Project Plan
Workplace Safety System
The Capstone Experience

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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

Hello, we have detected a PPE violation from camera 8 at 3:42PM on 9/20/17. To view more information, login to your manager account at gm.com/safetyportal/
## Screen Mockup: Home Page

### Recent Notifications

<table>
<thead>
<tr>
<th>Camera</th>
<th>Area</th>
<th>Time</th>
<th>Date</th>
<th>Manager</th>
<th>PPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>D</td>
<td>10:41AM</td>
<td>9/25/17</td>
<td>Bob Smith</td>
<td>Eye Protection</td>
</tr>
<tr>
<td>8</td>
<td>A</td>
<td>12:11PM</td>
<td>9/25/17</td>
<td>Bob Smith</td>
<td>Headwear</td>
</tr>
<tr>
<td>5</td>
<td>C</td>
<td>1:23PM</td>
<td>9/25/17</td>
<td>Bob Smith</td>
<td>Gloves</td>
</tr>
<tr>
<td>14</td>
<td>E</td>
<td>3:35PM</td>
<td>9/25/17</td>
<td>Jay Jones</td>
<td>Headwear</td>
</tr>
<tr>
<td>7</td>
<td>B</td>
<td>4:03PM</td>
<td>9/25/17</td>
<td>Jay Jones</td>
<td>Eye Protection</td>
</tr>
<tr>
<td>1</td>
<td>F</td>
<td>5:57PM</td>
<td>9/25/17</td>
<td>Jay Jones</td>
<td>Gloves</td>
</tr>
</tbody>
</table>
Screen Mockup: Notification History

Date: 9/27/17
Area:

Most Forgotten PPE: **Gloves**

Time Range: **1-3PM**

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

<table>
<thead>
<tr>
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<th>Manager</th>
<th>PPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>D</td>
<td>9:41AM</td>
<td>9/27/17</td>
<td>Bob Smith</td>
<td>Eye Protection</td>
</tr>
<tr>
<td>8</td>
<td>A</td>
<td>10:34AM</td>
<td>9/27/17</td>
<td>Bob Smith</td>
<td>Headwear</td>
</tr>
</tbody>
</table>
Screen Mockup: Manager Settings

First name: Bob
Last name: Smith
Phone Number: 1234567890
PPE: Glasses

Save  Cancel
# Screen Mockup: Camera Management

## Camera Management

### Cameras Table

<table>
<thead>
<tr>
<th>Number</th>
<th>Area</th>
<th>IP</th>
<th>Last Modified</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D</td>
<td>35.9.39.150</td>
<td>9/14/17</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>35.9.39.155</td>
<td>9/27/17</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>35.9.36.114</td>
<td>9/8/17</td>
</tr>
<tr>
<td>4</td>
<td>E</td>
<td>35.9.34.121</td>
<td>9/25/17</td>
</tr>
<tr>
<td>5</td>
<td>B</td>
<td>35.9.31.116</td>
<td>9/22/17</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>35.8.4.115</td>
<td>9/25/17</td>
</tr>
</tbody>
</table>

**Camera ID:**
- 7

**Area:**
- M

**IP:**
- 35.9.8.132

[Save, Cancel]
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?