Cellphone Implementation to Address Distracted Driving Using AI

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1. Introduction

1.1 Background

Automobile accidents are the global leading cause of youth death aged 5 to 29, resulting in over a million deaths every year [1]. In fact, California is the second highest total ranked place for these accidents, due to the increasing number of distracted drivers on the road [2], [3]. In my research, I explored a unique way to detect and deter phone usage while driving by leveraging AI in combination with IOS software implemented in a cellphone.

1.2 Problem

I developed a solution in which the very same device (e.g., cellphone) that causes distracted driving is utilized to detect and deter the distracted driving (Figure 1). Such novel solution requires the cellphone itself to determine (1) whether the cellphone itself is in a moving vehicle, (2) whether the cellphone is being used, and (3) whether the person using the cellphone is a driver. My research aims to evaluate whether a cellphone can be configured, via IOS app development in combination with AI training to accurately determine three metrics, i.e., speed, phone usage, and driver identification, so that they can be combined in a processing architecture implemented in a cellphone to detect phone usage by driver.

Figure 1. Cell phone causing the distracted driving can be utilized to detect and deter distracted driving.

2. Investigation

2.1 Methodology

I developed a distracted-driving detector that is run on a cellphone using IOS software and a trained AI model. The processing architecture includes three detectors (kinematic detector, usage detector, and driver detector) and an evaluator (Figure 2).

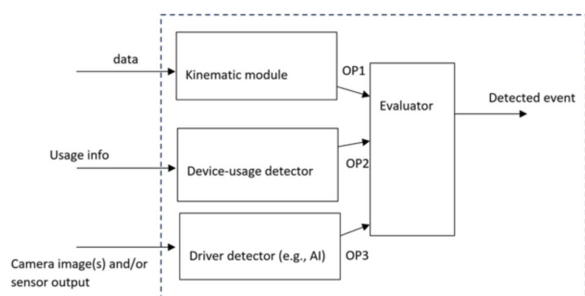

Figure 2. Processing architecture of distracted-driving detector

The AI implements the driver detector and is trained using 329 training images of different drivers and passengers. The training images captured environmental cues (e.g., car seat, steering wheel, window, visor, etc.) so that the

AI model can learn to distinguish a driver from passenger based on these cues.

During use, the kinematic detector obtains speed information from the cellphone's GPS unit. The usage detector obtains touchscreen usage from the touchscreen sensors. If the cellphone's speed is above 5 mph, and if the usage metric indicates cellphone usage, then the cellphone camera captures an image of the cellphone user. The AI model analyzes the image to determine whether the person using the moving cellphone is a driver or not. If so, the distracted-driving detector concludes that there is distracted driving (Figure 3).

```
while app Running:
    gate(1) check speed > 20mph:
        fetch speed data from Apple's location manager
        if speed > 20 = true:
            gate(1) check device usage:
                fetch user's input on screen using
                simultaneousGesture property (identifies
                touches to the screen)
                if user currently swiping on phone:
                    gate(3) use neural network to check
                    driver vs passenger:
                        if neural network returns "driver":
                            distracted event must have
                            occured -> administer
                            consequence screen:
                                pops up screen and force
                                user to wait 3 seconds
                                after 3 seconds, detect
                                touch to deescalate back
                                to gate(1)
                        else:
                            deescalate to gate(1)
                else:
                    deescalate to gate (1)
        else:
            do not escalate to next step and continue
            checking speed

# Figure 3. Pseudocode
```

I tested the accuracy of the driver detection (AI model) using 103 testing images. Since GPS unit and touch screen sensors are well known to be accurate [4], [5], the speed and usage metrics are not tested.

2.2 Results

Figure 4 shows the testing results of the AI model. The testing images include 66 driver images, 21 passenger images, and 16 uncertainty images. The AI model correctly identifies 61 driver images, 18 passenger images, and 10 uncertainty images, with 86.4% accuracy.

	DRIVER	PASSENGER	UNCERTAIN
TRUE DRIVER	61	4	1
TRUE PASSENGER	2	18	1
TRUE UNCERTAIN	1	5	10

$$Accuracy = \frac{61 + 18 + 10}{103}(100\%) = 86.4\%$$

Figure 4. Testing result showing AI model accuracy

3. Conclusion

3.1 Related Work

A previous approach employed by fleet companies relies on physically mounting a dashcam in front of the employee-driver [6]. My approach is different because it does not require a separate dashcam. Instead, my solution utilizes the cellphone (the item causing the driver's distraction) itself to detect distracted driving, which is advantageous because drivers who are distracted by cellphone usage certainly will have the cellphone.

3.2 Limitations

A limitation to my research is the size of training data utilized to train the AI. The training data set includes only 329 training images. The accuracy of the AI model is expected to increase if larger training data set (covering more different situations, such as different persons, different vehicles, different poses, etc.) is utilized.

3.3 Societal Impact

My innovation will help reduce distracted driving and death tolls in major cities. Insurance companies and government will benefit from reduced expenses due to car accidents. Also, parents can utilize this innovation to prevent their children from distracted driving.

4. References and Additional Details

4.1 References

[1] World Health Organization, “Road traffic injuries,” World Health Organization, Jul. 20, 2026. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries.

[2] UC Berkeley Safe Transportation Research and Education Center (SafeTREC), “2025 SafeTREC Traffic Safety Facts,” Univ. California, Berkeley, 2025. [Online]. Available: https://safetrec.berkeley.edu/2025-safetrec-traffic-safety-facts.

[3] National Safety Council, “Distracted driving,” *Injury Facts*. [Online]. Available: https://injuryfacts.nsc.org/motor-vehicle/motor-vehicle-safety-issues/distracted-driving/.

[4] N. Gershenfeld, “How do touch-sensitive screens work?,” MIT School of Engineering, Jun. 7, 2011. [Online]. Available: https://engineering.mit.edu/ask-an-engineer/how-do-touch-sensitive-screens-work.

[5] V. Gikas and H. Perakis, “Rigorous performance evaluation of smartphone GNSS/IMU sensors for ITS applications,” *Sensors*, vol. 16, no. 8, p. 1240, Aug. 2016. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/27527187/

[6] Samsara, “Samsara AI Dash Cams,” YouTube. [Online]. Available: https://www.youtube.com/watch?v=PazzdlNtB-k.

4.2 Disclosures & Acknowledgements

Claude AI was used in conjunction with my prompting to create parts of an application. It was also utilized to artificially generate synthetic images for training and testing a newly developed AI model