Personalizing Homemade Bots with Plug & Play AI for STEAM Education

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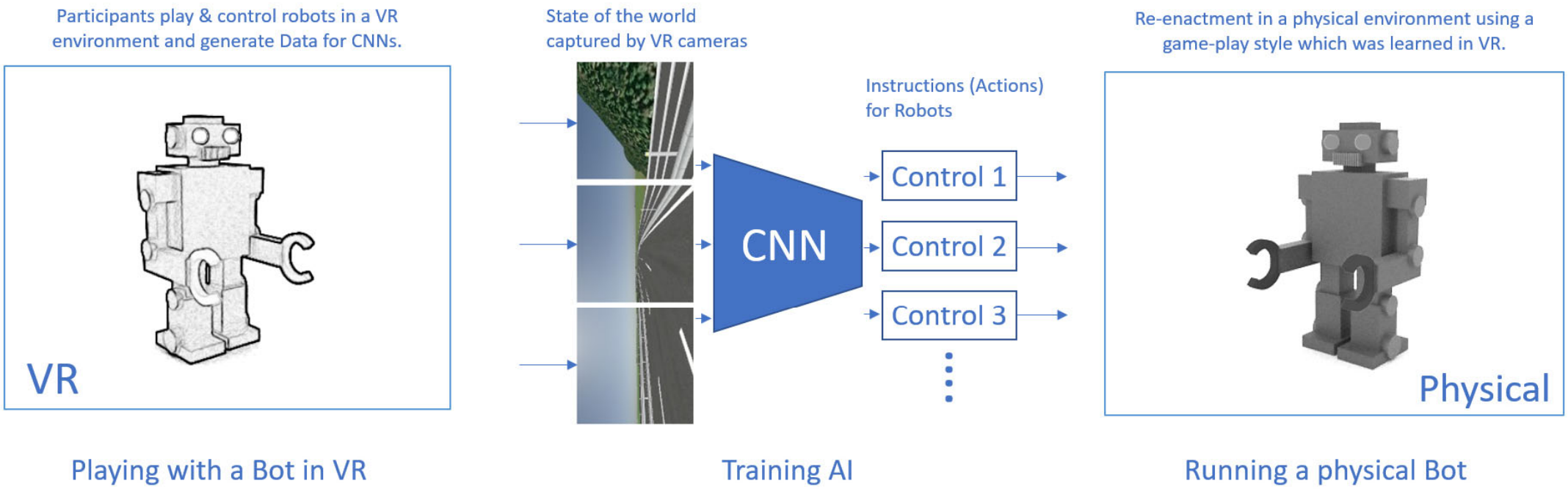
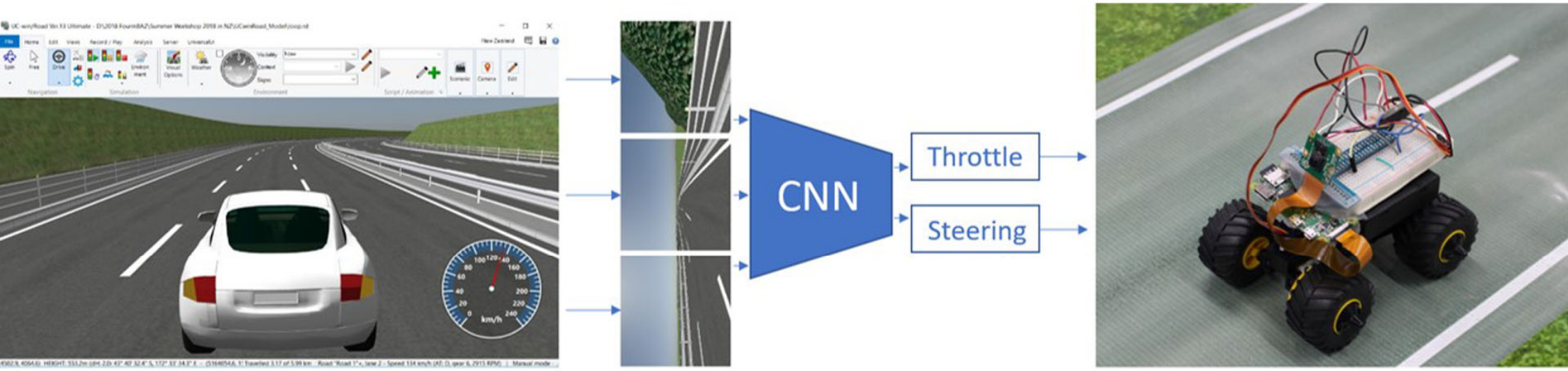
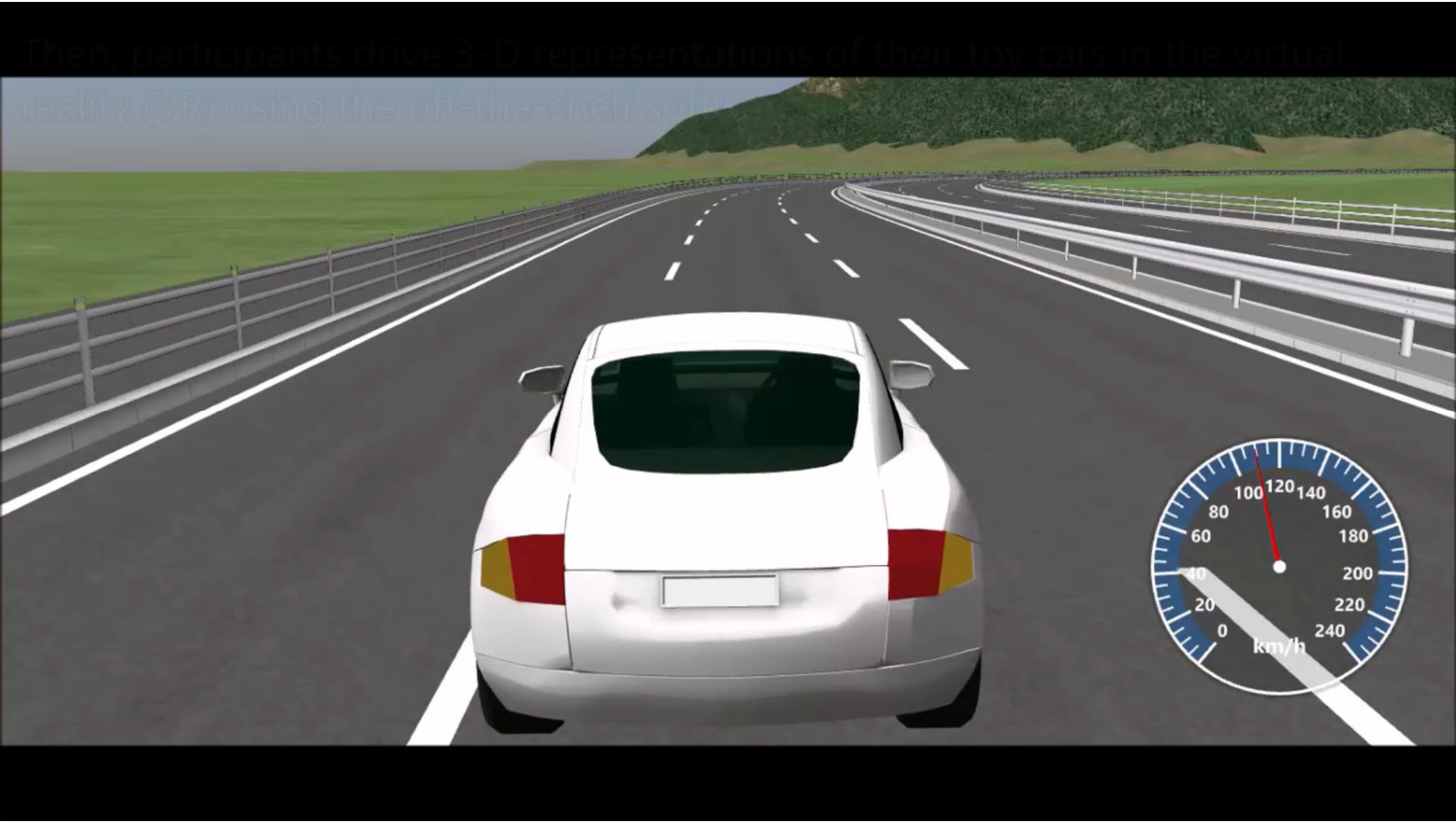


We propose a new framework for hands-on educational modules to introduce ideas in AI and robotics casually, quickly, and effectively in one package.



As a case study to demonstrate the idea of the framework, an educational module to create a toy car with a camera controlled by Raspberry Pi is introduced.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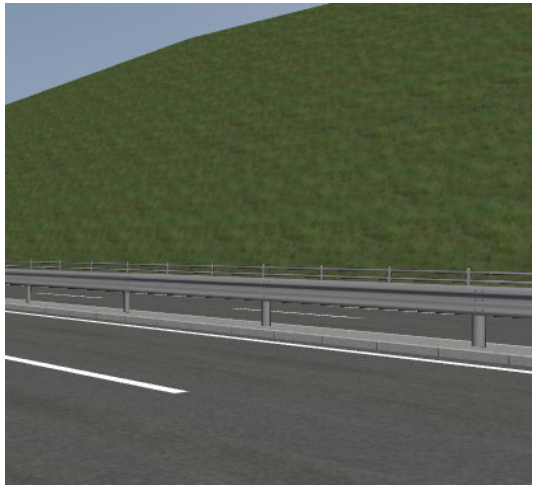
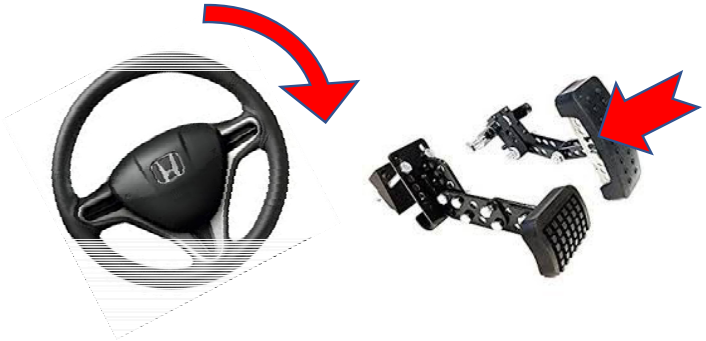
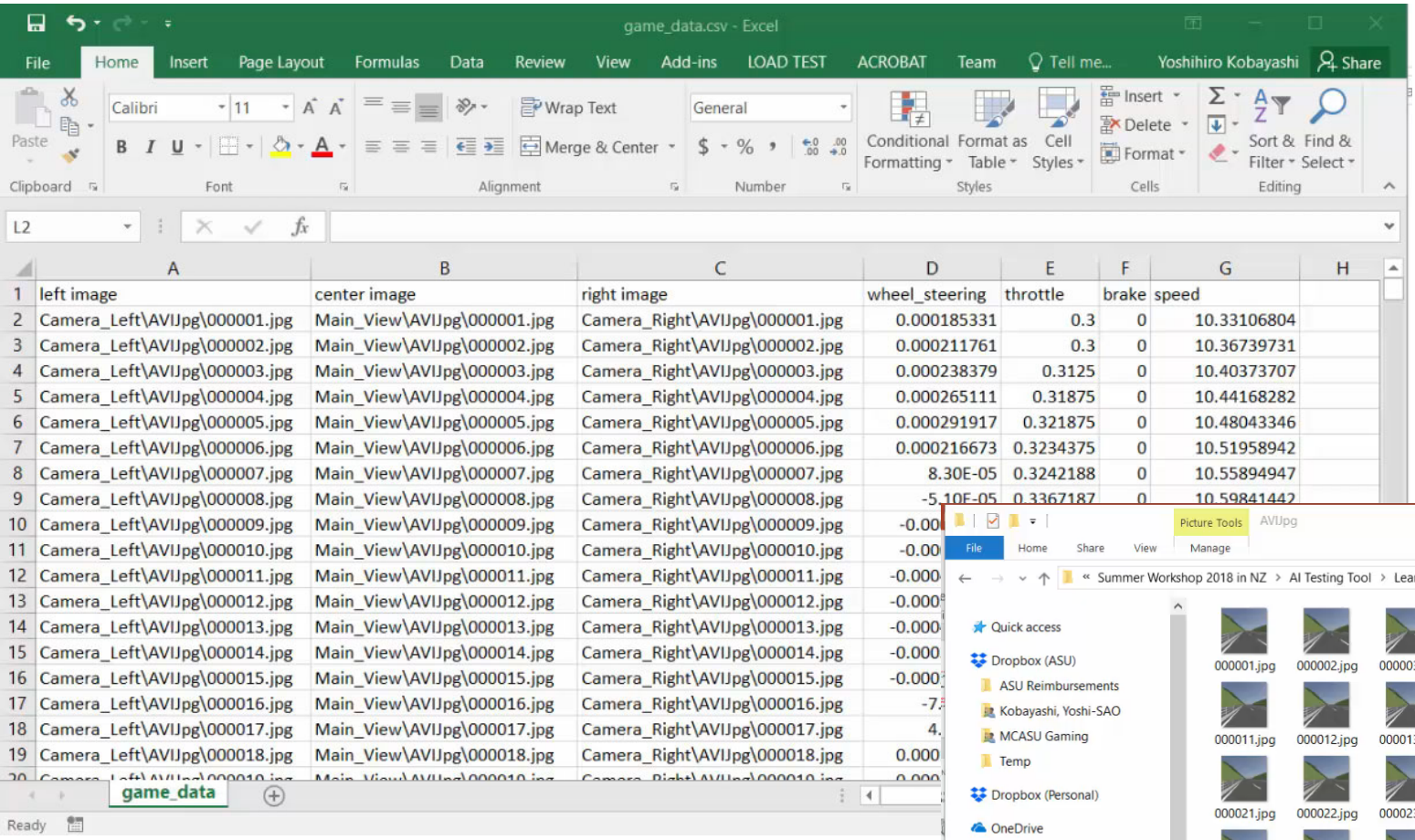
Training Data for each frame

128

128






game_data.csv - Excel
File Home Insert Page Layout Formulas Data Review View Add-ins LOAD TEST ACROBAT Team Tell me... Yoshihiro Kobayashi Share
Paste Calibri 11 Wrap Text General Conditional Formatting Format as Table Cell Styles Insert Delete Format Sort & Filter Find & Select
Clipboard Font Alignment Number Styles Cells Editing
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A B C D E F G H
1 left image | center image | right image | wheel_steering | throttle | brake | speed
2 Camera_Left\AVIJpg\000001.jpg | Main_View\AVIJpg\000001.jpg | Camera_Right\AVIJpg\000001.jpg | 0.000185331 | 0.3 | 0 | 10.33106804
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4 Camera_Left\AVIJpg\000003.jpg | Main_View\AVIJpg\000003.jpg | Camera_Right\AVIJpg\000003.jpg | 0.000238379 | 0.3125 | 0 | 10.40373707
5 Camera_Left\AVIJpg\000004.jpg | Main_View\AVIJpg\000004.jpg | Camera_Right\AVIJpg\000004.jpg | 0.000265111 | 0.31875 | 0 | 10.44168282
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game_data
Ready
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File Home Share View Manage
Summer Workshop 2018 in NZ › AI Testing Tool › LearningDataUCwinRoad20180712 › Main_View › AVIJpg
Search AVIJpg
Quick access
Dropbox (ASU)
ASU Reimbursements
Kobayashi, Yoshi-SAO
MCASU Gaming
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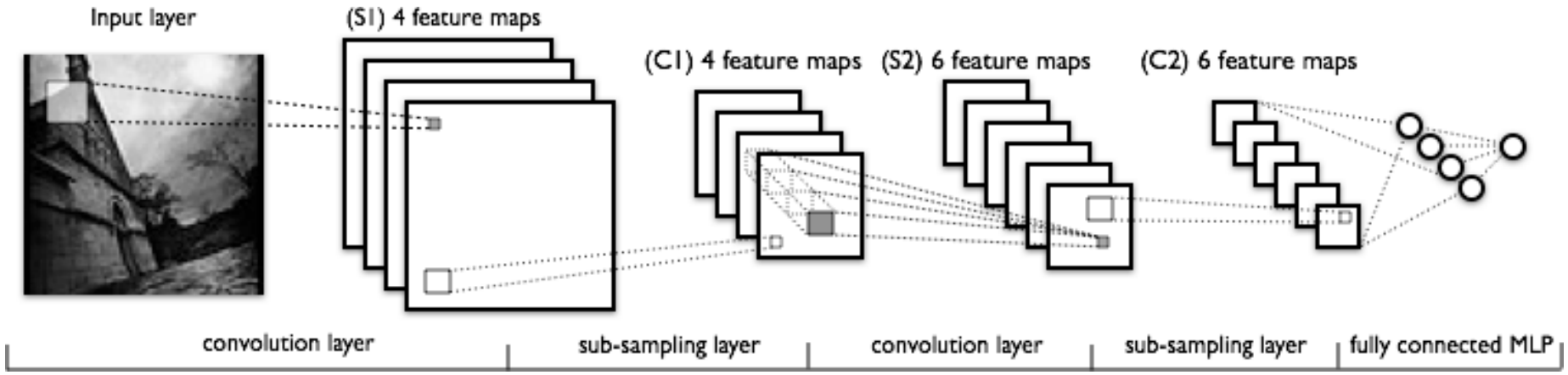
4,404 items

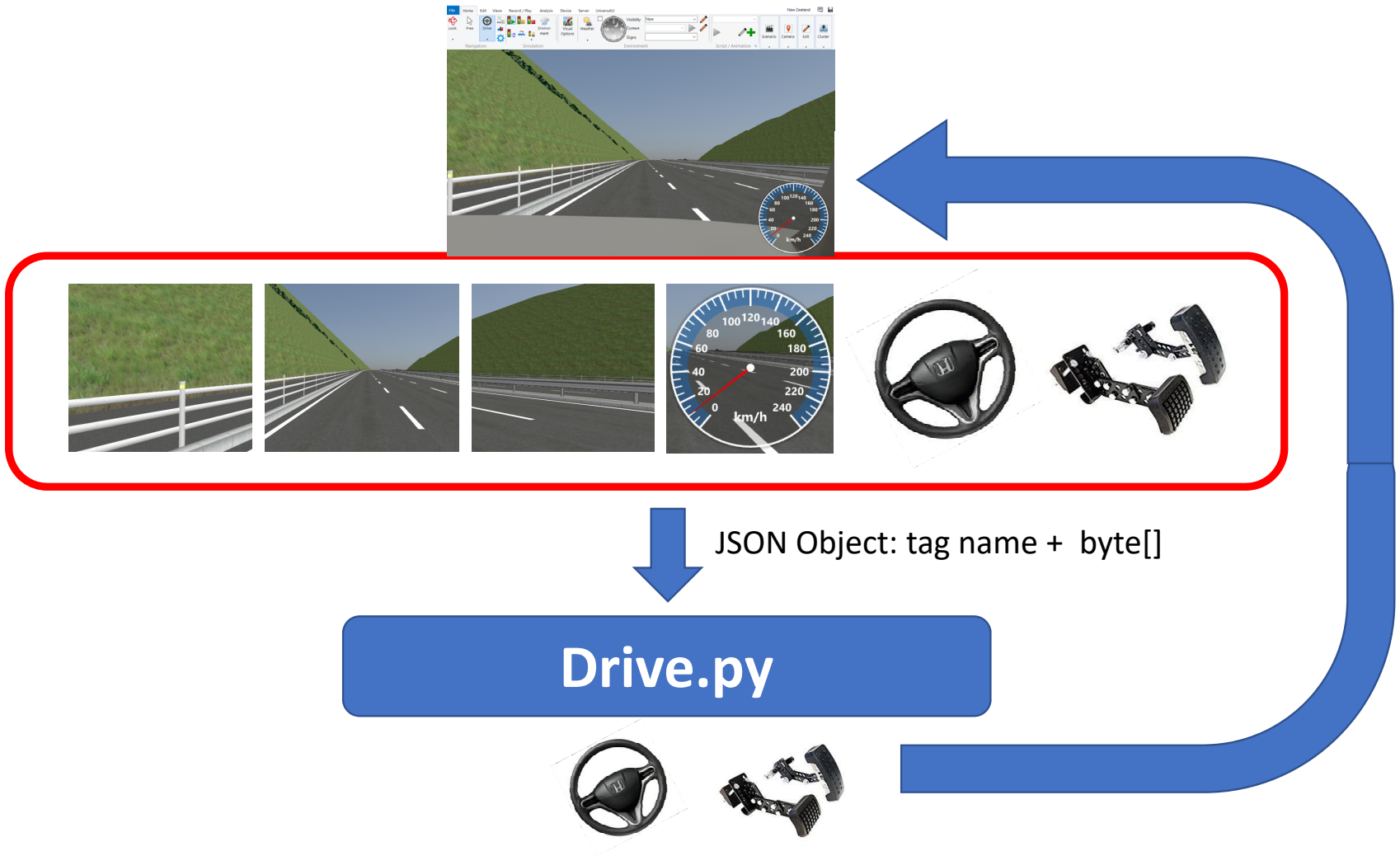
AI Model: CVS Data and CNN/AI Model

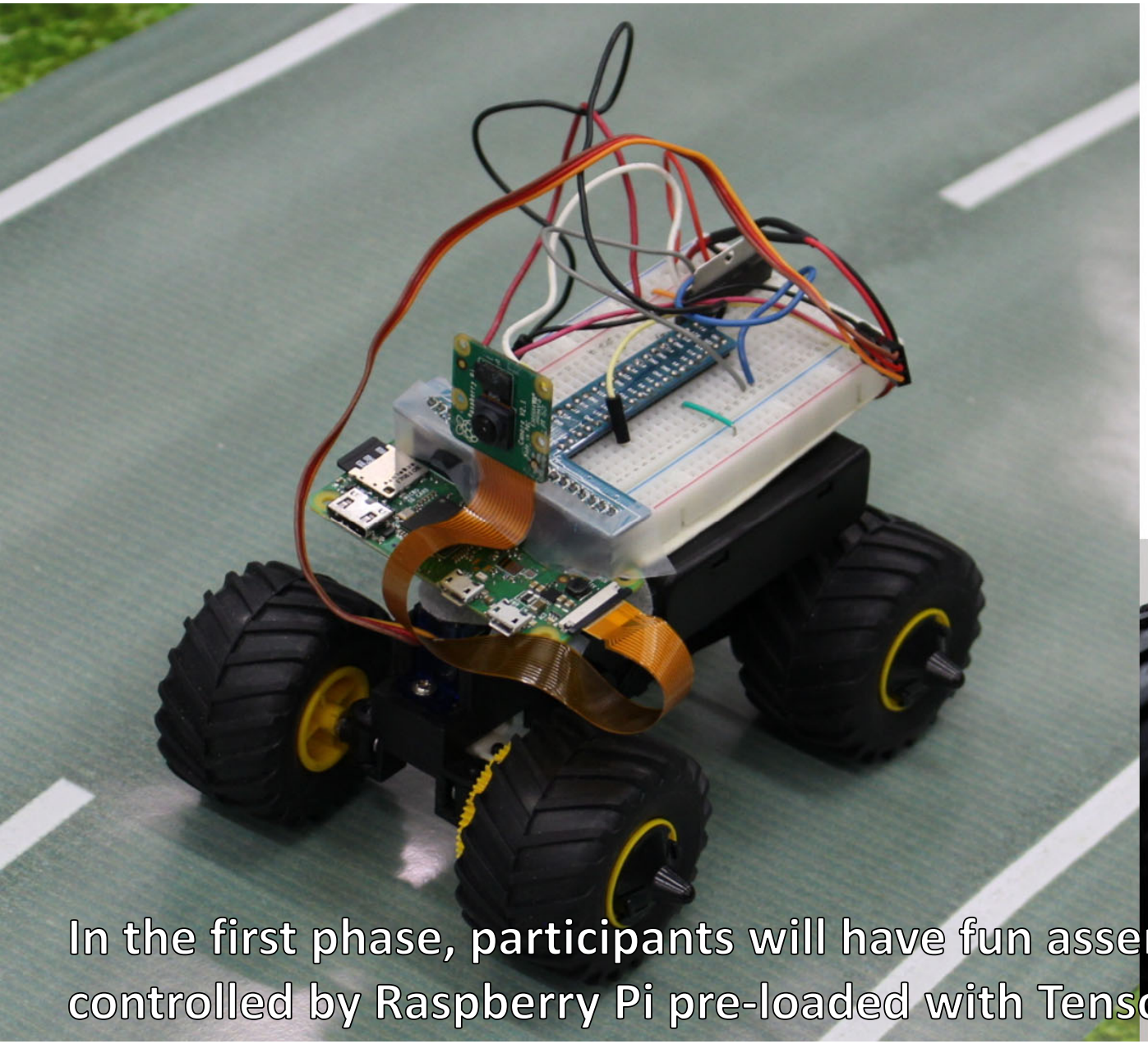
Model.py:

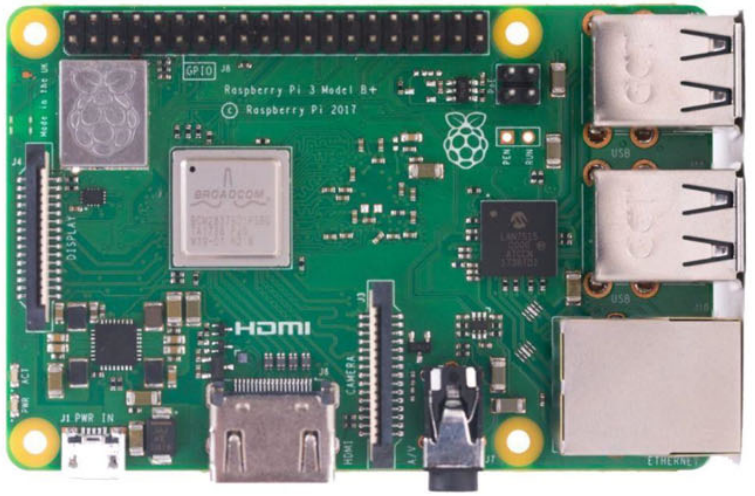
- Read the "game_data.cvs" and make test.h5 file
- It takes 5 hours to train the data… (Not completed today)

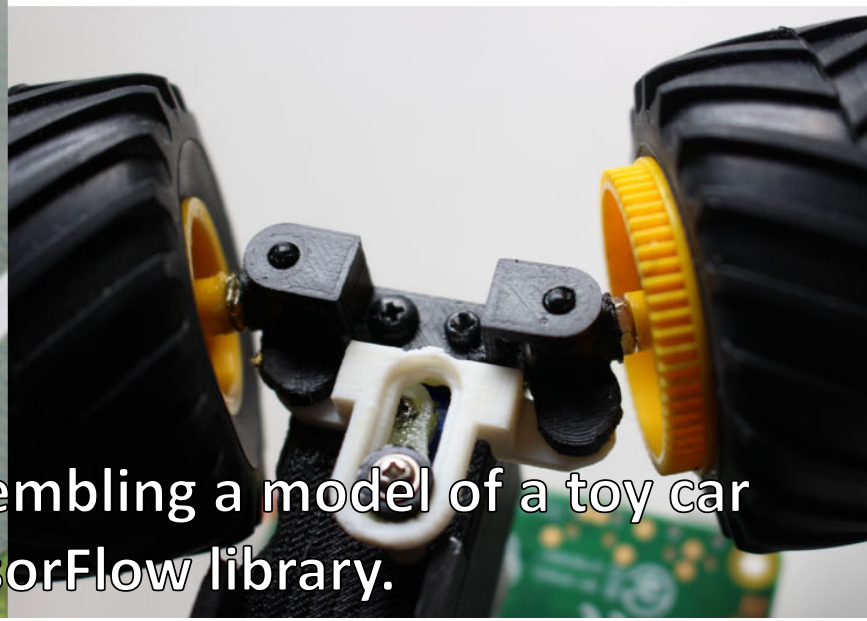


Driving by AI: Between Road and AI Server

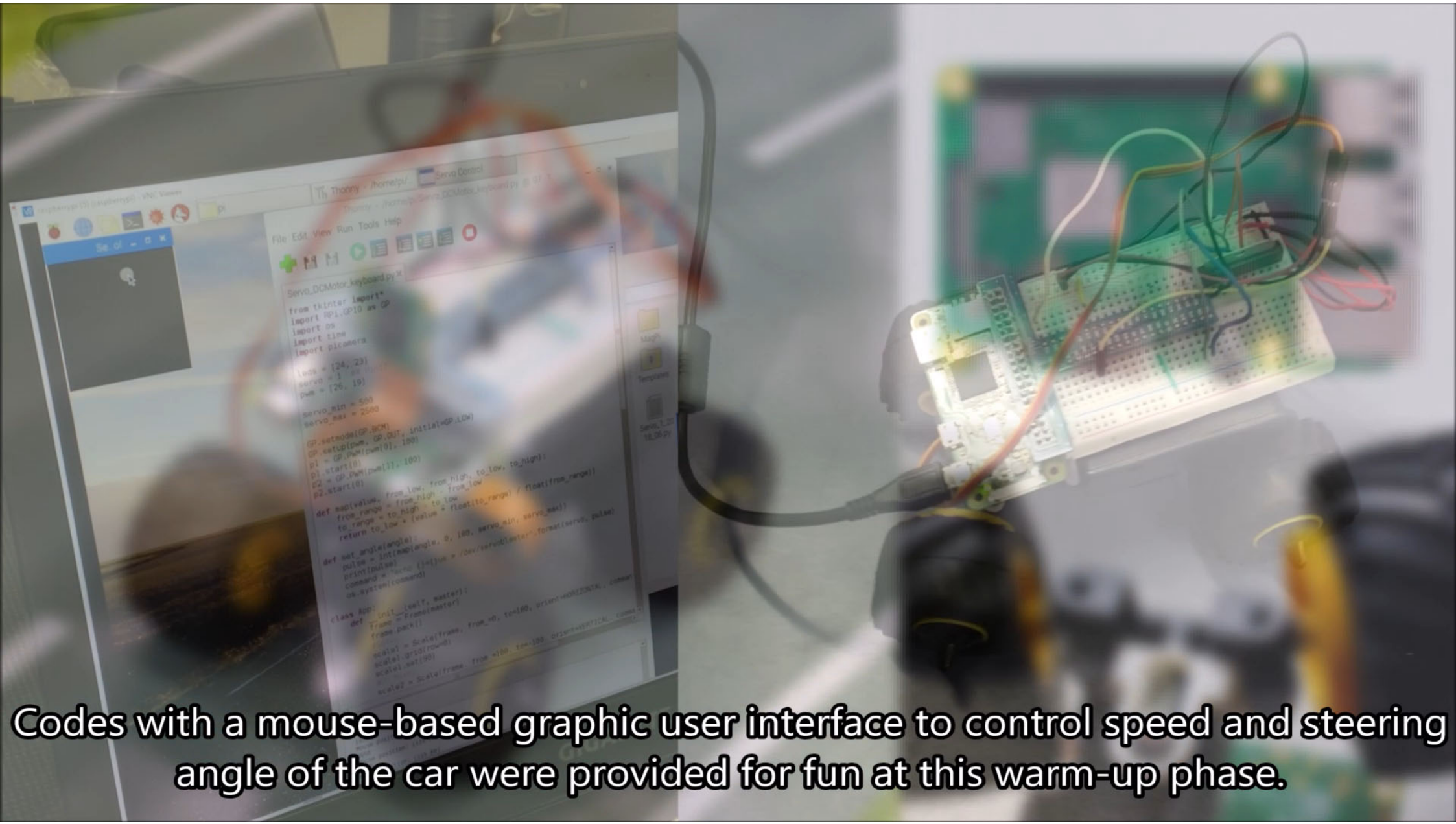


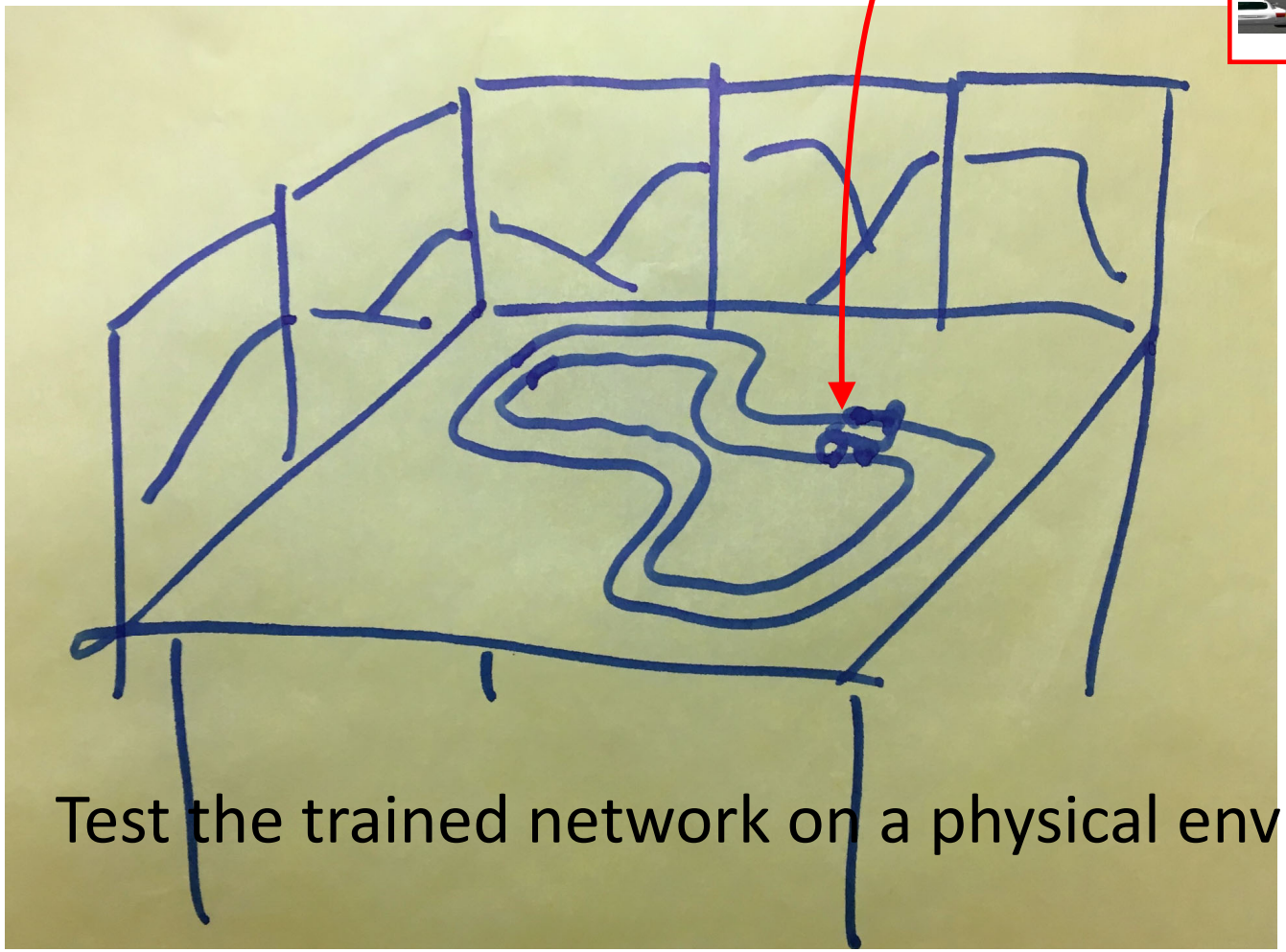




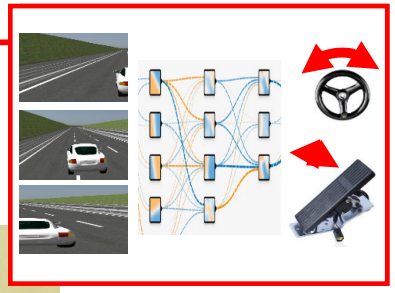


In the first phase, participants will have fun assembling a model of a toy car controlled by Raspberry Pi pre-loaded with TensorFlow library.


Codes with a mouse-based graphic user interface to control speed and steering angle of the car were provided for fun at this warm-up phase.



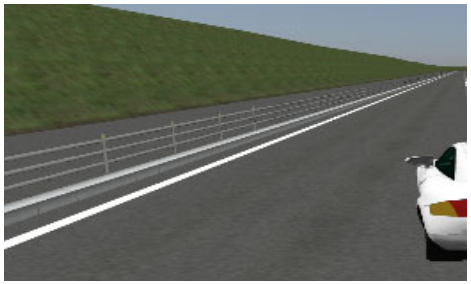
Network

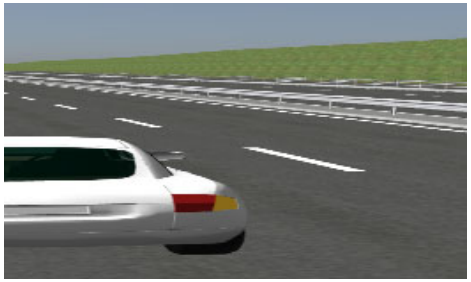


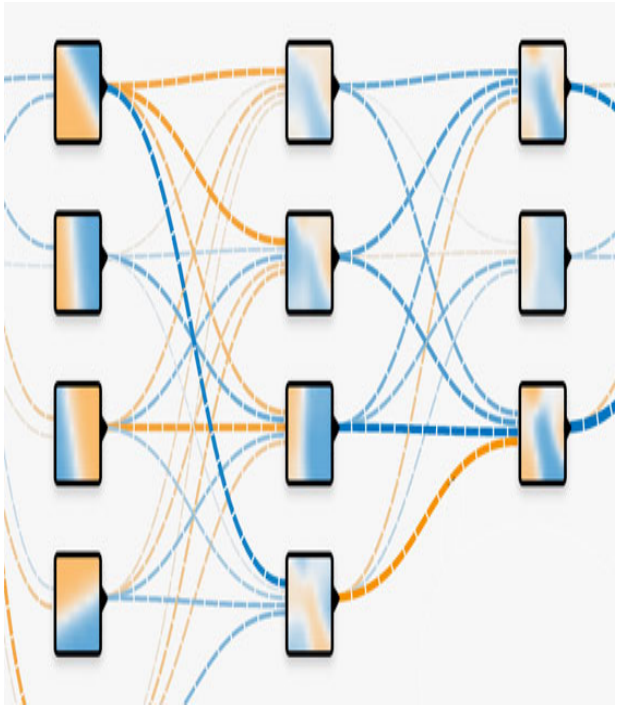
ML

Test the trained network on a physical environment

ML

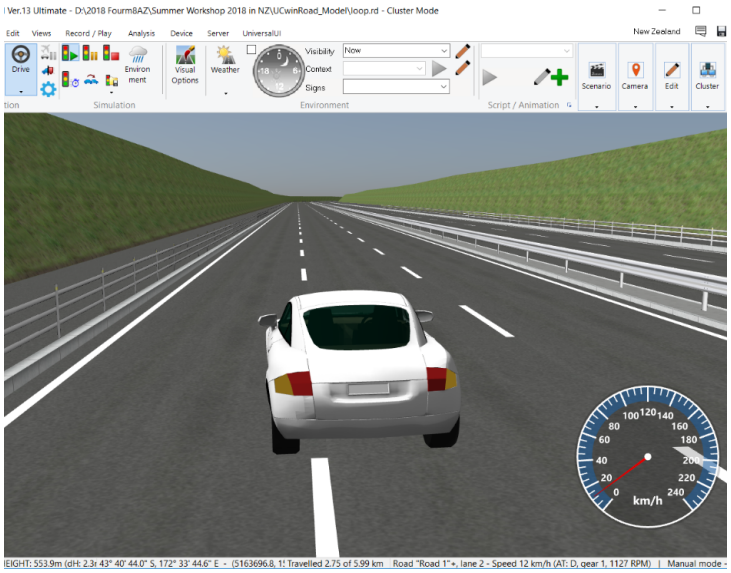




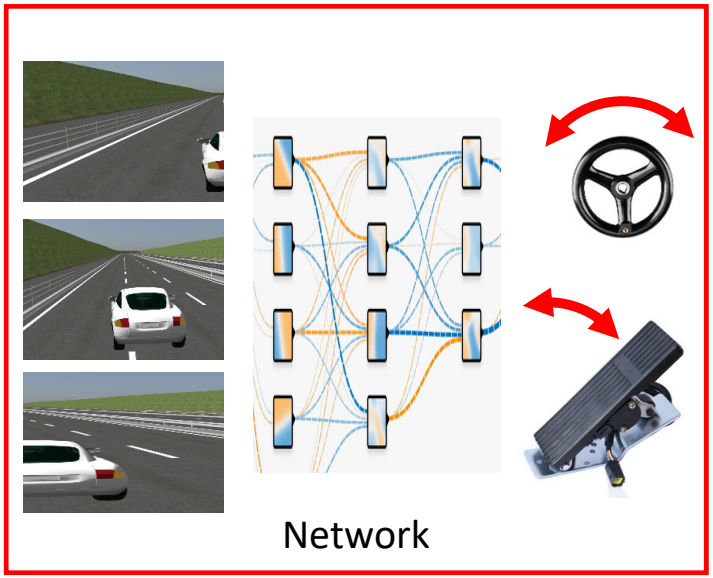


Network

UC-win/Road

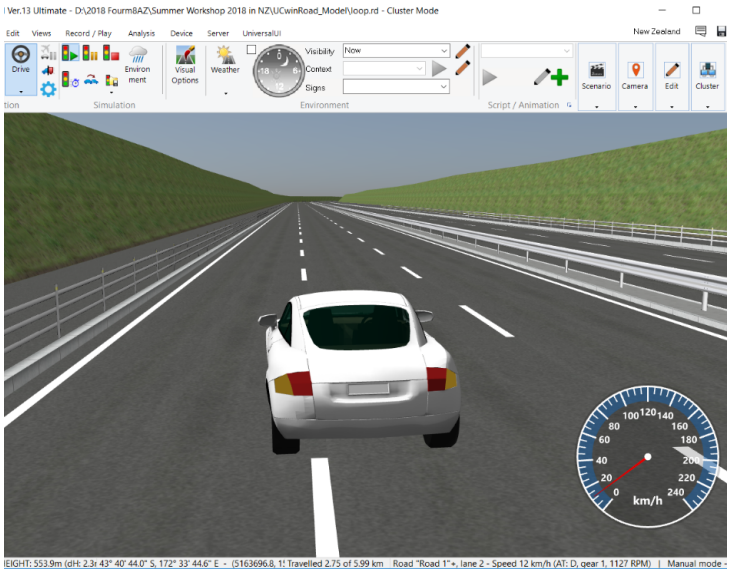


ML



Apply the network to a new driving course to see how the player would drive the new course.

UC-win/Road



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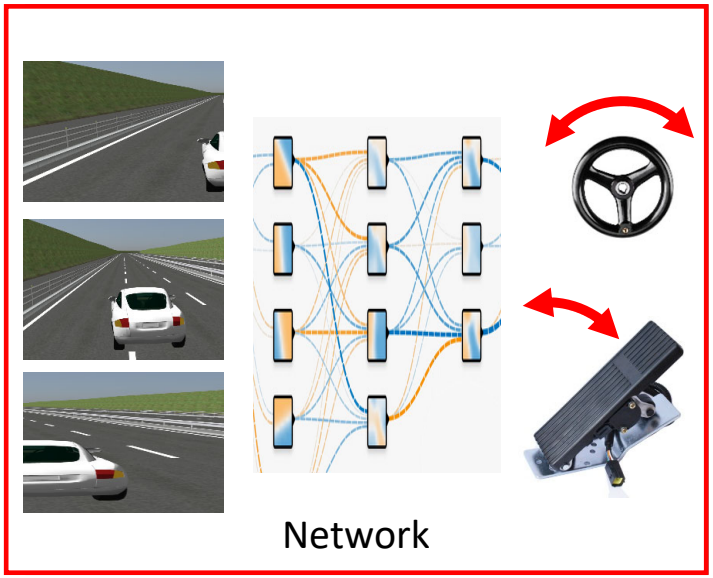
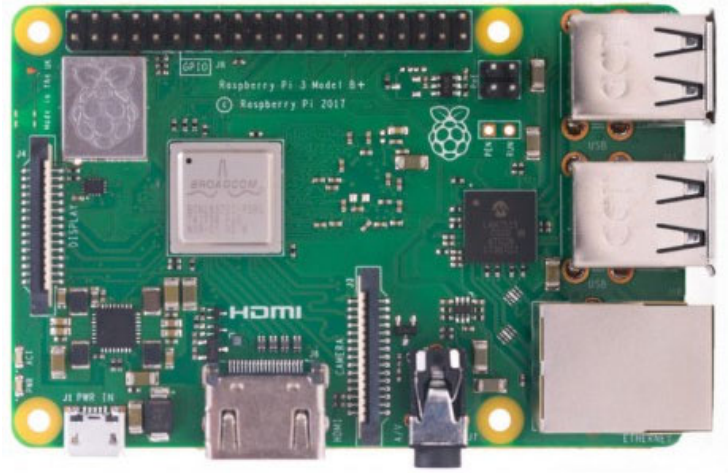
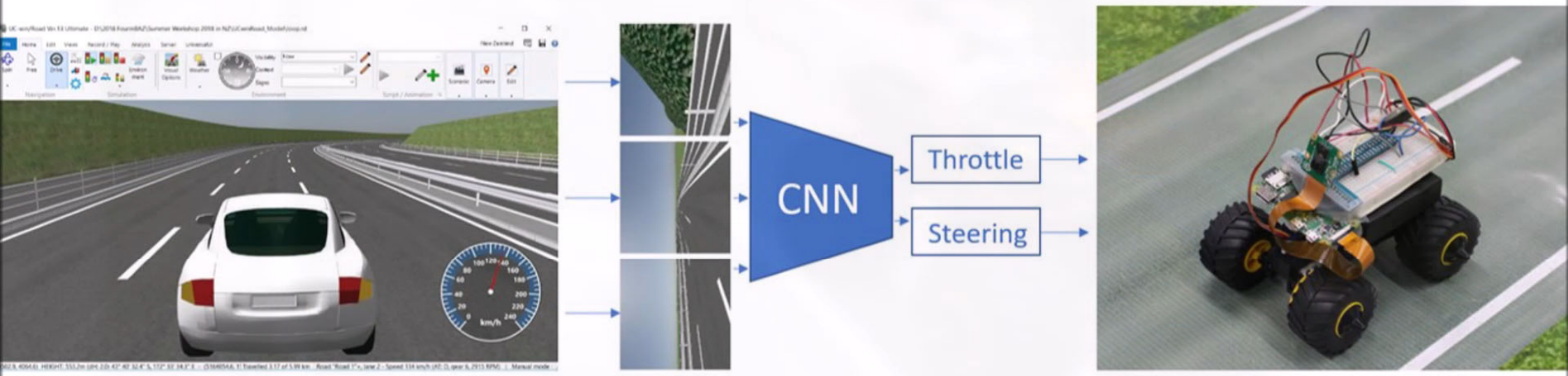





Finally, the physical toy car is controlled by the network – which was trained to use the way the participant drove the virtual car.



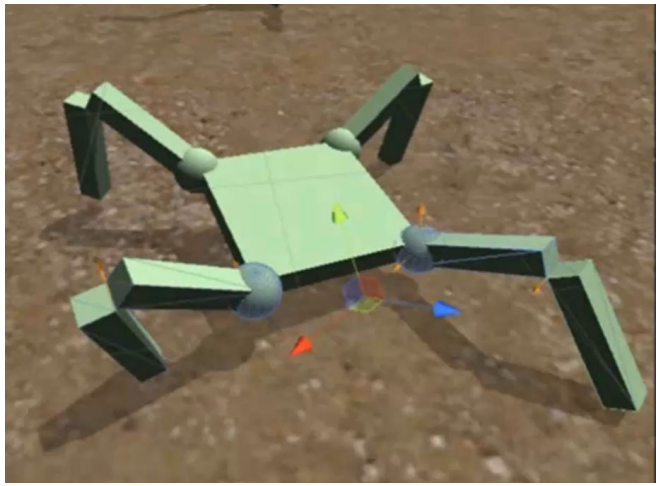
Playing in VR

Training AI

Running a Toy Car with a play style

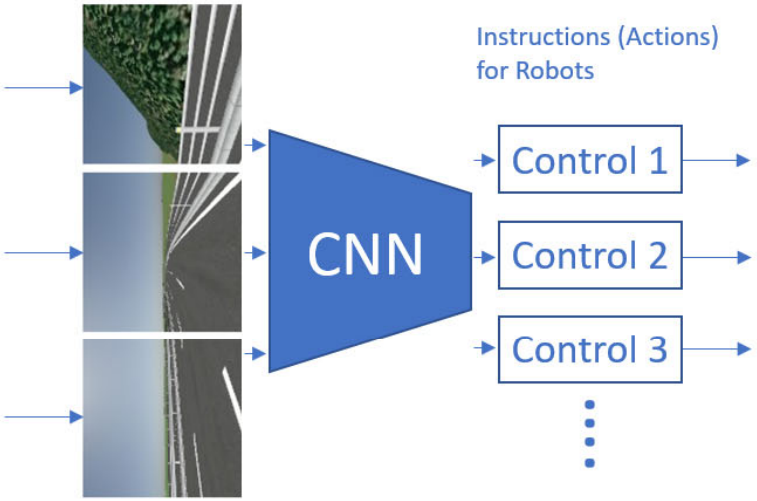
Through the example of AI driving with a toy car, we tested our proposed framework for an educational module that can introduce AI and robotics together in one package in a short period of time

Participants play & control robots in a VR environment and generate Data for CNNs.



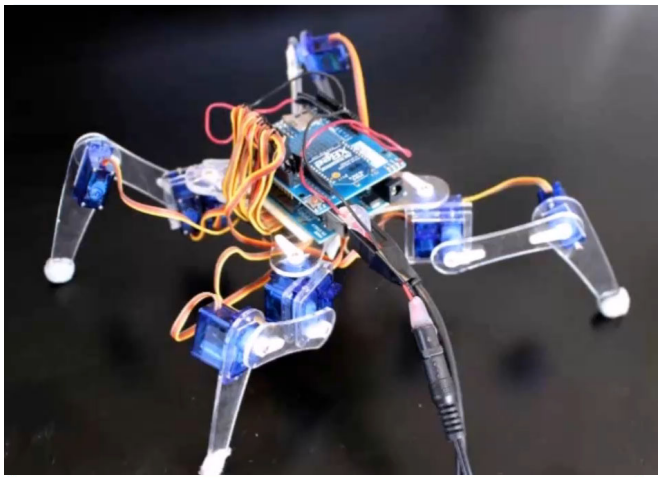
Playing with a Bot in VR

State of the world captured by VR cameras



Training AI

Re-enactment in a physical environment using a game-play style which was learned in VR.



Running a physical Bot


Application 2: Your skill is good enough?
HONDA

Conclusions

Our AI model is trained to assimilate the participant's game-play style, which will be later re-enacted by the physical robot assembled by the participant.

Through this approach, we intend to demonstrate the AI's ability to personalize things and hope to stimulate participants' curiosity and motivation to learn.

Future Work

The current single-board computers have a practical limitation for a size of networks to run in real time, and further advancement will help introduce more complex application examples.

In terms of the driving model, for future work, we can compare the reactions of our AI models to those trained by professional drivers and could develop a coaching system.

The physical miniature course needs to be made visually closer to VR scenes to minimize the gap for a more accurate performance of the network.

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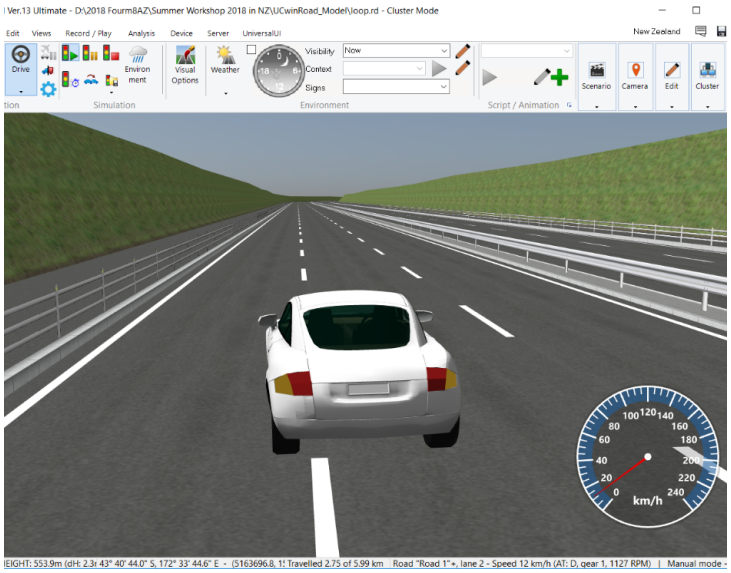
UC-win/Road



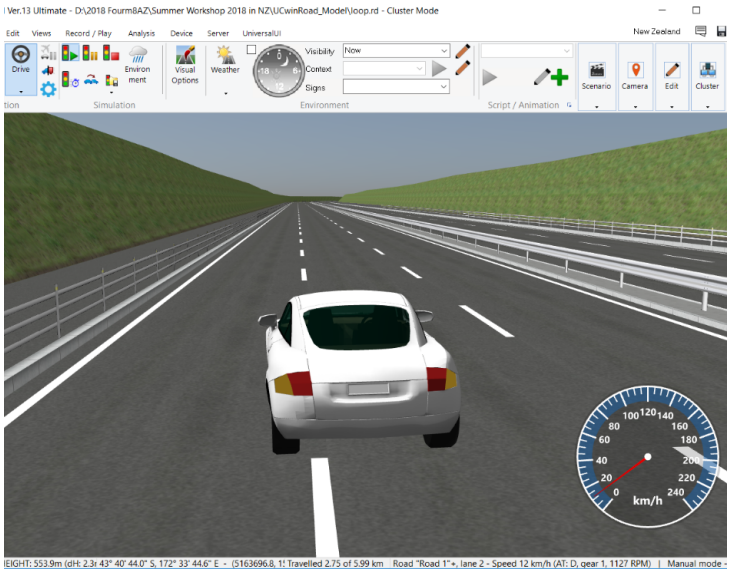
A player drives a car.

ML

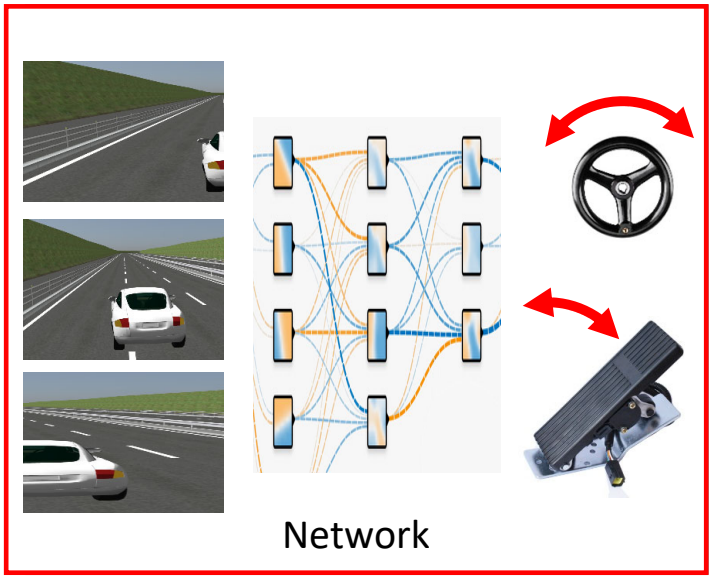
TensorFlow

Train a network with the player's driving data.

UC-win/Road

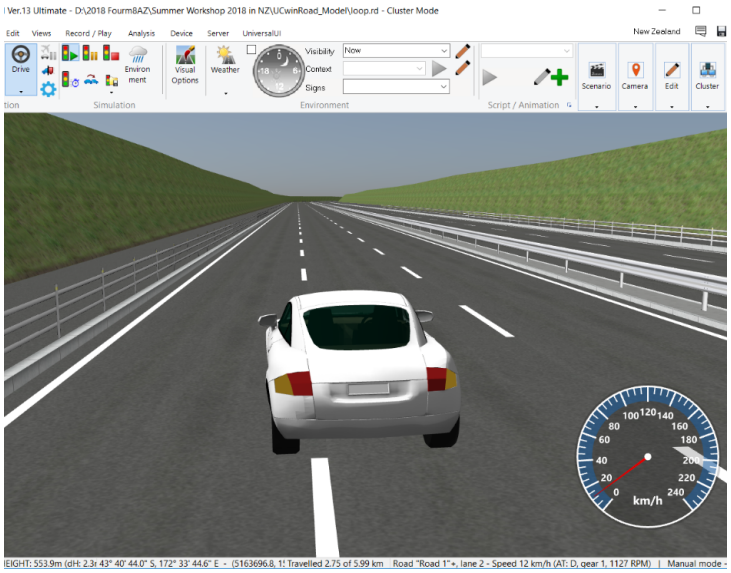


ML

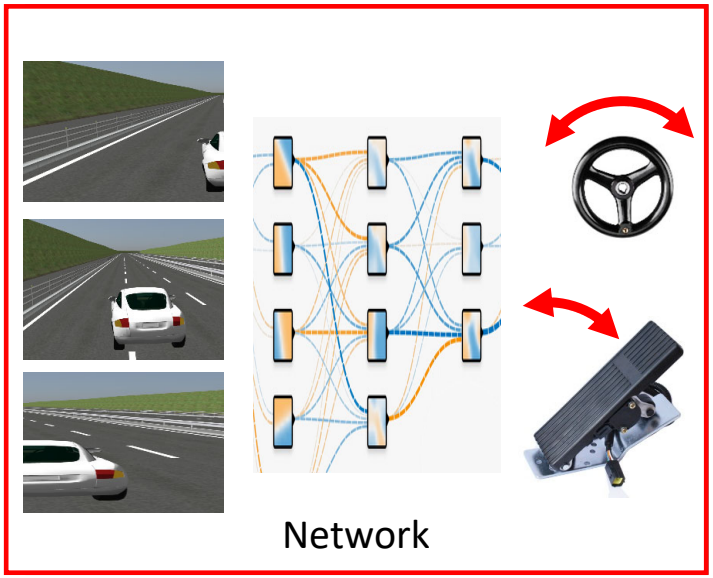


Create a network that returns a steering angle & speed for a condition captured in camera images based on the provided player's driving data.

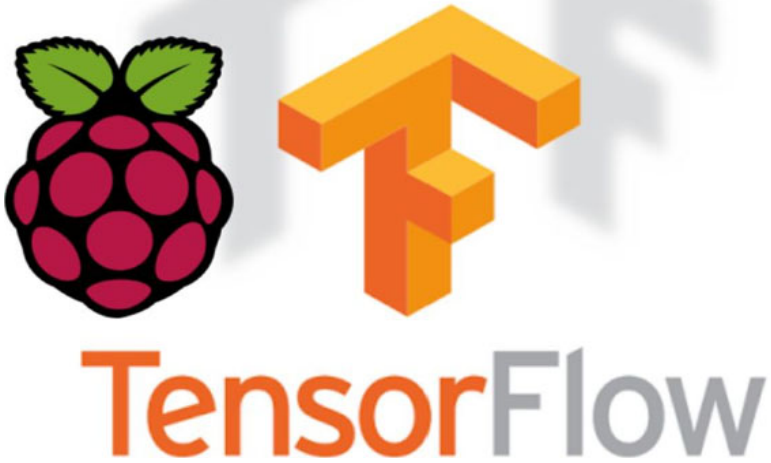
UC-win/Road

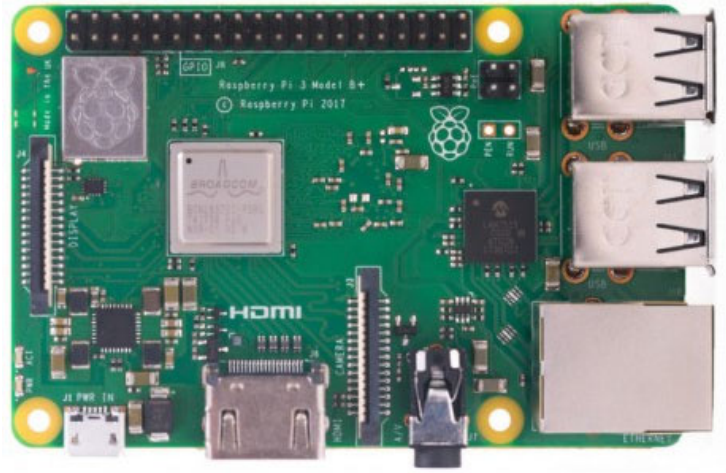


ML

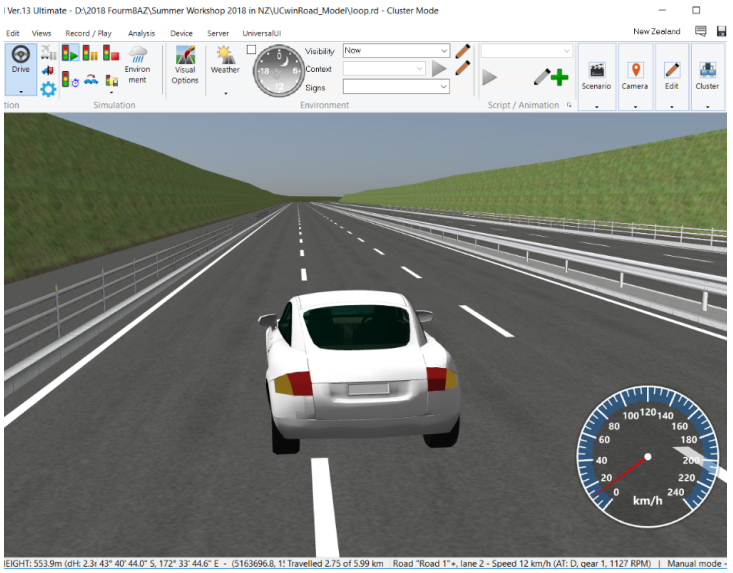


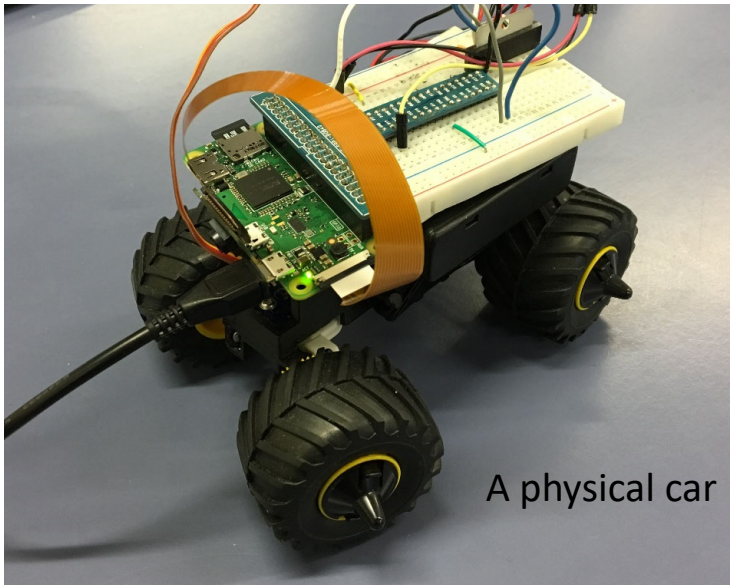
Installed the same ML tool, TensorFlow on RaspberryPi,
so it can use the same trained network.





UC/WinRoad





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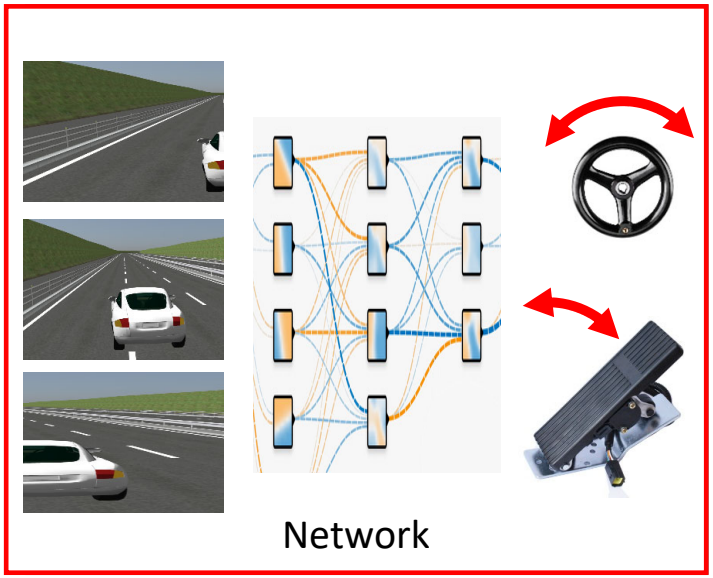
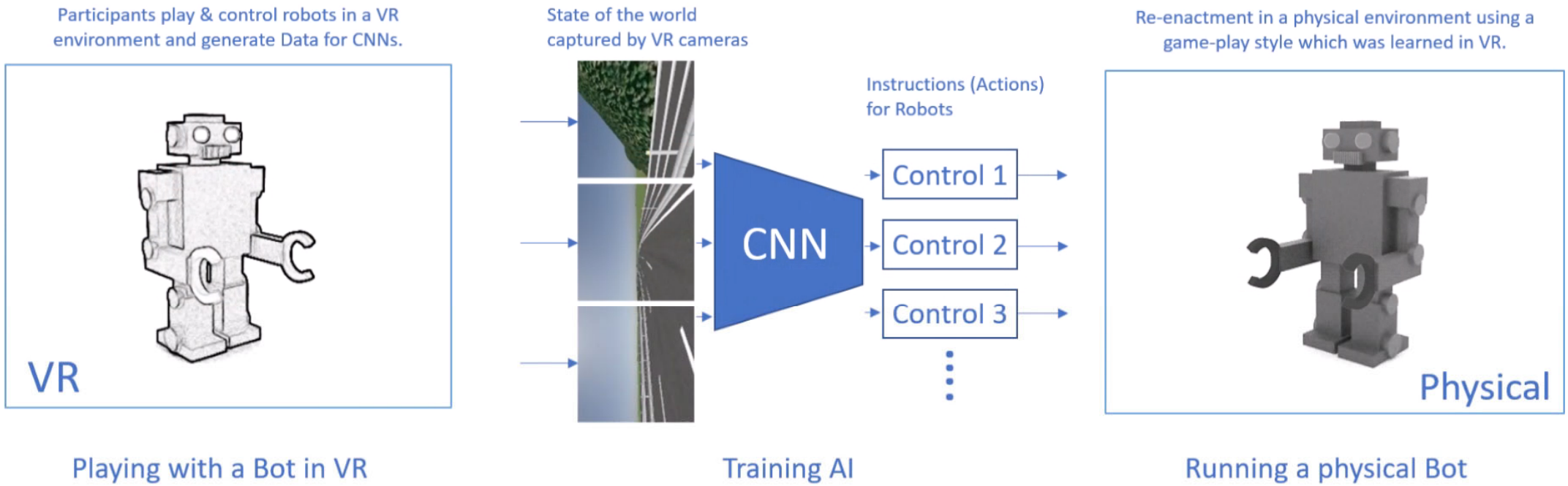


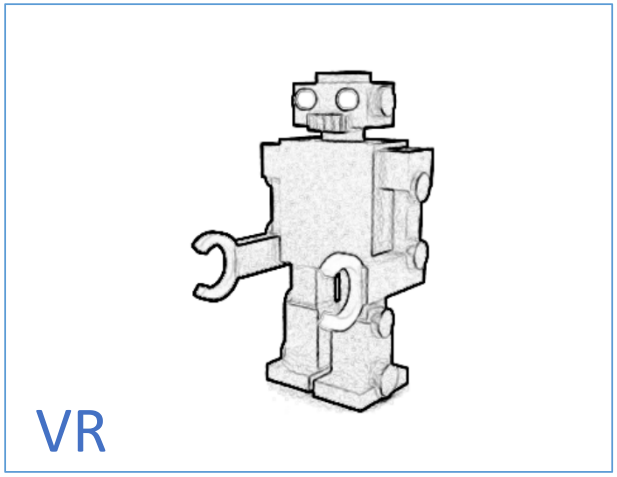
The trained network can be used for driving a physical car connected to the Raspberry Pi.

The model car will run like the way that the player drives a car.



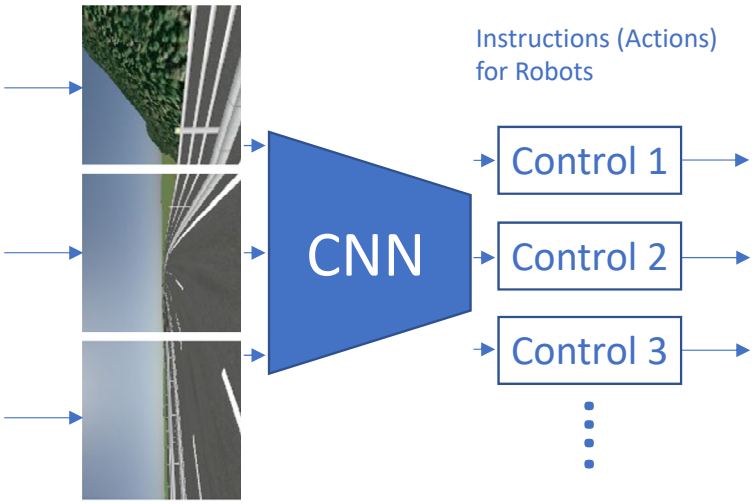
We propose a new framework for hands-on educational modules to introduce ideas in AI and robotics casually, quickly, and effectively in one package.

Participants play & control robots in a VR environment and generate Data for CNNs.



Playing with a Bot in VR

State of the world captured by VR cameras



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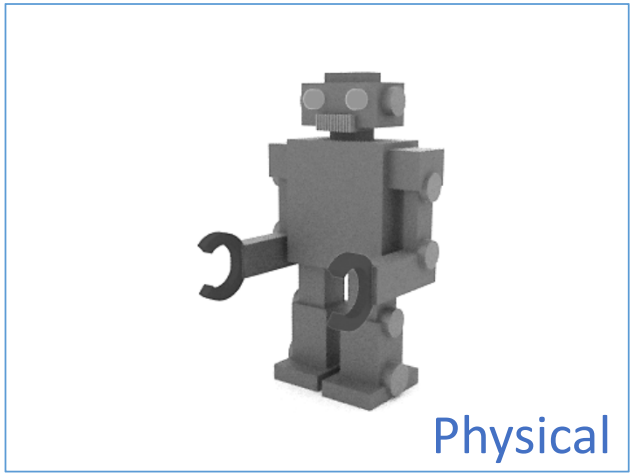


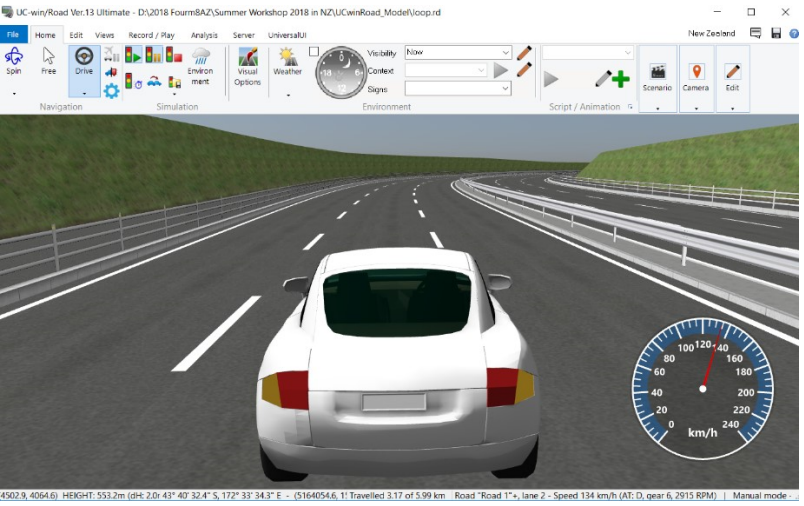
Running a physical Bot

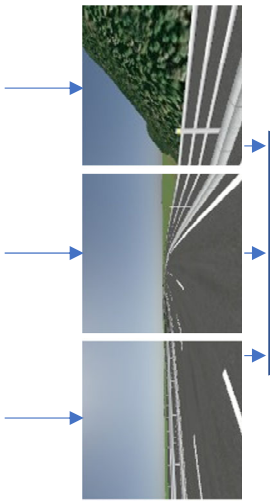
We propose a new framework for hands-on educational modules to introduce
ideas in AI and robotics casually, quickly, and effectively in one package.

Playing in VR

Training AI

Running a Toy Car with a play style

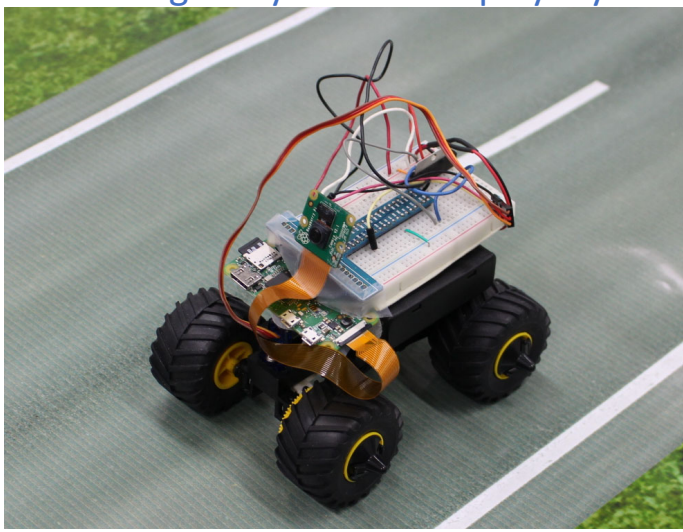


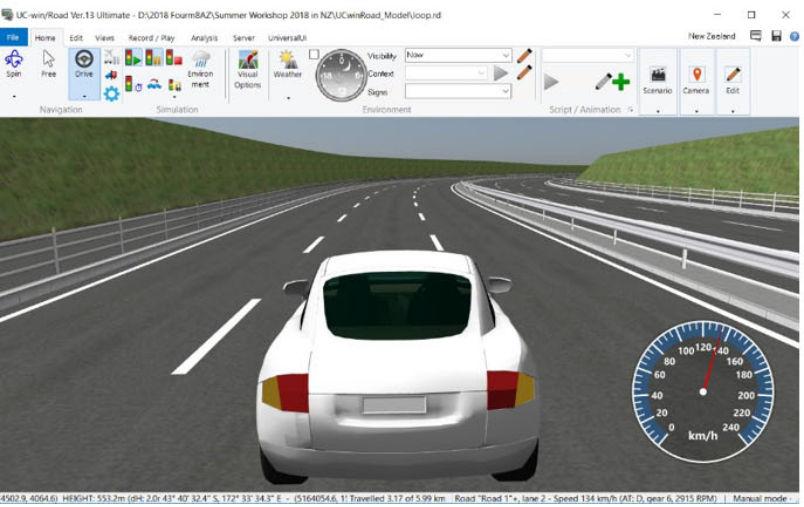


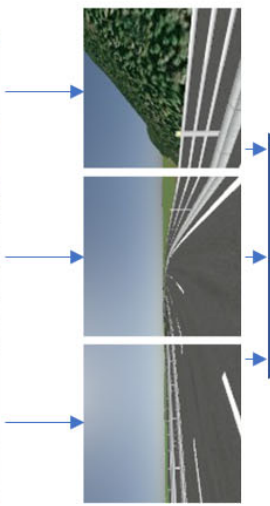
CNN

Throttle

Steering







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