Addressing the Issue

• Problem
  • Doctors spend too much time on paperwork
  • Paperwork compromises time spent with patients

Data based on:
Forbes
New York Times
Health.edu
TheSurgicalLab.com
Current Problem with Doctor Paperwork

- Messy handwriting is dangerous
- 7,000+ deaths a year from misinterpretation

Data based on:
- New York Times
- TheSurgicalLab.com
Integrating a Solution

Automate Operative Report!

Result

• More time with patients and family
• Not as rushed
• No more Messy handwriting

Operative Report

Surgery Information:
Patient Name: David Roster
Doctor Name: Brian Humphreys
Hospital Name: Valley Cottage
Procedure Name: Appendectomy
Time and Date of Surgery: March 9, 2019 4:00 pm

Surgery Event and Instrument Information:

- Instruments Used: AR-13975SR, AR-139708BF, AR-10000
- Most Used Instrument: AR-139708BF
- Least Used Instrument: AR-13975SR

Instrument Usage Pie Chart

Sequence of Events Graph

Surgery Narrative:
The surgeon performed an appendectomy. The surgeon started the procedure by performing an incision for 90 seconds using AR-139708BF. Second, the surgeon did probing for 37 seconds using AR-10000. Third, the surgeon performed an extraction for 38 seconds using AR-10000 and AR13975SR. Fourth, the surgeon did a suture for 12 seconds using AR-139708BF and AR-13975SR. Finally, an unexpected event occurred and the surgeon had to deviate from the textbook outline for the procedure. The incision, probing, extraction, and suture took more time to complete than the average time for each procedure in previous surgeries. Overall, the surgery was successful.
"Generating operative reports is the holy grail of medical tech industry"
-Bruce Kennedy (VP of Tech at Arthrex)

ASSIST MD IS SHOOTING FOR THE STARS!

Assist MD wishes to automate Operative Reports
Let’s learn about surgery and the technologies used!

So this sounds pretty cool...
How is automating Operative Reports possible???

**Textbook surgical knowledge**

- All procedures can be described in a step by step sequence of events
- All surgical events/steps are preformed using a specific set of instruments

**Computer vision**

- Detect instruments on surgical table with camera (these are instruments not in use)
- Extrapolate instruments that are in use
Sequence Mapping

Input → Output
Probing

Input → Output
Extraction

Input → Output
Incision

Input → Output
Suturing
Instrument Elimination

All Tools = Tools on Table = Tool in Use
Detection Software

Trained using YOLO v2
An opensource classifier

Deployed in DARKFLOW
- A TENSORFLOW wrapper for darknet models.
- Runs in Python

Simply pipe the STDOUT to our app.
Instrument Detection
Building on the concepts

- We take the live surgery data
- We clean and process analytics
- We organize statistics into a friendly interface on our website
Data Analytics

- Filter out low confidence frames
- Log duration each instrument was used
- Map sequence of instruments to medical events
- Construct narrative for Operative Report
Now let’s demo the project ...
Our vision for the future

We did a lot of work over these last two quarters
Vision

• What we currently do!

• What we envision we can do!
  • Smart room that logs events before surgery happens
  • Smart watch with biometrics scanning that logs patients recovery
Thank you audience for your time, you’ve been great!!

Thank you to Arthrex for partnering with UCSB Capstone and providing assistance throughout the journey to our group.

And a special thanks to Professor Krintz and Professor Bultan for the hard work they put into Capstone and dealing with us hooligans!

And did I mention the judges look great today (:Add