Regulating Autonomous Vehicles Amid Uncertainty

Nidhi Kalra
1. How safe should autonomous vehicles be?

2. How can we know how safe they are?

3. How do we design good autonomous vehicle policy?
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Uncertain
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3. How do we design good autonomous vehicle policy?
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3. How do we design good autonomous vehicle policy?
Federal Motor Vehicle Safety Standards (FMVSS) pose a barrier to deploying some types of AVs

- FMVSS specify car design, construction, performance, and durability requirements

- Many innovative AV designs (e.g., no human driver) would not comply with FMVSS
NHTSA offers exemptions to FMVSS for development of innovative safety features.

But NHTSA limits exposure to risk by requiring certain conditions.

Safety
Developers must demonstrate equivalent safety between conforming and non-conforming vehicles.

Quantity
Developers may obtain exemption for only 2,500 vehicles per year.
“Practical Autonomous Vehicle Exemptions” or “PAVE Act” proposes raising FMVSS exemptions from 2,500 to **100,000 vehicles/exemption/year**.

Does this make sense?
Neither the letter nor the spirit of the exemption process works when applied to AVs.

Need to demonstrate that the non-conforming vehicle can be as safely driven by a human as a conforming vehicle.
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Need to demonstrate that an autonomous vehicle can drive itself safely.
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Need to demonstrate that an autonomous vehicle can drive itself safely

• No definition of AV safety
Neither the letter nor the spirit of the exemption process works when applied to AVs

Need to demonstrate that the non-conforming vehicle can be as safely driven by a human as a conforming vehicle

Need to \textit{demonstrate} that an autonomous vehicle can drive itself \textit{safely}:

\begin{itemize}
  \item No definition of AV safety
  \item No practical way to demonstrate safety prior to deployment
\end{itemize}
1. How safe should autonomous vehicles be?  
2. How can we know how safe they are?  
3. How do we design good autonomous vehicle policy?

By managing uncertainty...
There is a tradeoff between risk and reducing uncertainty.

What if regulations were designed with this risk-information tradeoff in mind?
This tradeoff can be understood mathematically.

The graph shows the miles needed to detect difference in AV and human driver safety rates, with the x-axis representing the percent difference in AV and human driver safety rates. The y-axis represents the miles needed to detect this difference, with the graph dividing into two sections: undetectable differences and detectable differences.

- Undetectable differences: A point indicating 5 billion miles.
- Detectable differences: A point indicating 60 million miles.

The graph illustrates how as the percent difference increases, the miles needed to detect a difference decrease, with different categories such as fatality, reported injury, total injury, reported crash, and total crash.
This tradeoff can be understood mathematically.
Bottom line

• When faced with great uncertainty, it is almost impossible to get regulations right the first time

• Policies that manage uncertainty could enable innovation, while balancing the tradeoff between risk and information

• A graduated approach additionally helps avoid the problem of the horse and the barn door