MICHIGAN STATE
UNIVERSITY

Project Plan
Workplace Safety System

The Capstone Experience
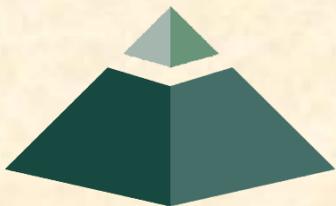
Team GM

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From Students…
…to Professionals

Functional Specifications

- Use cameras to identify workers missing proper Personal Protective Equipment (PPE)

- Notify safety managers of safety incidents via SMS

- A web portal will provide reporting of safety incidents to help managers identify patterns of concern.
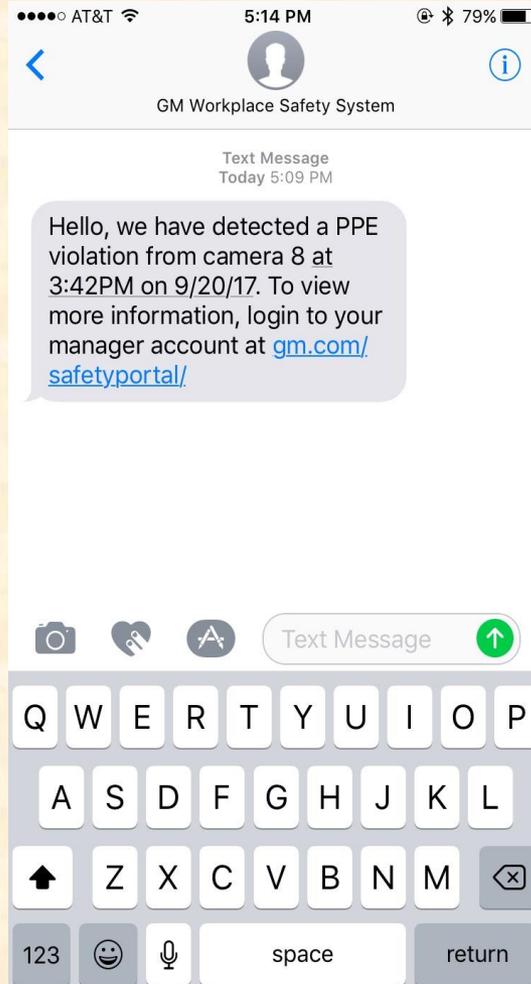
Design Specifications

- Deep Neural Network trained to detect factory workers and PPE
- Web portal displays statistics and allows for management of the Workplace Safety System

Screen Mockup: SMS Notification

Screen Mockup: Home Page

GENERAL MOTORS

HOME   NOTIFICATION HISTORY   MANAGER SETTINGS   CAMERA MANAGEMENT

Recent Notifications

Camera	Area	Time	Date	Manager	PPE
3	D	10:41AM	9/25/17	Bob Smith	Eye Protection
8	A	12:11PM	9/25/17	Bob Smith	Headwear
5	C	1:23PM	9/25/17	Bob Smith	Gloves
14	E	3:35PM	9/25/17	Jay Jones	Headwear
7	B	4:03PM	9/25/17	Jay Jones	Eye Protection
1	F	5:57PM	9/25/17	Jay Jones	Gloves

Screen Mockup: Notification History

GENERAL MOTORS

Date: 9/27/17   Area:

Most Forgotten PPE: **Gloves**

Time Range: **1-3PM**

Incidents on 9/27/17: **16**

9/27/17 Notifications

Camera	Area	Time	Date	Manager	PPE
3	D	9:41AM	9/27/17	Bob Smith	Eye Protection
8	A	10:34AM	9/27/17	Bob Smith	Headwear

Screen Mockup: Manager Settings

Screen Mockup: Camera Management

Technical Specifications

- Data
  - Enormous amount of data required for object detection
- Training System
  - NVIDIA Deep Learning GPU Training System (DIGITS)
- Models
  - DetectNet Deep Neural Network
  - Four Models for object detection
- Database
  - Need persistent data to store the details of safety incidents
- AWS
  - Immense amount of storage space for training data
  - NVIDIA Deep Learning SDKs and GPU-Acceleration

System Architecture
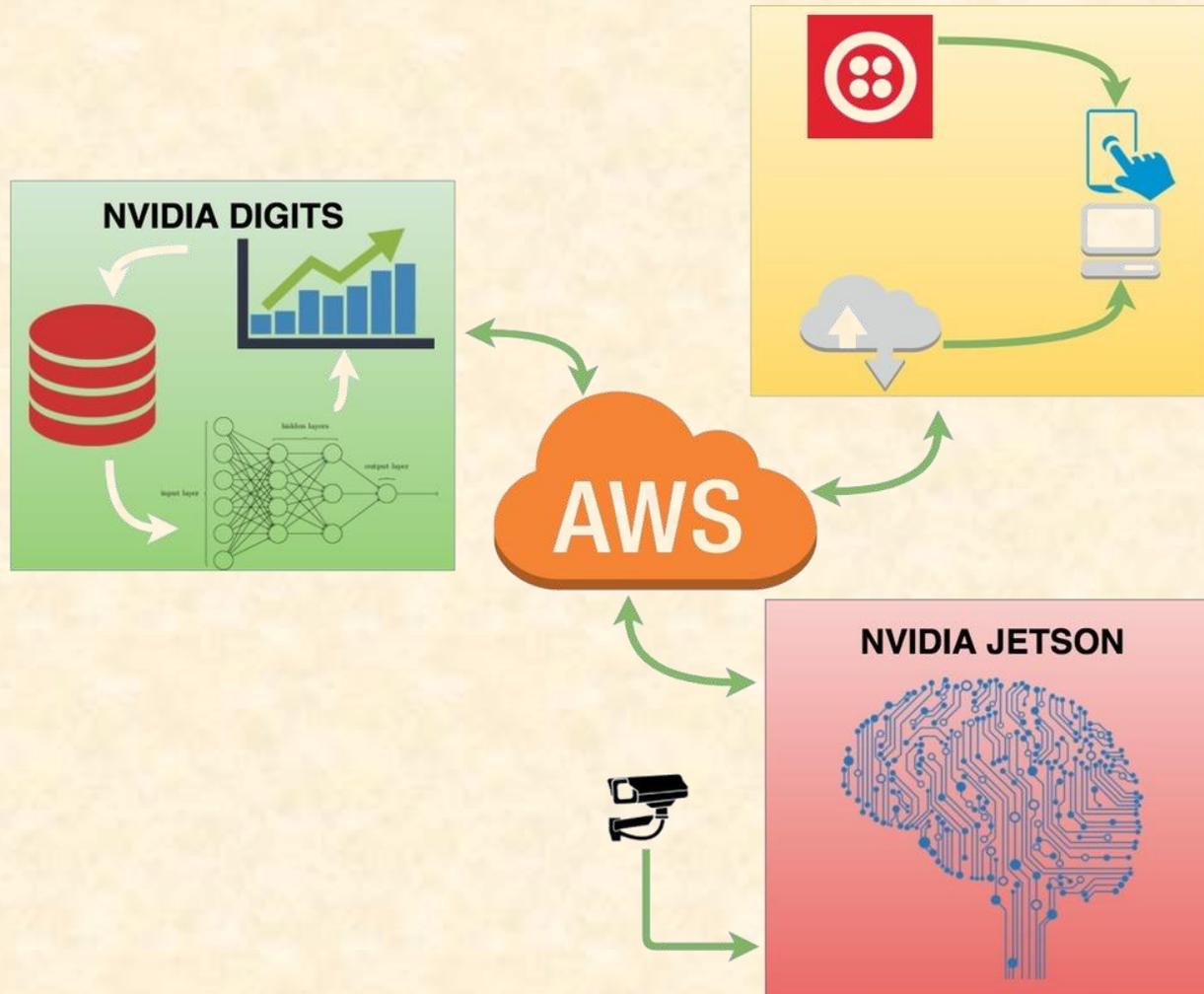
System Components

- Hardware Platforms
  - NVIDIA Jetson TX-2
  - USB Camera
- Software Platforms / Technologies
  - NVIDIA DIGITS
  - AWS
  - PHP/MySQL
  - Python

Testing

- DIGITS (Test models before deployment)

- PHPUnit Testing

- Prototype to test SMS

- Test video capture and model classification

Risks

- Training/Testing Models
  - No experience testing and training models on DIGITS
  - Consult Machine Learning experts at NVIDIA, Deep learning Institute Kit, and documentation online
- Web Portal
  - Many members of the team have no experience creating websites
  - Review PHP tutorials and documentation
- Camera Demo
  - Don't know whether or not the environment will have an impact on model performance
  - Recreate factory environment

Questions?

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