### What are you looking at? The Importance of Driver Monitoring

### Improving Methods to Measure Attentiveness Through Driver Monitoring

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### Distracted driving is a predominant issue in vehicle safety.

# Claimed **3,142**

lives in 2019\*

- How often is a driver inattentive during one trip?
- Will inattention increase with more advanced vehicles (AVs)?
- How do we measure inattentiveness?
- How and when should we notify the driver when they are being inattentive?



\*National Highway Traffic Safety Administration, Driver Distraction & Electronic Device Use, 2020, https://crashstats.nhtsa.dot.gov/#!/PublicationList/4:

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A privately funded naturalistic driving database was made available to support this study's research objectives.

- Individuals recruited to use the equipped research vehicles in place of their personal vehicle
- Collection of DMS output and vehicle parameters, including:
  - Glance Location
  - Speed
  - Acceleration
  - Steering Wheel Torque
  - Throttle Pressure
  - Brake Pressure



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Given context (10 seconds) before the attention rating, we determined the driver's attention level at the end of the event.

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#### Moderately Distracted 73 events

Driver has more extended glances off road, sometimes with phone use or longer uses of the center console

#### Slightly Distracted 157 events

Driver is looking around, often to the center console, for longer periods of time

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1,367 events

#### Very Distracted 58 events

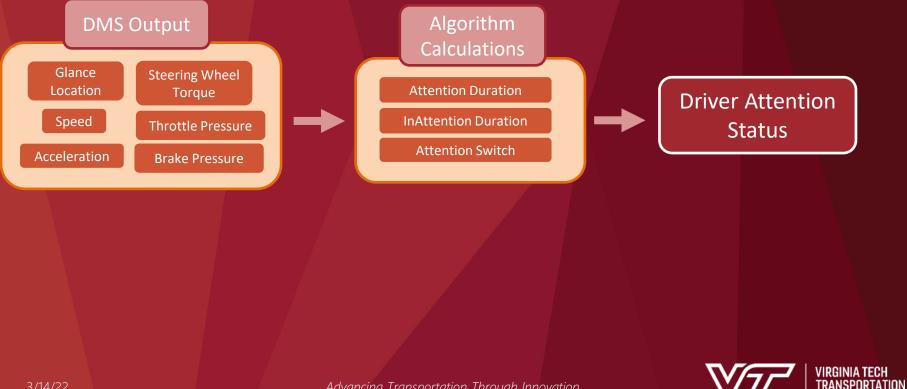
Driver has combined sources of distraction with prolonged glances off road to a cell phone and the center console

#### Not Distracted 1,079 events

Driver is clearly engaged in the driving task, characterized by glances off road to locations relevant for safe driving

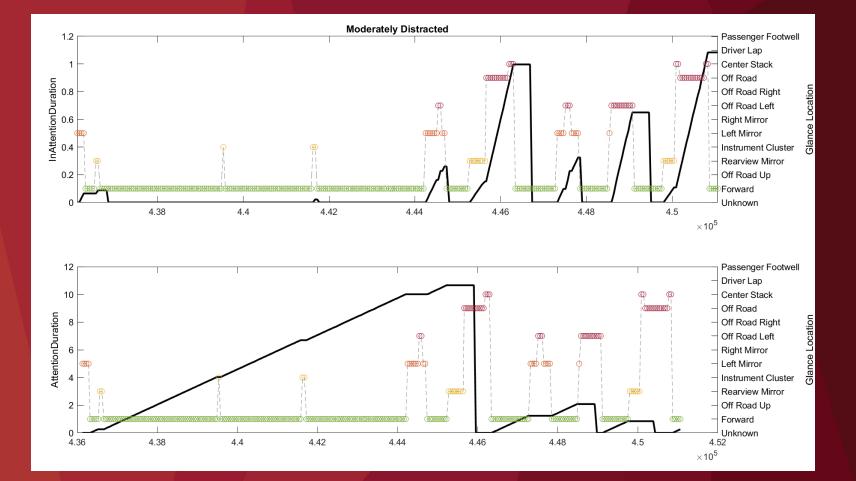


VIRGINIA TECH TRANSPORTATION INSTITUTE At each timepoint, values were calculated within the algorithm to output the suspected attention level of the driver.



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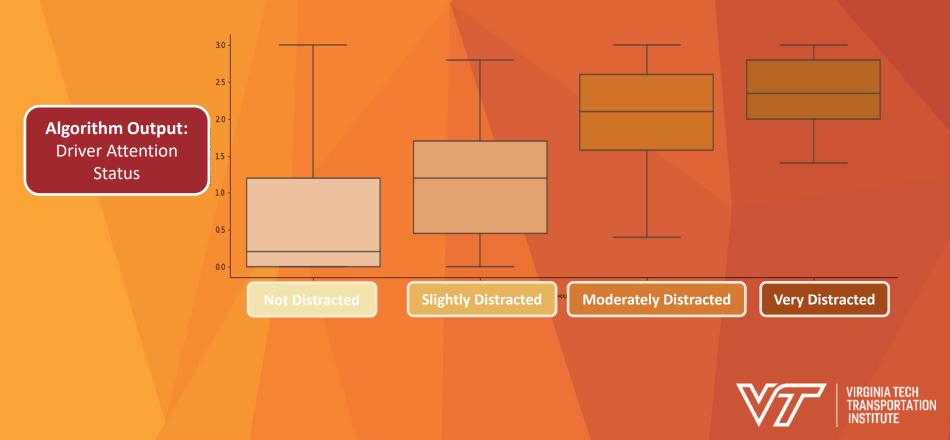


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The attention status was compared to the ground truth, which was determined during data reduction.

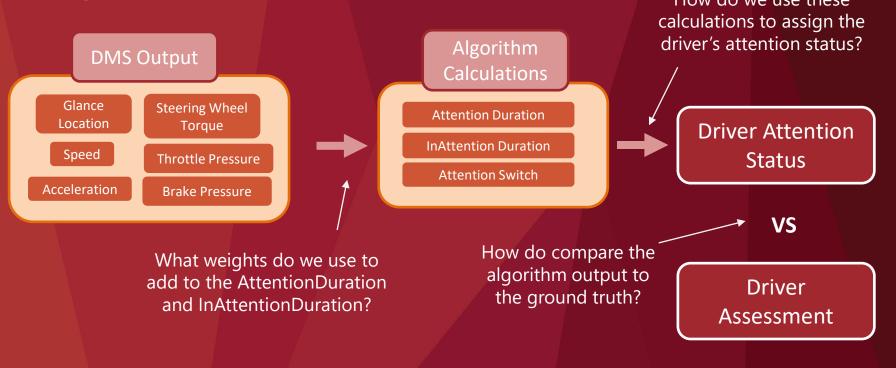


Calculate error
Minimize error
Prioritize the correct bin

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## Adjustments can be made along different parts of the algorithm design process.

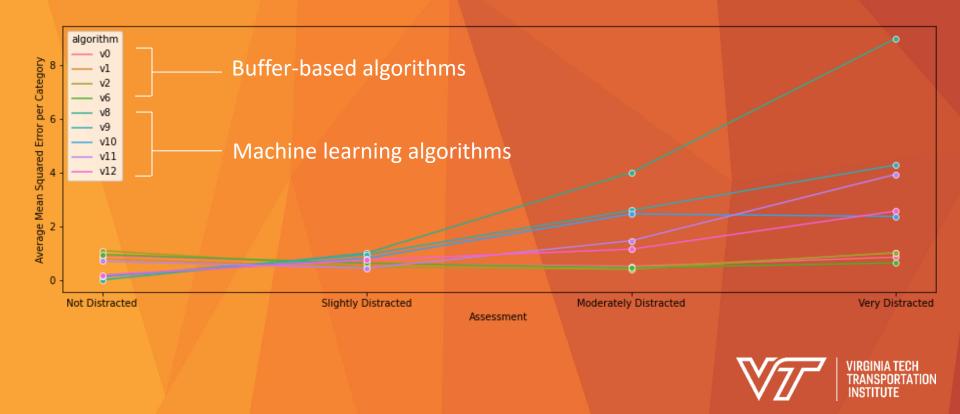


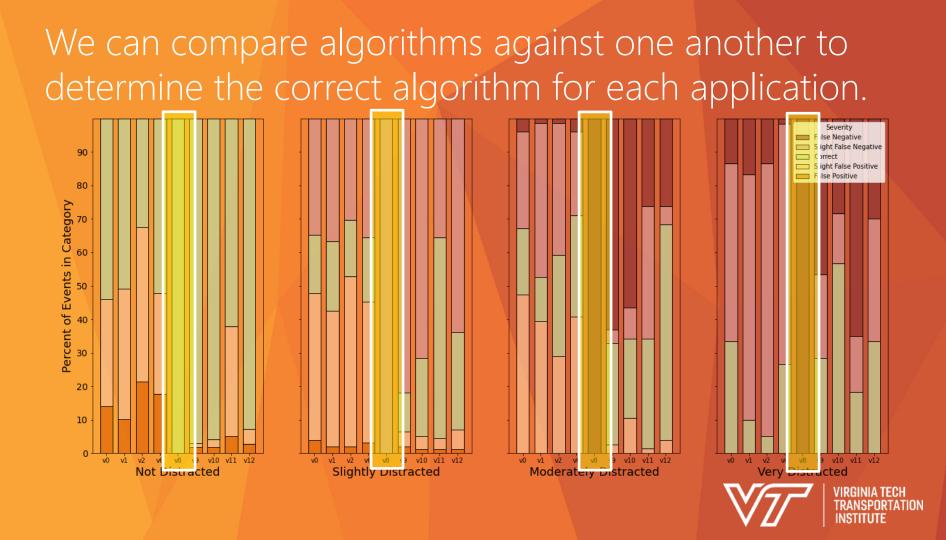




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# We can compare algorithms against one another to determine the correct algorithm for each application.





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### In Summary,

- Tools available now make it easier to determine when a driver is inattentive
- Algorithms used to determine driver attention should be designed with an understanding of their limitations and could be used as a guideline for further development
- At a minimum, both glance location and speed should be used to assess driver attention
- DMS could be an important component in reducing distractions





### Thank you!



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