Capstone for Arthrex

ASSIST MD
Problems faced by Medical Personnel

Record Patient/Event annotations

PA transcription of records

Malpractice and legal defenses
What does Assist-MD do?

Real-time tracking of medical Instruments

Generate stats of surgical events
How can Assist-MD Help the Medical Industry?

Effortless documentation and extremely accurate surgery event indexing

Medical personnel receive analytics that could improve their performance

Doctors have more time for patient care - time to improve cafeteria food (;
Overview

iOS

AWS

Web
The Frontend

Overview: React and AWS SDK

Key Points: Navigation bar and Search bar

Challenges: Making website seamlessly transition from different devices as well as handling different bugs the user might cause
Data Upload Solution:

HVStream allows data to be uploaded to our AWS resources.

Implements:

- Swift upload due to ease of access using phone cameras
- Quick changes can be made to upload variables
- Future implementations: live streaming using frame capture
- Connects to AWS S3 and AWS Lambda
AWS Backend

Lego-like service architecture
Takes care of Web Hosting
Creates event triggers
Runnable instances of code
EC2 instance to run Darknet
Image Recognition

Problem: We need our system to be able to recognize surgical tools.

e.g. AR-10000 & AR-13975SR
Solution: Machine Learning with YOLO.v2

- You Only Look Once
- runs on CNN Darknet
- open source
- by Joseph Redmon
- optimized for speed

<table>
<thead>
<tr>
<th>Method</th>
<th>Pascal 2007 mAP</th>
<th>Speed</th>
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<tbody>
<tr>
<td>DPM v5</td>
<td>33.7</td>
<td>.07 FPS, 14 s/img</td>
</tr>
<tr>
<td>R-CNN</td>
<td>66.0</td>
<td>.05 FPS, 20 s/img</td>
</tr>
<tr>
<td>Fast R-CNN</td>
<td>70.0</td>
<td>.5 FPS, 2 s/img</td>
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<tr>
<td>Faster R-CNN</td>
<td>73.2</td>
<td>7 FPS, 140 ms/img</td>
</tr>
<tr>
<td>YOLO</td>
<td>63.4</td>
<td>45 FPS, 22 ms/img</td>
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Custom ML Model in Action
Stand-in Server

In case ec2 instance fails:

- Use local machine as server, Cover our bases

- Download files, run darknet, upload prediction to aws S3

- Challenges: handle various edge cases, testing
Next Steps
Moving Forward
into CS 189B

Frontend
More analytics

Backend
Live streaming

Machine Learning
Personnel tracking

Other Areas
Increasing accuracy
Thank you for listening and have a good rest of your day!

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