

# DeepPicar: A Low-cost Deep Neural Network-based Autonomous Car

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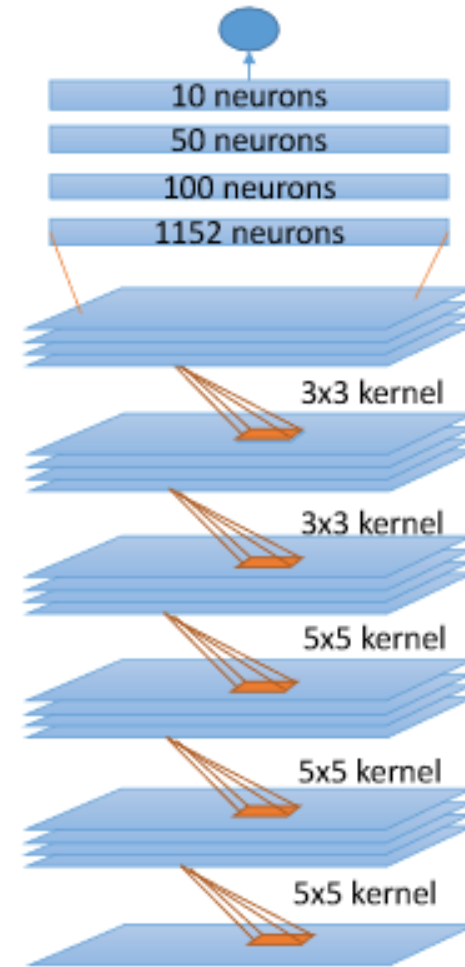


# DAVE-2

- 2016 project conducted by NVIDIA using the End-to-End approach with a Deep Neural Network (DNN).
- Could successfully drive a car on public roads.



Source: <https://devblogs.nvidia.com/deep-learning-self-driving-cars/>



output: steering angle  
fc4: fully-connected layer  
fc3: fully-connected layer  
fc2: fully-connected layer  
fc1: fully-connected layer

conv5: 64@1x18  
convolutional layer

conv4: 64@3x20  
convolutional layer

conv3: 48@5x22  
convolutional layer

conv2: 36@14x47  
convolutional layer

conv1: 24@31x98  
convolutional layer

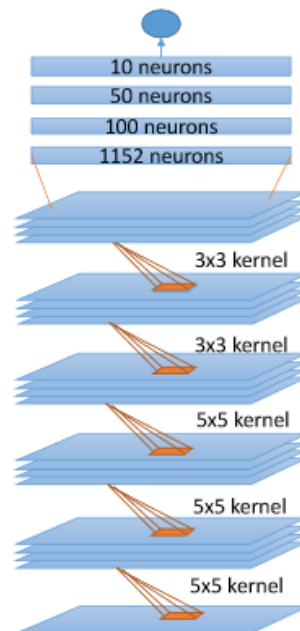
input: 200x66 RGB pixels

DAVE-2 DNN: 9 layers, ~250K parameters,  
~27M connections

# DeepPicar

- A **low cost**, small scale replication of NVIDIA's DAVE-2.
- **Uses the exact same DNN.**
- Runs on a Raspberry Pi 3 in **real-time.**

Item	Cost (\$)
Raspberry Pi 3 Model B	35
New Bright 1:24 scale RC car	10
Playstation Eye camera	7
Pololu DRV8835 motor hat	8
External battery pack & misc.	10
<b>Total</b>	<b>70</b>



output: steering angle  
fc4: fully-connected layer  
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conv5: 64@1x18  
convolutional layer

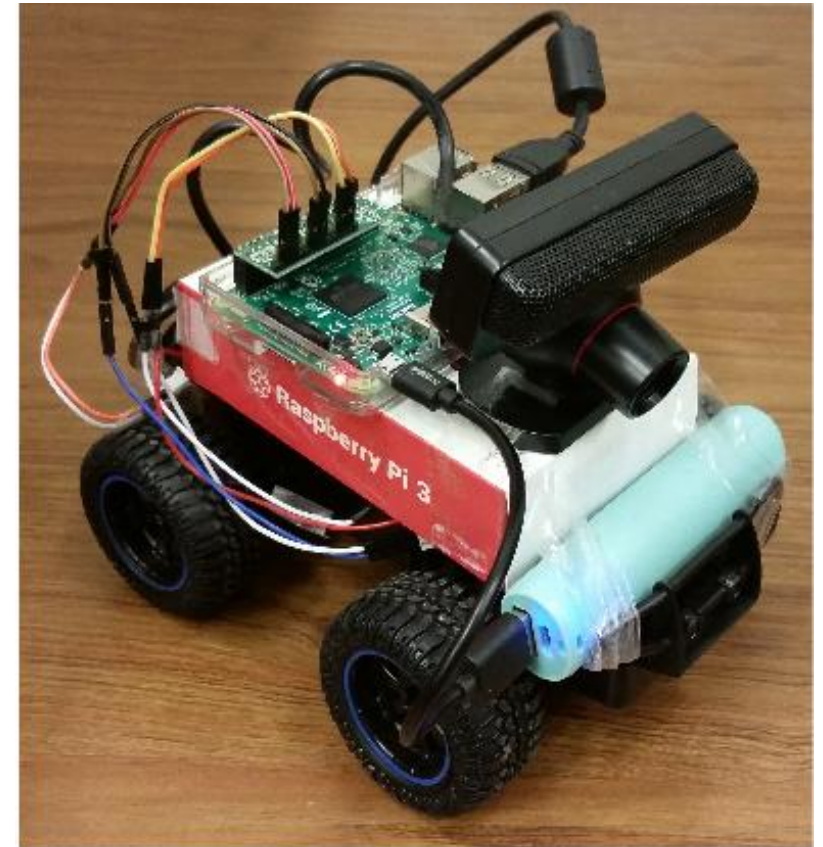
conv4: 64@3x20  
convolutional layer

conv3: 48@5x22  
convolutional layer

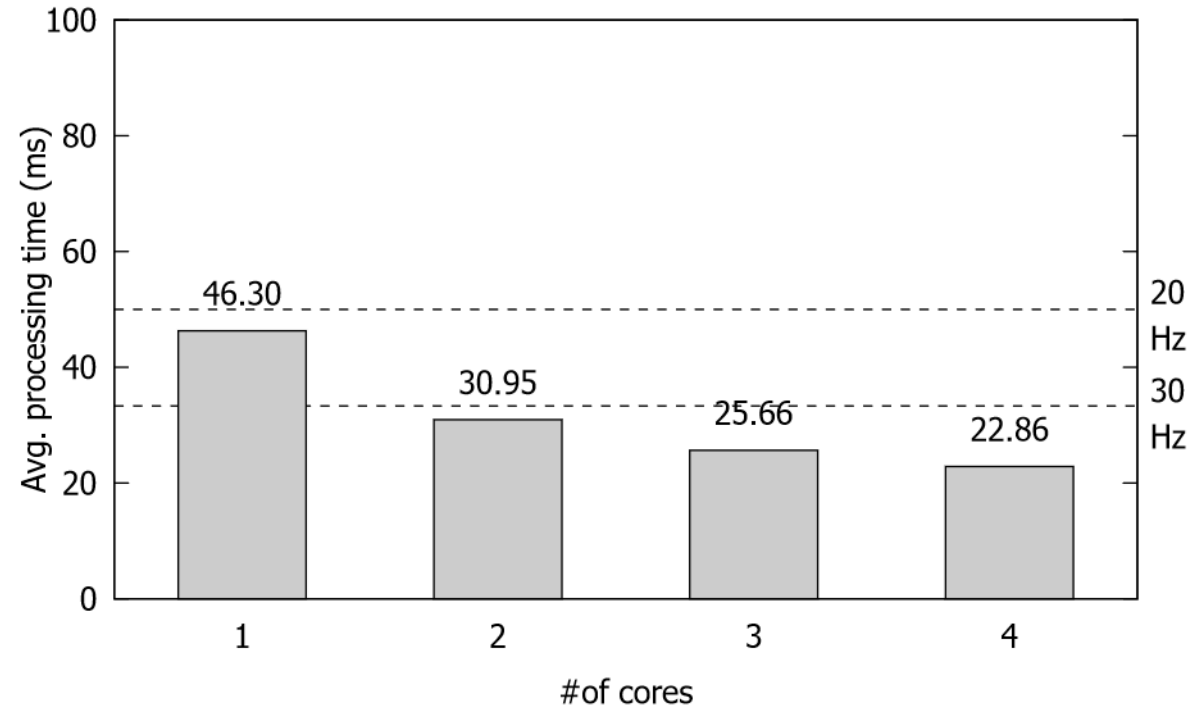
conv2: 36@14x47  
convolutional layer

conv1: 24@31x98  
convolutional layer

input: 200x66 RGB pixels



# Real-Time Performance



- CNN inferencing runs in real-time on the Pi 3.
- Even with one core, 20 Hz performance is feasible.

# Use Cases

- Research
  - DeepPicar's CNN workload can be used as a representative **real-world benchmark workload**.
- Education
  - DeepPicar can be used for student projects (both university and K-12) to have hands on experiences without significant financial investment.

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