# Exploring the efficacy of scenario-based testing in autonomous vehicle systems

By Ben Gafford

Safety is important

Autonomous vehicle (AV) safety is *very* important

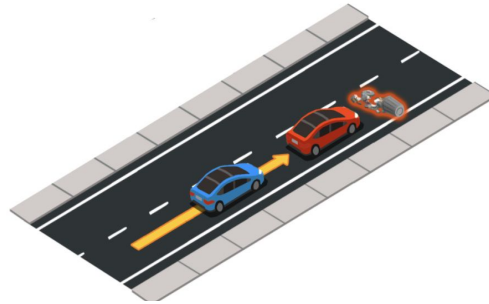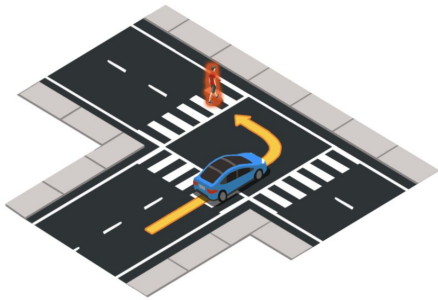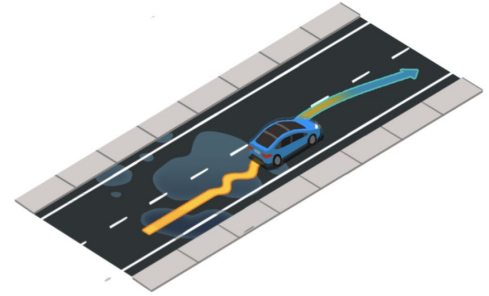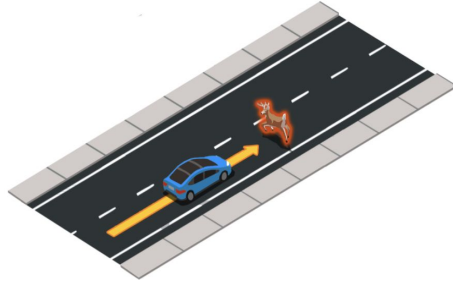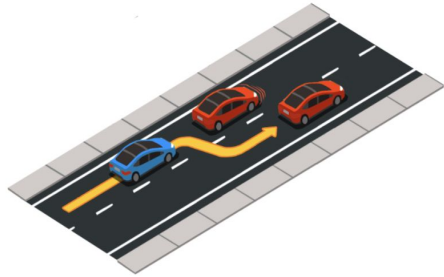It's hard to be confident in autonomous vehicle (AV) safety

# How can we gain confidence in AV safety?

**Scenario-based testing**

# Scenario-based testing

# Why does scenario-based testing give us confidence?

*"If something were wrong with the system, we would have seen it after running N=<large_number> scenarios"*

*– Intuition*

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(We should probably investigate this a bit more)

# Investigating assumptions

**RQ1:**

*What types of safety bugs can scenario-based testing identify, and with what probability?*

**RQ2:**

*Which scenario-selection strategies are superior for identifying which kinds of bugs?*

# Exploring these research questions with a case study



Image source: Apollo.Auto

# Using historical bug data



Image source: Apollo.Auto

**A Comprehensive Study of Autonomous Vehicle Bugs**

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# Investigating assumptions using case studies

**RQ1:**

*What types of safety bugs can scenario-based testing identify, and with what probability? [in Autoware and Apollo]*

**RQ2:**

*Which scenario-selection strategies are superior for identifying which kinds of bugs? [in Autoware and Apollo]*

# Summary

The importance of safety in autonomous vehicles merits further investigation into the underlying assumptions of scenario-based testing.

Using existing production-level open source AV systems as case studies, we can explore these assumptions in more detail.