

Deep Learning aplicado a Sistemas Embebidos

Visión Computacional

Classification



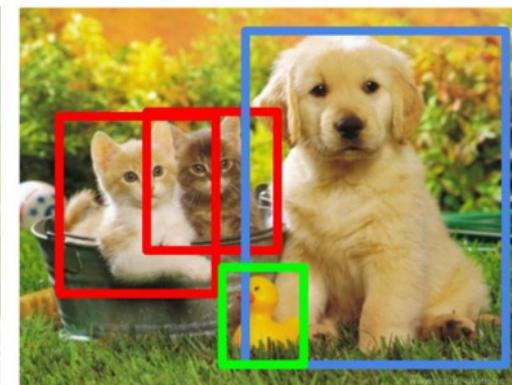
CAT

Classification + Localization



CAT

Object Detection



CAT, DOG, DUCK

Instance Segmentation

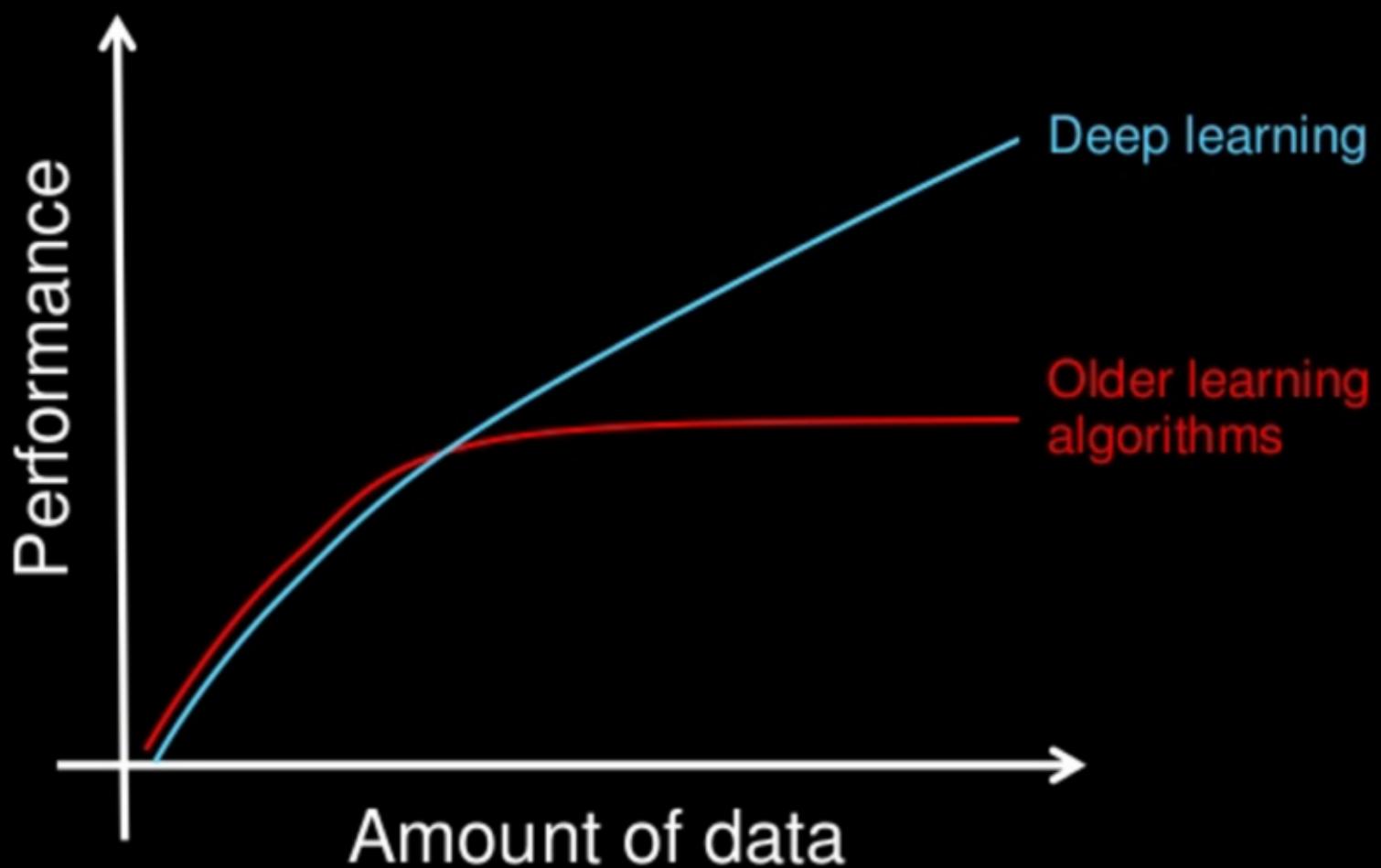


CAT, DOG, DUCK

Single object

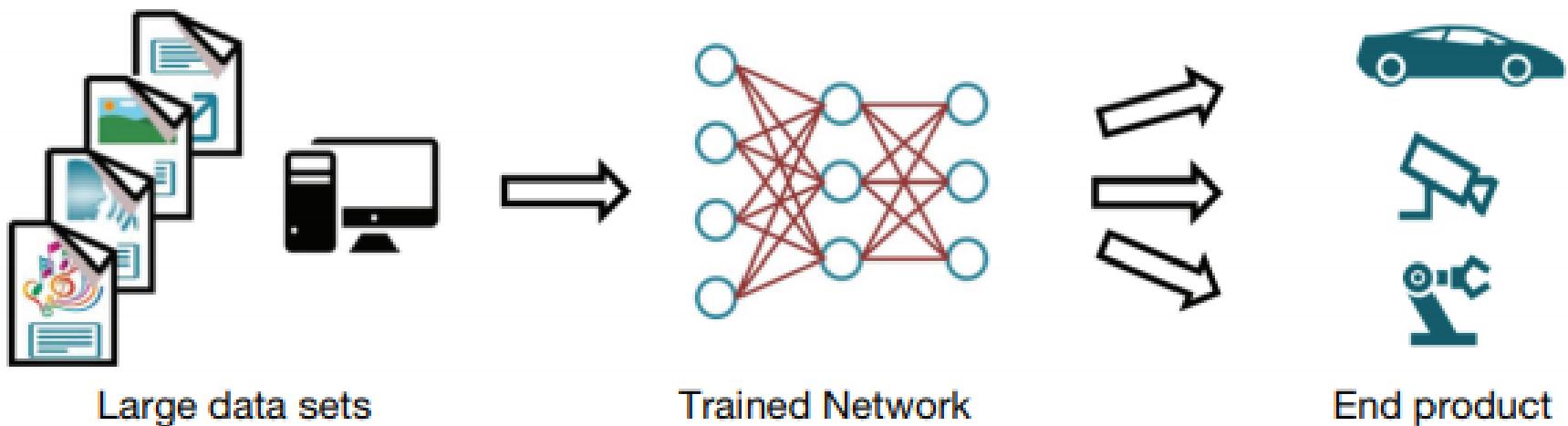
Multiple objects

Why deep learning



How do data science techniques scale with amount of data?

Pipeline



Training
(PC/GPU)

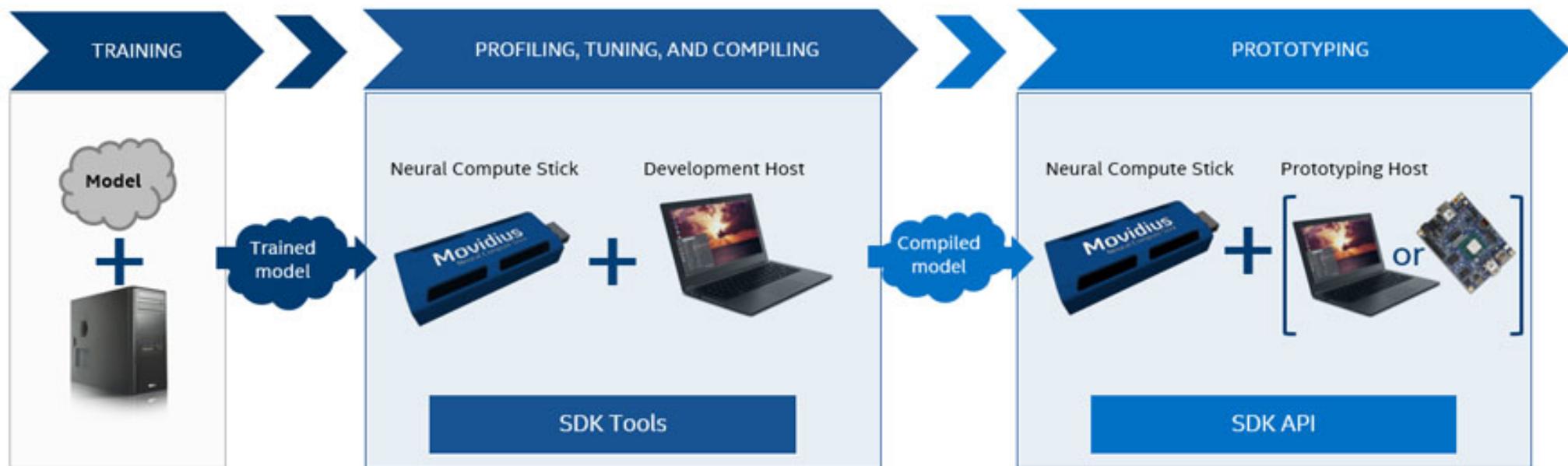
Format Conversion
(if necessary)

Inference – deployment
(embedded processor)

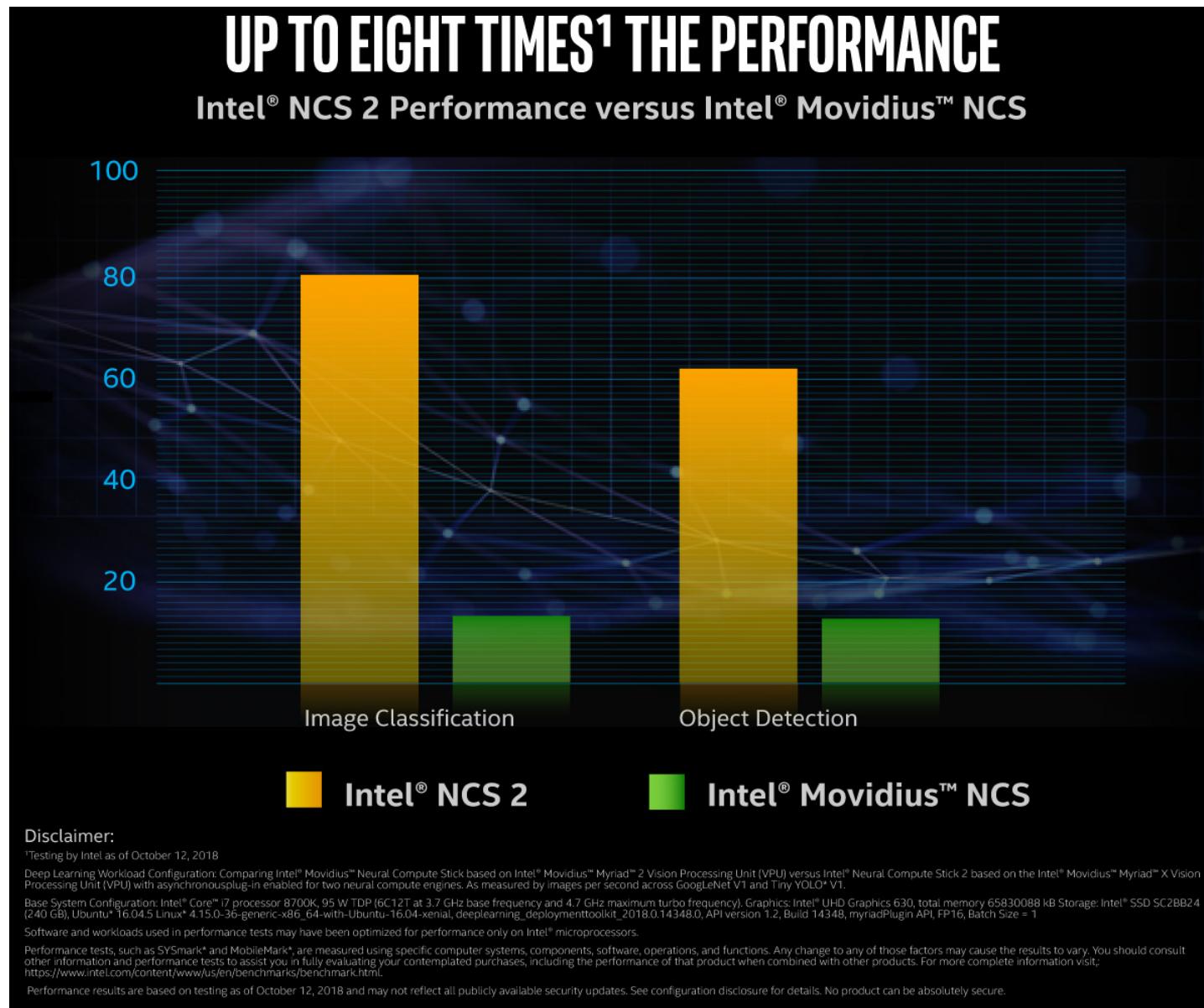
Puntos a considerar

- Consider the entire application
 - Combination of traditional computer vision and DL.
- Choose the right performance point.
 - FPS, Weight, Accuracy, Hardware arquitecture and price
- Think embedded.
 - Right network.
- Ensure ease of use.
 - Work with popular frameworks.
 - Community.
 - Ease of development and ease of evaluation

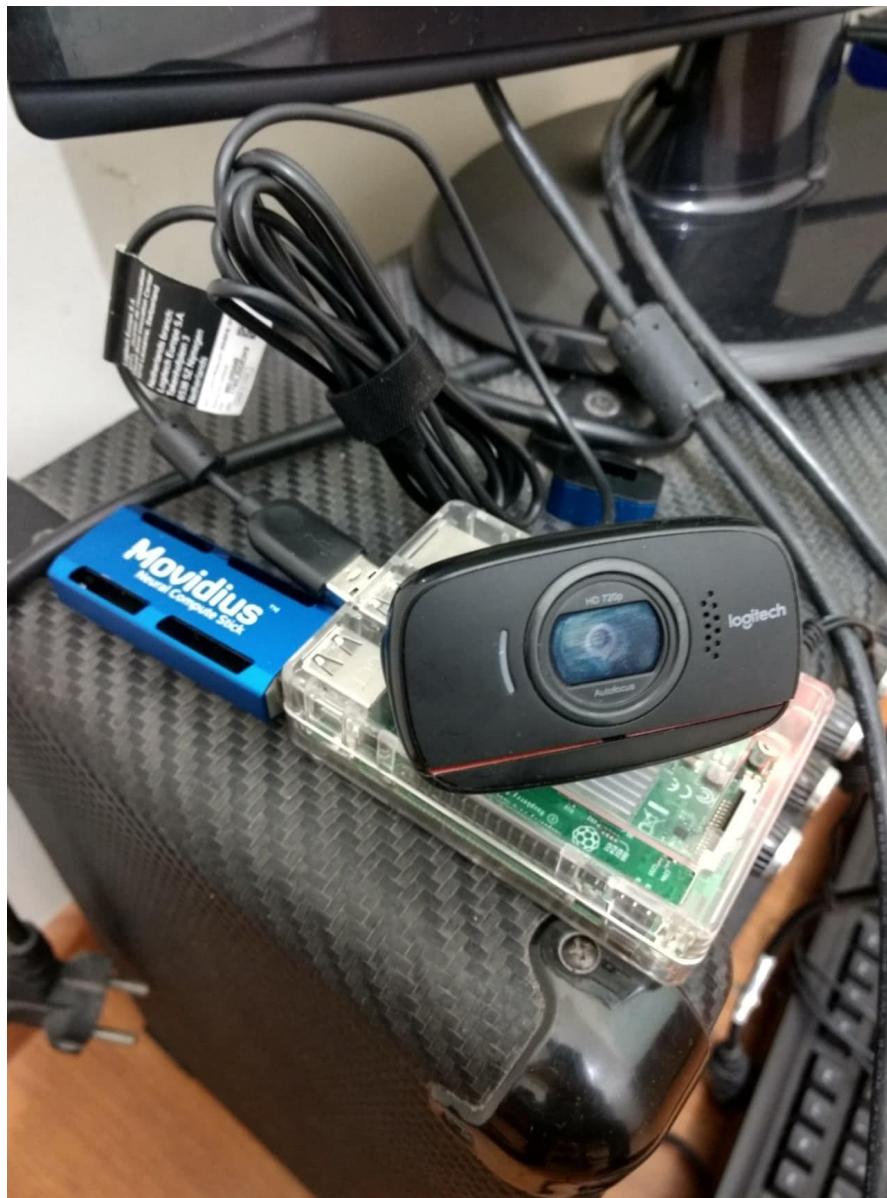
NCS Movidius



NCS Movidius 1 vs 2



Hardware – Acceso a Oficinas

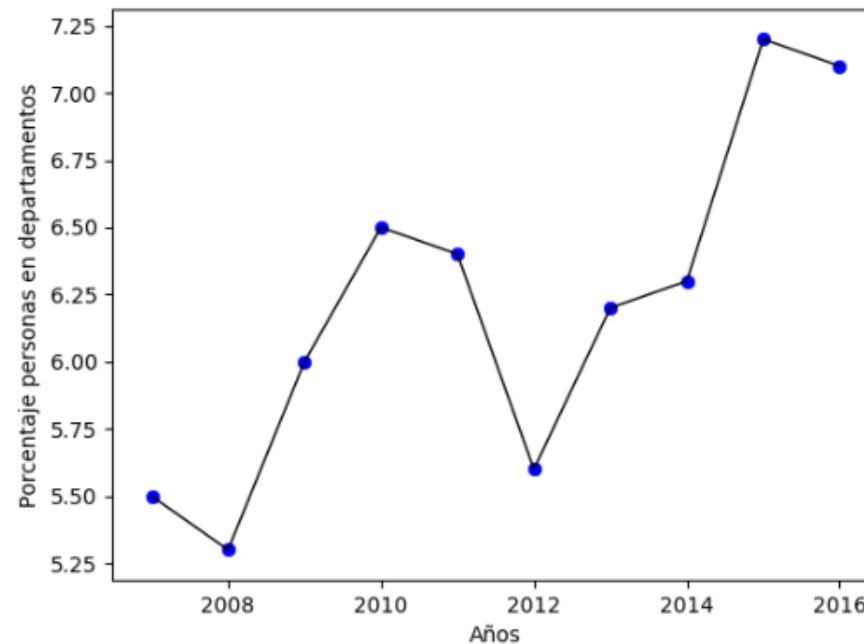


Demo

https://www.youtube.com/watch?v=smnl1_Fes8I

Motivation

- Incrementar la seguridad en los departamentos.
- Dar una solución sin la intervención del humano.



(a) Growth of people living in apartments.
Source: Private households of Peruvians
2007-2016. INEI.

Robot Móvil

- Monster truck 1/10
- NVIDIA TX1, 1 Arduino, 3 web cams.

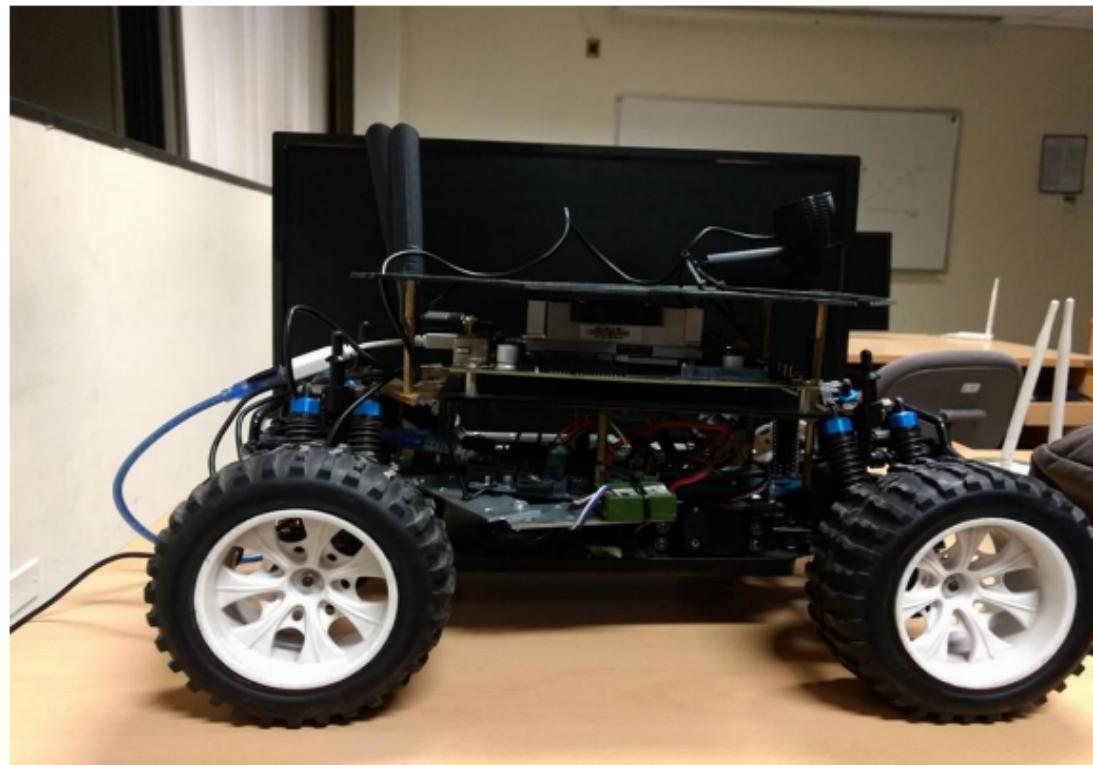
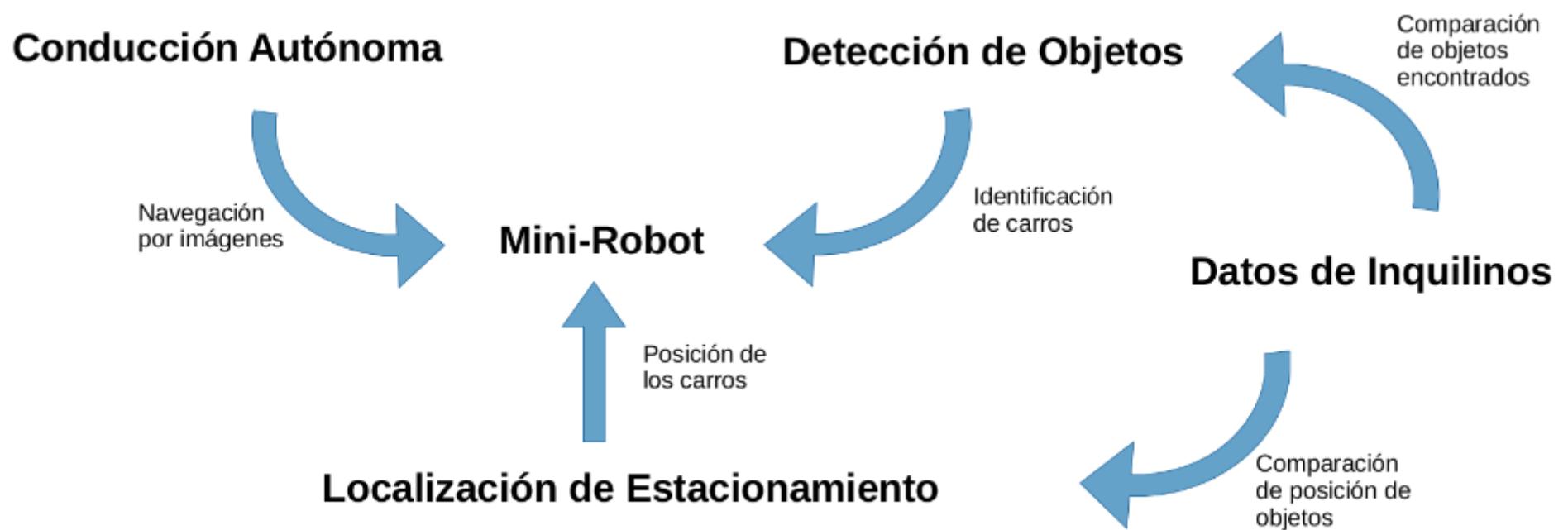


Fig. 5: Mini-Robot para el testeo en garaje

Method

- Diagram of the activities that the robot must solve.



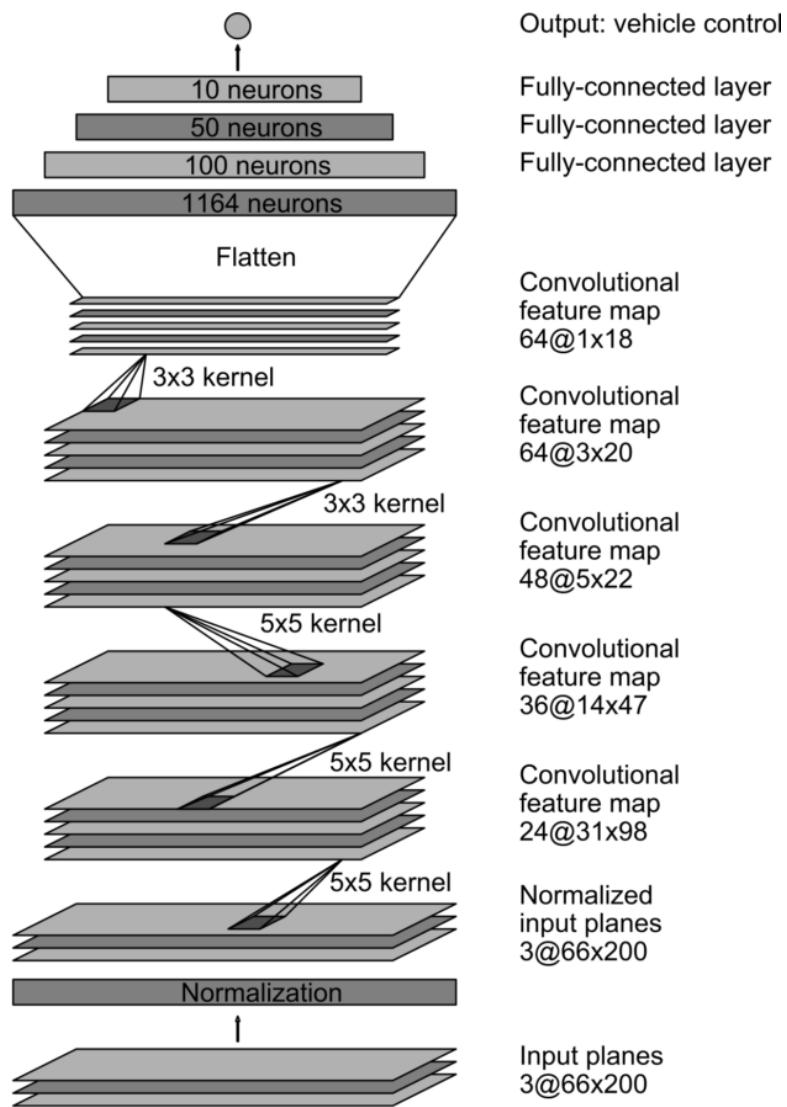
Datos de Inquilinos

- Registrar pertenencias de cada inquilino y su respectivo modelo de carro.
- Mantener en una base de datos para corroborar el resultado del modelo.

Num. Dep.	Nombre	Num. Estac.	Modelo carro	Placa	Carro	Bicicleta	...
1101	Pedro	23	Toyota	ACM-123	Si	No	...
1502	Juan	34	Gol	ABC-345	No	Si	...

Conducción Autónoma

- Basada en NVIDIA Net
- Conducción basado en full imágenes

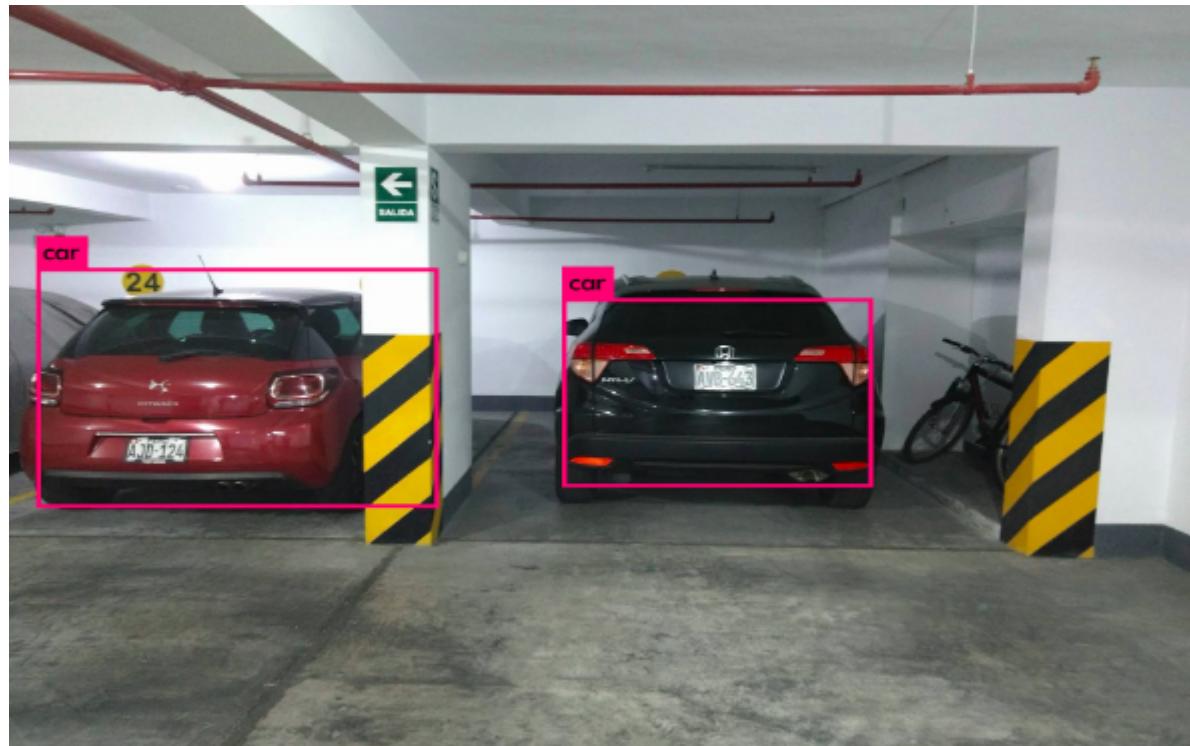


NVIDIA Self-Driving Car

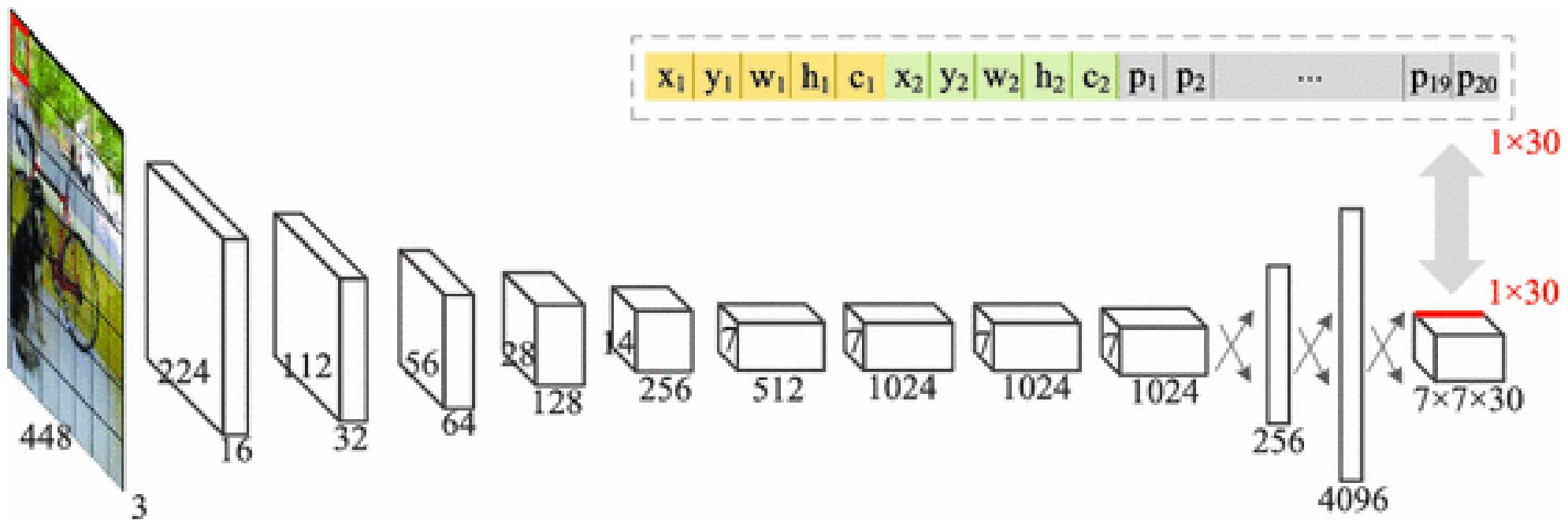
- <https://www.youtube.com/watch?v=-96BEoXJMs0>

Object Detection

- Detect cars for each parking lot using the tiny YOLO model.

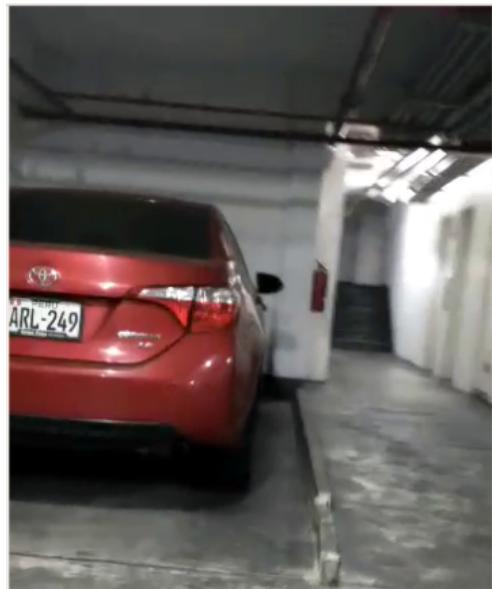


Tiny YOLO

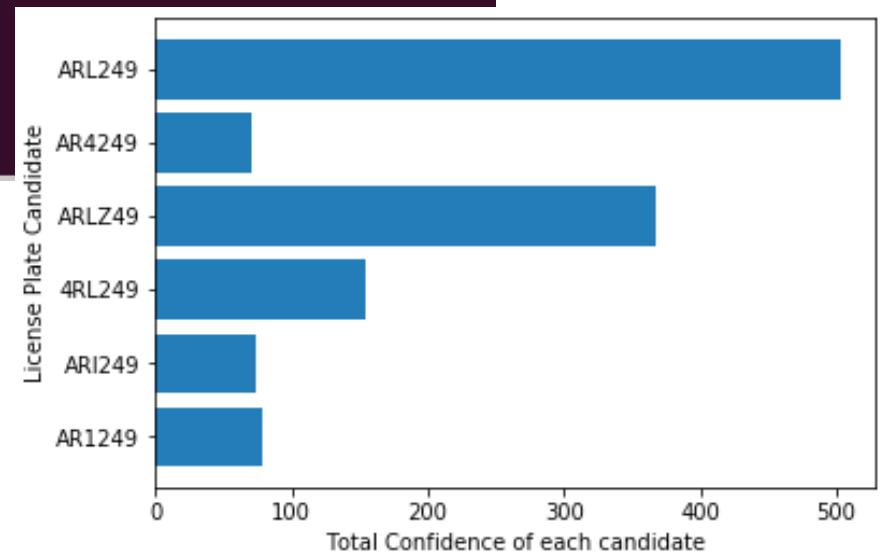


License Plate Recognition

- Detect cars for each parking lot using the tiny YOLO model.



```
adminhpc@lab04-17:~$ python3 prueba.py
ARL249
4RL249
03AR4249
03
03
```



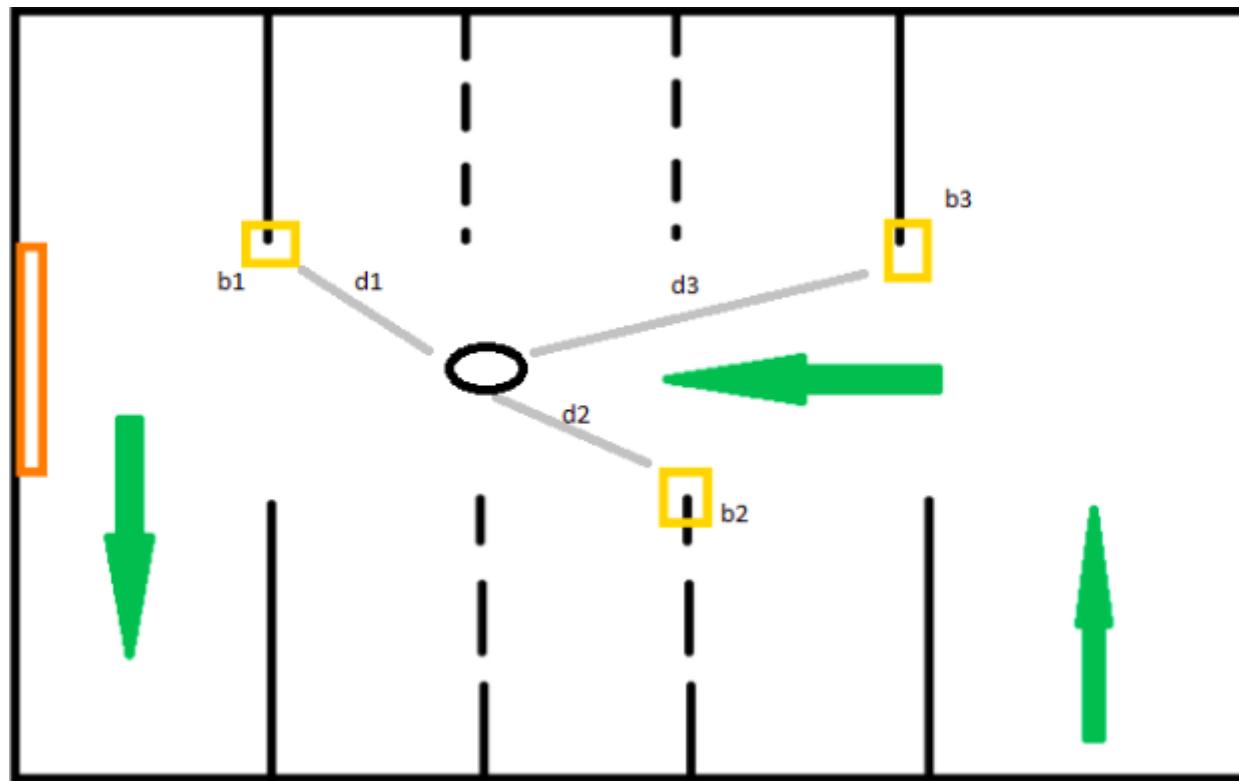
Verificación de propietario



Consulta Vehicular

Localización de Estacionamientos

- Posicionamiento de sensores de IoT: Beacons.
- Estimar los límites de cada estacionamiento.



Gracias