



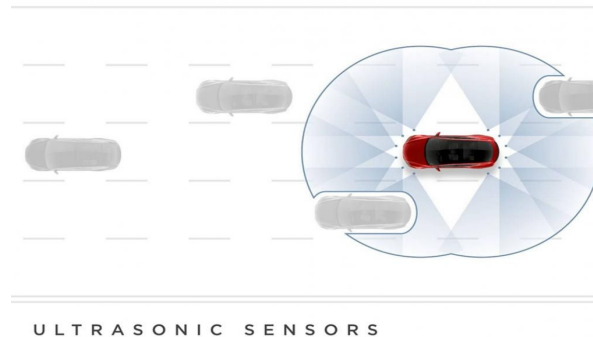
# Ultrasonic Communication between Semi-autonomous and Fully-autonomous vehicles

Thomas Hansen  
Ajene Johnson

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# What we're doing

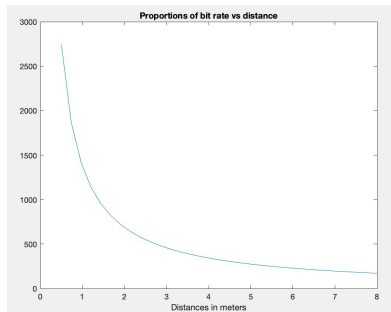
Our goal is to utilize already present ultrasonic sensors in autonomous vehicles, in order to share information about cars' intended movements. This will make autonomous vehicles better at predictive driving, something which has been a problem for cars up until now.



# How it will work

We will use DSSS (direct-sequence spectrum spread) modulation for communication between cars, in an effort to reduce doppler shift effect and avoid the impact of noise while driving.

Bit rate =  $\log_2(K)/T_s$ , where  $T_s$  = duration of frame,  $K$  = distinct data signals



Here we see a limited bit rate of 100's of bits a second, and a drop off in bits/sec as distances increases past ~2 meters. This suggests the best information to send will be merging/turning information or information about the car, not complex movement information from a distance.



## How it's different

Current methods use cellular networks for communication or propose new frequencies for communication between cars

Easier to implement, since we don't need FCC permission

Requires attackers to be nearby, since it only allows for short range communication

Cheaper, since no additional hardware is required beyond what is already on the car



## Who benefits?

Consumers and car safety advocates

Smoother riding experience, potentially less accidents



## Risks

Potential for misinformation, however in combination with the visual and lidar sensor information this is unlikely to be a large issue



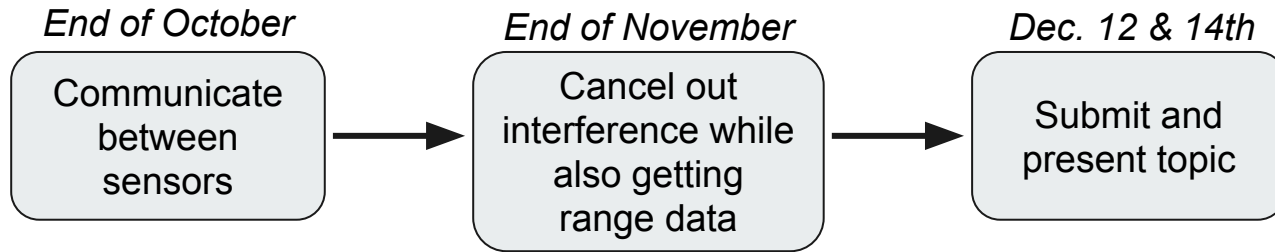
## Resources required

We'll be able to run our tests in the real world with simple ultrasonic sensors, and we'll look into running our tests with matlab implementations as well





# Time Frame







# Questions?

Thanks for your time!