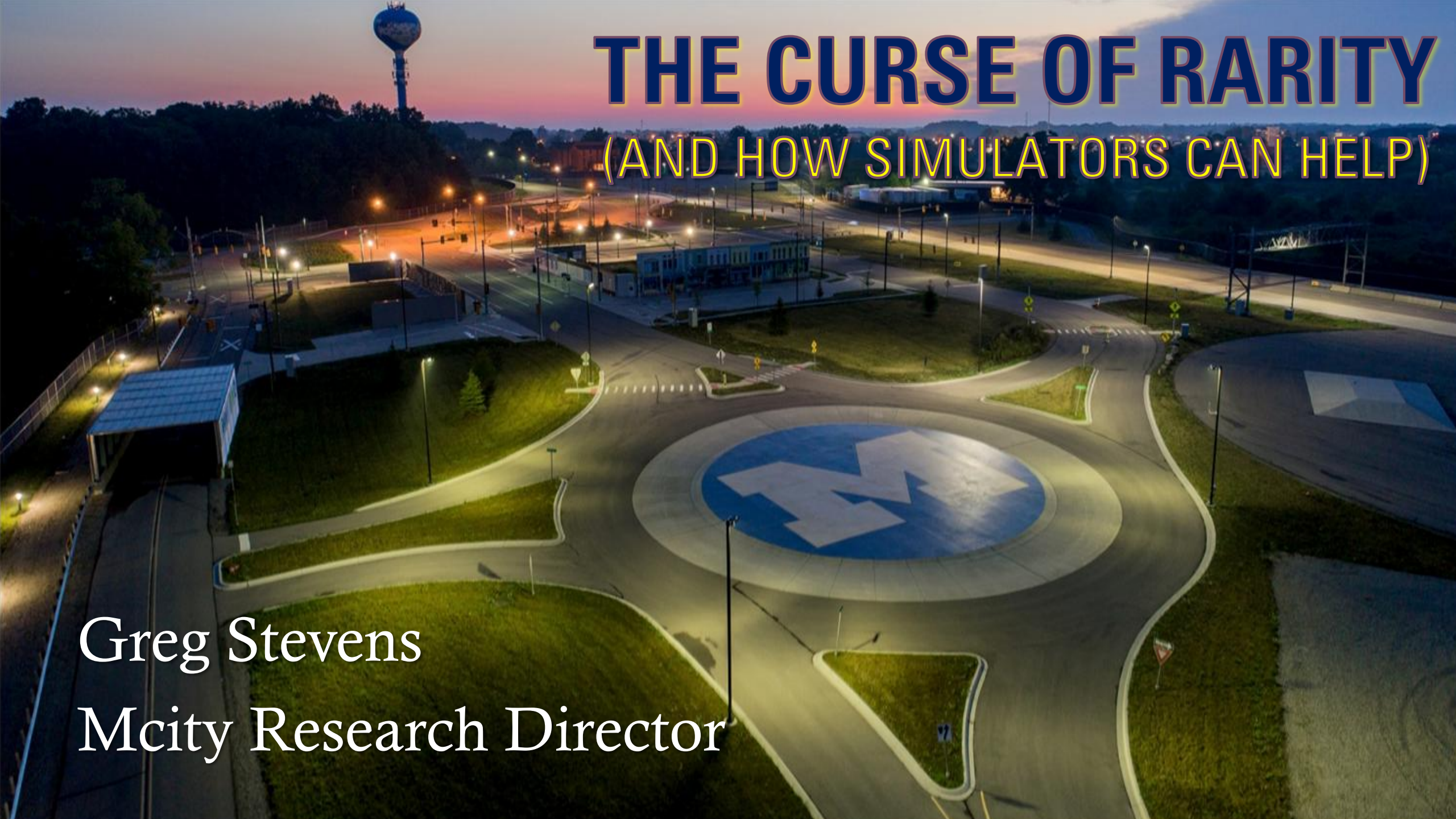


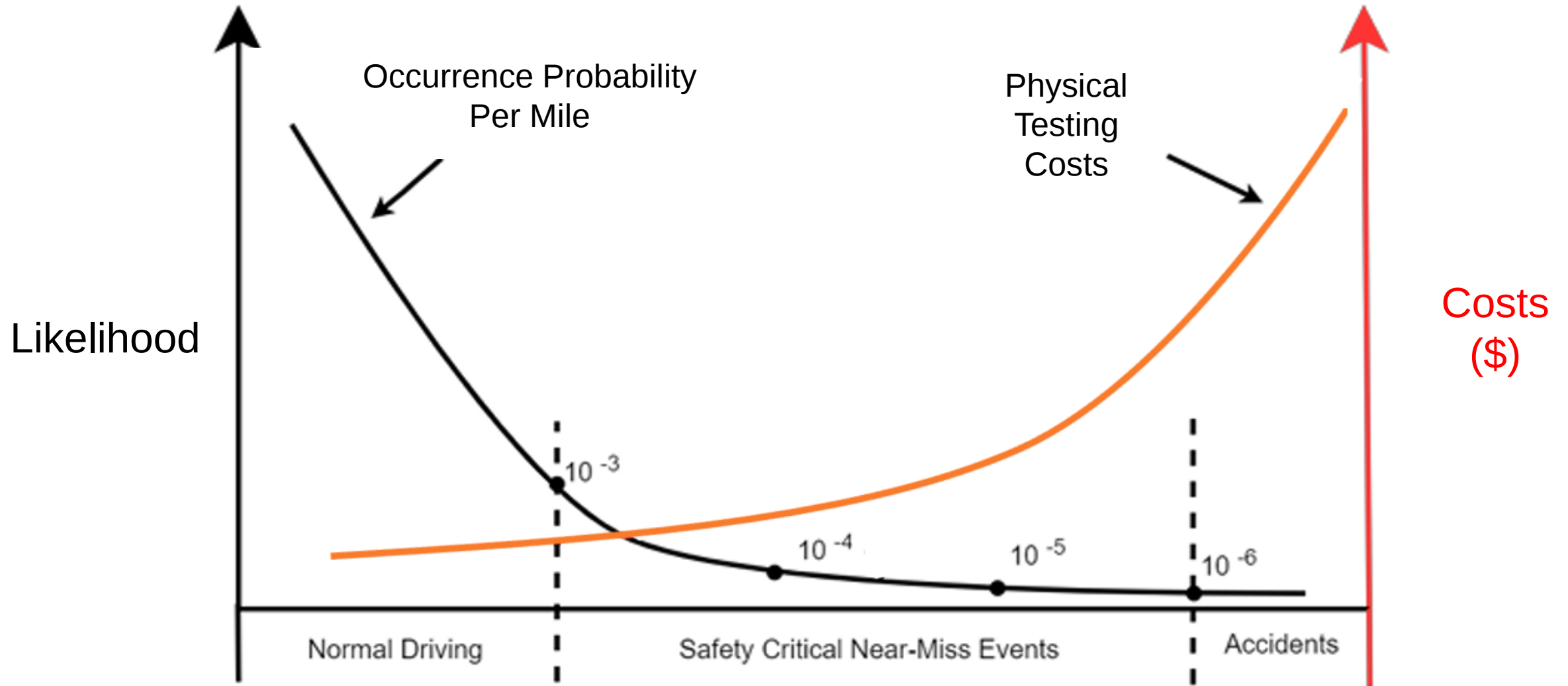
An aerial night photograph of a modern roundabout. The roundabout has a large blue and white circular graphic in the center. The surrounding area is illuminated by streetlights, and a water tower is visible in the background against a twilight sky.

# THE CURSE OF RARITY

## (AND HOW SIMULATORS CAN HELP)

Greg Stevens  
Mcity Research Director

# Challenge: The Curse of Rarity is a Major Obstacle in AV Development



# Risky & Rare Scenarios

Long tail of  
driving scenarios  
presents  
significant  
challenges

From presentation  
by Dmitri Dolgov  
(Waymo)

[https://www.youtube.com/watch?v=s\\_wGhKBjH\\_U&t=1s](https://www.youtube.com/watch?v=s_wGhKBjH_U&t=1s)

Unusual Behaviors



Stray  
Cyclists



Toddlers  
on the Loose



Falling  
Skateboarders

Foreign Objects on the Road



A BBQ Grill  
Falling Off Truck

Extreme Weather

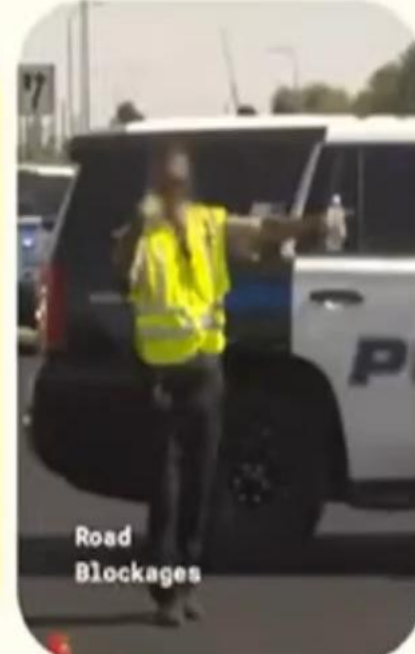


Falling Trees



Flooding

Unique Interactions



Road  
Blockages



Last Minute  
Lane Changes

# McCity's Open-Source Digital Twin

[github.com/mcity/mcity-digital-twin](https://github.com/mcity/mcity-digital-twin)



QR Code for Digital Twin  
(open-source)



**NVIDIA.**  
Omniverse  
with Sensor  
RTX APIs

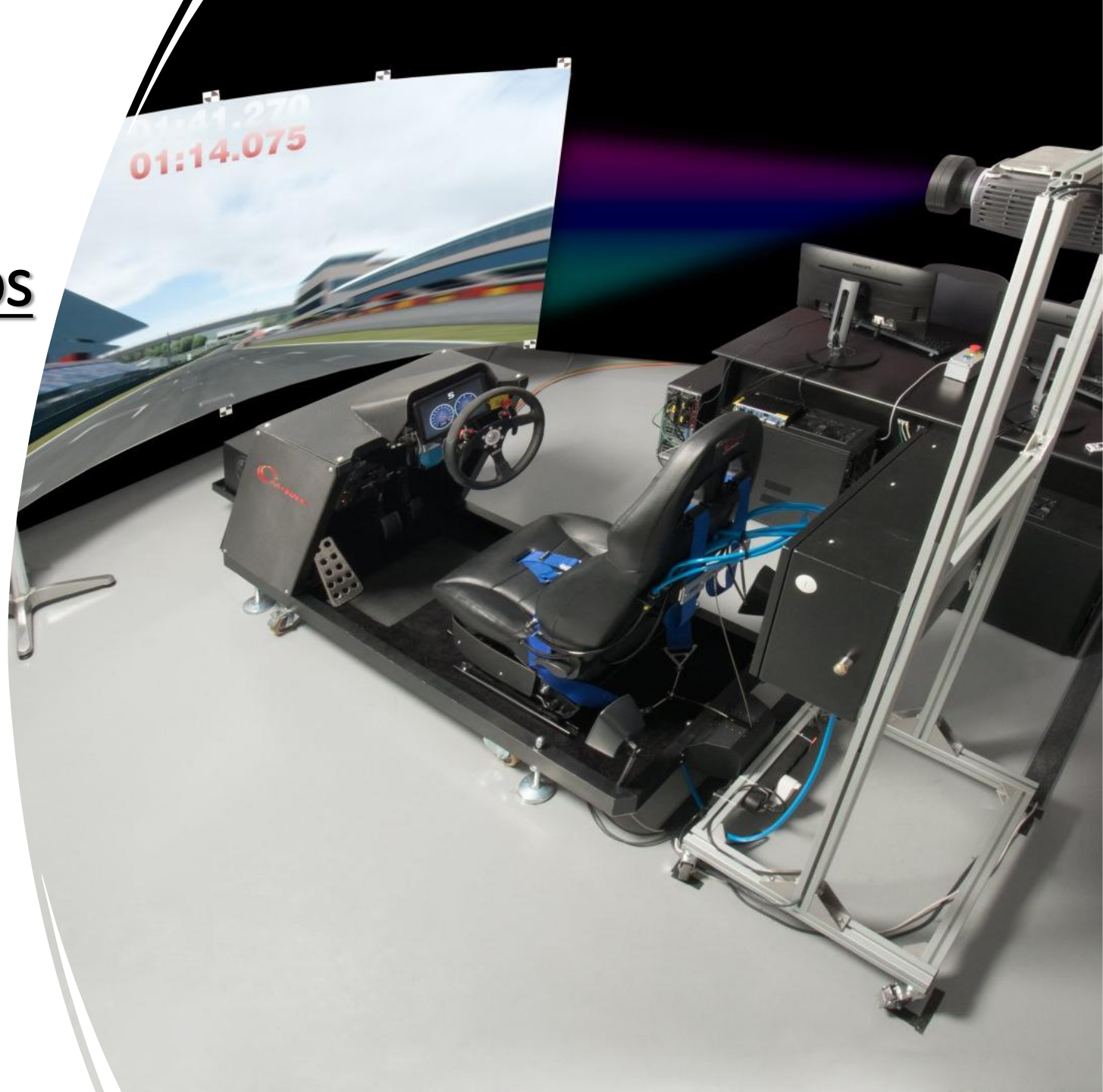


QR Code for TeraSim  
Behavior Modeling  
(open-source)

# A Safe and Efficient Human Factors Platform for Evaluating Risky Scenarios

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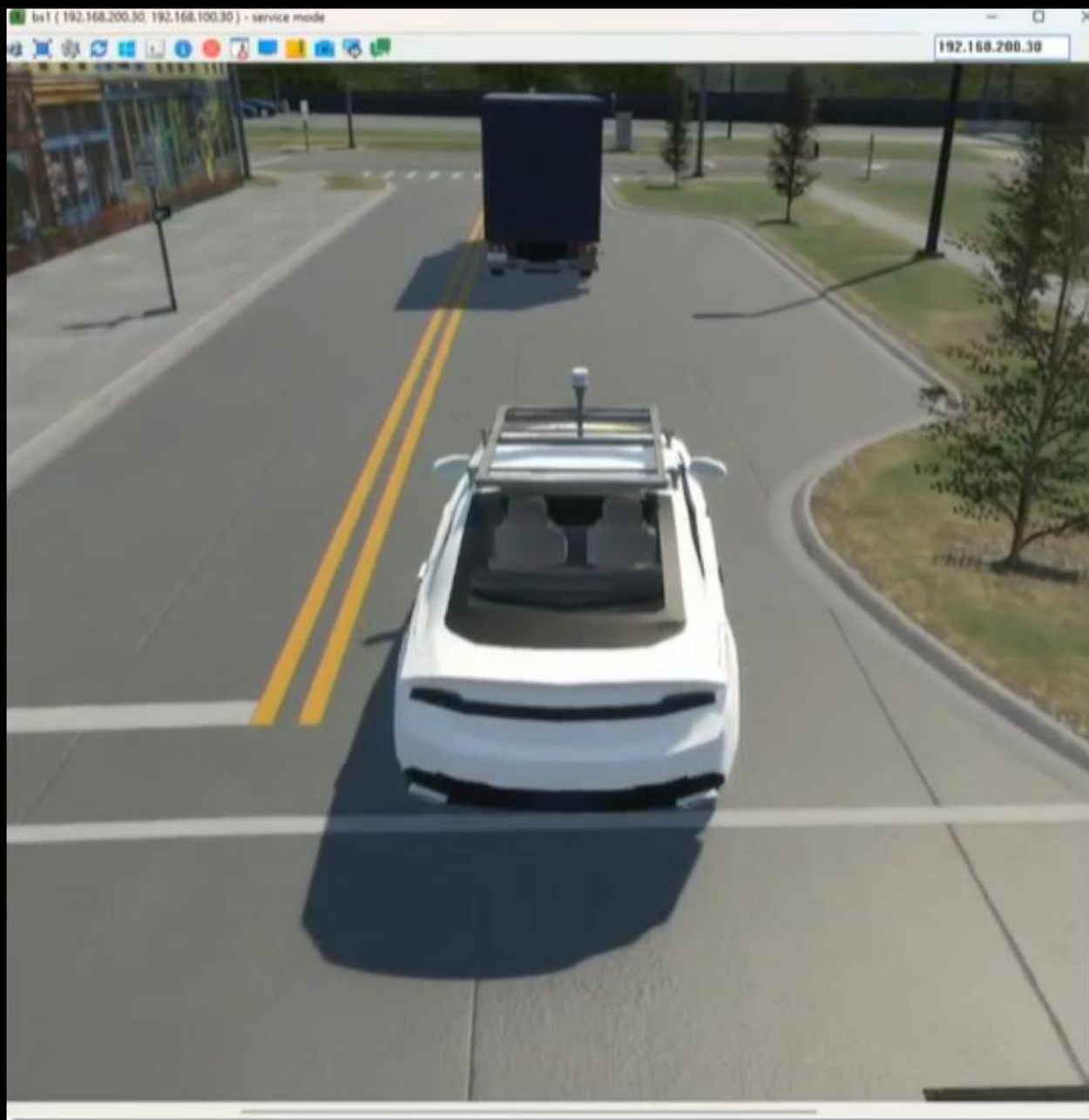
How might we *safely* and *efficiently* allow non-experts to co-drive driver assistance features in risky scenarios so that they can provide subjective, human-factors feedback to improve our features and to develop effective user interface strategies?



# Mixed Reality with the Full Vehicle in the Loop



UNRESTRICTED



Full video at: <https://www.youtube.com/watch?v=c2pAkreHDfo>

# SAE Level 3 Automated Driving is the **Peak** of Human Factors Work

- The driver is watching a movie while the Level 3 feature is engaged.
- An object falls out of a truck ahead of the Level 3 vehicle.
- Level 3 feature starts automatically braking and doing an evasive lane change.
- AND Level 3 feature asks the driver to re-engage immediately. **How should this be done?**
- Where does the driver look? What does the driver do? Is their reaction helpful or harmful?



This can only be done safely and realistically in a dynamic driving simulator



Questions?