Building a robot that learns how to drive by himself

PyData Kaunas, 2018

Hello!

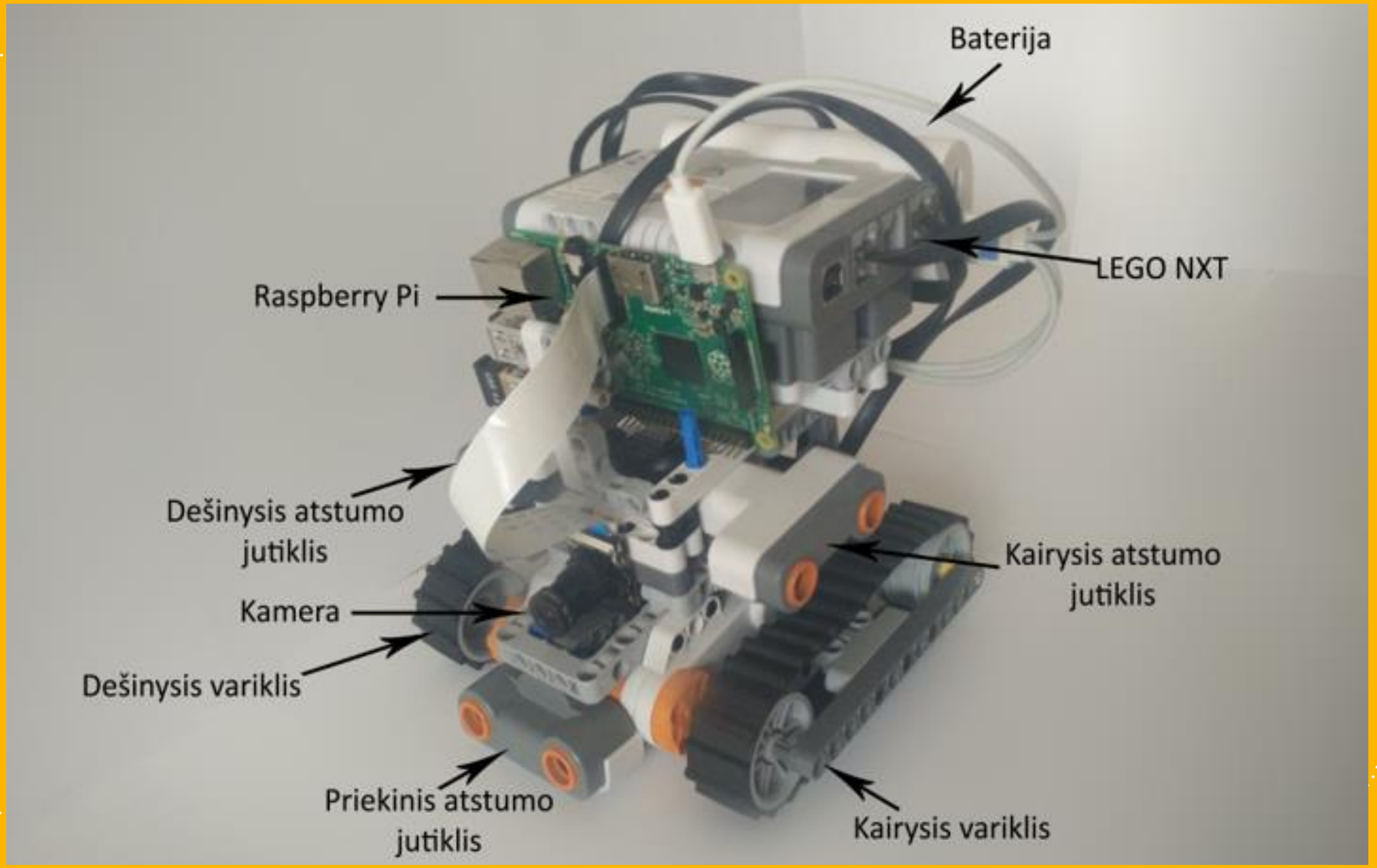
I am Evaldas Kazlauskis

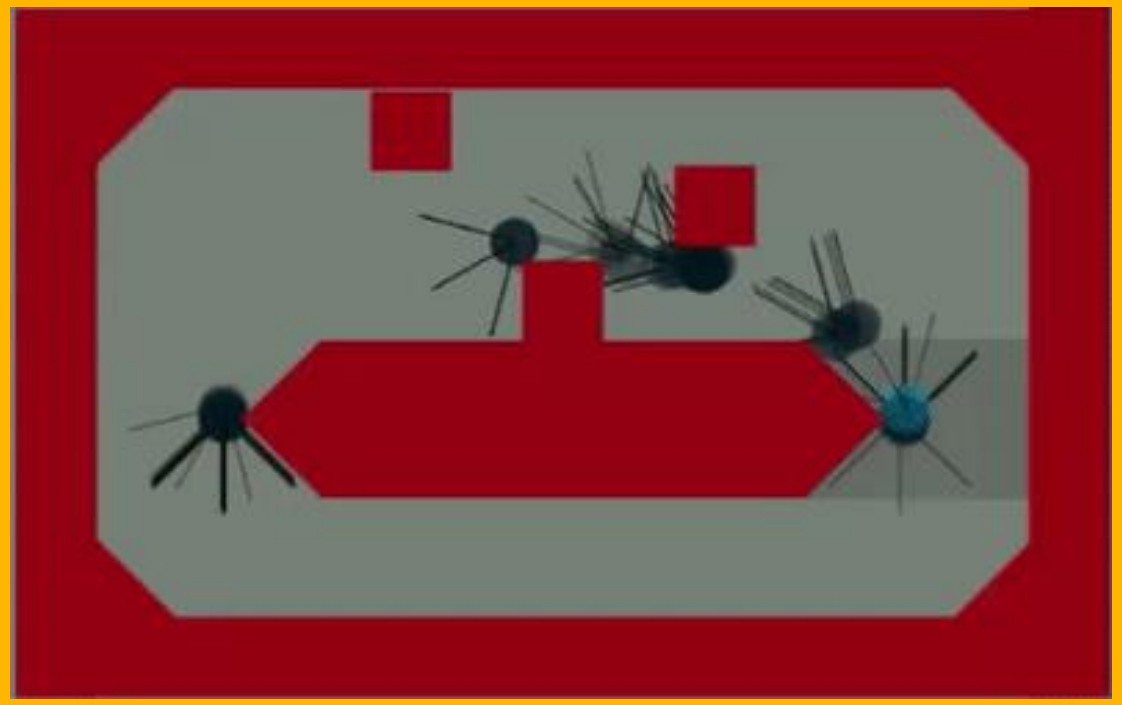
Data Scientist @ CUJO AI

Background: software developer

A picture is worth...

...a thousand words.


Baterija
LEGO NXT
Raspberry Pi
Dešinysis atstumo jutiklis
Kairysis atstumo jutiklis
Kamera
Dešinysis variklis
Priekinis atstumo jutiklis
Kairysis variklis



Our robot

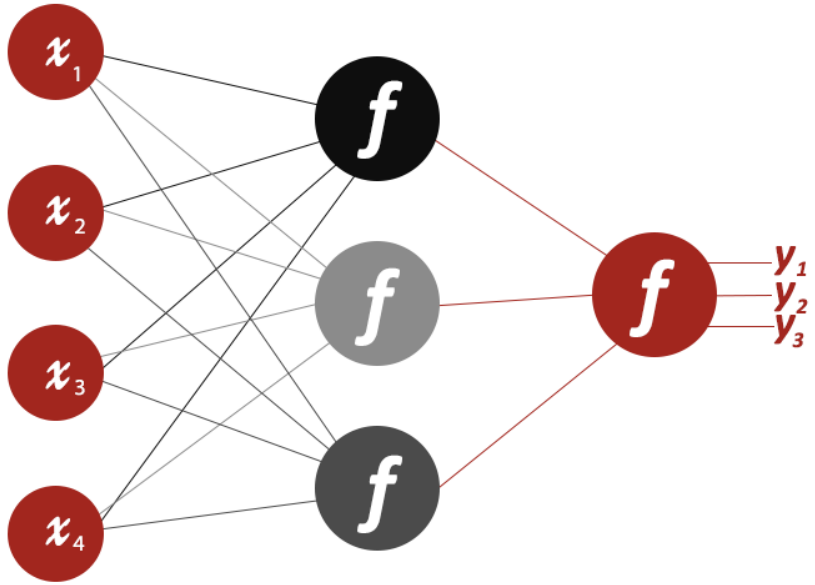
WHAT IT CAN AND KNOWS

- Has inputs from distance sensors
- Turn left/right
- Constantly drives

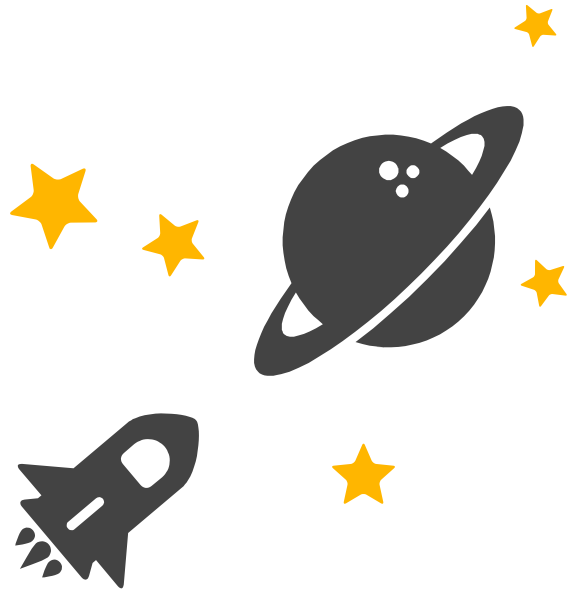
WHAT IS GOAL

- Drive as long as possible without hitting anything or dying.

Our robot's brains



Artificial
genetic evolution



Solving problems like mother nature thought us – by bruteforcing and hoping for the best.

“Intelligence is based on how efficient a species became at doing the things they need to survive.”

- Charles Darwin

Applying genetic evolution

- Initialize population
- Evaluate each agent of population after iteration
- Build a new mutated generation based on scores

Environment rules

- Agents can't see each other
- Agent hits wall -> death
- Agent has to drive Δs in Δt, otherwise -> death
- Score = total distance
- Distance sensors return [0, 1]
- Iteration time: 60 seconds

New mutated agent

- From top n parents select 2 randomly
- Calculate parents' selection probability from their scores
- Merge two parents
- Add random noise to new weights

Repeat!

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Tunable parameters

- Population size
- Top parents count
- Mutation rate
- Noise size

What to do next

Implement Neuro Evolution of Augmented Topologies (NEAT)

backbone

Robot controller

Python MIT Updated on May 14, 2017

cyclops

KAZE Pilot eyes

C++ MIT Updated on May 14, 2017

geneticCars

Genetic cars simulation using Unity 3D

C# ★ 1 1 MIT Updated on May 3, 2017

darknet

Fork of pjreddie/darknet repo

C Updated on Mar 26, 2017

github.com/kazepilot

Thanks!

Any questions?

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