



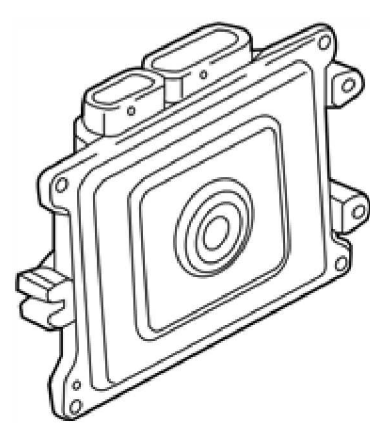
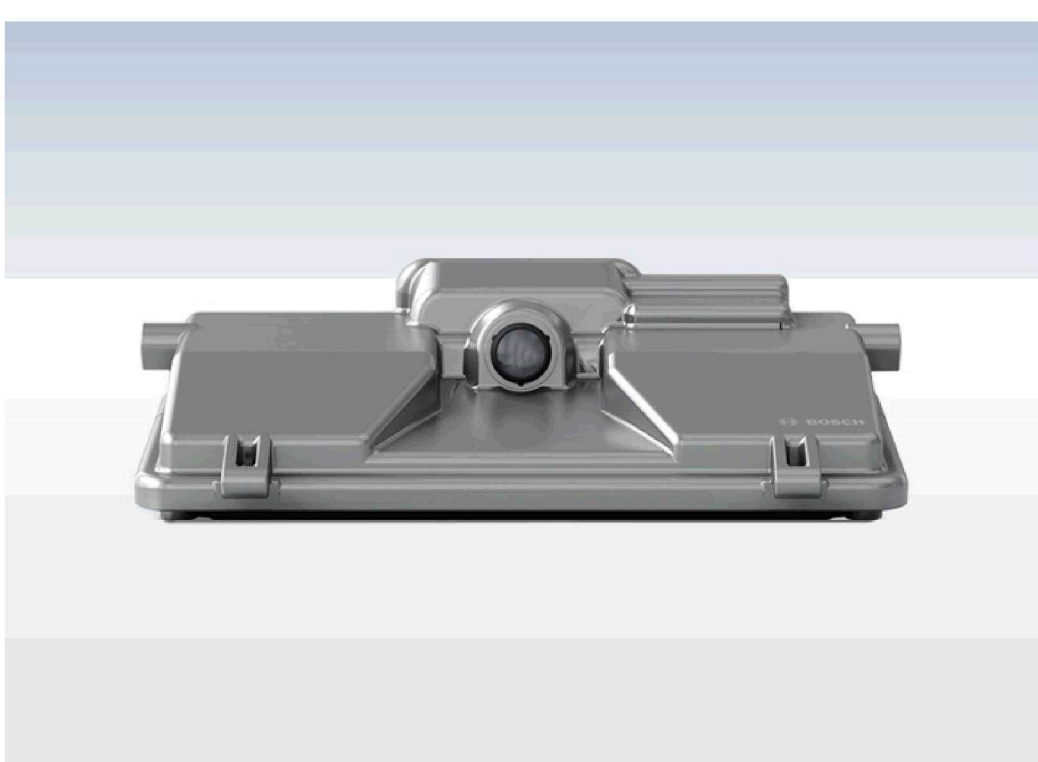
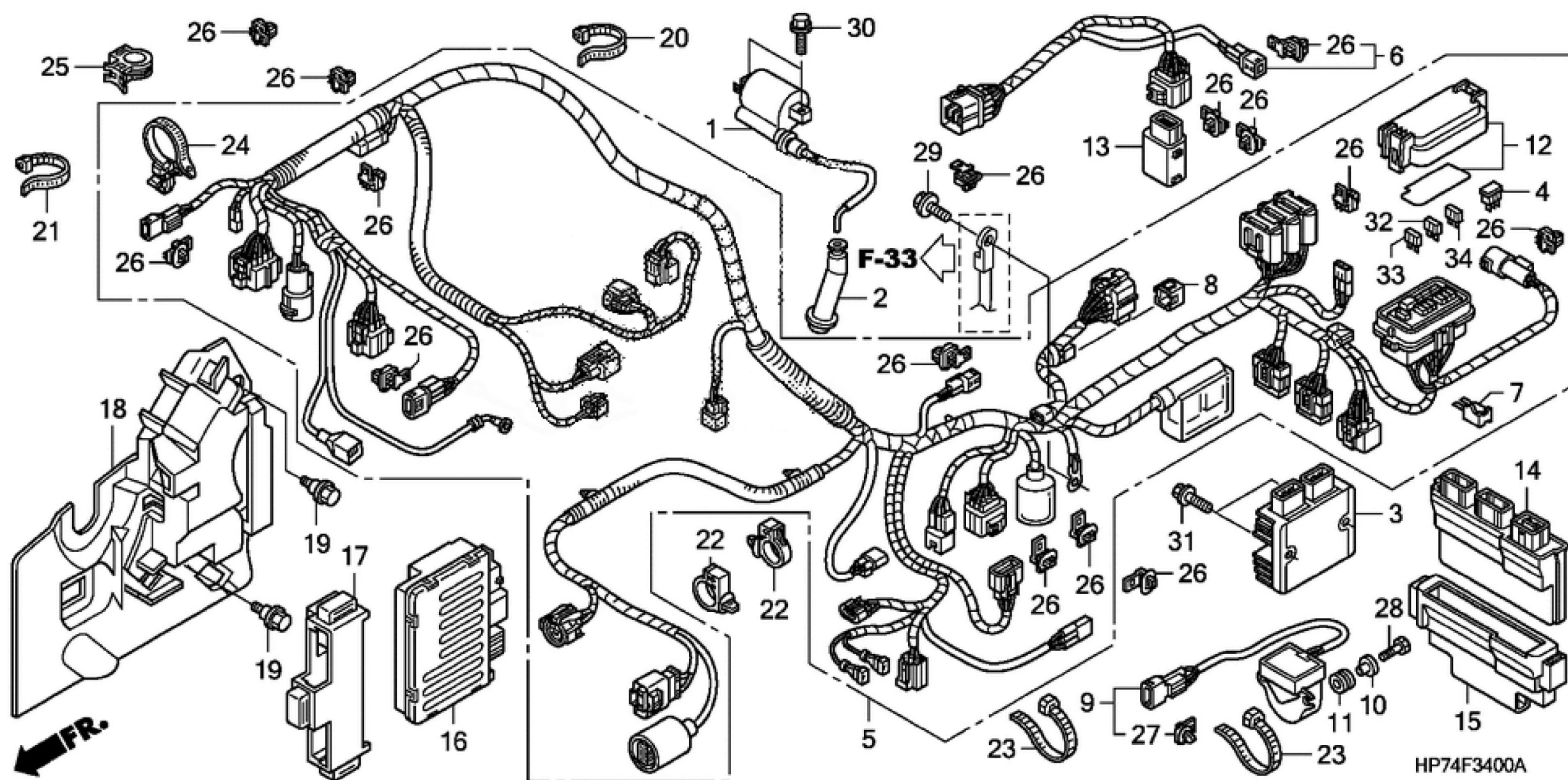
# Automotive Penetration Testing

Interns: Haikuo (Kevin) Yin, Victoria Zheng

Mentor: Jason Gao

## Background and Motivation

- Modern cars are increasingly more computerized. Brakes, acceleration, steering, gear etc. are connected to a central computer and controlled electronically.
- Many of a car's typical functions are getting increasingly automated with services like lane keeping assistance, predictive braking, adaptive cruise control, and automatic parking. While convenient, these services take control away from the driver and give more control to the computer.
- Cars are also getting more connected through services like GPS, OnStar, the entertainment system, or over the air updates. These features increasingly allow more remote access to the car.
- The combination of these factors results in today's cars being more vulnerable to remote exploits than ever before. Hackers and researchers have already discovered a number of vulnerabilities that compromise the safety and privacy of these vehicles and their drivers.



## Approach

- We acquired the electronic components of a 2019 Honda Civic with image recognition capabilities:
  - Electronic Control Unit (the computer)
  - Multi-purpose camera
  - Mid-range radar sensor
  - Wiring harness to connect them together
- We will do penetration testing on these components. Some examples include:
  - CAN bus message spoofing
  - Perception spoofing on camera and radar (i.e. adversarial machine learning)
  - DoS vulnerability analysis (i.e. bus-off, flooding etc.)
  - Other edge/corner cases that may cause errors
- We will also instrument the inputs and outputs of these components so we can virtualize the system. This will allow us to run more tests in the future unrestricted by hardware limitations.

1. <https://www.wolfchasehonda.com/inventory/new-2019-honda-civic-lx-fwd-4d-sedan-19xfc2f65ke012714>
2. <https://www.bikebandit.com/oem-parts/2011-honda-fourtrax-rancher-420-at-eps-trx420fpa-wire-harness/o/m154841sch764534>
3. <https://www.bosch-mobility-solutions.com/en/products-and-services/passenger-cars-and-light-commercial-vehicles/driver-assistance-systems/lane-departure-warning/multi-purpose-camera/>
4. [https://www.bosch-mobility-solutions.com/en/products-and-services/passenger-cars-and-light-commercial-vehicles/driver-assistance-systems/predictive-emergency-braking-system/mid-range-radar-sensor-\(mrr\)/](https://www.bosch-mobility-solutions.com/en/products-and-services/passenger-cars-and-light-commercial-vehicles/driver-assistance-systems/predictive-emergency-braking-system/mid-range-radar-sensor-(mrr)/)
5. <https://www.hondapartsnow.com/genuine/honda~0~37820-6a0-a06.html>
6. <https://www.wired.com/story/car-hacking-biometric-database-security-roundup/>
7. <https://threatpost.com/modern-car-warning/142190/>
8. <https://www.consumerreports.org/automotive-technology/automakers-embrace-over-the-air-updates-can-we-trust-digital-car-repair/>