

Opening the road to self-driving cars
planetary rovers and military vehicles

Ramón González

MIT, robonity

1.250.000

Road traffic deaths worldwide

25

One person is killed every 25 seconds



94%

Crashes due to human error

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~0 How?

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A horizontal timeline showing the evolution of autonomous vehicles. It is divided into two rows by blue arrows indicating the decades.

- 1960s:** Unimate (Joseph F. Engelberger)
- 1970s:** Stanford cart (Stanford Univ.), Shakey (SRI Co.)
- 1980s:** Terregator (CMU)
- 1990s:** Navlab series (CMU)
- 2000s:** Stanley (Stanford University)
- 2010s:** Curiosity rover (NASA)

A collage of news articles related to autonomous vehicles:

- VentureBeat:** Tactile Mobility gives autonomous cars AI to measure road conditions
- Bloomberg Businessweek:** Self-Driving Cars Can Handle Neither Rain nor Sleet nor Snow
- electrek:** Tesla's fully self-driving cross-country road trip to 'probably' happen with version 10 'alpha build', says Elon Musk

MER Spirit rover

Troy, May 2011, Mission cancelled

Credits: Planetary Society

Rover embedding in Mars!

MER Opportunity rover

MER Spirit rover at JPL

Meridiani Planum, April 2005, 5 weeks

Meridiani Planum, December 2004, 2 weeks

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from the stars to the people



R. Gonzalez et al., 2018. Slippage and immobilization detection for planetary exploration rovers via machine learning and proprioceptive sensing. *Journal of Field Robotics*.

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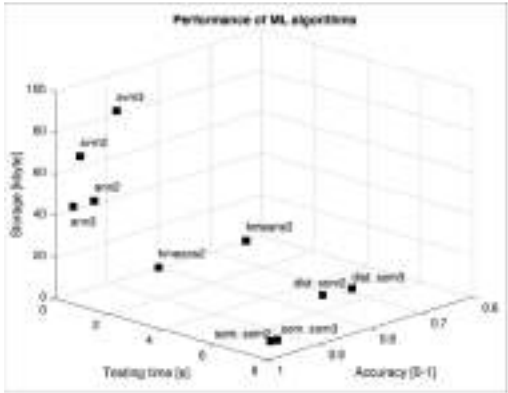
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R. Gonzalez et al., 2018. Slippage and immobilization detection for planetary exploration rovers via machine learning and proprioceptive sensing. *Journal of Field Robotics*.

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Model	Storage (MB)	Testing time (s)	Accuracy (0-1)
svm	~100	~1.5	~0.95
nn	~80	~2.5	~0.92
svm	~60	~3.5	~0.90
svm	~40	~4.5	~0.88
svm	~20	~5.5	~0.85
svm	~10	~6.5	~0.82
svm	~5	~7.5	~0.80
svm	~2	~8.5	~0.78
svm	~1	~9.5	~0.75
svm	~0.5	~10.5	~0.72
svm	~0.2	~11.5	~0.70

R. Gonzalez et al., 2018. Slippage and immobilization detection for planetary exploration rovers via machine learning and proprioceptive sensing. *Journal of Field Robotics*.

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R. Gonzalez and K. Iagnemma, 2016. Soil Embedding Avoidance for Planetary Exploration Rovers; *International Conference of the ISTVS*.

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The challenges of teaching driverless cars to see the world **TechTalks**

by Ben Dickson September 12, 2016

Self-Driving Cars Still Don't Know How to See

An Uber autonomous SUV killed a pedestrian. What does that say about the promise of self-driving technology?

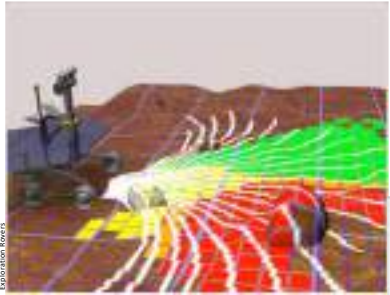
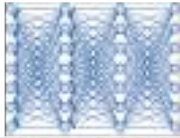
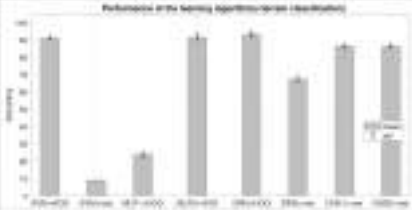
The Atlantic




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DEEP NEURAL NETWORKS

Manning et al., 2016, Sensor navigation and mobility intelligence on the Mars Exploration Rovers

R. Gonzalez, K. Iagnemma; DeepTerraMechanics: Terrain Classification and Slip Estimation for Ground Robots via Deep Learning; arXiv, June 2018

Tecnología - Robonity ha sido uno de los diez finalistas en el NATO Innovation Challenge

Tecnología de robótica interplanetaria para crear rutas en zonas de conflicto **MARCA**





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roboCucumbers Vision by robonity

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roboFace Vision by robonity

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AI
Robotics
Computer vision