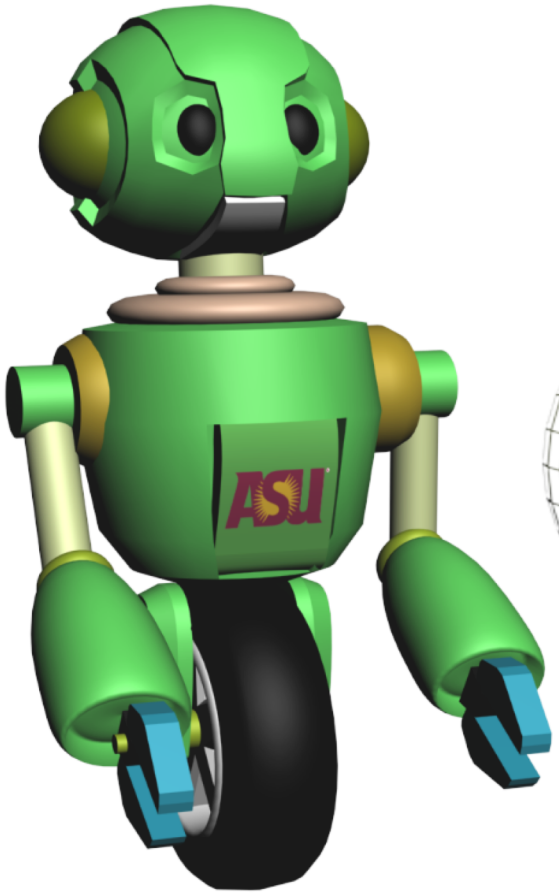
Neural Network In Practice

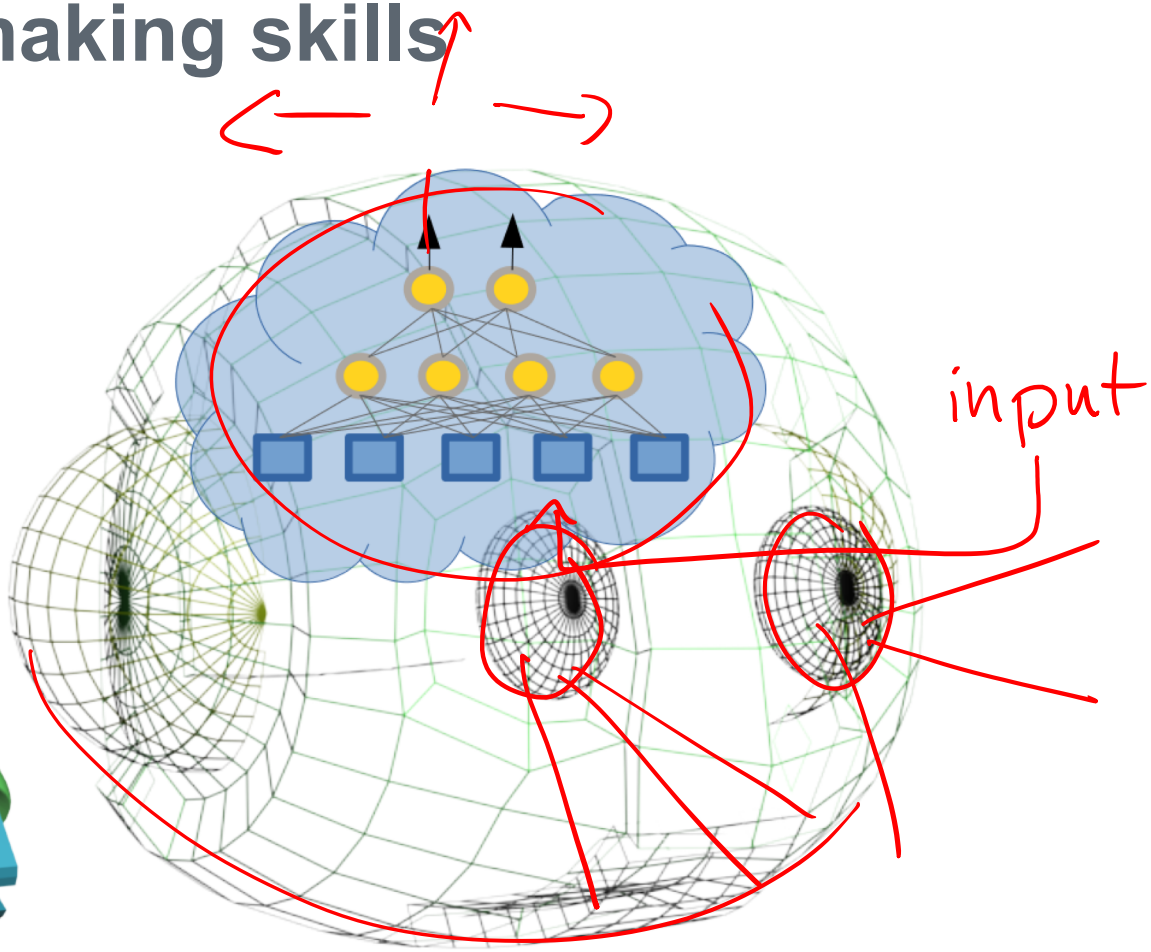
Heni Ben Amor, Ph.D.
Assistant Professor
Arizona State University

Ira A. Fulton Schools of Engineering
Arizona State University

Neural Networks for Robot AI

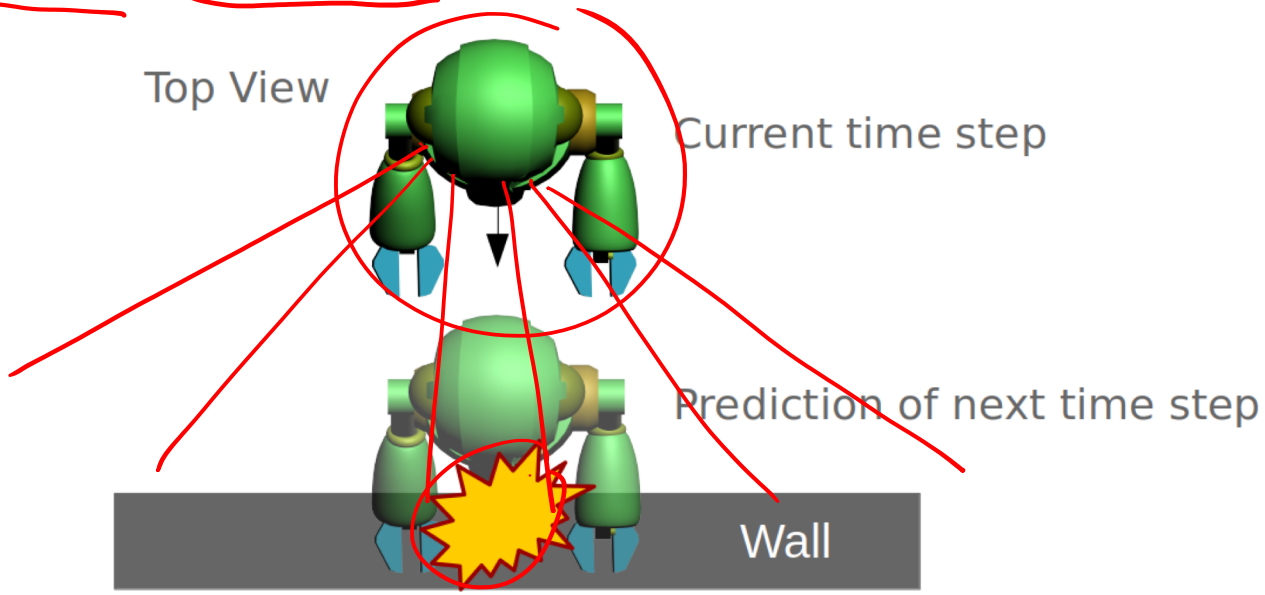
- We can train ANNs to impart the robot with decision-making skills





Example 1: Learning to Predict Collision

- **Example task for deep learning in robotics**
- **Learning a predictive model of collisions**
- **Input to neural network: distance sensor values**
- **Output of neural network:**
  {collision, !collision}

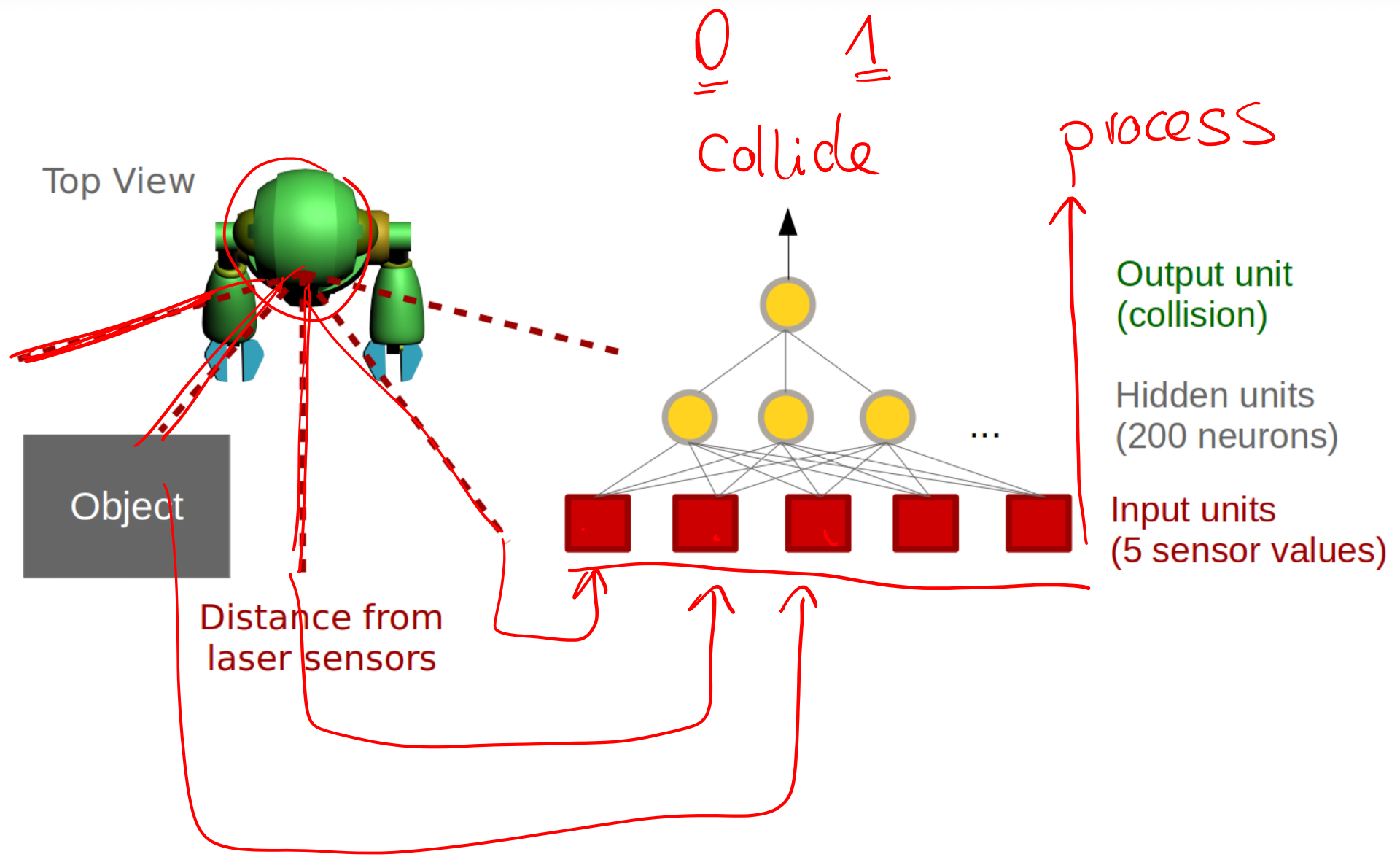


Example 1: Creating the Network

- **Our goal:** Predict collisions before they occur
- **Input to neural network:** distance sensor values
- **Output of neural network:**

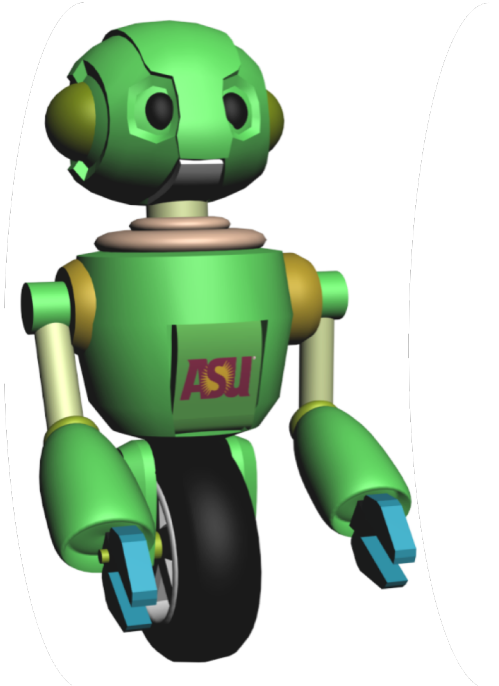
  {collision, !collision}
- **Network output will be in the range** [0..1]

Example 1: Creating the Network

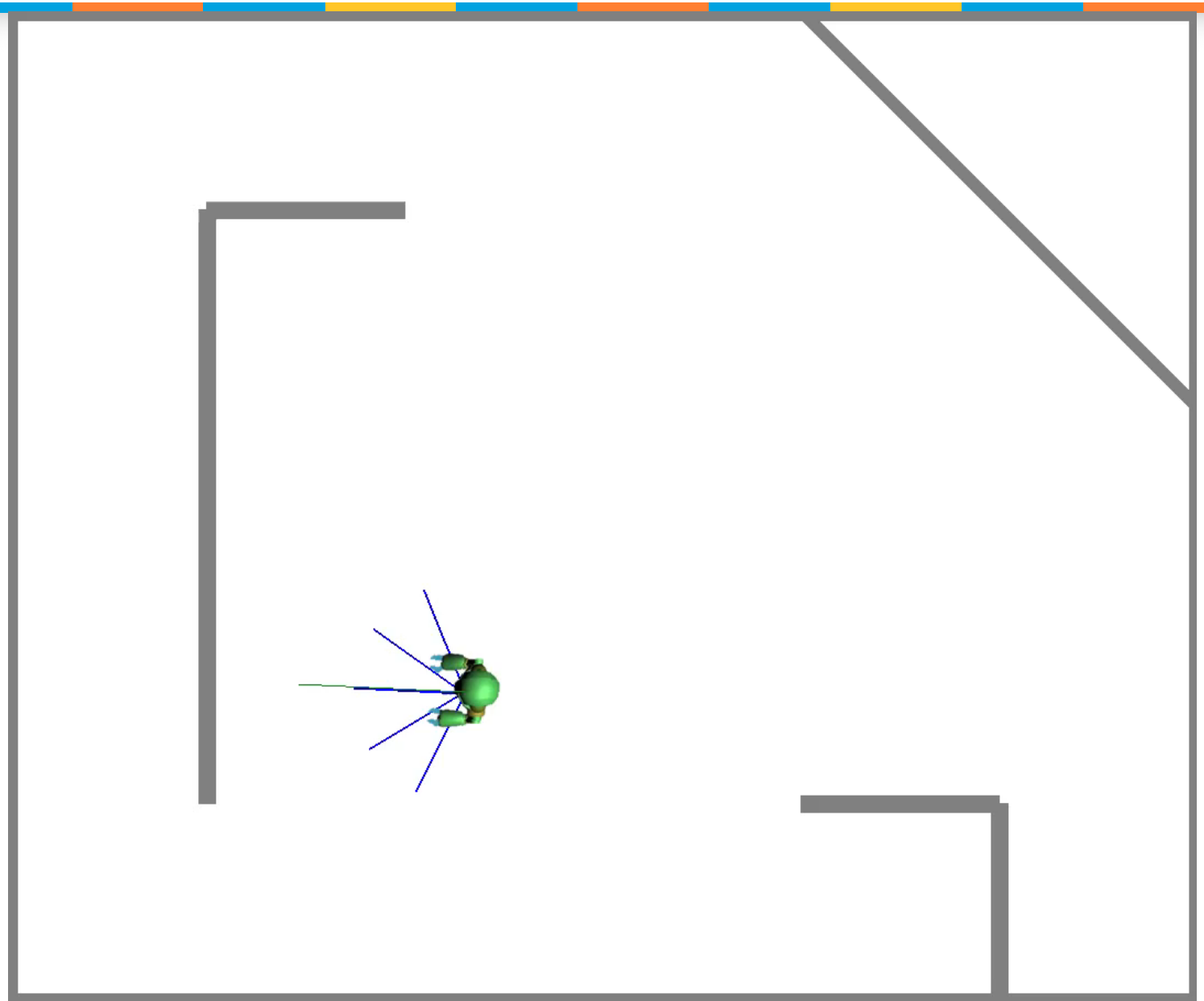


Example 1: Collecting Training Data

- Let the robot wander randomly
- Each step, record
  sensor values + *{collision, !collision}*
- Collision can be measured by a bumper sensor



Example 1: Collecting Training Data



Example 1: Training the Network

- We want our ANN to predict collision
- We have training data where for each input, we have the corresponding desired output (label)
- This is called **supervised learning**
- Now, change ANN weights so the output mimics labelled data
- To check accuracy of ANN, we will test it on a set of unseen data (test set)

Example 1: After Training