CS50 for JDs

Algorithms and the Law

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Algorithms

What is an algorithm?

Algorithms

How are algorithms evaluated?

Algorithms

How *should* algorithms be evaluated in addition to the metrics mentioned?

Algorithms and the law

Explore some of the moral and legal implication of computer algorithms through two examples

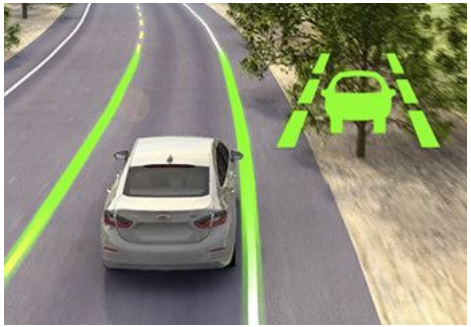
Autonomous driving

Available on a car near you

CS50 for JDs

Mercedes-Benz
Active braking

Honda
Cruise control



Chevrolet
Lane keeping assist

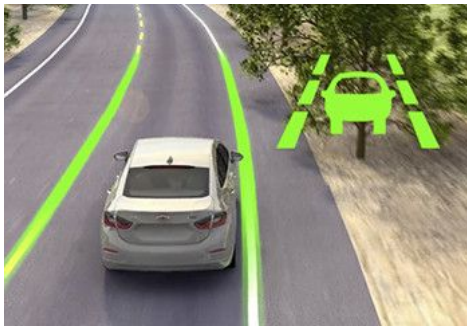
Tesla
Autopilot

Learn

less and less human control

Mercedes-Benz
Active braking

Honda
Cruise control



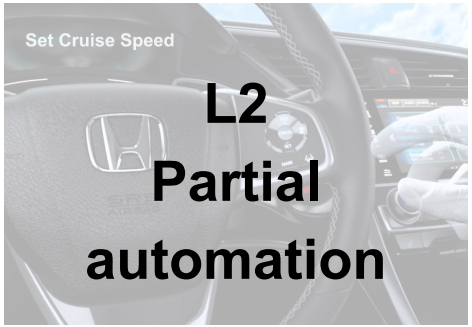
Chevrolet
Lane keeping assist

Tesla
Autopilot

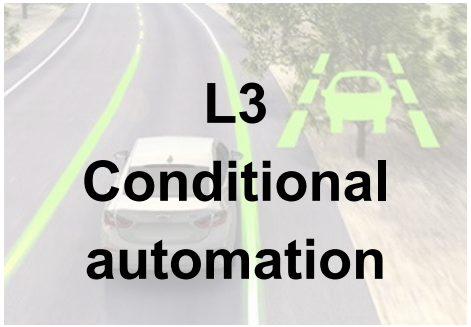
Levels of autonomous driving

L1 - L5

Mercedes-Benz
Active braking



Honda
Cruise control



Chevrolet
Lane keeping assist

Tesla
Autopilot

Learn

L5
Complete Automation

Sci-fi movie of your choice

Why autonomous driving?

Why law students should think about it?

Why autonomous driving?

This is the future.

Why autonomous driving?

Should machines be perfect?

Why autonomous driving?

How does AI play into this?

Start with an exercise

Try to build this lane keeping car in Scratch

Code

http://bit.ly/CS50JD_lane

Feel free to collaborate. You have 10 min.

Recap

What was harder than you imagined?

Recap

What are the caveats to your algorithm?
(Do you foresee it failing at any time)

Recap

What did you implement to help make the "car" safer for its occupants and the people around it?

Autonomous driving

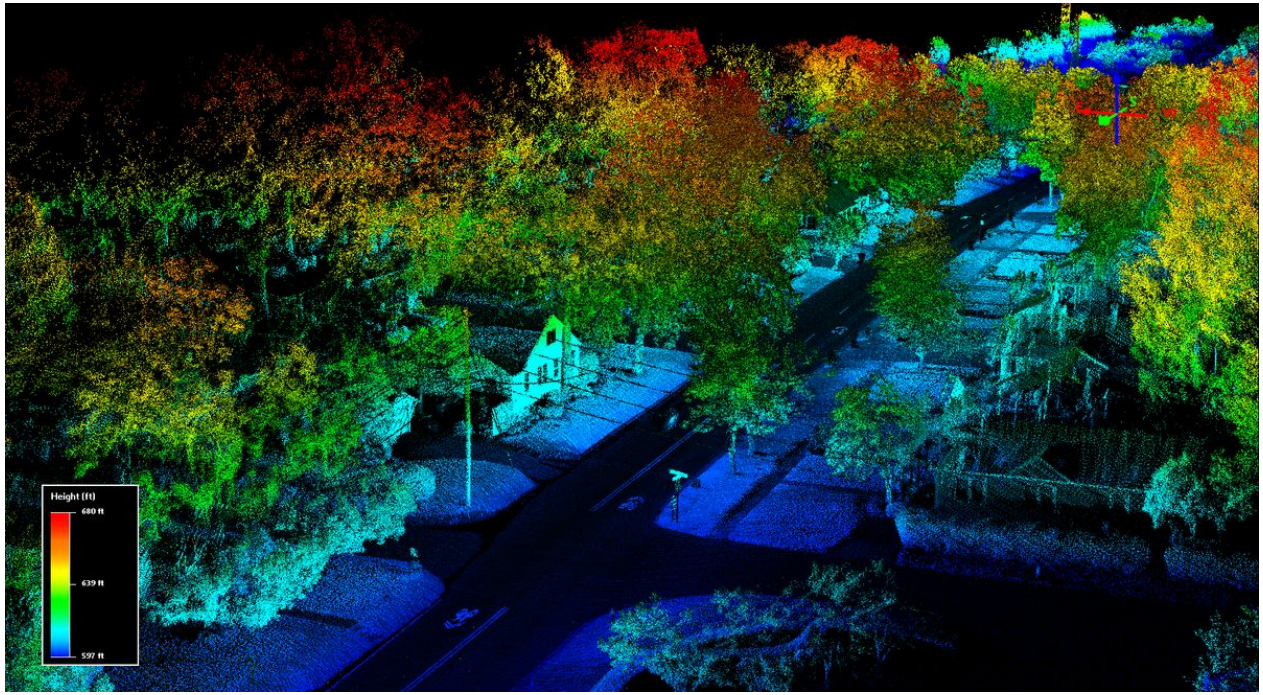
How it works, really

Autonomous driving

It all starts with the sensors

Mobileye® camera

Learn



Lidars

Learn

Autonomous driving

Perception processes the sensor data and produce obstacle information

Autonomous driving

Prediction infers future motion of other vehicles

Autonomous driving

Localization gives out real-time information on the current location of the vehicle

Autonomous driving

Path planning calculates both the route to destination and the microscopic movement path on the road

Learn

Autonomous driving

Control systems map out the steering angle and acceleration to achieve the intended path

Autonomous driving

All the previous steps occur dozens of times per second

Autonomous driving

What if it goes wrong?

Death of a pedestrian

Self-driving Uber test vehicle struck and killed a pedestrian in Arizona in 2018

Death of a pedestrian

Cause: 1. Human driver wasn’t monitoring the situation at the time

Death of a pedestrian

Cause: 2. Algorithm failed to recognize that braking was needed initially due to reaction time limits

Learn

Death of a pedestrian

Aftermath: 1. neither Uber nor the human driver was criminally charged

Death of a pedestrian

Aftermath: 2. Uber settled with the victim's family

Death of a pedestrian

Aftermath: 3. Arizona suspended Uber's testing permit, and Uber suspended testing in all other states for 9 months

Questions

Do you think Uber was at fault for this accident?

If so, who at Uber should be responsible?

Think

Questions

Should and how should machines predict human behavior?

Think

Questions

Who should the algorithm protect in dire situations? Who should be allowed to make that decision?

Think

Questions

Accountability or intellectual property?

Think

Questions

What about software updates? Should they be monitored by a third-party?

Think

Questions

If and how should we allow emerging tech to make mistakes?

Think

Short break

5 min

Catastrophic system failure

Boeing 737 MAX

Boeing 737 MAX

One of Boeing's latest models, in service since mid 2017

Boeing 737 MAX

Two tragic crashes resulting in 346 deaths happened within 5 months in 2018 and 2019

Boeing 737 MAX

The model was grounded around the world in March 2019

Boeing 737 MAX

Root of the problem: buggy Maneuvering Characteristics Augmentation System (MCAS)

New York Times report

Boeing 737 MAX

Contributing factors: bad design, bad sensors, insufficient communication with clients, lack of proper oversight, etc.

Learn

Boeing 737 MAX

Aftermath: 10 billion dollars in loss to Boeing; multiple lawsuits from victims and client airlines; Boeing CEO fired

Learn

Boeing 737 MAX

Complex systems in mature products are unlikely to fail unless multiple processes fail

Implication for counsel

What can you do as legal counsel to warn leadership about potential legal risks?

Think

Implications for litigators and trial lawyers

Which parties can be sued?

What can be your plan of attack or defense?

Think

Implications for lawmakers

Which part(s) of the R&D process can be regulated?

Think

Back to the beginning

How should algorithms be evaluated?

Think

Back to the beginning

Should machines be perfect?

Think

Back to the beginning

What if algorithms are not created by humans, but as “black boxes” by machines?

Think

Extended readings:

Technical

Lattice planner for autonomous driving (if you really, really like math)
MCAS
How complex systems fail

News and opinions

NYTimes reporting on the 737 MAX incident
NPR on the Uber self-driving accident
Harvard Magazine on AI ethics

Laws and regulations

National Society of Professional Engineers' autonomous vehicles policy guide
Harvard Journal of Law and Technology paper on algorithms and the law