Machine Learning for Probabilistic Robotics with Webots

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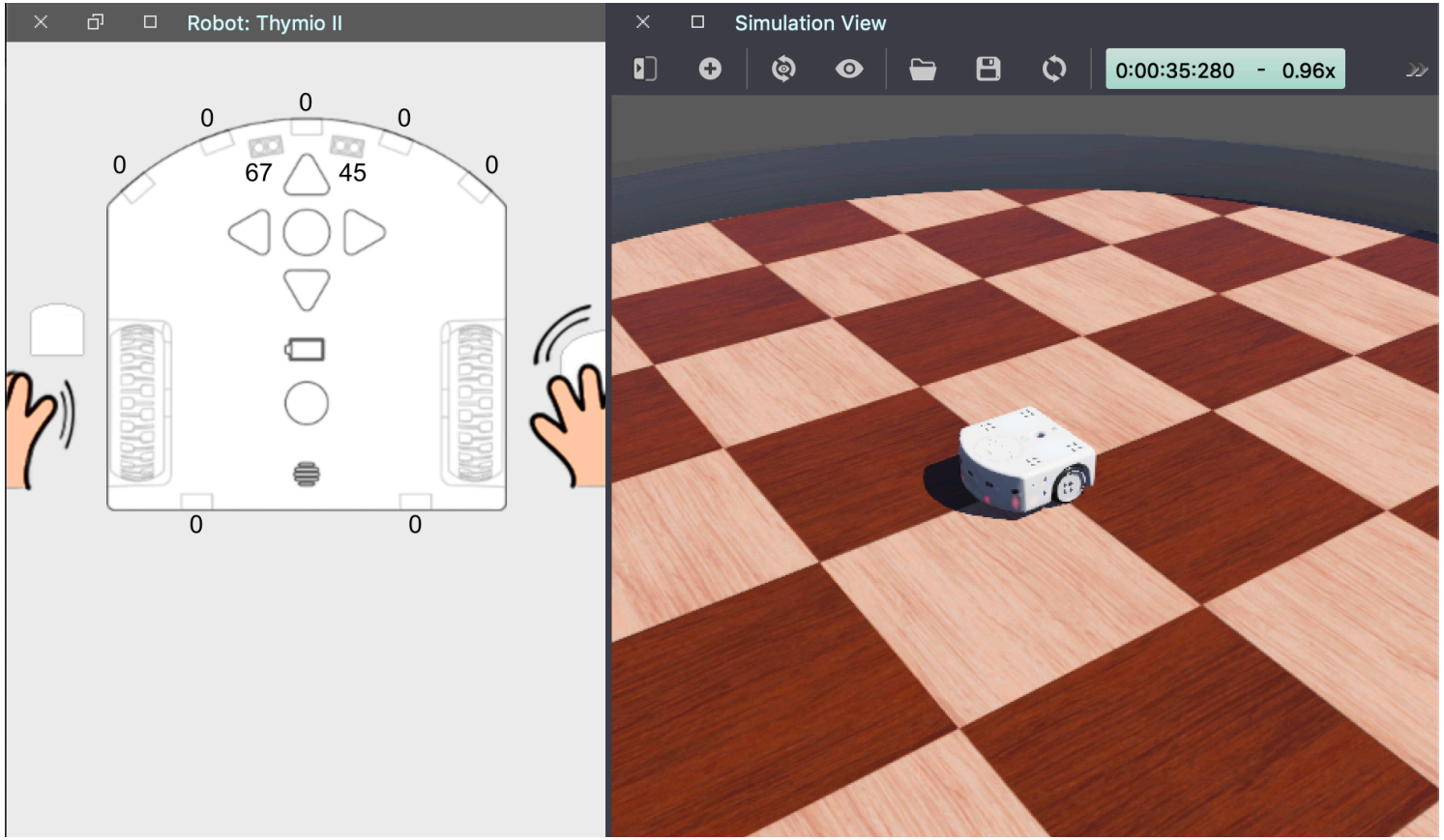
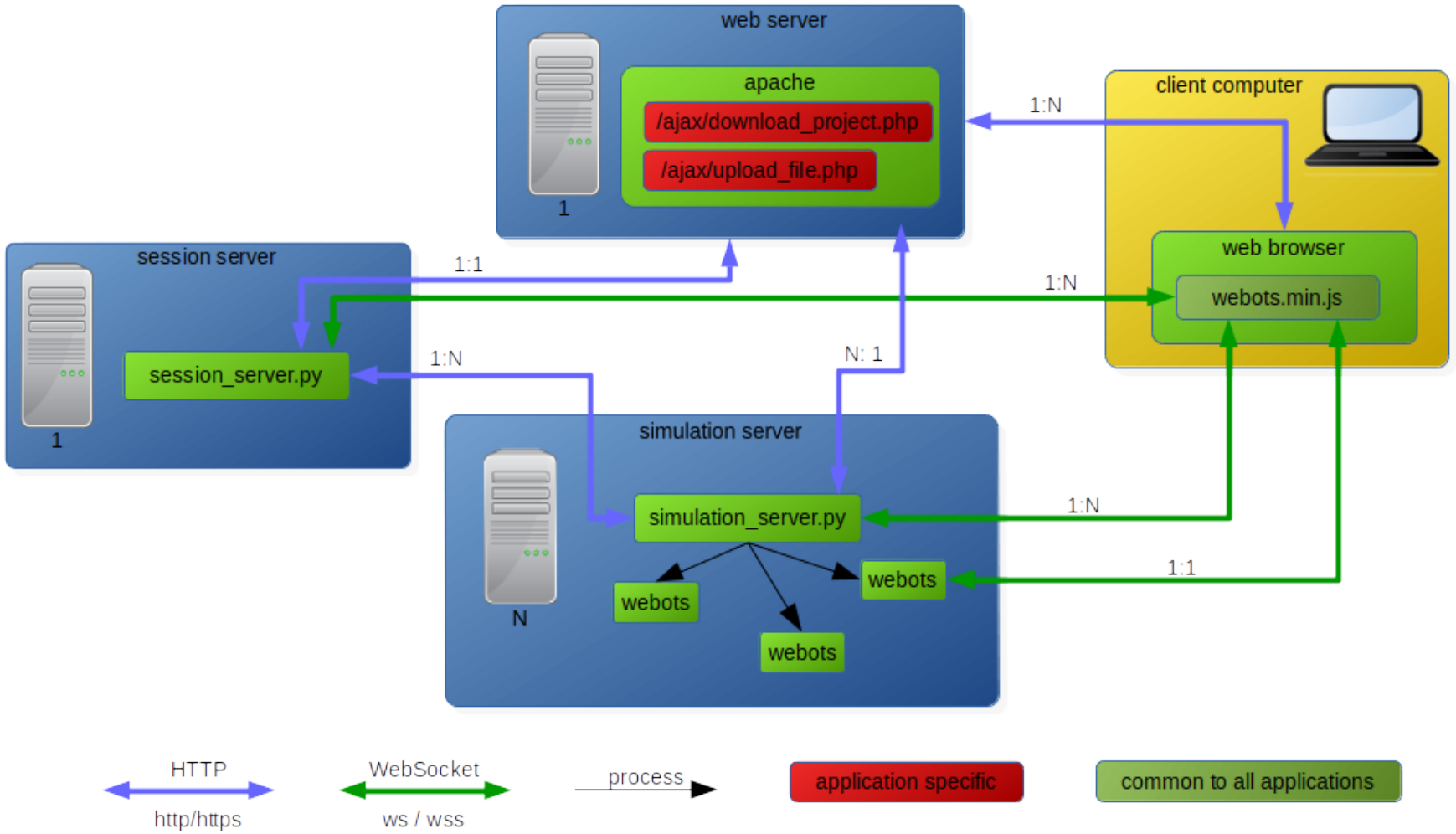


Webots R2019b new features

- HTML controller plugins:
  Webots API:
  wb_robot_wwi_receive_text
  wb_robot_wwi_send_text
- Web Streaming Server

Web Streaming Server



Creme

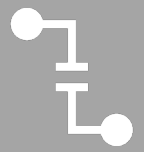
K Keras

Online learning with Creme + Keras

- Creme a library for online machine learning with python
- Keras is a high-level neural networks API
- Together can be combined to do online learning: a model that learns one observation at a time.

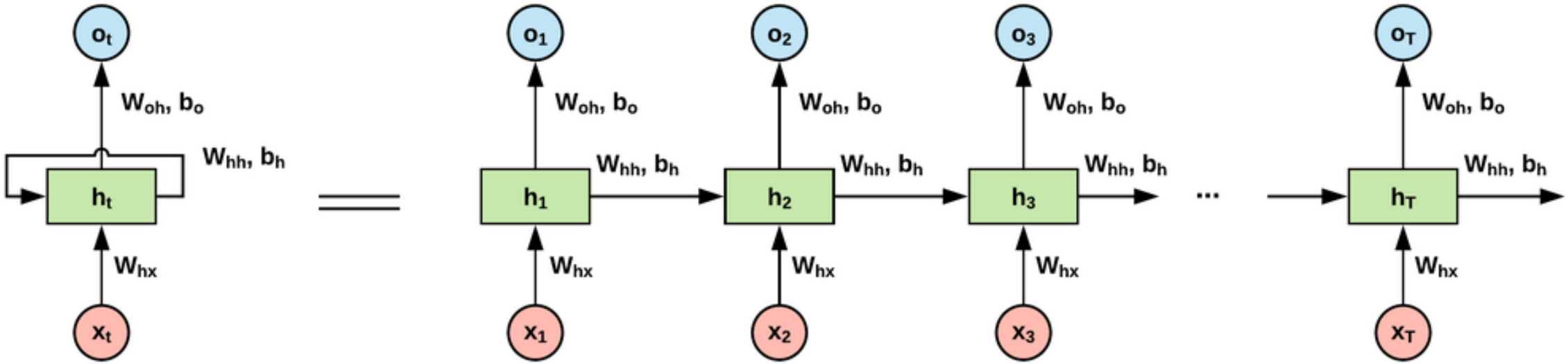
What can we do with both?

Make it easy to use RNN and CNN.



They allow to work with pre-trained neural networks and forward propagate to a pre-specified layer.

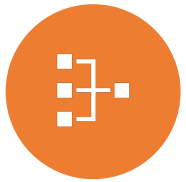
This allows to do **transfer learning** and to train just a specific layer using new incoming data.



Big picture: RNN

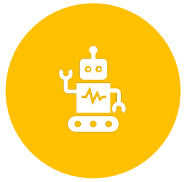
- RNNs are fed with data then outputs a result back into themselves. They are smart at remembering things that have happened in the past.

Project Goals Proposition



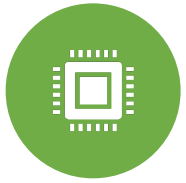
Take two environments: simple, and complex.

Capture sensor data and robot coordinates for an e-puck in both environments.



Apply ML with probabilistic techniques to estimate the robot position in the small and complex environment: planning to use RNN and particles filter.

Use online learning to train the robot in the small and complex environment.



Study and apply transfer learning techniques: use another robot and see if it can learn from the pre-built dataset to predict its position in the simple and complex environment

Compare results and put them in the Webots webserver.