

# AI Meets Racing



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Frederik Gielis

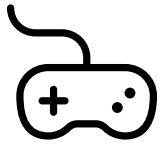
Thierry Eeman

MADE WITH  
beautiful.ai

# Inhoud

- 1 Wat is Race to the Future?
- 2 De raceauto  
Hardware, software, OpenCV, AI (and why not)
- 3 De race
- 4 Wat we geleerd hebben
- 5 Digital Innovation

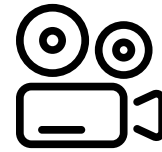
# Wat is Race to the Future?



RC race wagens



Om ter snelst naar de  
finish



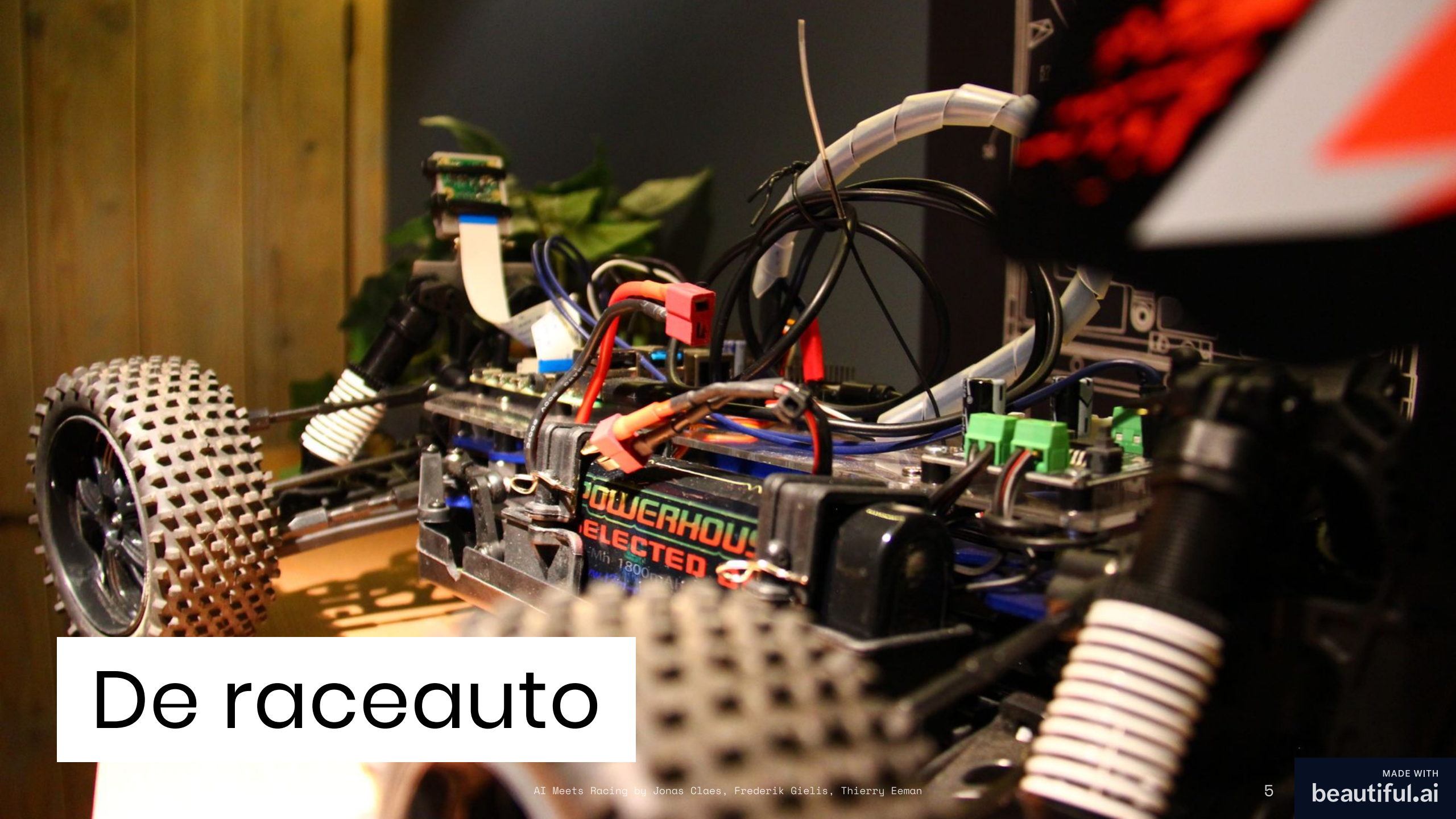
Standaard met camera



Straftijd bij  
losmaken wagen

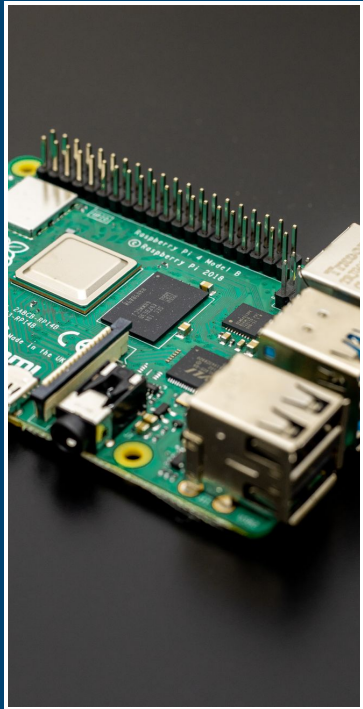
# Verloop Race





# De raceauto

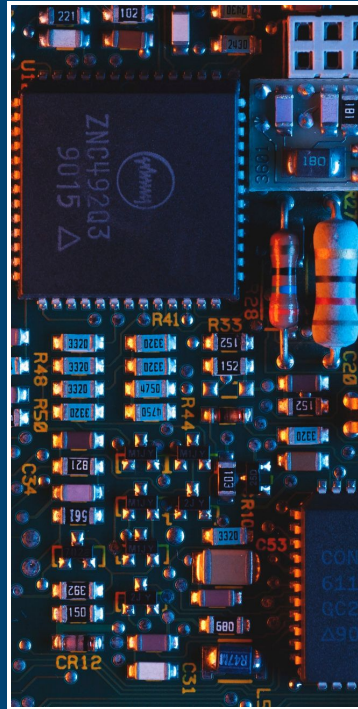
# De raceauto



Raspberry Pi 4B  
4GB



NiMH Batterij  
1800 mAh



Electronic Speed  
Controller (ESC)



Electric Motor



PiCam V2



3D printed  
camera extension

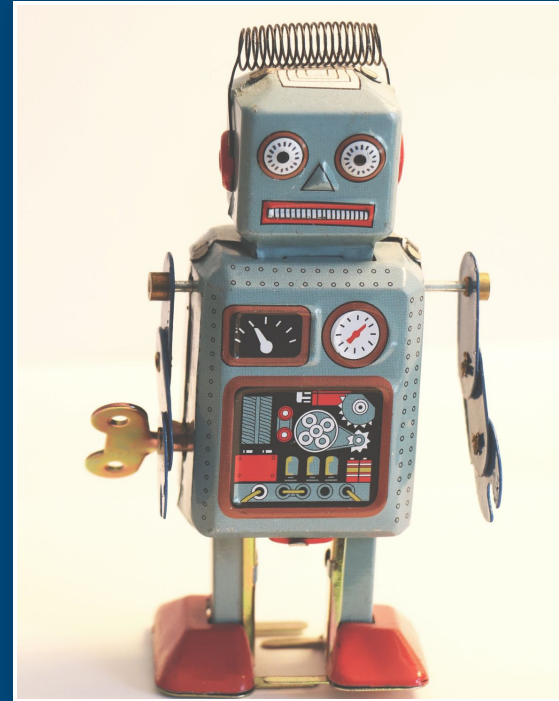
# De raceauto



Linux (Raspbian 64-bit Bullseye)



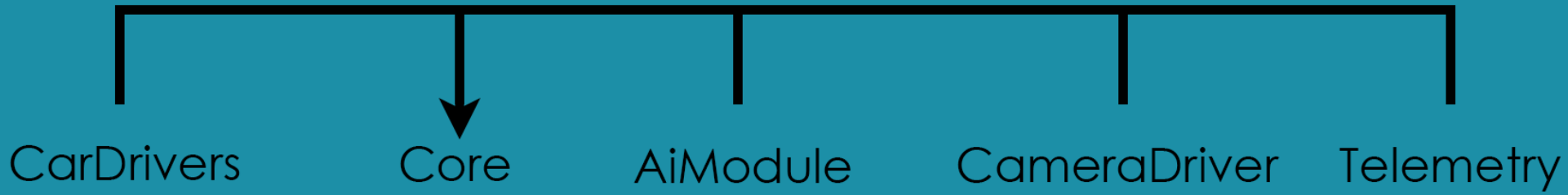
Docker



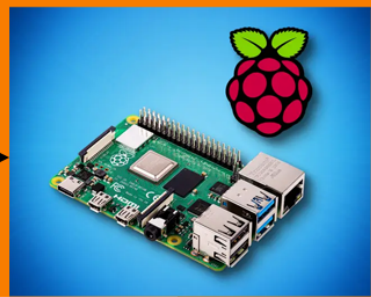
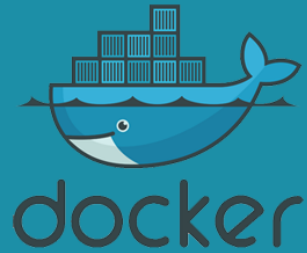
Robot Operating System (ROS1)



Telemetry



Software



buck boost converter



Hardware

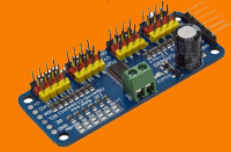
RF transmitter



Arduino Nano



PWM 16 channel



batterij



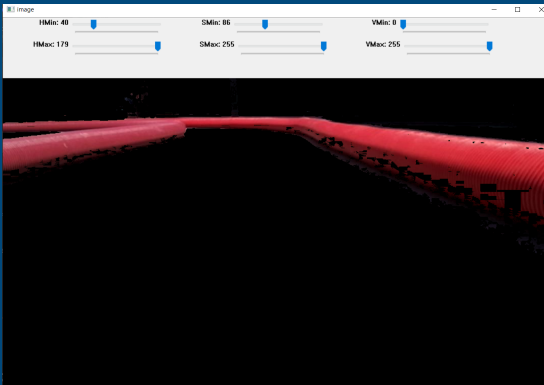
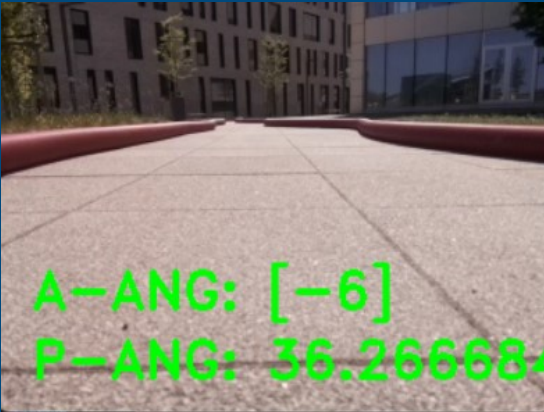
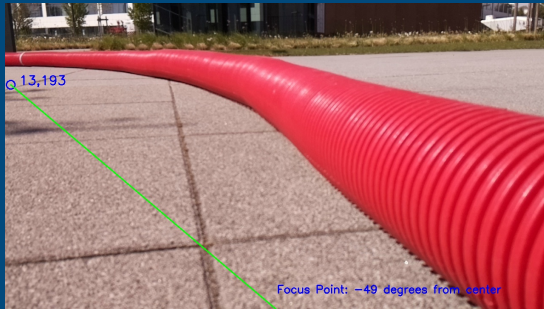
Servo motor



Electronic Speed Controller







SOFTWARE

# Helper software

Custom geschreven software om de iteraties en het leerproces te versnellen.

- Data Annotator
- Debugger (actual vs prediction)
- Sliders voor OpenCV instellingen



Velocity



Steering angle

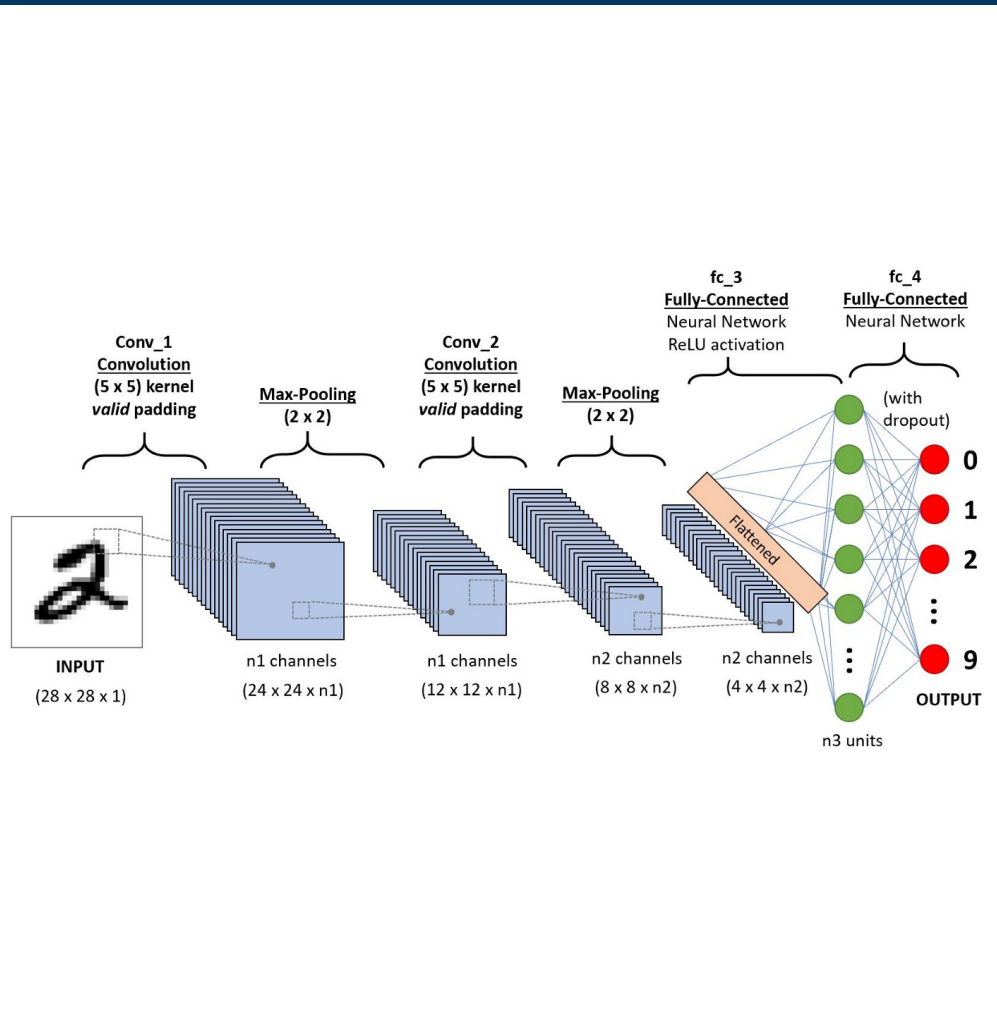


# Telemetry Dashboard

# OpenCV overlay

**Video**

# Project Objectives

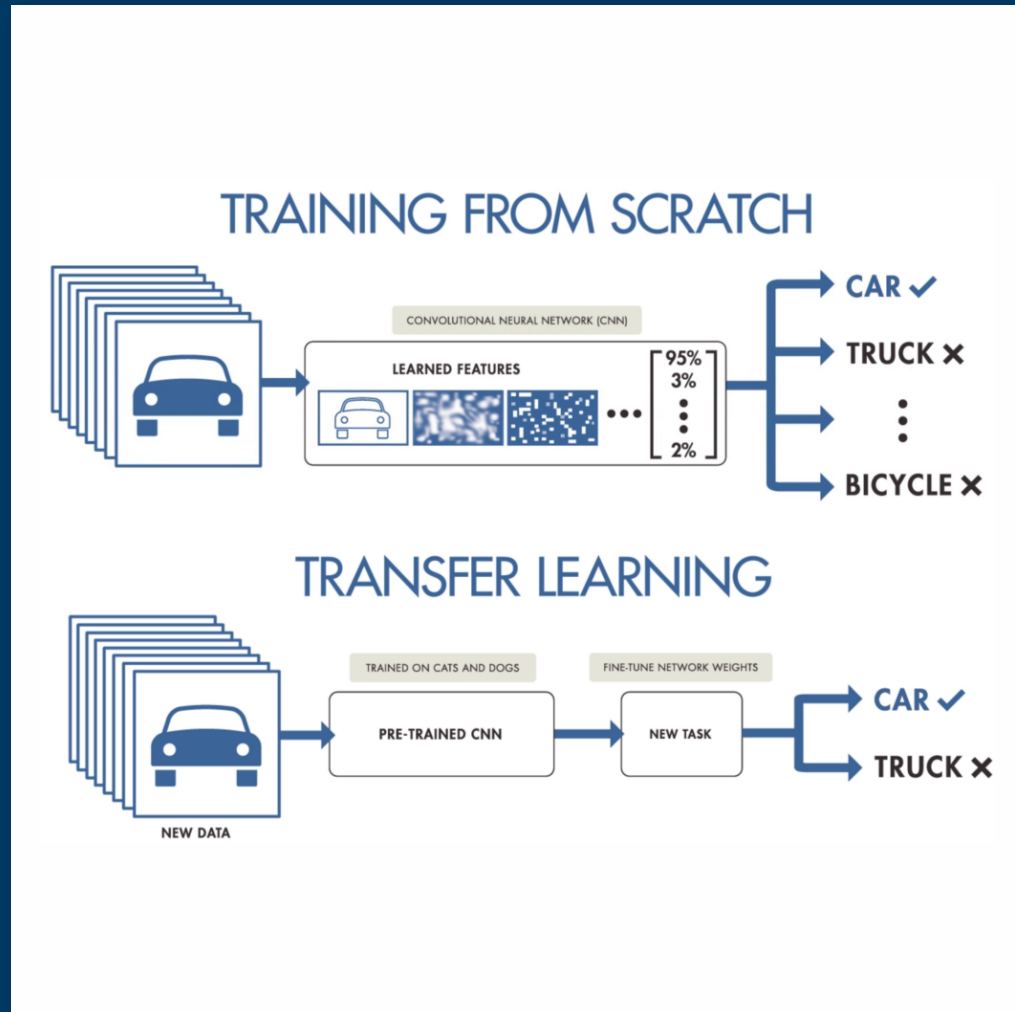


## Deep learning

Milestone 1 - Convolutional Network

- Regression
- Classification

# Project Objectives



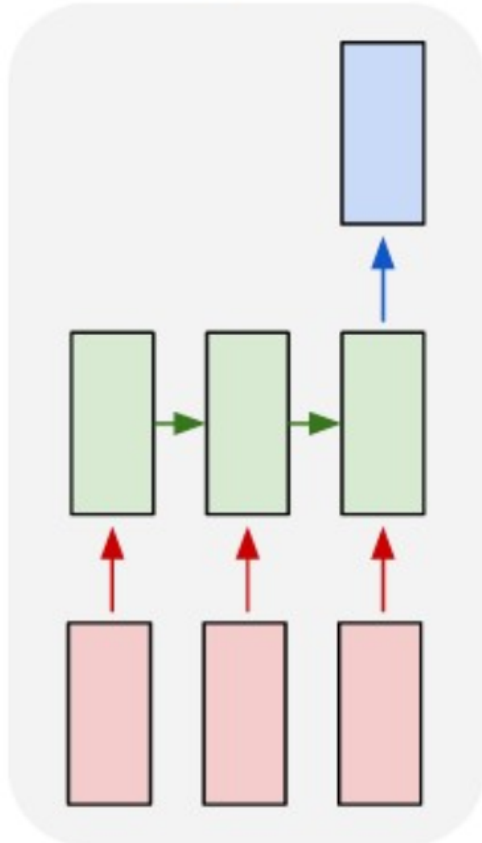
## Transfer learning

Milestone 2 - Convolutional Network with pretrained Resnet, VG16

- Regression
- Classification

# Future Objectives

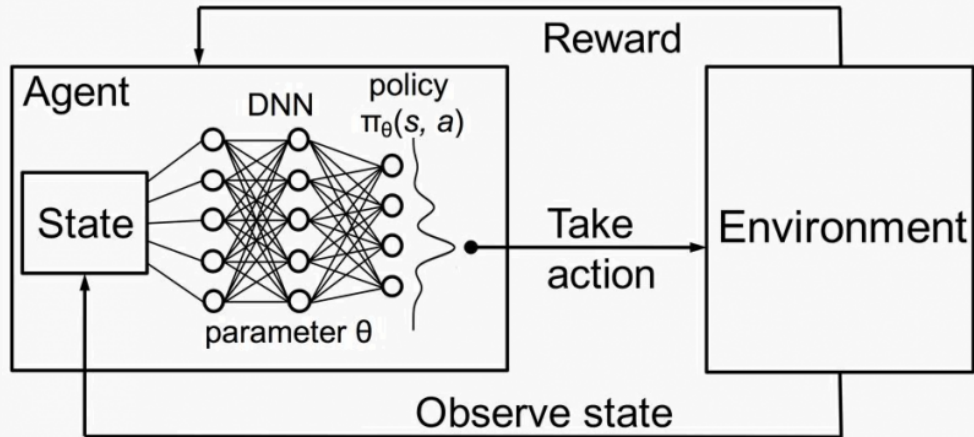
many to one



LSTM met TimeDistributed  
convolutional network

Niet gehaald - nog onderzoeken

# Future Objectives



## Deep Reinforcement Learning

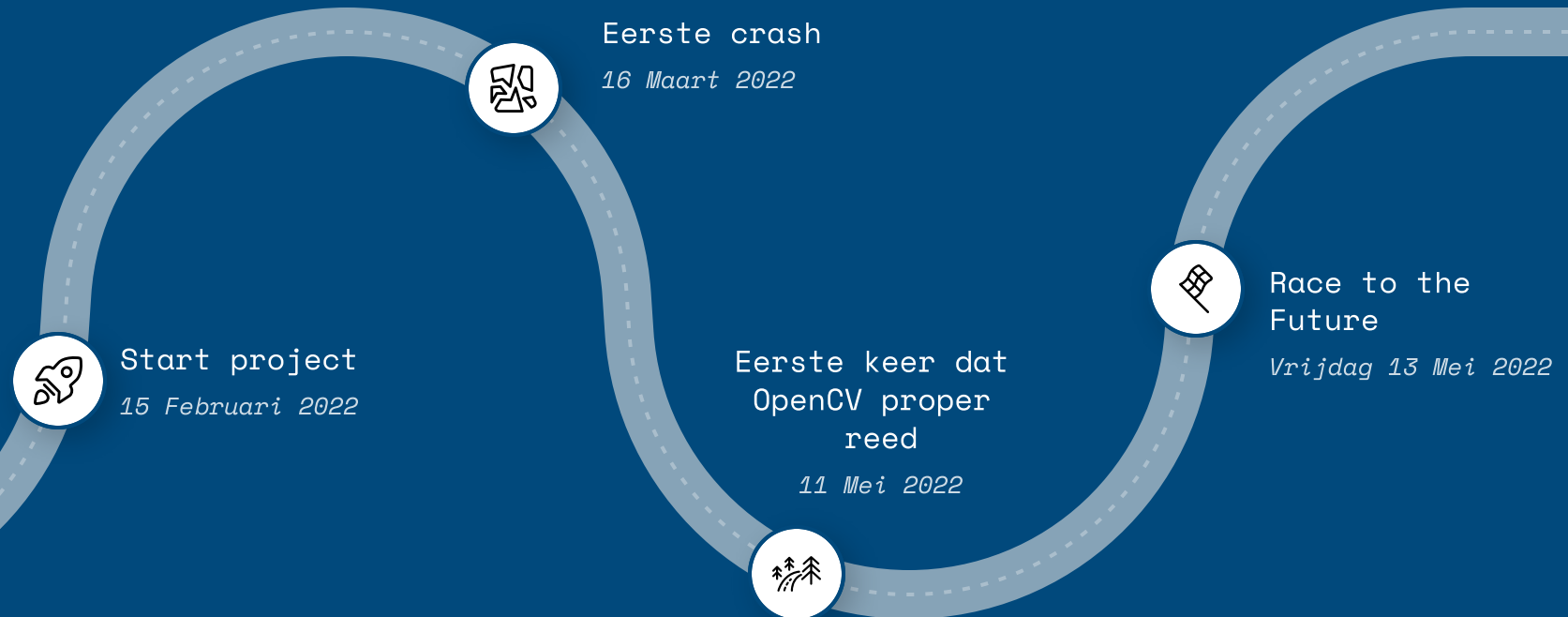
ISAAC, Gazebo, ...

- action - reward system
- training in virtual environment



**Video**

# De race



# Op naar de eerste crash!

Ja, dit is toevallig gefilmd.

**Video**

# Race to the Future

Heat 1

**Video**

**Video**

Wat hebben we geleerd?



# Wat hebben we geleerd

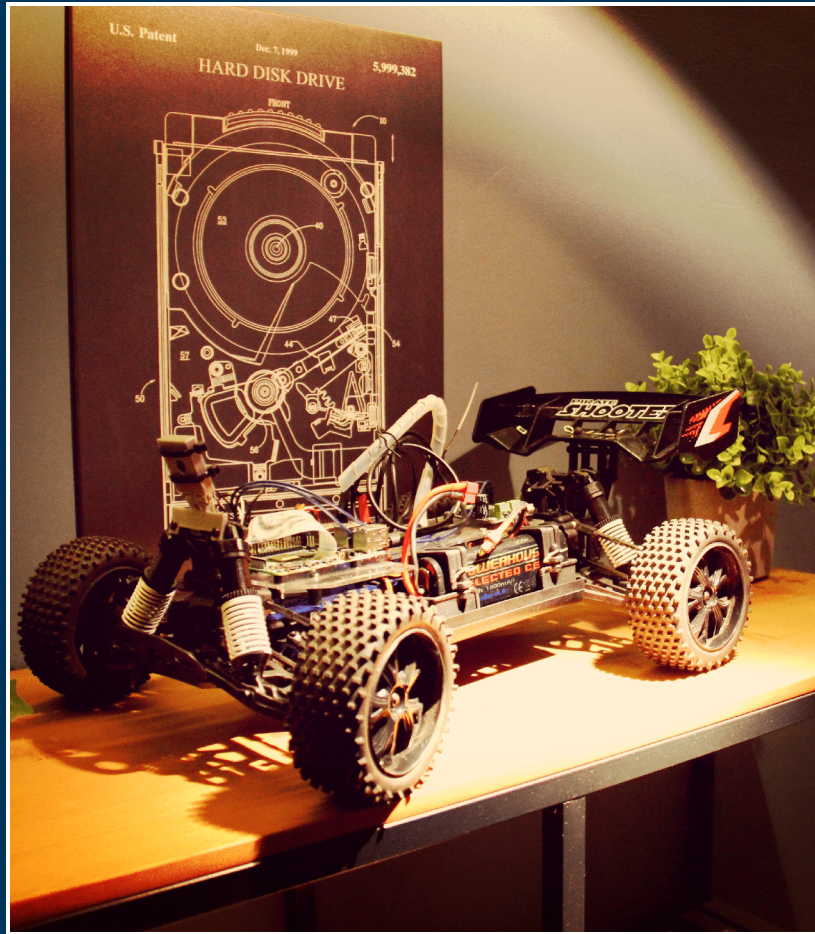
- OpenCV
  - Ver kijken
  - Augmentation niet nodig
- AI
  - Augmentation niet nodig
  - Meer data (6.000 <-> 60.000)
  - 'Cleane' data
  - Bias vermijden

# Waarom Digital Innovation?

# Digital Innovation

- 1 Domeinoverschrijdende projecten
- 2 Aangepast op jouw interesses
- 3 Vrijheid
- 4 Echte klanten en bedrijven

# Digital Innovation



## Congresdag

Donderdag 19/05 12.00 - 15.45

D202

# Merci voor 't luisteren!

Tijd voor de **vragenronde!**