Learning to drive based on multiple sensor cues in The Open Racing Car Simulator (TORCS)

Project Progress Presentation

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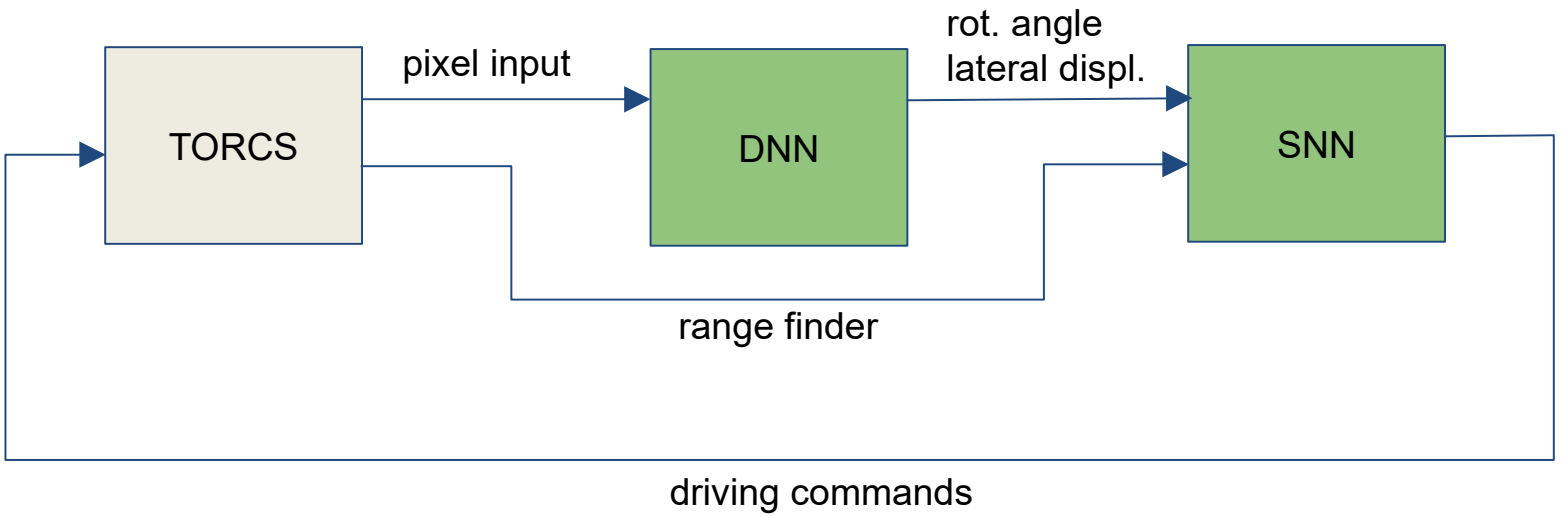
Presentation Structure

1. Overview
2. CNN
3. Controller
4. Timetable

Overview



DNN: Deep Neural Network
SNN: Spiking Neural Network

Controller

The nengo controller is built with the following **modules**:

- Steering
- Accelerating / breaking
- Gear changing
- Clutching

We aim to use **supervised learning** for the following modules:

- Steering
- Accelerating / breaking

The other ensemble connections are **handcrafted**.

Supervised Learning - Steering

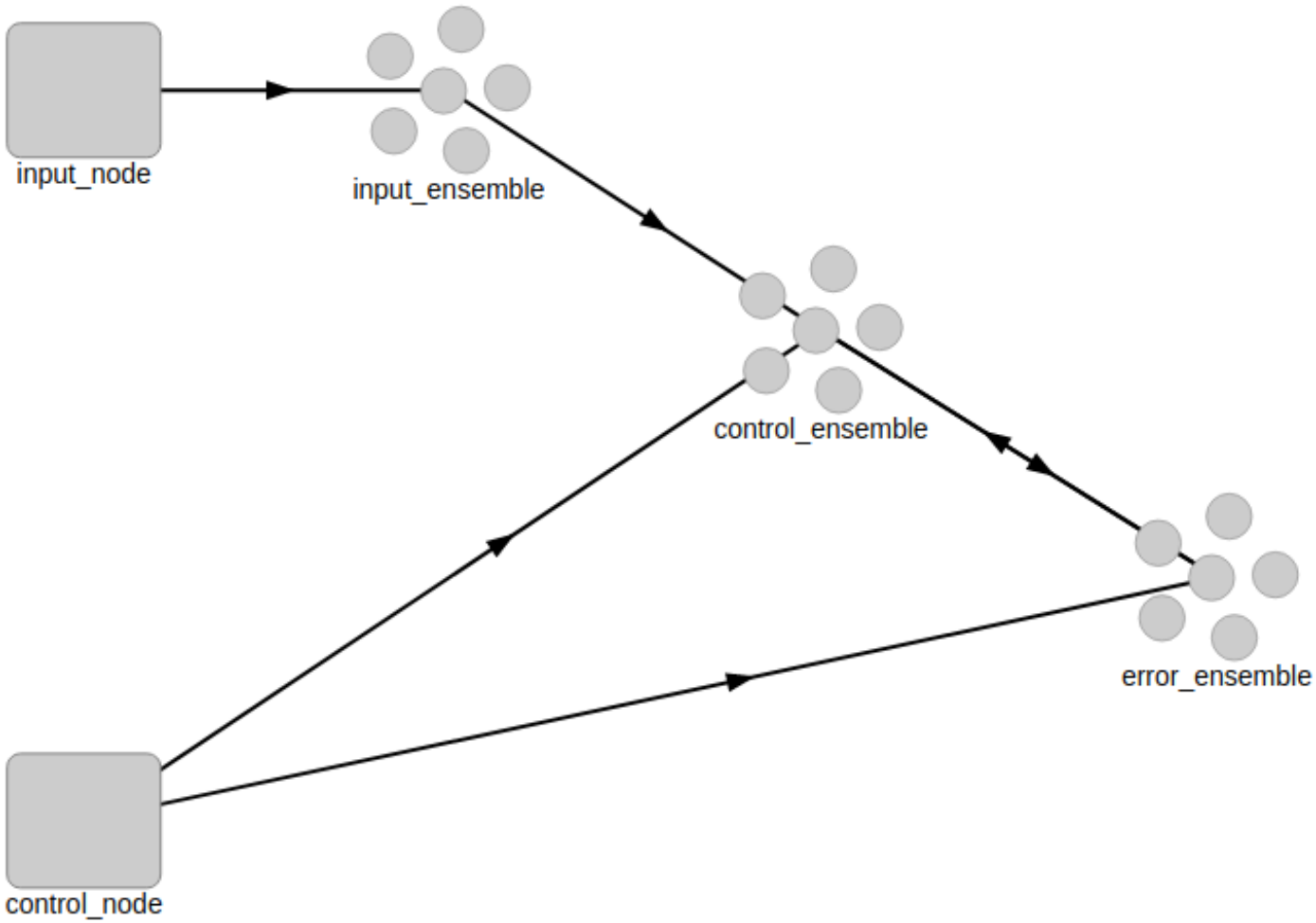
Input Signals:

- Speed
- Lateral displacement
- Rotation angle
- Range sensor (19 dimensions)

Output Signals:

- Steering angle

Supervised Learning – Steering
- offline online learning



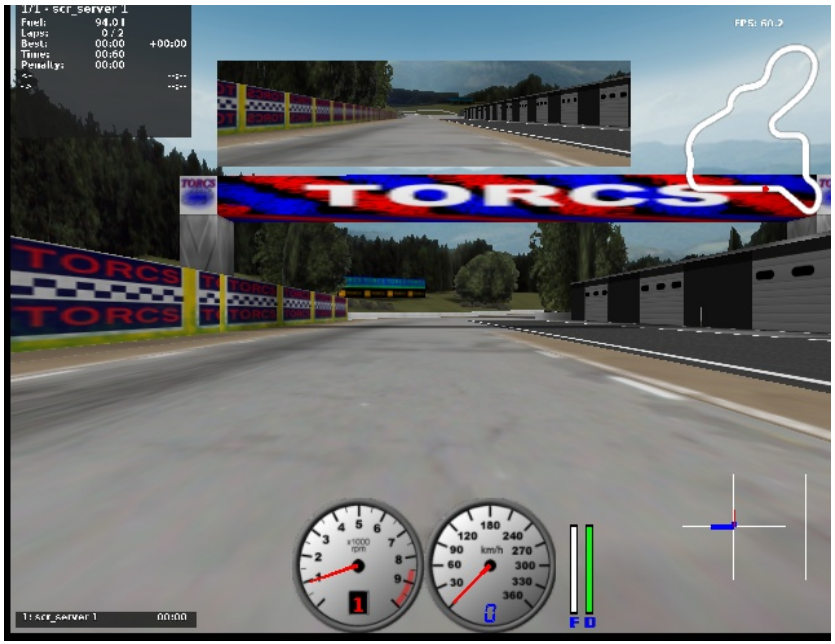
Controller

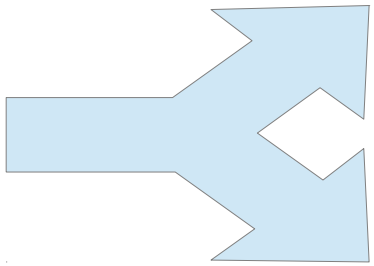
- learning alternatives

- Nengo deep learning library
- Train connection function with tensorflow / keras
- Hard code connection function

Deep Neural Network

- learning sensor data from images





Angle

Distance

Deep Neural Network
- training the network

One training track

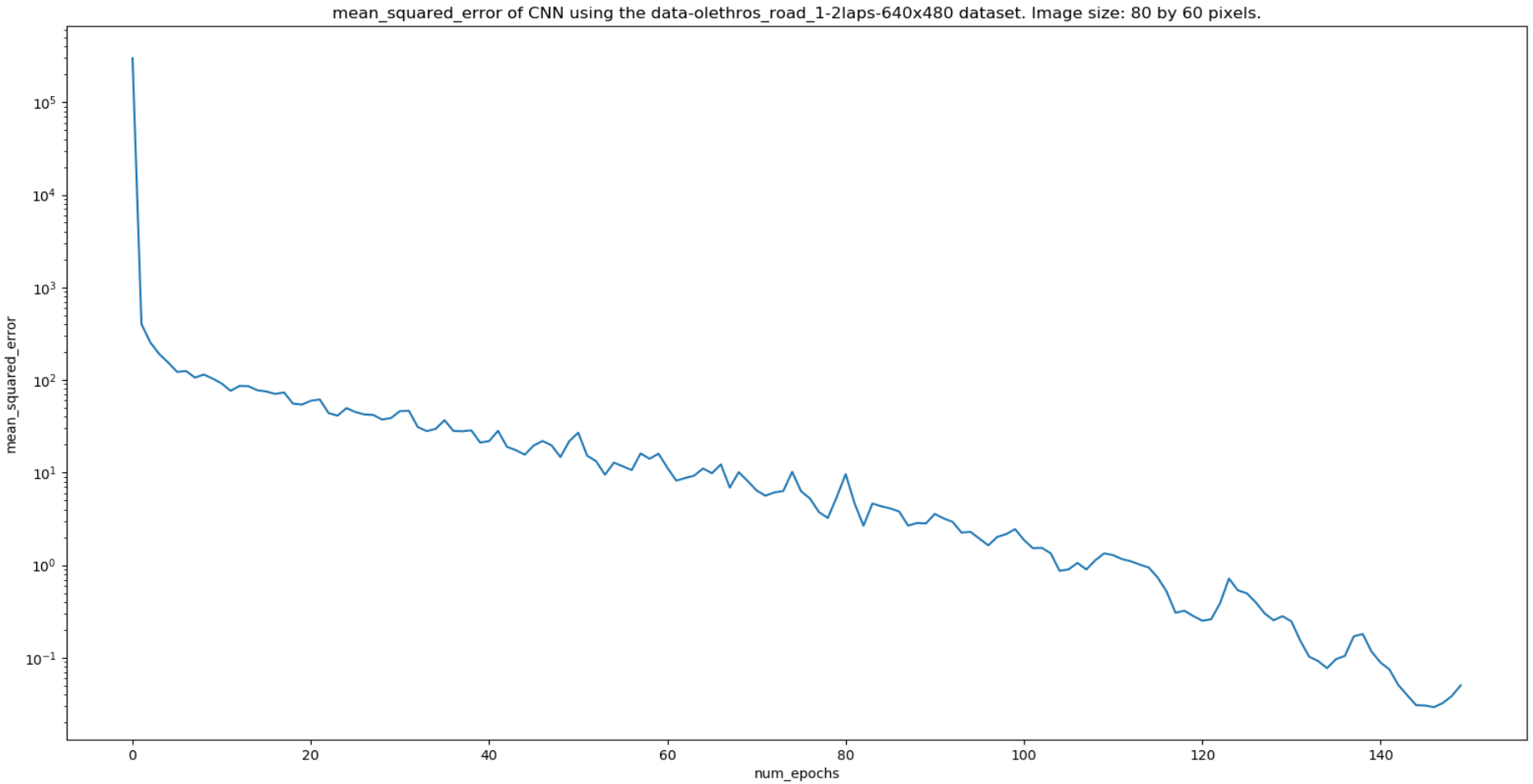
4930 samples

150 training epochs

Input image scales: 0.125, 0.25, 0.5

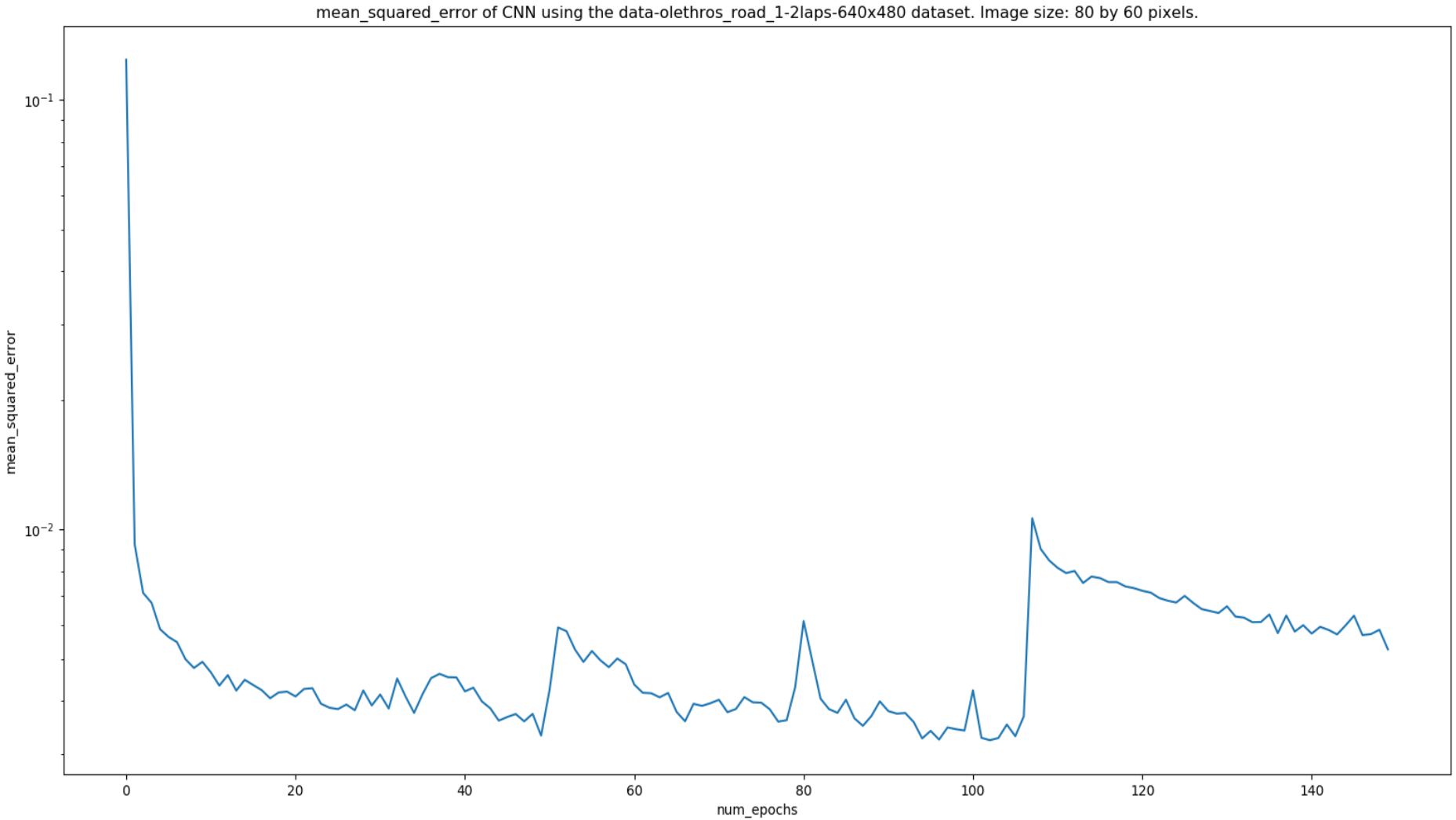
Deep Neural Network

Img → Conv2D → Conv2D → FCL → FCL → values



Deep Neural Network

„AlexNet“: Img →
Conv2D → Conv2D → Conv2D → Conv2D → Conv2D → FCL → FCL → FCL
→ values



Deep Neural Network

- possible improvments

- Generate **own** training data

- Generate **more** training data

- Try **different** network architectures
    - difficult to evaluate without testing

Timetable

- We are a bit behind on our original planing

  Now:
  - Write report draft 7/12/17 – 14/12/17
  - Write final report 15/12/17 - 11/1/18

  Until report draft:
  - Finish training the CNN
  - Experience on training the SNN

  Final report:
  - Connect CNN and Controller
  - Discuss the supervised learning results for the SNN

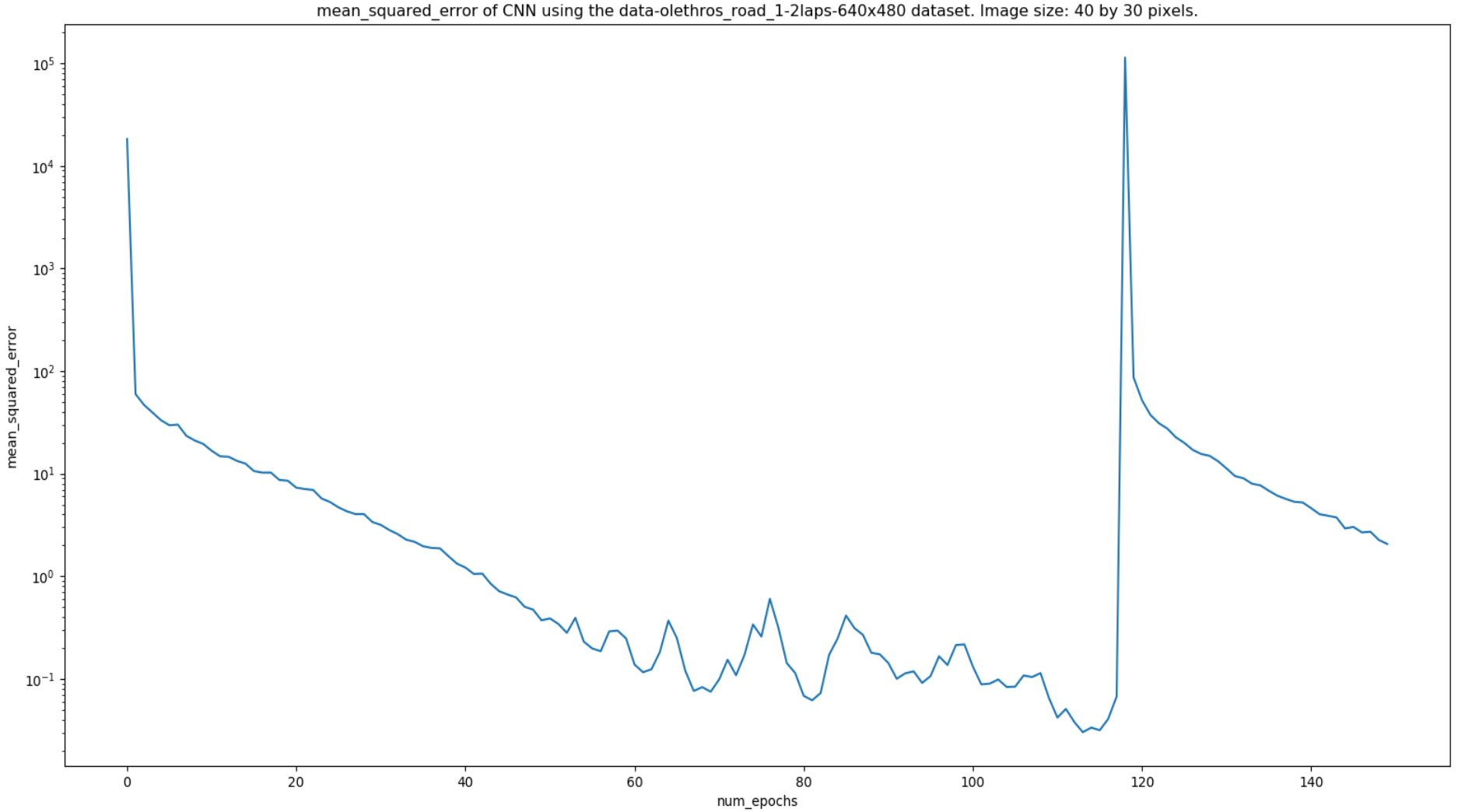
Questions

- Does our car need to be able to drive on tracks we didn‘t train on?
  - „generalised model“

Thank you for listening!

Deep Neural Network

Img → Conv2D → Conv2D → FCL → FCL → values



Deep Neural Network

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