



# Autonomy at the End of the Earth

Jeremy P. Bos

Asst. Professor, Electrical and Computer Engineering; [jpbos@mtu.edu](mailto:jpbos@mtu.edu)



## **Autonomous Vehicles that are 1% safer than humans would:**

- Reduce gasoline consumption by **20 million** gallons
- Save **\$10 billion** in property damage and lost productivity
- Prevent **50,000** accidents
- **20,000** injuries
- Save **360 lives**
- **EVERY YEAR**

How do we define safe?

- **1** accident every **200,000** miles
- **1** incident **in** every **1 billion** hours of operation
- **45 billion** incident-free miles

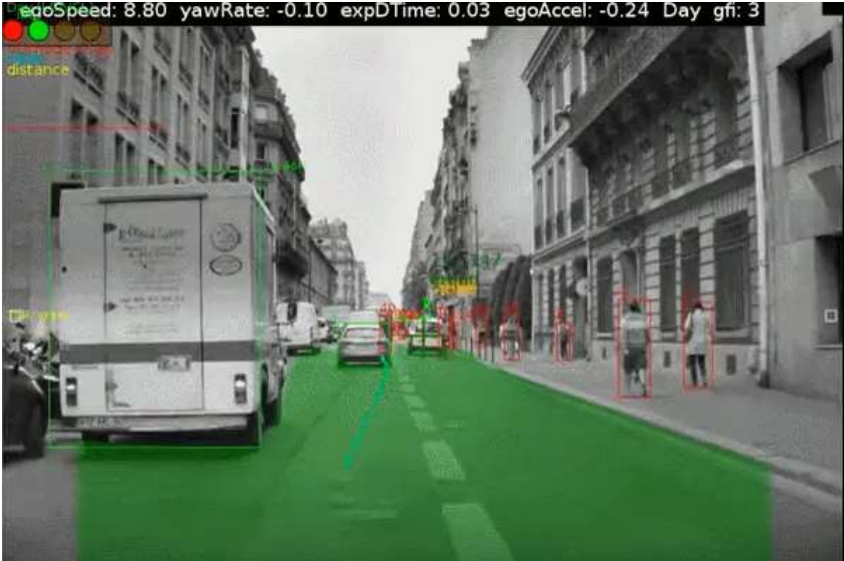
**3.148 trillion**

miles in 2015 (US.DOT)

**1.45%**

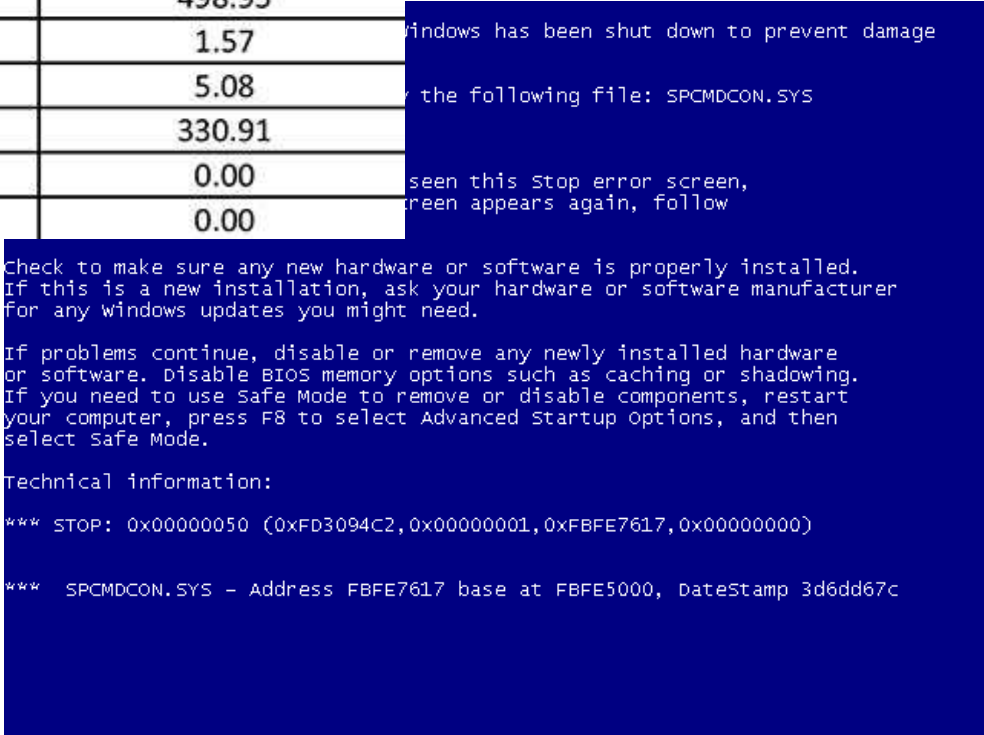
of miles traveled  
annualy

# ...but not all miles are created equal



# ...and we're no where near close to fully autonomous

| Company  | Autonomous miles | Disengagements | Rate per 1000 miles |
|----------|------------------|----------------|---------------------|
| Google   | 635868           | 124            | 0.20                |
| Cruise   | 10015            | 284            | 28.36               |
| Nissan   | 4099             | 28             | 6.83                |
| Delphi   | 3125             | 178            | 56.95               |
| Bosch    | 983              | 1442           | 1466.94             |
| Mercedes | 673              | 336            | 498.95              |
| BMW      | 638              | 1              | 1.57                |
| Ford     | 590              | 3              | 5.08                |
| Tesla    | 550              | 182            | 330.91              |
| Honda    | 0                | 0              | 0.00                |
| VW       | 0                | 0              | 0.00                |



# Autonomy at the End of the Earth



V2X Data  
Sharing

Vehicle  
Dynamics

Functional  
Safety

Sensor  
Fusion

Surface  
Estimation

Path  
Planning

Robotics Systems  
Enterprise

SAE AutoDrive  
Challenge

KRC Winter  
Testing