

# **More than meets the eye**

**Analyzing Anesthesiologists' Visual Attention in  
the Operating Room Using Deep Learning Models**

# Introduction

- Anesthesia:
  - Sedation (Hypnosis) and Analgesia for patients undergoing surgery
- Anesthesiologists:
  - sustain patients' vitals, prevent patient harm
  - *Perceive* cues from the patient's environment, and *intervene* when needed, to *achieve* predetermined goals – Situational awareness
- Anesthetic process:
  - Induction, Maintenance, Emergence

# How is it guided?

- Patients' vitals are presented on a monitor screen
- Goals for each presented parameter are maintained by recurrent observation, intervention, and reassessment.
- Anesthesiologists need to have situational awareness to provide anesthesia safely
- The training process is reliant on acquiring situational awareness.

# Assessment in training

- Assessment of situational awareness is difficult
- Visual attention is a good marker for vigilance, experience, and ability to provide safe anesthesia
- Continuous observation of anesthesiologists is needed but is not readily available
- Head-mounted cameras are used to assess visual attention; however, they are **not sustainable** for long-term data collection

# What we did

- Employed a novel methodology, combining monitor-mounted webcams-minimally intrusive, with Deep Learning Models
- Used gaze detection and mapped the visual attention pattern along with domain expert mapping of the anesthetic process
- Compared the results in both methods to assess the validity of the proposed measurements

# Our results

- Recorded 12 anesthetic procedures
  - 10 by residents
  - 1 by an attending
  - 1 by a resident and an attending
- Measured 3 parameters for anesthesiologists' visual attention
  - Frequency (glance/ 5 min)
  - Length
  - Cumulative duration

# AI aided gaze detection

- Vital signs monitor interaction, during the whole induction process:
  - Total time of 27% (P-value 0.0167) with a mean frequency of 14 glances over 5 minutes, spanning 4.6 seconds each
- Vital signs monitor interaction during the Airway management phase:
  - Total time of 39% (P-value of 0.0238)
- Similar results where observed by the domain expert!

# Conclusion

- Visual attention, a crucial skill required from anesthesia residents, can be assessed with minimally obtrusive equipment when aided by Artificial intelligence
- Continuous Operating Room data collection, based on wall-mounted recording equipment, may prove feasible and efficient for process mapping and analysis of anesthetic procedures, which will aid in the improvement of practice