UCLA Mobility Lab

UCLA Institute of Transportation Studies

Cutting-edge operations concepts related to intelligent infrastructure, cooperative driving, signal control, and curbside management

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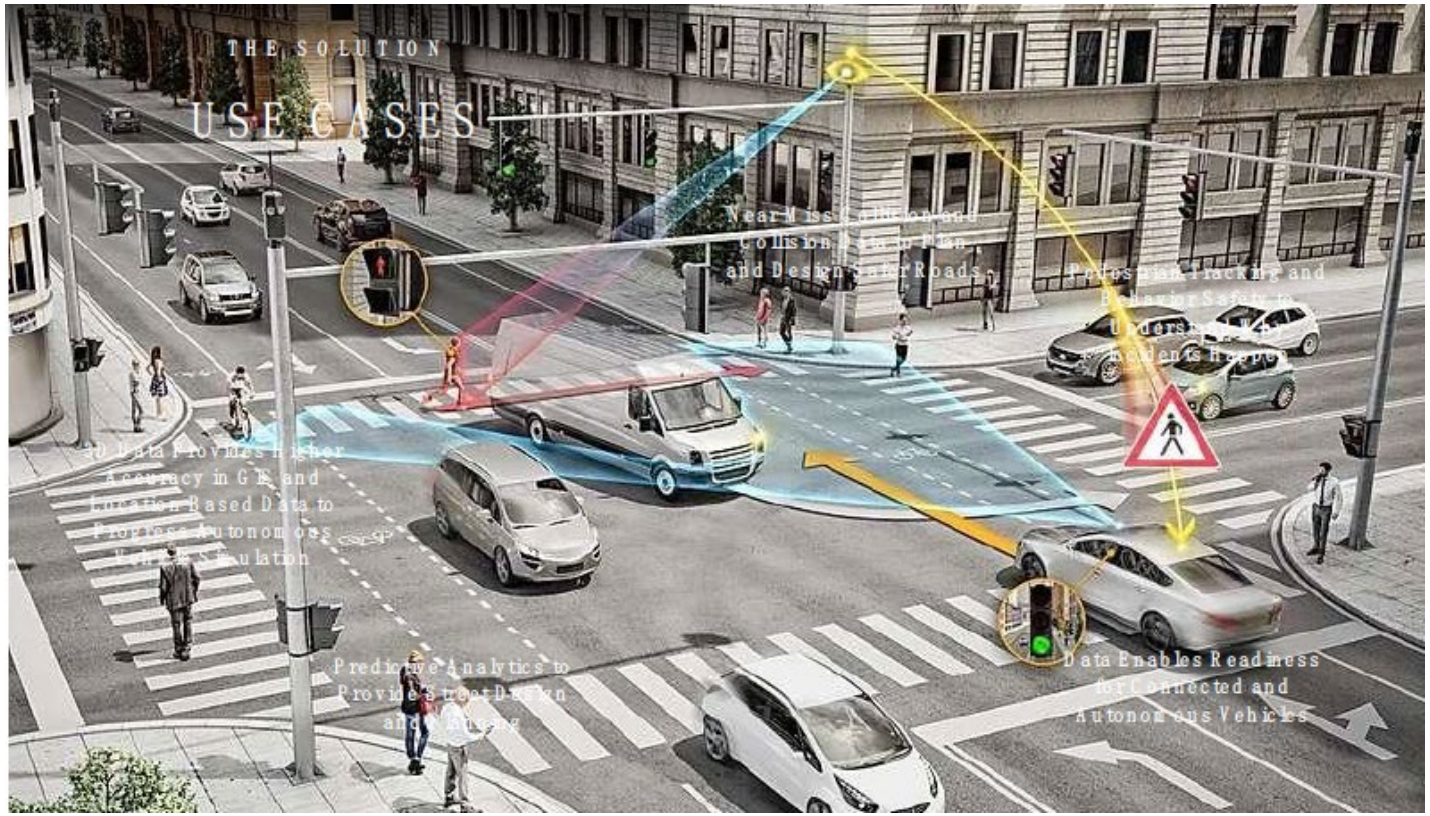
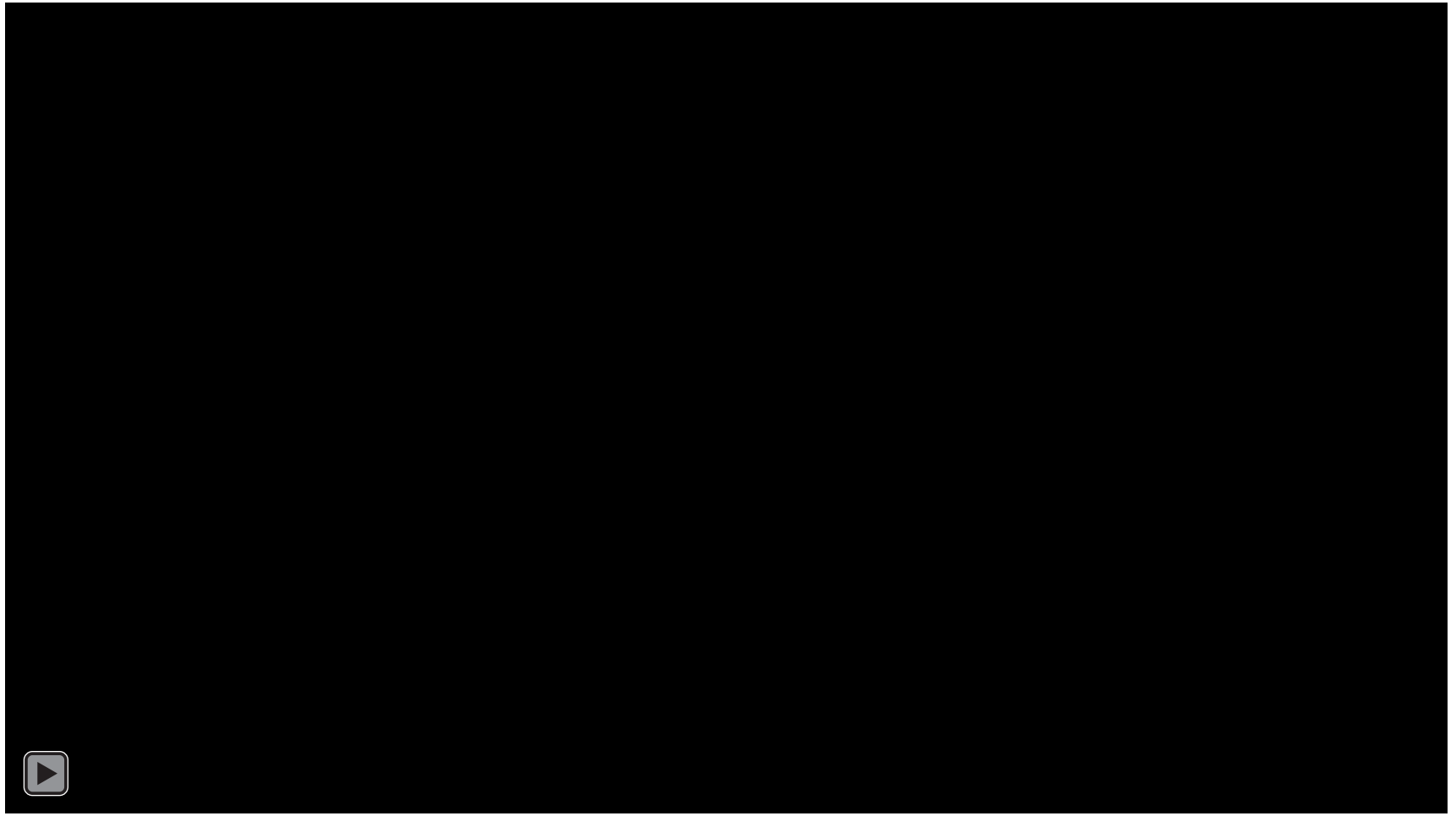
Deploy Smart Infrastructure

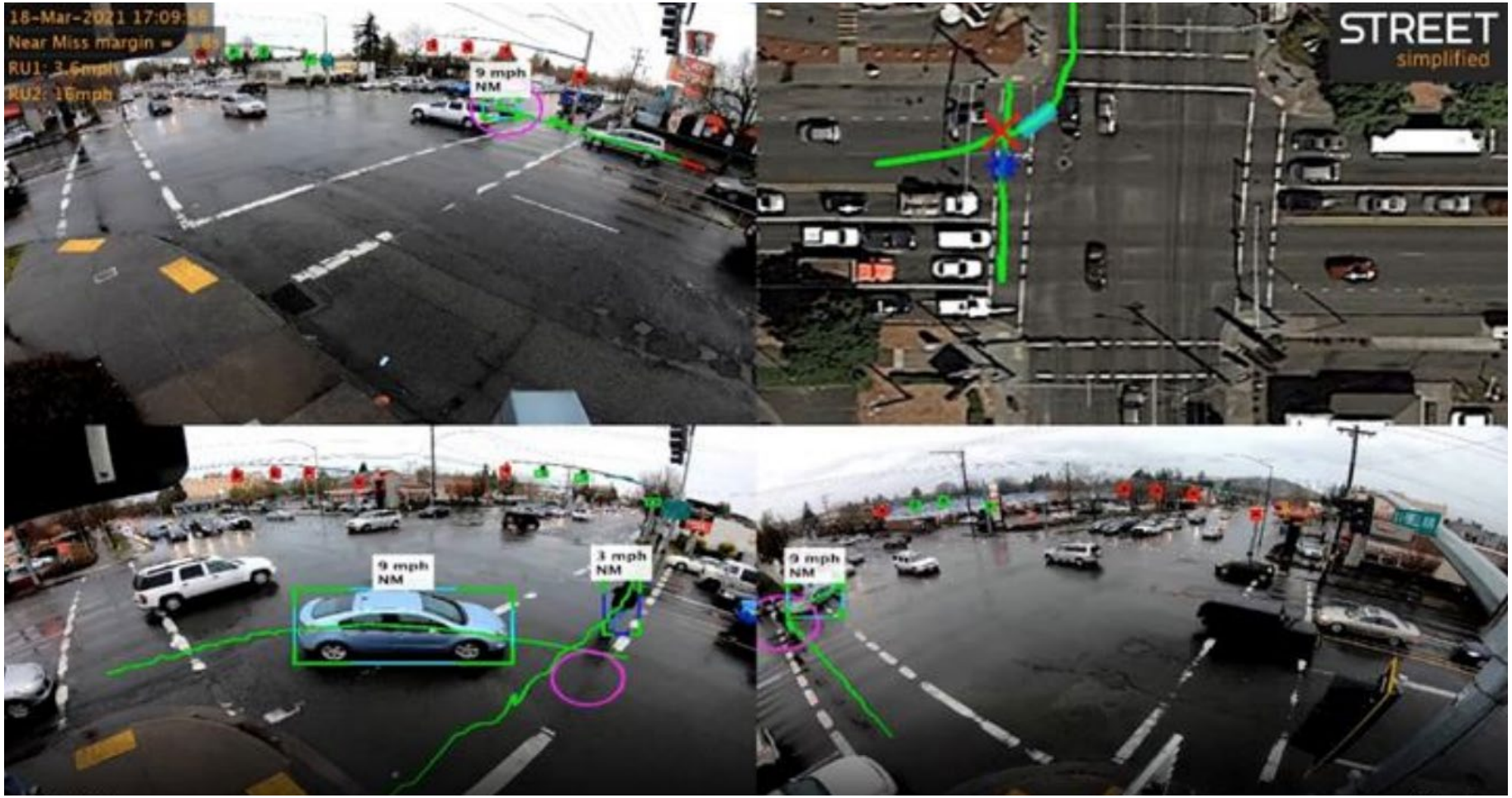
- State-of-the-art Deep Learning/AI algorithms, computer vision, edge computing and IoT systems to **provide real-time data for intelligent decision-making** as smart transportation solutions at congestion and safety roadway hotspots, such as signalized intersections and mid-blocks



The Rich Data and Information

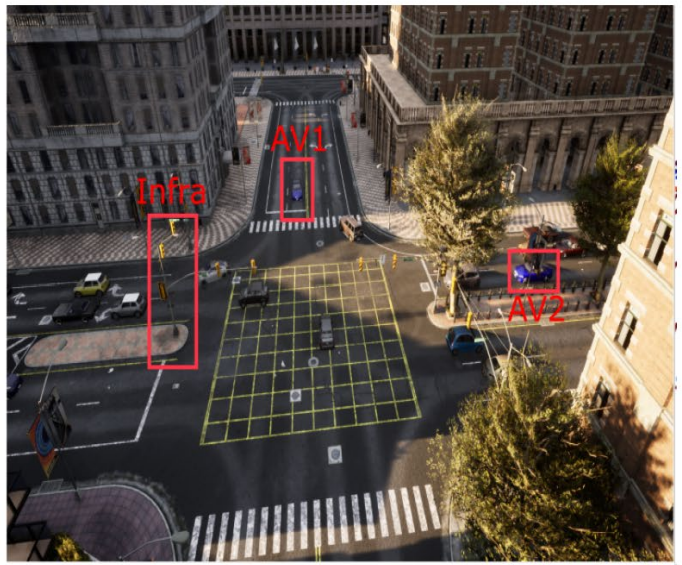


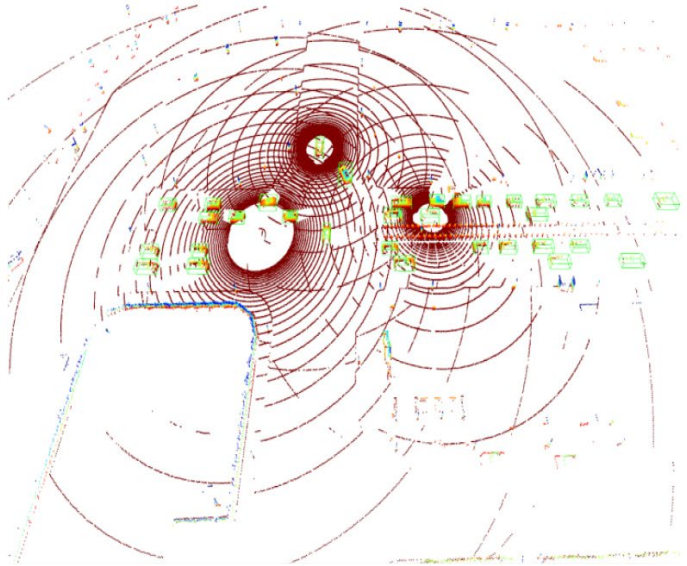
Next-Gen Safety Analytics



Infrastructure-assisted Automated Driving

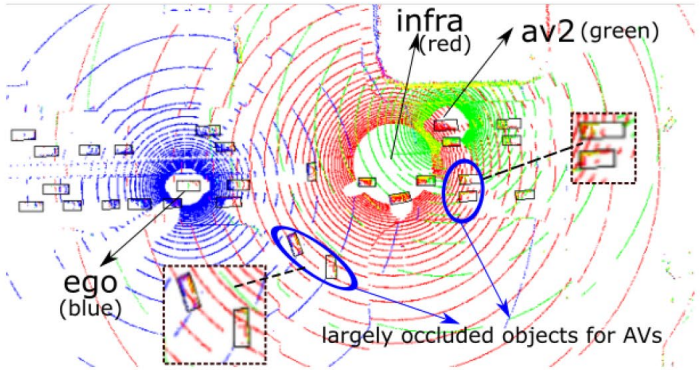
- demonstrate how the advanced infrastructure data can support safe, efficient operations of CAVs in mixed traffic
- support automated driving systems to safely and efficiently maneuver through complex environments (e.g., intersections, merge areas) from the perspectives of infrastructure-assisted perception (multi-sensor fusion to generate a holistic detailed view), localization (localizing the CAV via communication between vehicles and infrastructure), and behavior/trajectory planning (decision making using additional information)



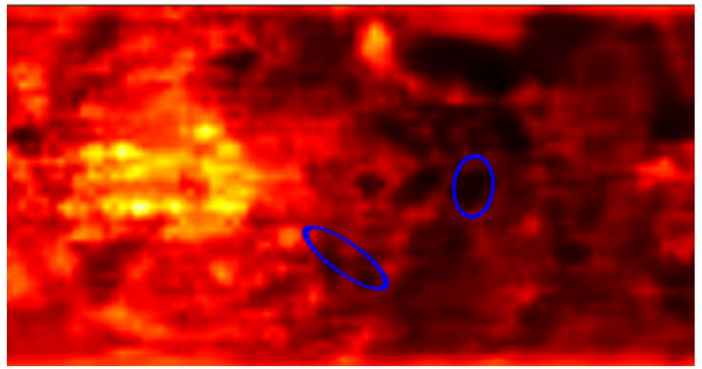


ITSC 2021; ICRA2021; ECCV 2022; IROS 2022.

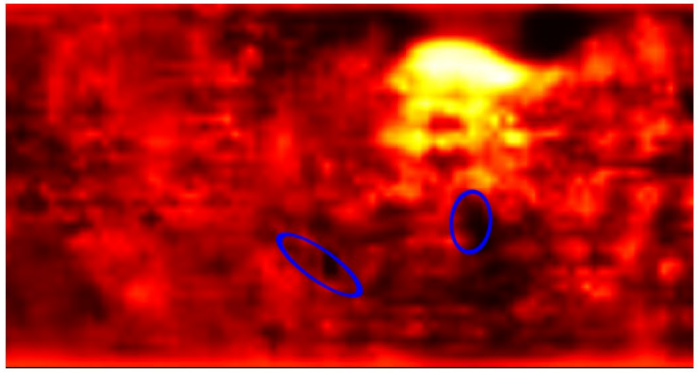
Infrastructure Rocks



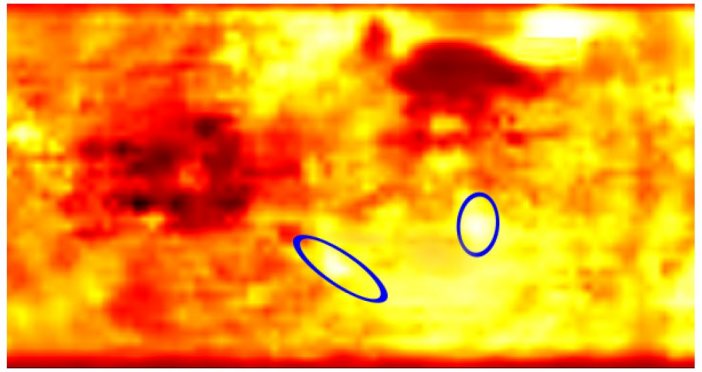
(a) LiDAR points (better zoom-in)



(b) attention weights ego paid to ego

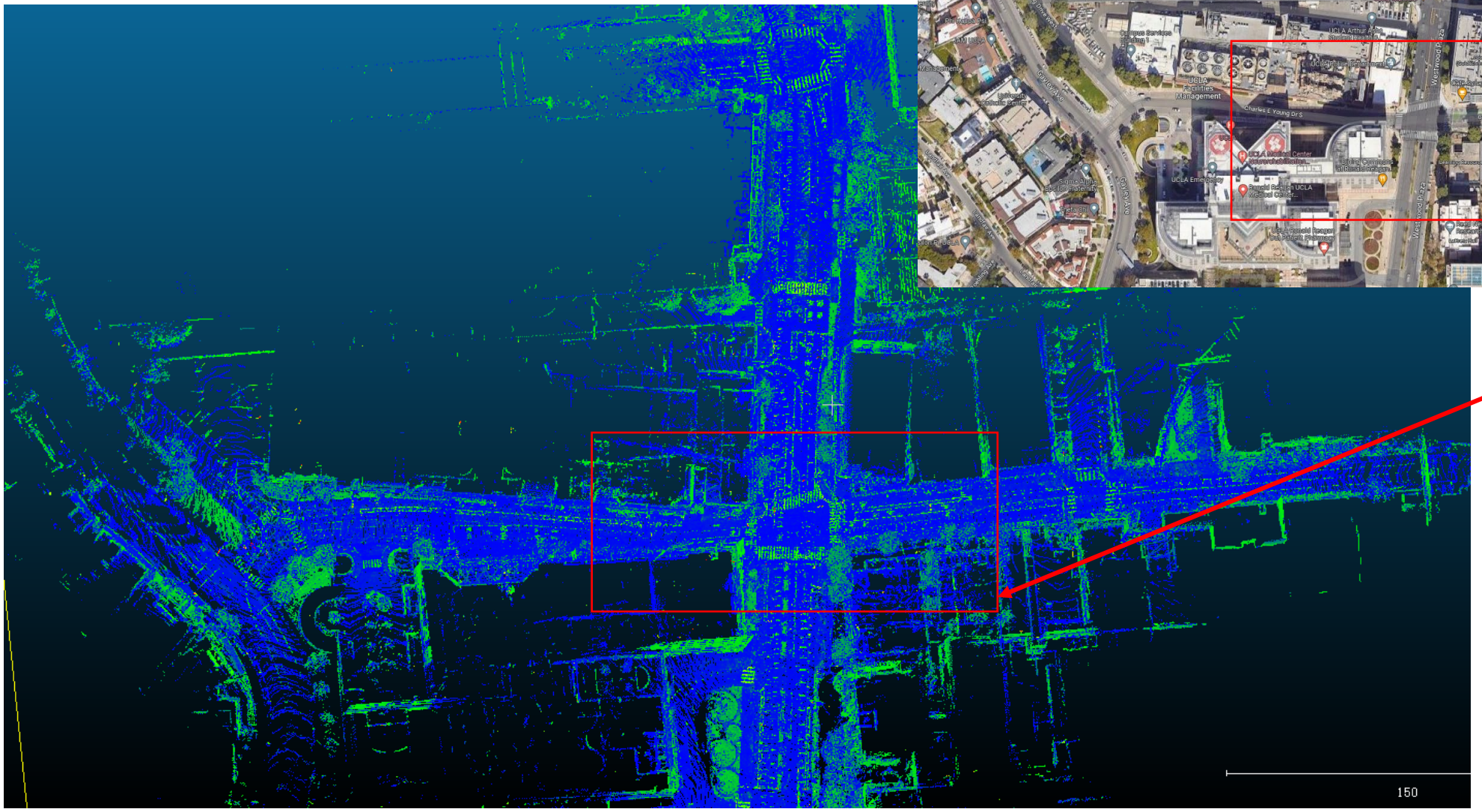


(c) attention weights ego paid to av2



(d) attention weights ego paid to infra

Digital Twins



Smart Intersection digital maps

Some Thoughts

- Infrastructure extends beyond the physicality of roads, encompassing advanced technologies like Artificial Intelligence (AI), sensor systems, and high-performance computing that facilitate real-time decision making and robust vehicle-to-vehicle as well as vehicle-to-infrastructure communication.
- Smart infrastructure ready to deploy by utilizing many existing technologies that have already matured in autonomous driving, computer vision, and edge/cloud computing
- Deep digitalization of infrastructure will bring huge benefits by enabling diverse downstream management applications
  - Safety management
  - Automated/cooperative driving
  - Signal control
  - Curbside management
  - Asset management
  - ……