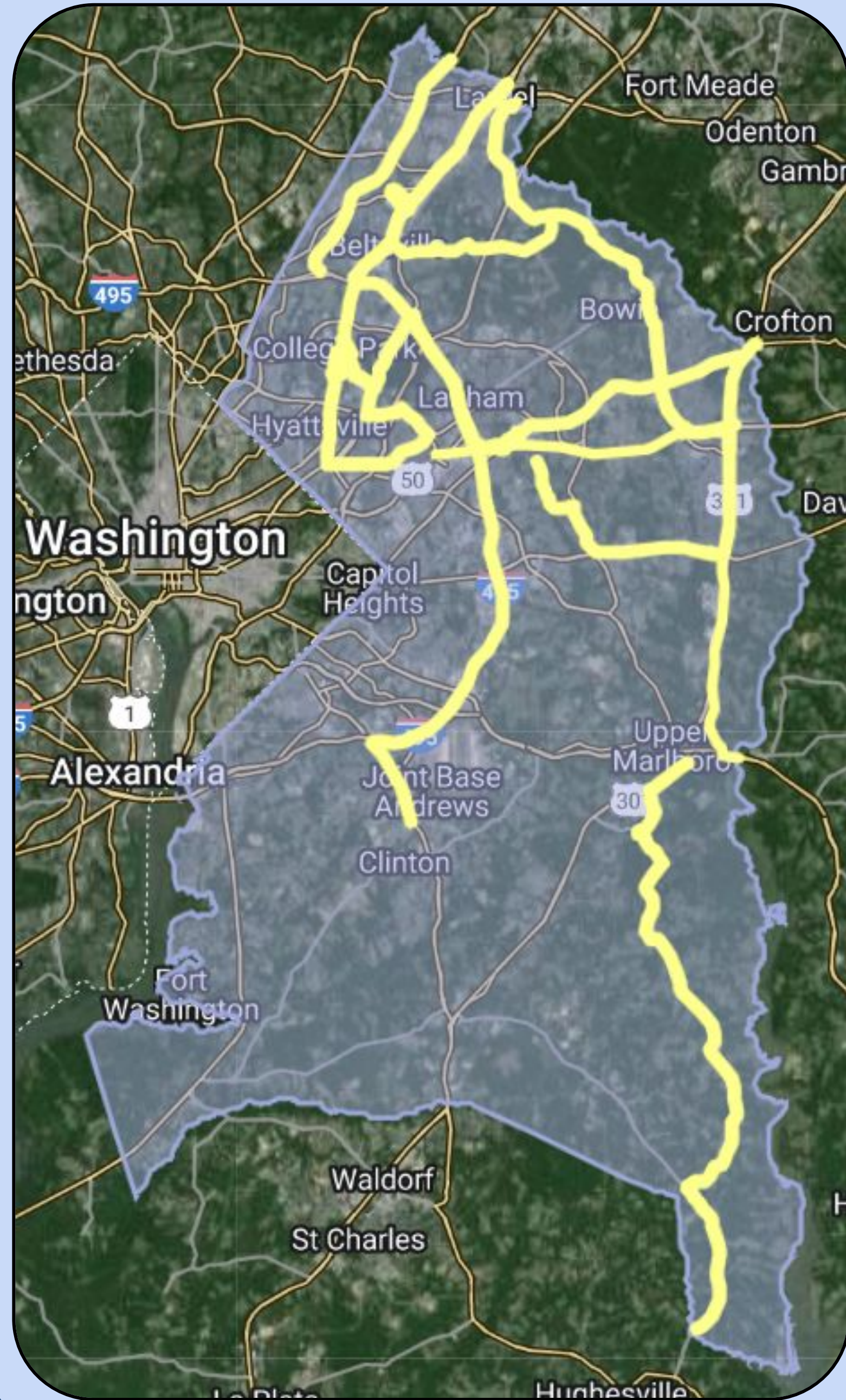


**Complete map of all roads driven within Prince George's County, Maryland**

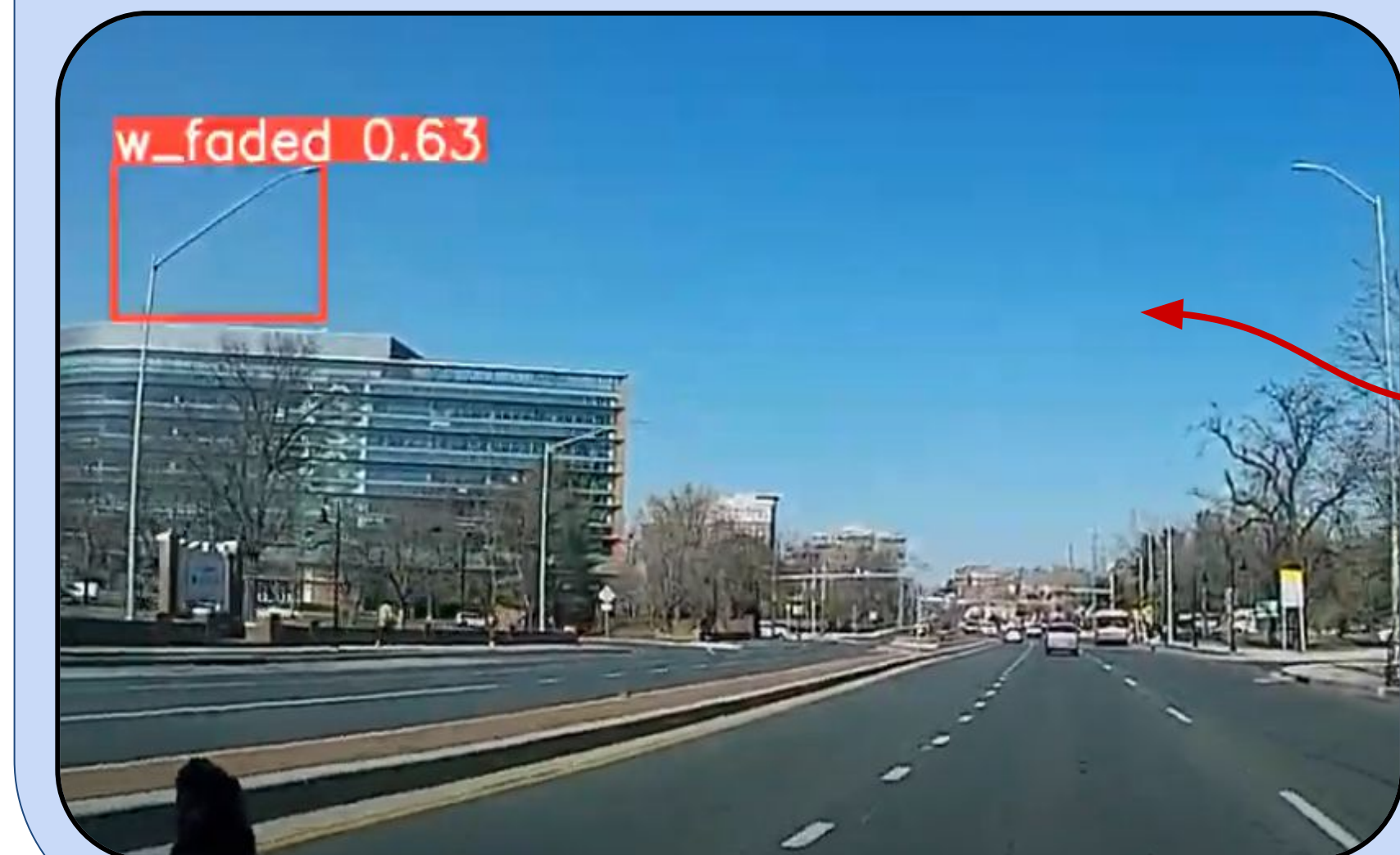


**Methodology**

Using a self-learning artificial intelligence model, YOLOv8, we are able to simulate Advanced Driver Assistance Systems (ADAS) in order to provide guidance as to what MD/Prince George's County roads need infrastructure improvement. YOLO (You Only Look Once) is a real-time object detection and identification framework used in a variety of projects and applications. It is self-learning and provides efficient and detections for computer vision applications.

Interstate Roads	State Roads	Minor Roads
I-95	MD 4	Ammendale Rd.
I-495	MD 5	Campus Dr.
US 1	MD 197	Croom Station Rd.
US 50	MD 201	Marlboro Pike
US 301	MD 381	Powder Mill Rd.
	MD 382	
	MD 410	

**Frequent Inaccurate Detections**



Street Lamps



Overhead Power Lines

**Results**

Detection Classification	
Number of Detections per Mile	Classification
< 30	Good
30 < x < 150	Fair
> 150	Poor

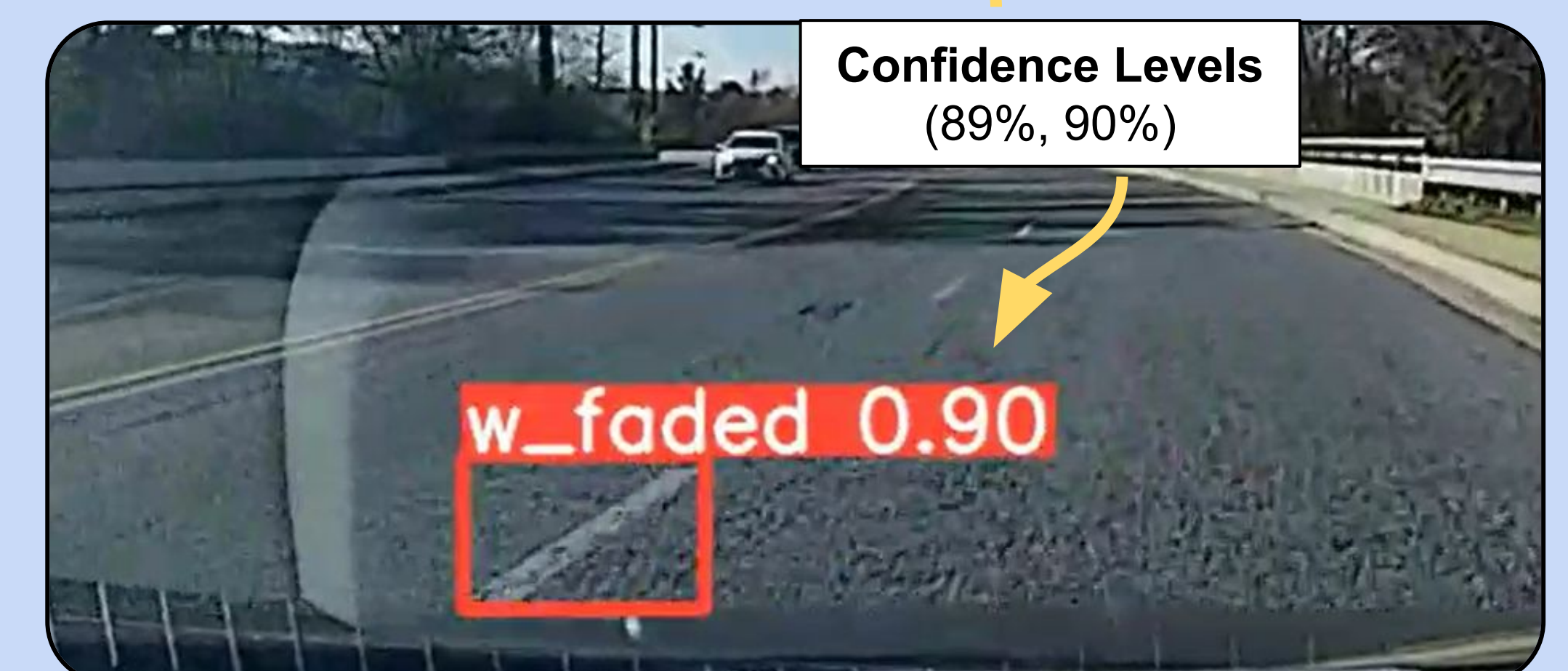
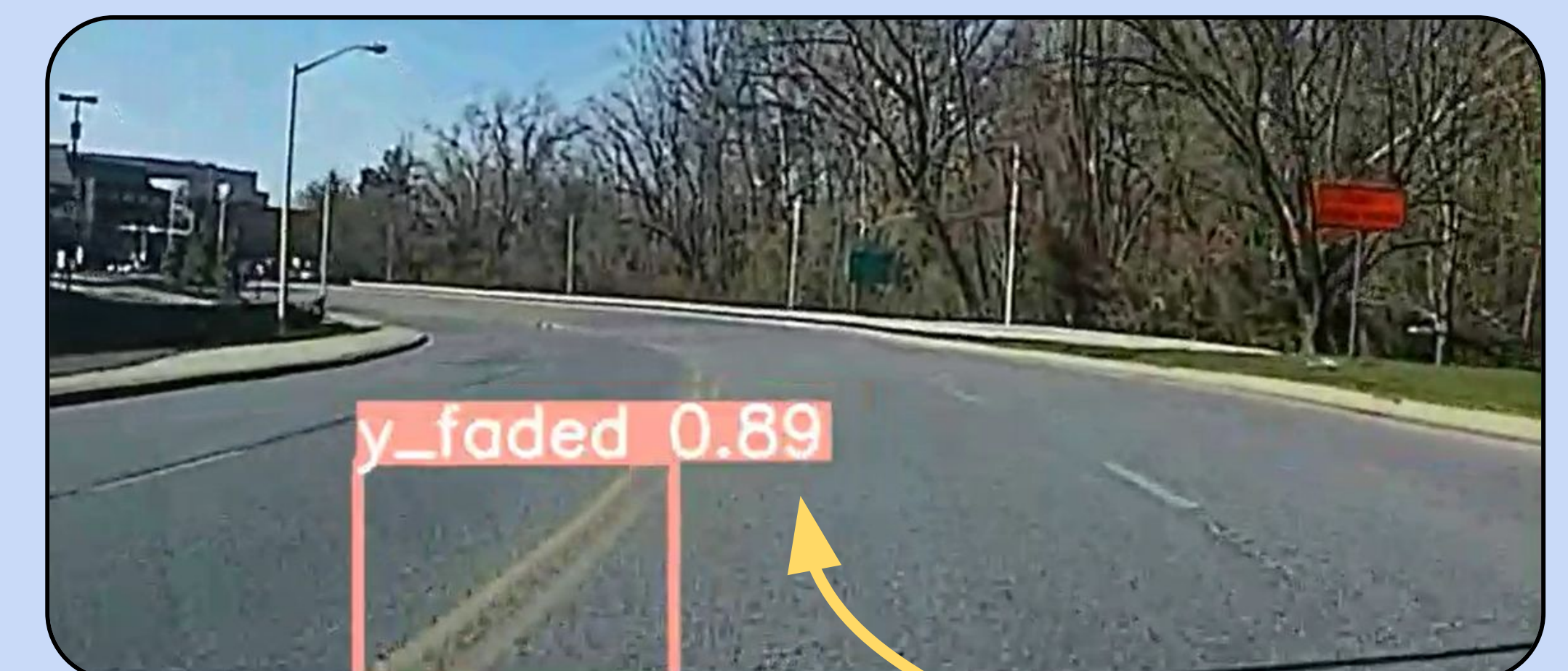
Interstate Roads		State Roads		Minor Roads	
I-95	51	MD 4	30	Campus Dr.	883
I-495	45	MD 5	9	Croom Station Rd.	51
US 1	12	MD 197	174	Marlboro Pike	148
US 50	12	MD 201	191	Powder Mill Rd.	30
US 301	50	MD 381	51		
		MD 382	53		
		MD 410	683		

Detections Observed per Mile

After all roads had completed the analysis portion of this project, they were scaled to a number of detections per mile that YOLOv8 had analyzed.

The appropriate values of a 'good,' 'fair,' and 'bad' road condition are based on the number of detections per mile. Annual pavement conditions map curated by State Highway Administration (SHA) and Maryland Department of Transportation (MDOT) was used as a frame of reference for the class range determination.

**True Detections and Results**



Confidence Levels (89%, 90%)

**YOLOv8: How Does It Work?**

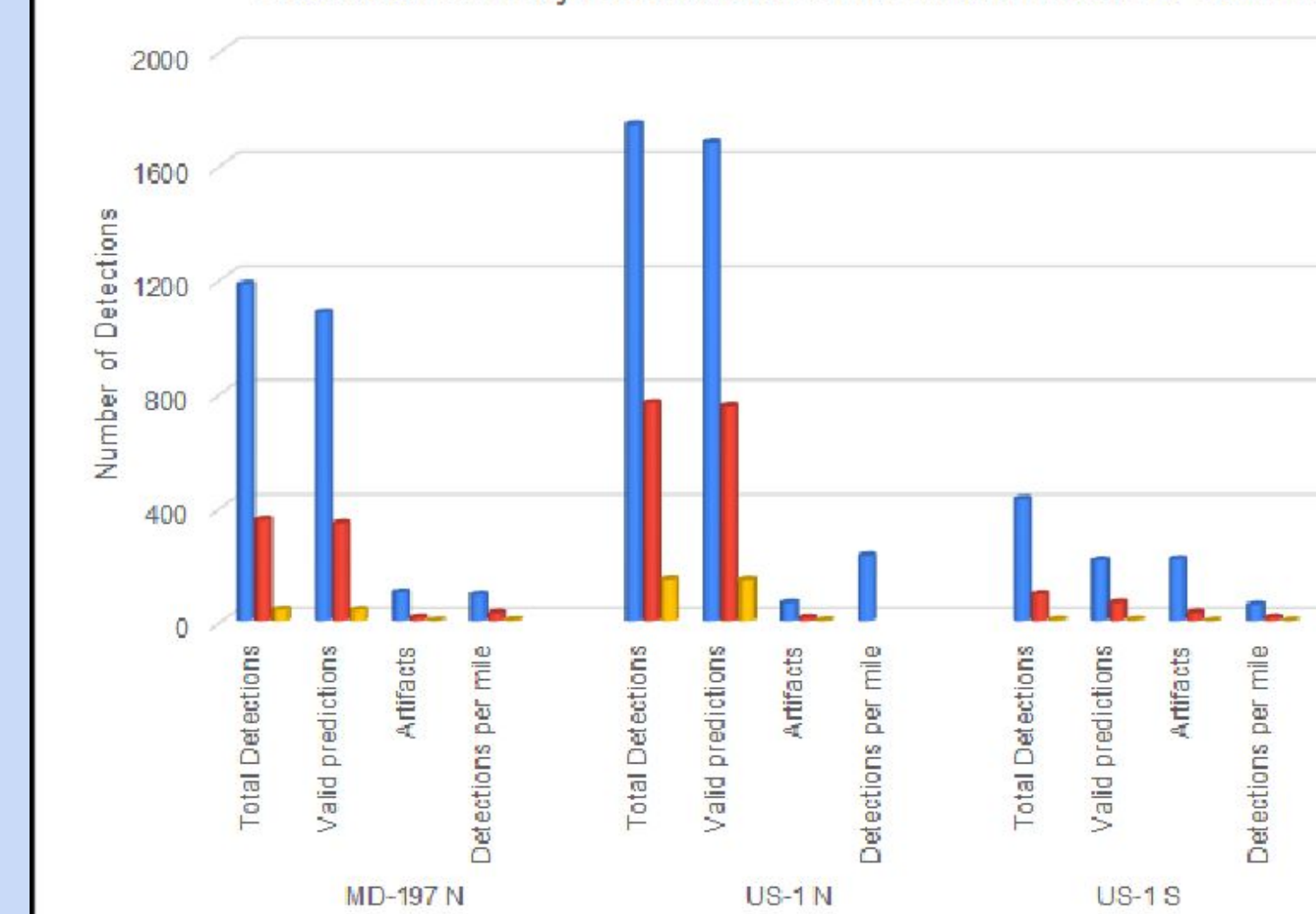
YOLO is an open-source framework. Using version YOLOv8, and training with a custom dataset, we can detect deteriorated lane markings.

Training included photos of both white and yellow faded demarcations annotated for the algorithm to recognize and identify as either "w\_faded" or "y\_faded" classes respectively.

The process was repeated 100 times in order to make the algorithm more accurate and precise.

# Images used for training	2100
# Images used for validation	840
Epochs (repeated process)	100

Detection Density Distribution at Different Levels of Confidence.



Increasing the level of confidence reduces number of false positives (artifacts).

The tradeoff is losing a significant amount of true positives, which is necessary for accurate road demarcation classification.

70% confidence was selected as optimal to maximize accuracy and precision for road class determination.