

VISTA: An Open Data-driven Simulator for High-Fidelity Autonomous Driving

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Open Source, Technology Transfer, & Commercialization
Spotlight Series

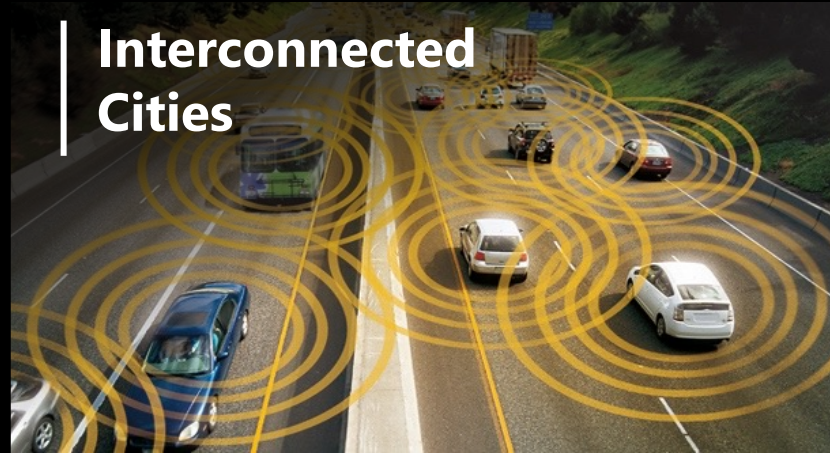


The promise of autonomy for sustainable mobility

Autonomous Vehicles



Interconnected Cities



Seamless Embedding Into Society



Fundamental Challenges

Unexpected Changes and Edge Cases



Dynamic Scenarios Harsh Environments



Complex Behaviors and Interactions



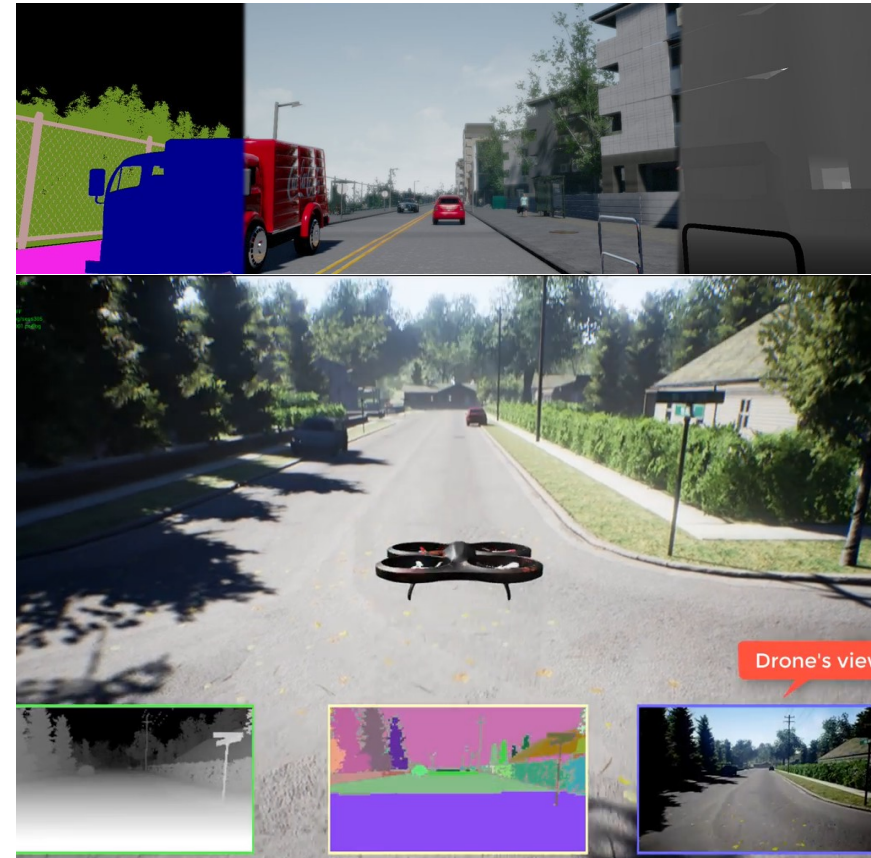
Building resilience through data

Real world



Slow, restrictive, expensive

Simulation



Realism, generalization, cost

Simulation for decision making

Model-based Simulation



Data-driven Simulation



Realism

Cost

Design

Modularity

Realism

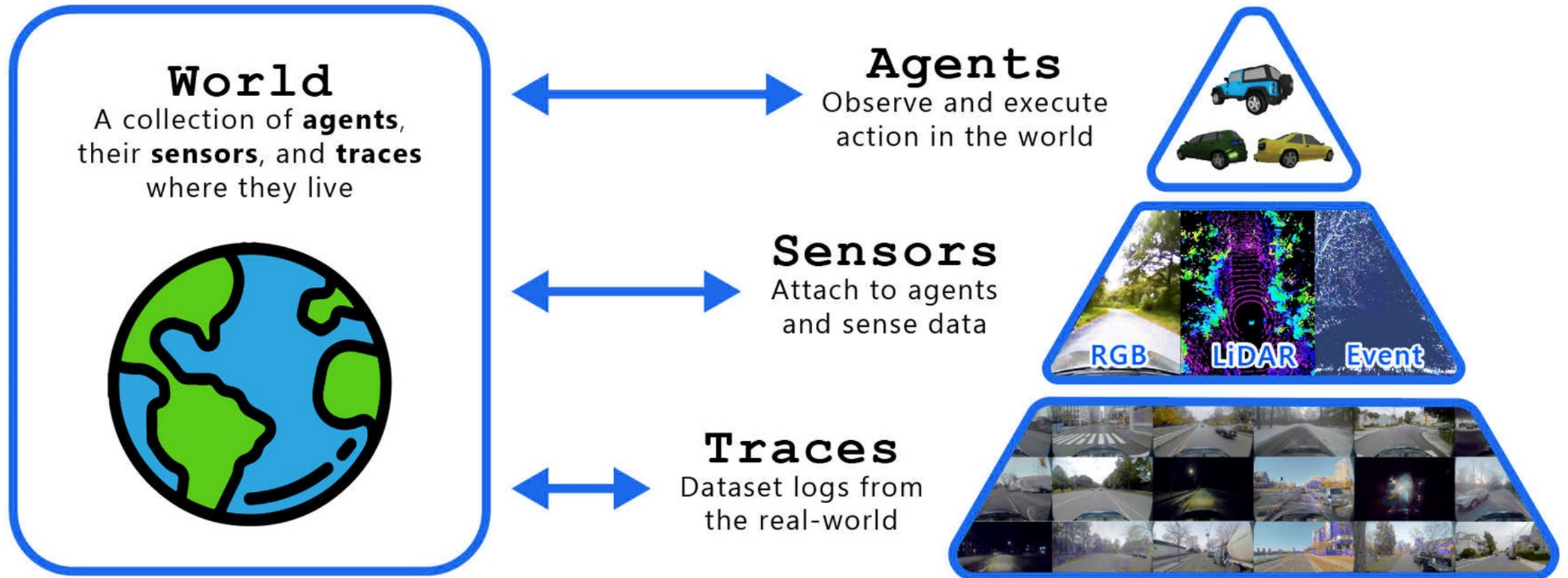
Cost

Design

Modularity

Real-to-Sim: building **synthetic worlds** directly from **real-world data** to enable resilient, sustainable autonomy

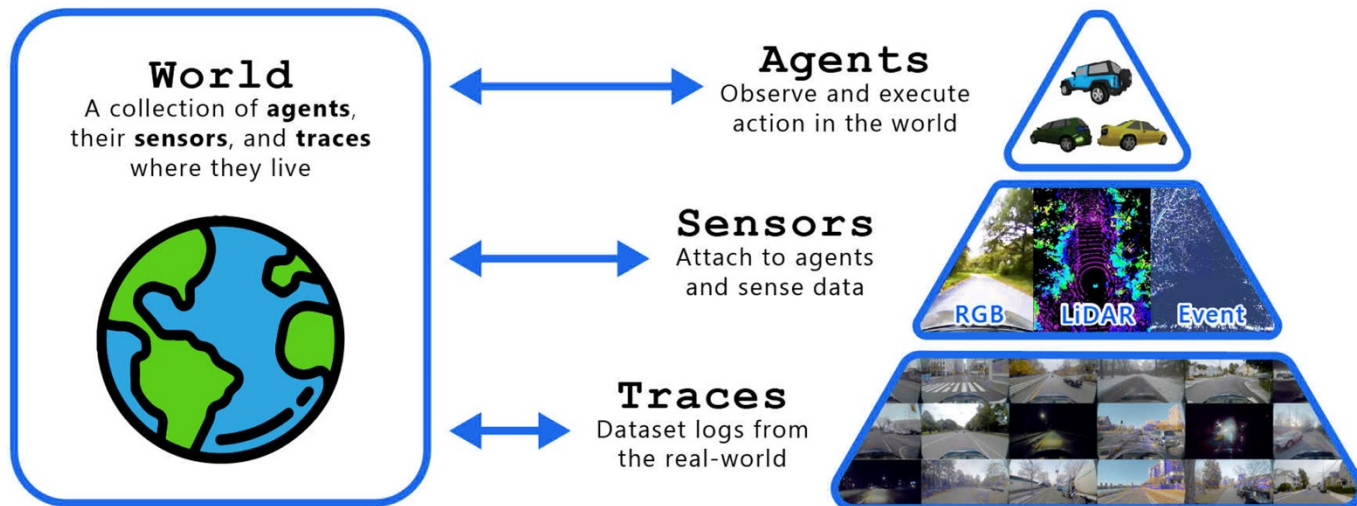
THE VISTA SIMULATOR



THE ISTA SIMULATOR

Open-sourced for the research community

vista.csail.mit.edu



```
>> pip install vista
```



pypi

7,334 installations
412 installs/month
93 installs/week



Starred 190



Fork 28



Issues 10



Pull requests 2

VISTA builds synthetic worlds from real-world data

VISTA: Virtual Image Synthesis and Transformation for Autonomy

Photorealistic data-driven simulation for synthesizing novel edge-case scenarios and data

Original Data

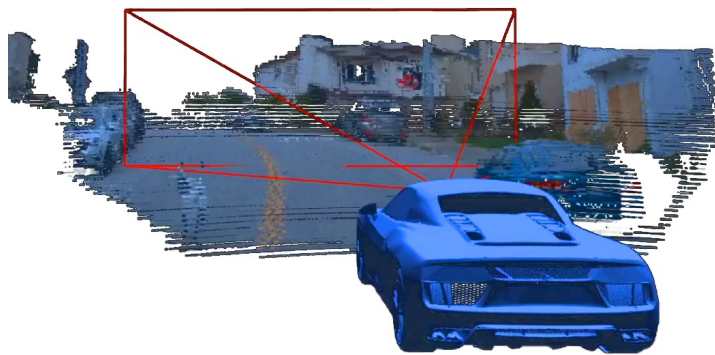


Novel Simulated Trajectory within VISTA



Data-driven simulation for resilient mobility

Physical



Simulate different physical sensing modalities

(2D cameras, 3D LiDAR, events, etc)

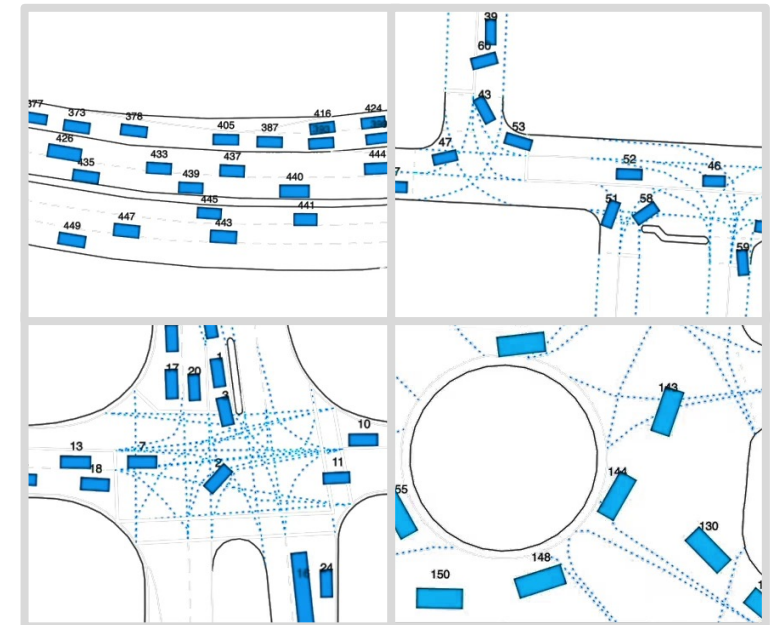
Environmental



Environmental and geographic perturbations

(weather, lighting, road type, etc)

Behavioral



Human-like interaction simulation

(multi-agent decision making, etc)

Data-driven simulation for resilient mobility

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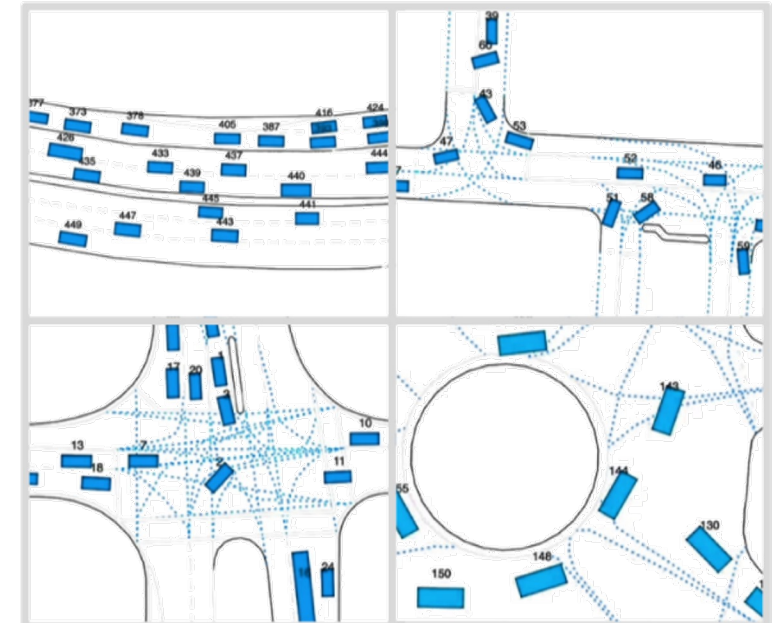
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(multi-agent decision making, etc)

Open source data-driven platforms

Data-driven approach leverages existing data to simulate thousands of new examples across a **variety of conditions**



A flexible platform for high-fidelity, photorealistic mobility simulation

```

# Initialize the VISTA simulator
world = vista.World(dataset)

# Create virtual agents in the world
for i in range(num_agents):
    agent = world.spawn_agent(location)

# Place sensors on the agent
agent.place_camera(pos_camera)
...
agent.place_lidar(pos_lidar)

# Run!
while True:
    # Simulate the environment and data
    sensor_data = agent.observe()

    # Feed data through end-to-end controller
    action = agent.brain(sensor_data)

    # Step with the desired action
    state, reward = agent.step(action)
    
```

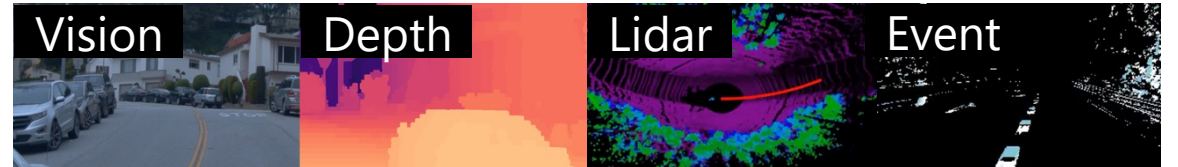
▶ Data-driven Environment



▶ Agent Library



▶ Virtual Sensors



▶ Rendering, Dynamics, and Control

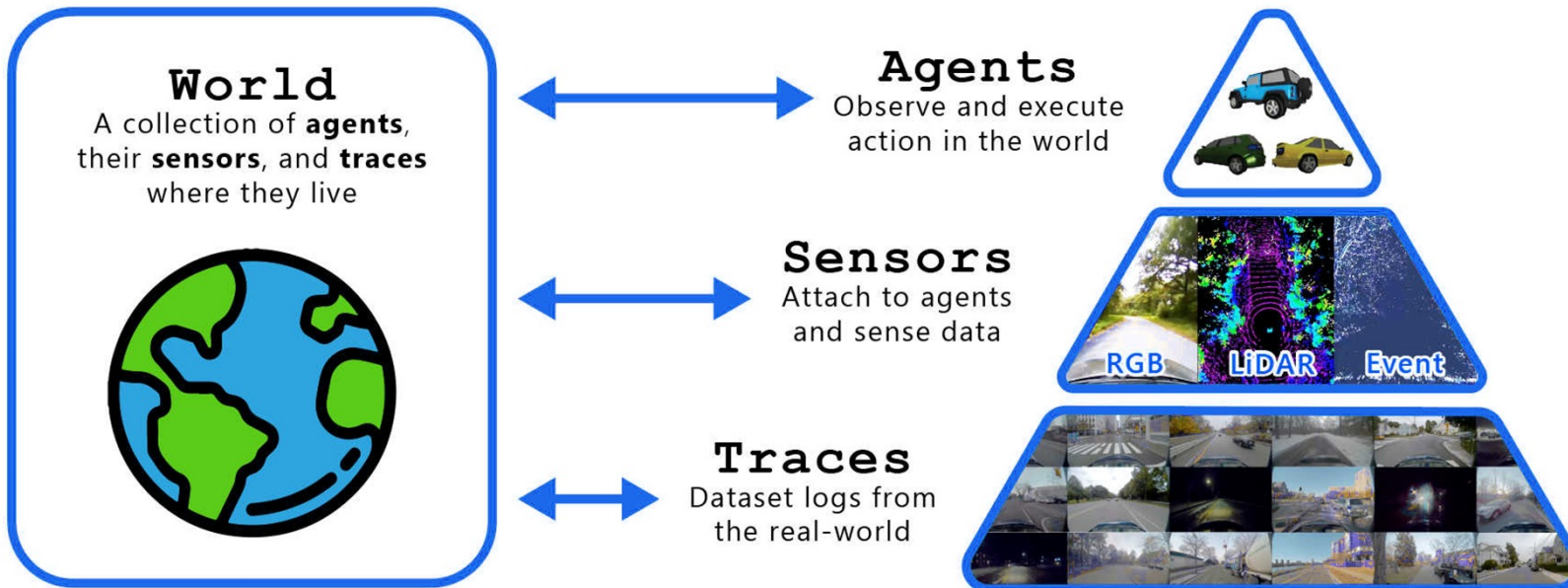


Summary

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Acknowledgements



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