

HDR DSC: DATA SCIENCE FOR SOCIAL GOOD IN URBAN AREAS

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Project website:
<https://datasciencecorps.umbc.edu>

This project is a collaborative effort with the University of Maryland Baltimore County as the coordinating and implementing organization, and the University of Baltimore, Towson University, and Bowie State University as implementing organizations.



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Fig. 1: Project Team

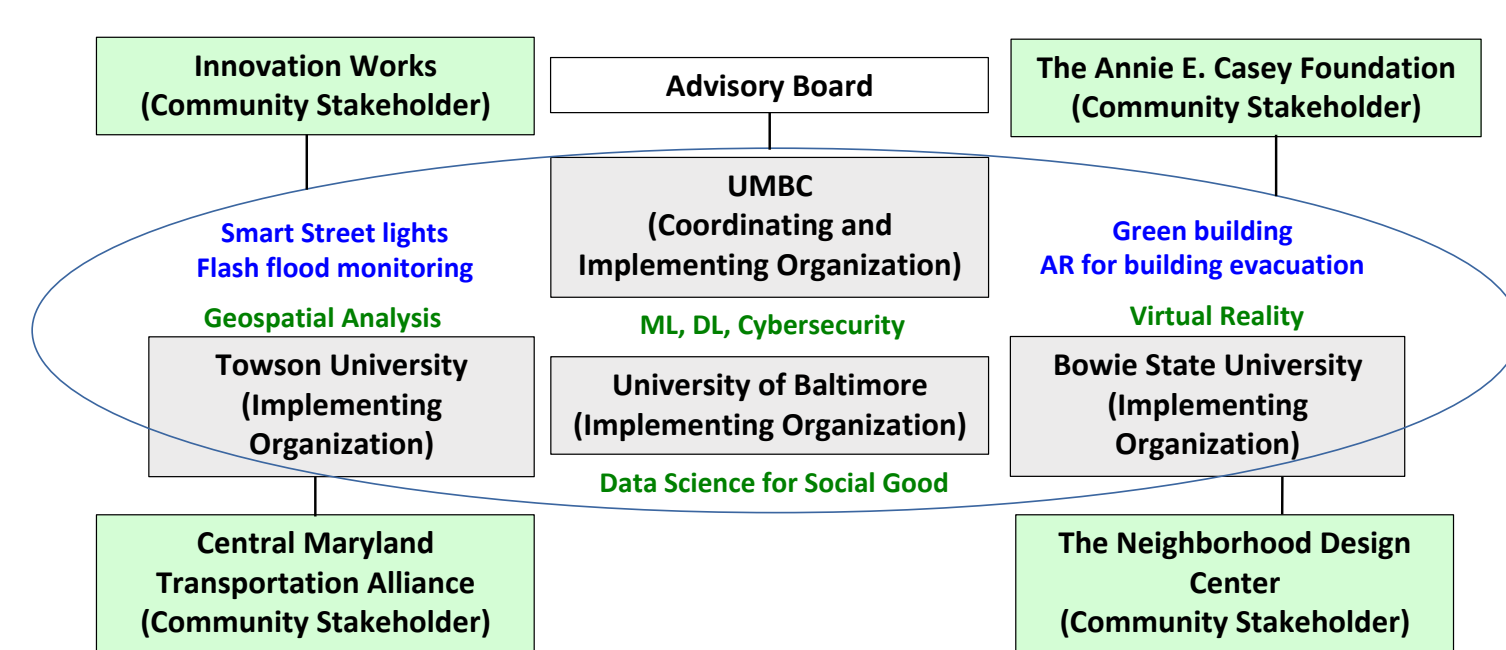
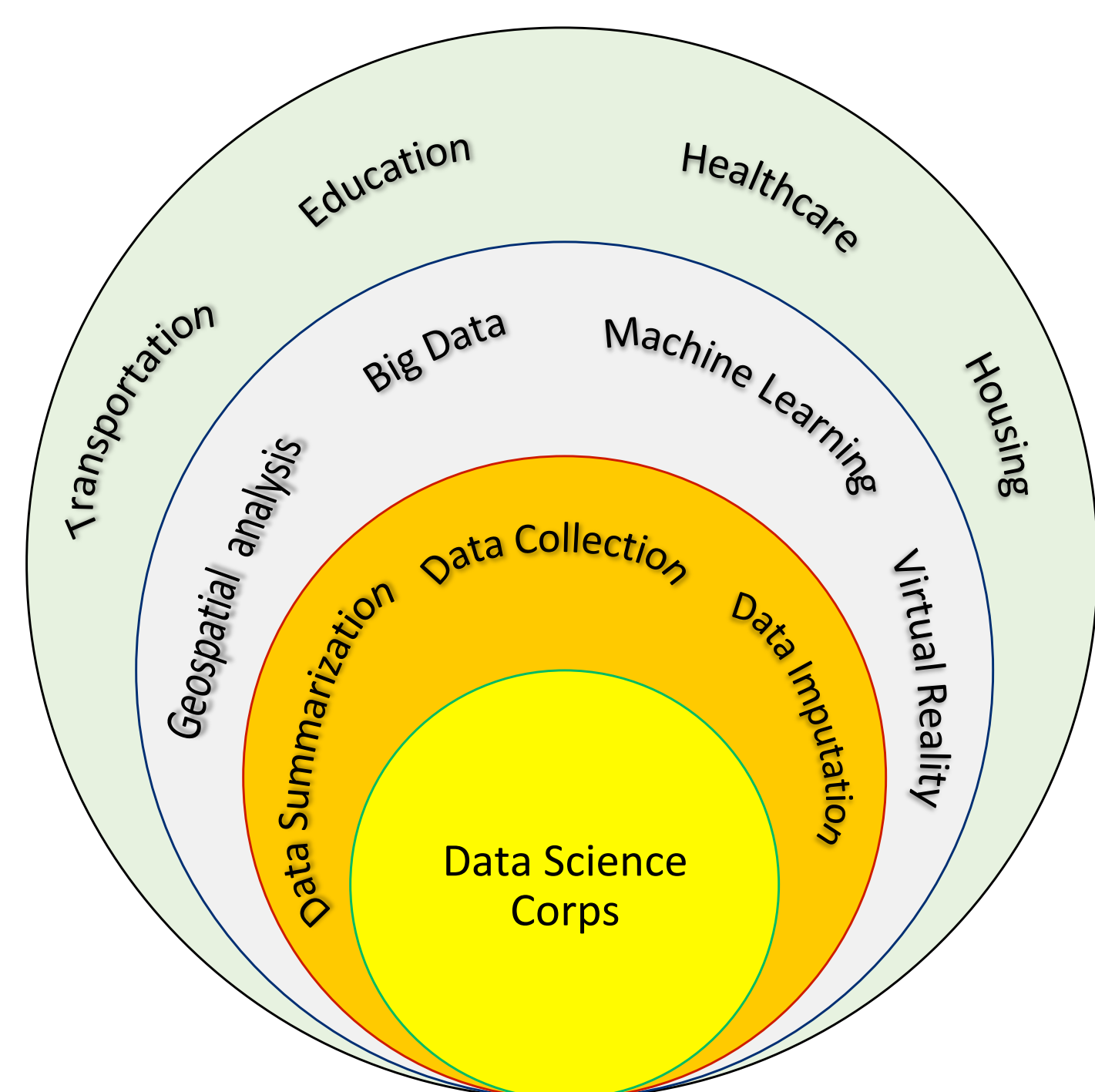


Fig. 2: Project Structure



ARIS: A Real Time Edge Computed Accident Risk Inference System

Goal: To deploy an intelligent transport system in urban environment, an effective and real-time accident risk prediction method is required that can help maintain road safety, provide adequate level of medical assistance and transport in case of an emergency. Reducing traffic accidents is an important problem for increasing public safety, so accident analysis and prediction have been a subject of extensive research in recent time. To overcome these challenges, we propose a system for real-time traffic accident prediction built on a traffic accident dataset named 'US-Accidents' which covers 49 states of United States, collected from February 2016 to June 2020. Our approach is based on a deep neural network model that utilizes a variety of data characteristics, such as time-sensitive weather data, textual information, and discerning factors. We have tested ARIS against multiple baselines through a comprehensive series of experiments across several major cities of USA, and we have noticed significant improvement during inference especially in detecting accident classes.

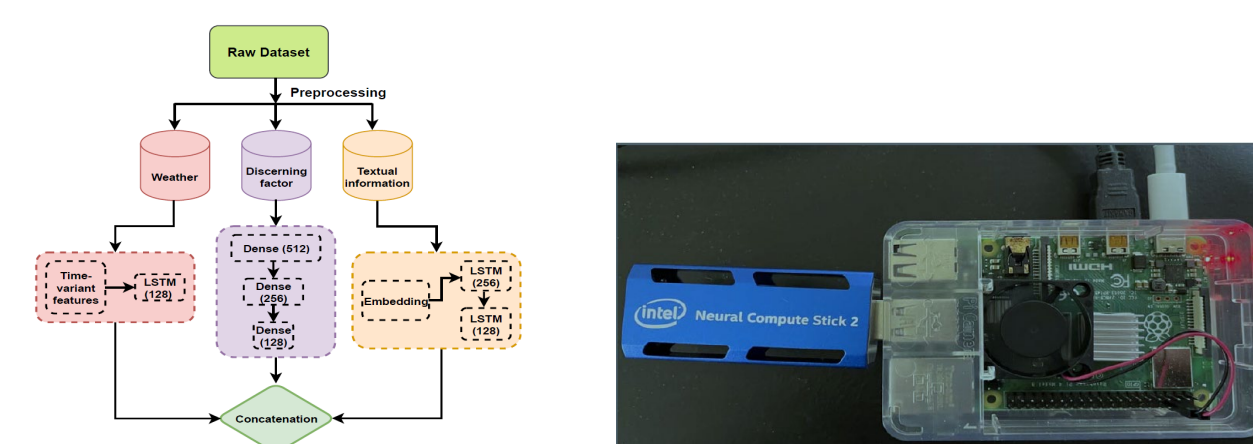


Fig. 4: AI on the Edge: Real-time Accident Prediction

City Name	LR		DT		RF		DNN		ARIS	
	Non-Accident	Accident	Non-Accident	Accident	Non-Accident	Accident	Non-Accident	Accident	Non-Accident	Accident
Allstate	0.63	0.8	0.66	0.81	0.67	0.78	0.81	0.88	0.84	0.91
Scalife	0.69	0.71	0.69	0.79	0.67	0.77	0.86	0.86	0.86	0.89
Detroit	0.69	0.76	0.72	0.78	0.69	0.87	0.85	0.86	0.89	0.89
Miami	0.69	0.76	0.72	0.78	0.69	0.77	0.86	0.86	0.89	0.89
Dallas	0.76	0.74	0.74	0.72	0.77	0.8	0.87	0.86	0.89	0.89
Chicago	0.59	0.73	0.45	0.77	0.66	0.66	0.66	0.79	0.76	0.81

Fig. 5: AI on the Edge: Real-time Accident Prediction

Edge AI for Real-time Crime Detection

Goal: The project develops compressed AI models for real time crime detection and prevention in smart cities.

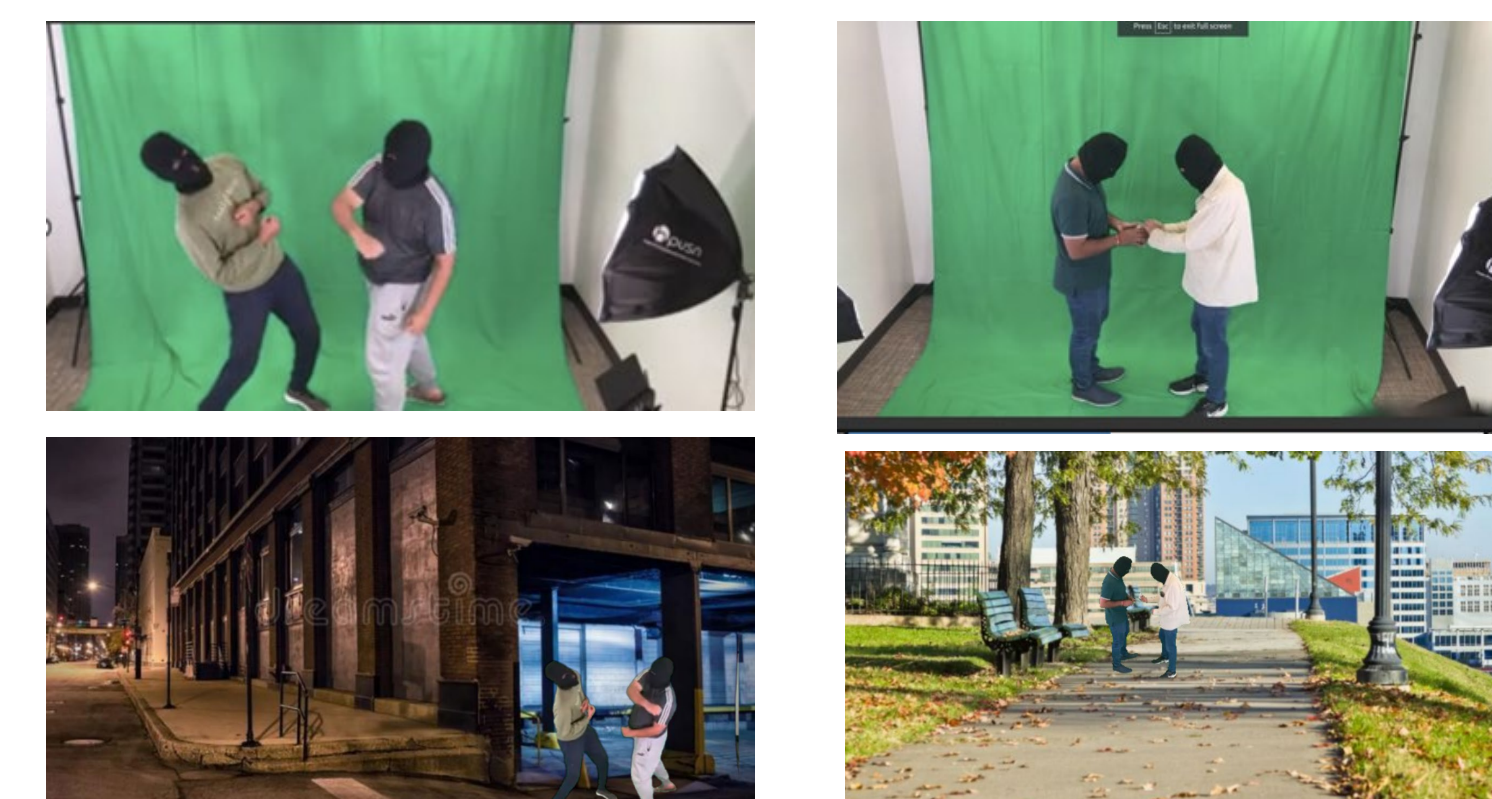


Fig. 6: Synthetic Crime Scene Creation

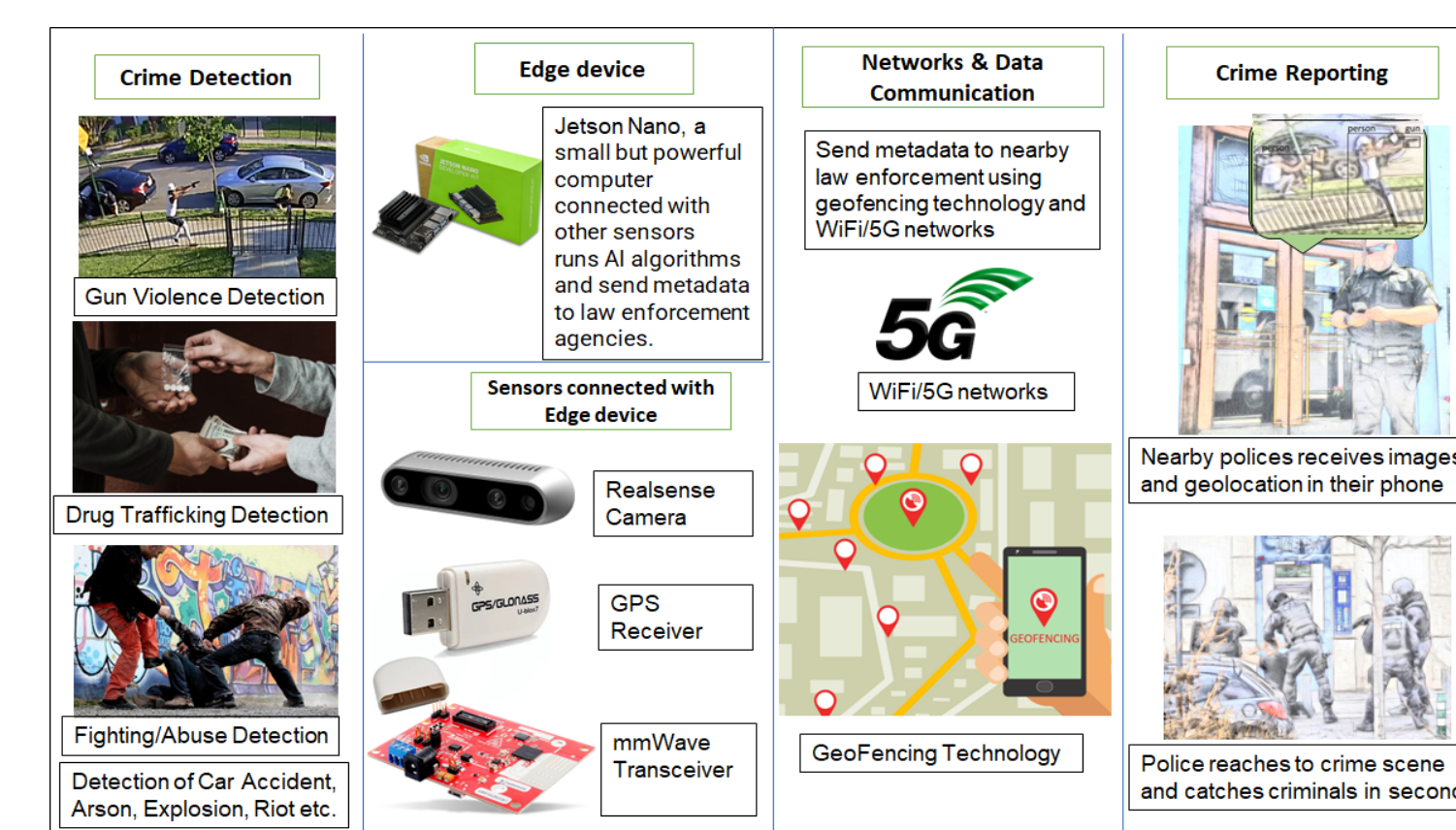


Fig. 7: Edge AI for Real-time Crime Detection

Using Social Media to detect Drug Retailing Activities

Goal: The goal of this project is to detect drug retailing using social media.

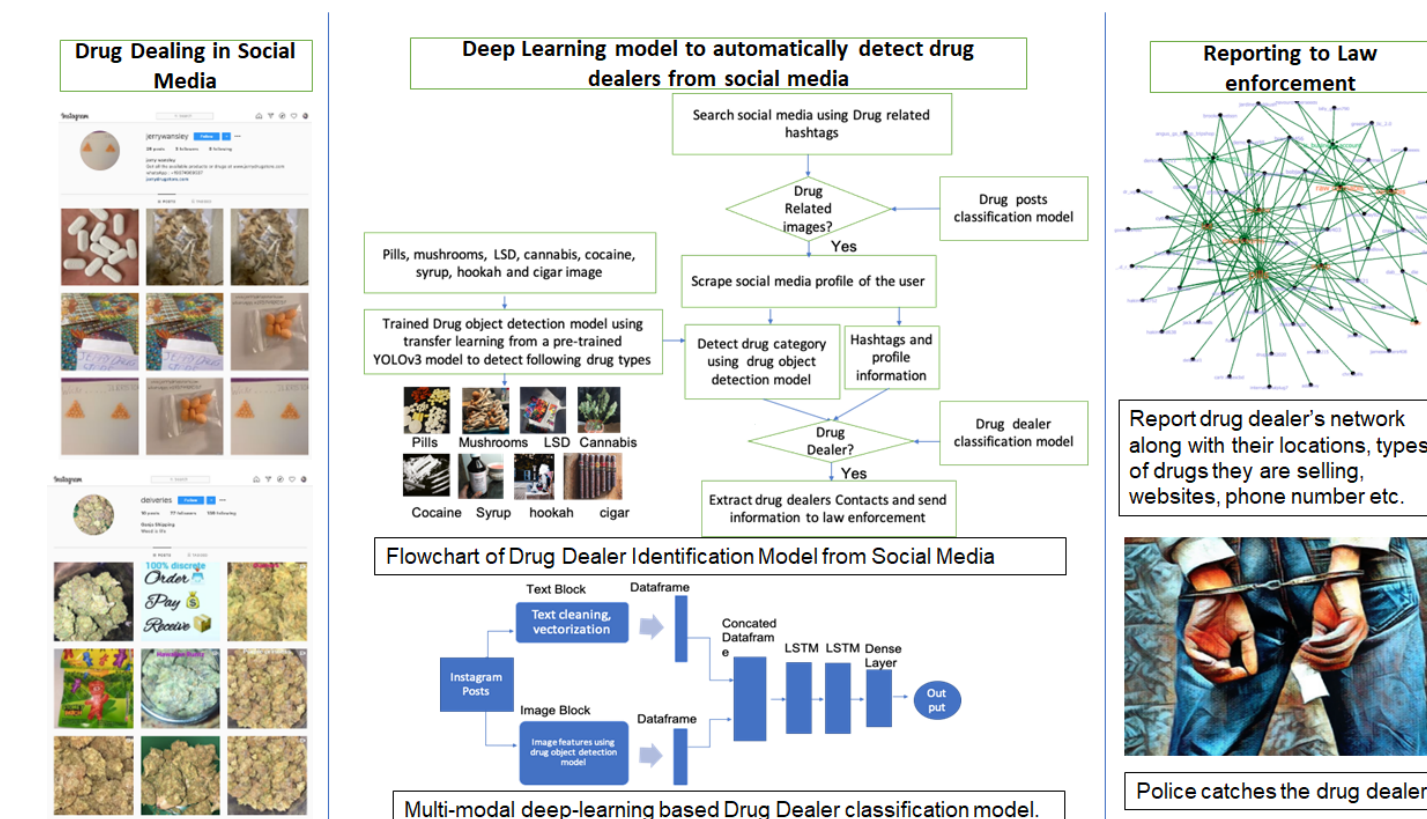


Fig. 8: Transfer Learning

Building Evacuation using AR

Goal: This work presents three cutting edge Augmented Reality Instructional (ARI) modules that overcome visual limitations associated with the traditional, static 2D methods of communicating evacuation plans for multilevel buildings.

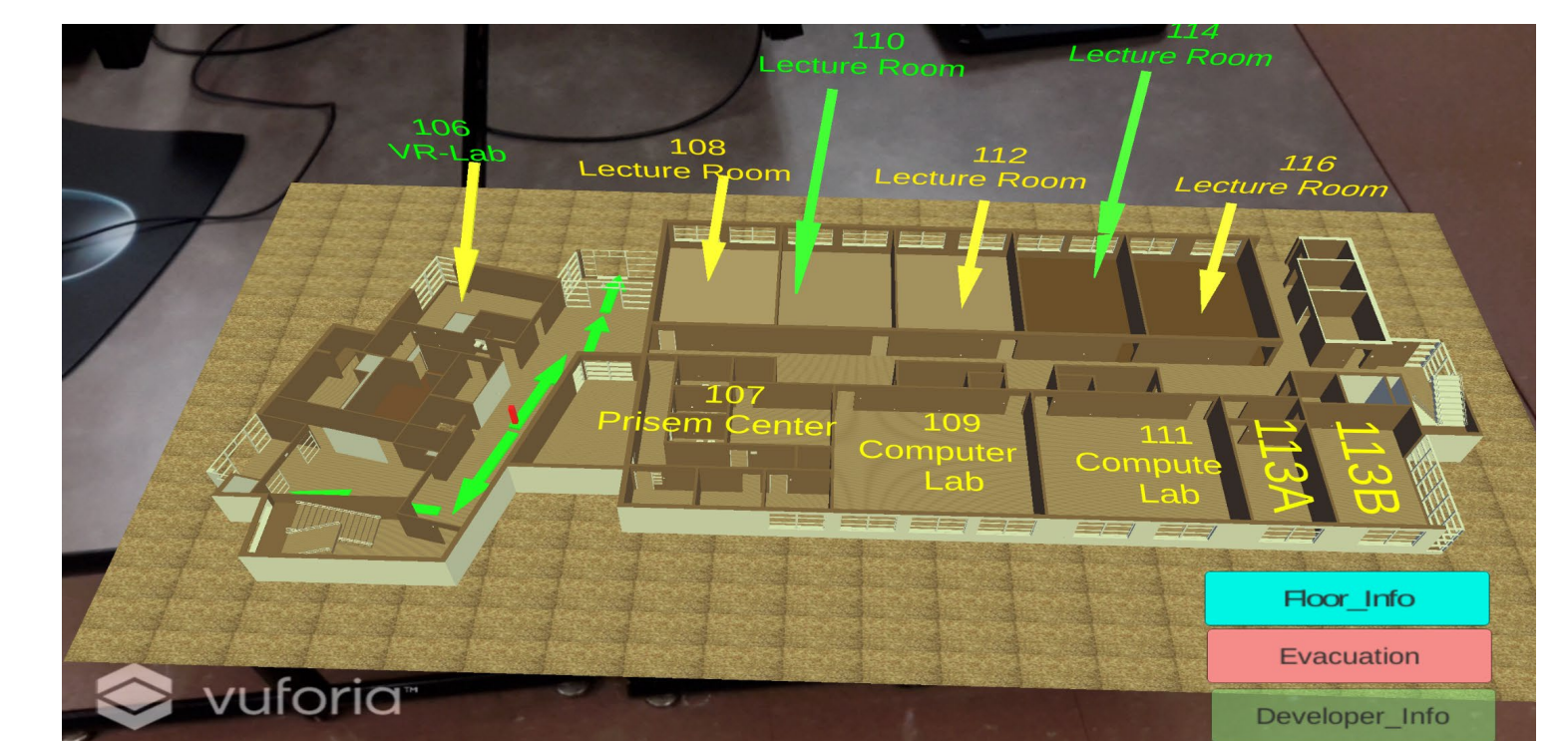


Fig. 9: Augmented Reality Modules

Real-time Monitoring of Accident Situations on the Edge

Goal: Our research is focused on detecting and monitoring accident situations in real-time by deploying AI models on sensors mounted at various road networks. One of the main challenges is to collect accident situation data without manually browsing through hours of video streams. We are developing accident situations in real-world road networks using a simulation platform that would be useful for training AI models.



Fig. 10: Creating Accident situations in CARLA



Fig. 11: Accident simulation