How will we be able to trust self-driving cars?

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The Self-Driving Car Safety Dilemma

- On one hand, the safety bar is low
  - Human drivers are quite bad
- Accident rates for self-driving vehicles will likely be significantly lower than with human drivers
- On the other hand, vehicle accidents related to semi-autonomous and fully autonomous vehicles receive significant press coverage
  - Tesla auto-pilot incidents
  - Uber self-driving car fatal accident
- Public perception of self-driving car safety is likely to be significantly more negative than reality

Human Perception of Risk

- Lifetime odds of being killed in
  - Car accident: 1 in 114
  - Airplane accident: 1 in 9,821

- Most people do not think twice about riding in a car but many people are scared of flying

More Appropriate Question

How safe will self-driving cars have to be to be accepted by the public?

What about security?

- this changes the calculations significantly
  - Elon Musk, “one of the biggest risks for autonomous vehicles is somebody achieving a fleet-wide hack”
  - remote attacks could increase accident rate substantially
- even 1 death from an intentional attack could be devastating for self-driving vehicles
- Lifetime odds of being killed in
  - Car accident: 1 in 114
  - Airplane accident: 1 in 9,821
  - Terrorist attack: 1 in 1,667

Important (High-Level) Technical Issues

- Safety
  - software safety, quality, and correctness
  - Toyota unintended acceleration problem
  - Toyota has been designing for safety for many years; what about Uber, Google, etc.?
- Security
  - remote attacks are most significant threat; assumption that "controllability can be maintained"
  - number of connected vehicles and types of connectivity are both increasing rapidly due to increasing applications and desired new functionalities
  - each new type of connectivity (and protocol implementation) provides a new potential vector for remote attacks