

Amy Lorincz, MSc^{1*}, Noée Ducros-Chabot¹, Rachel Cohen, MEng¹, Sukesh Adiga, PhD¹, Christopher Bechkam, PhD¹, Karim Elrakhawy^{1,2}, Timothée Bernard, MEng¹, Wayne Poll, MD³, M. Carmen Mir, MD, PhD⁴
*amy@vope.ai
1. Dept. of R&D, Vope Medical, 2. Faculty of Medicine, University of Montreal, Montreal, Quebec, Canada, 3. Applied Sciences Mgmt., LLC, Columbus, OH, USA, 4. Department of Urology, Mount Sinai, School of Medicine, New York City, NY, USA

Background

- Obstructions (smoke, blur, and fluid) during MIS can occur for up to **37% of time during surgery**
- Identifying these can reduce the need for manual clinical annotation in downstream tasks and enable evaluation of the impact of visual obstructions
- We propose a **real-time classifier** to detect various obstructions during MIS

Methods

- **MobileNet**-based model was trained on 7 robotic laparoscopic prostatectomy videos, **four** from **Intuitive’s da Vinci** and **three** from **Medtronic Hugo** (6,564 frames)
- 5 classes were chosen based on observed visual obstructions: *clear, smoke, blur, fluid, and out of body* as shown in Fig. 1

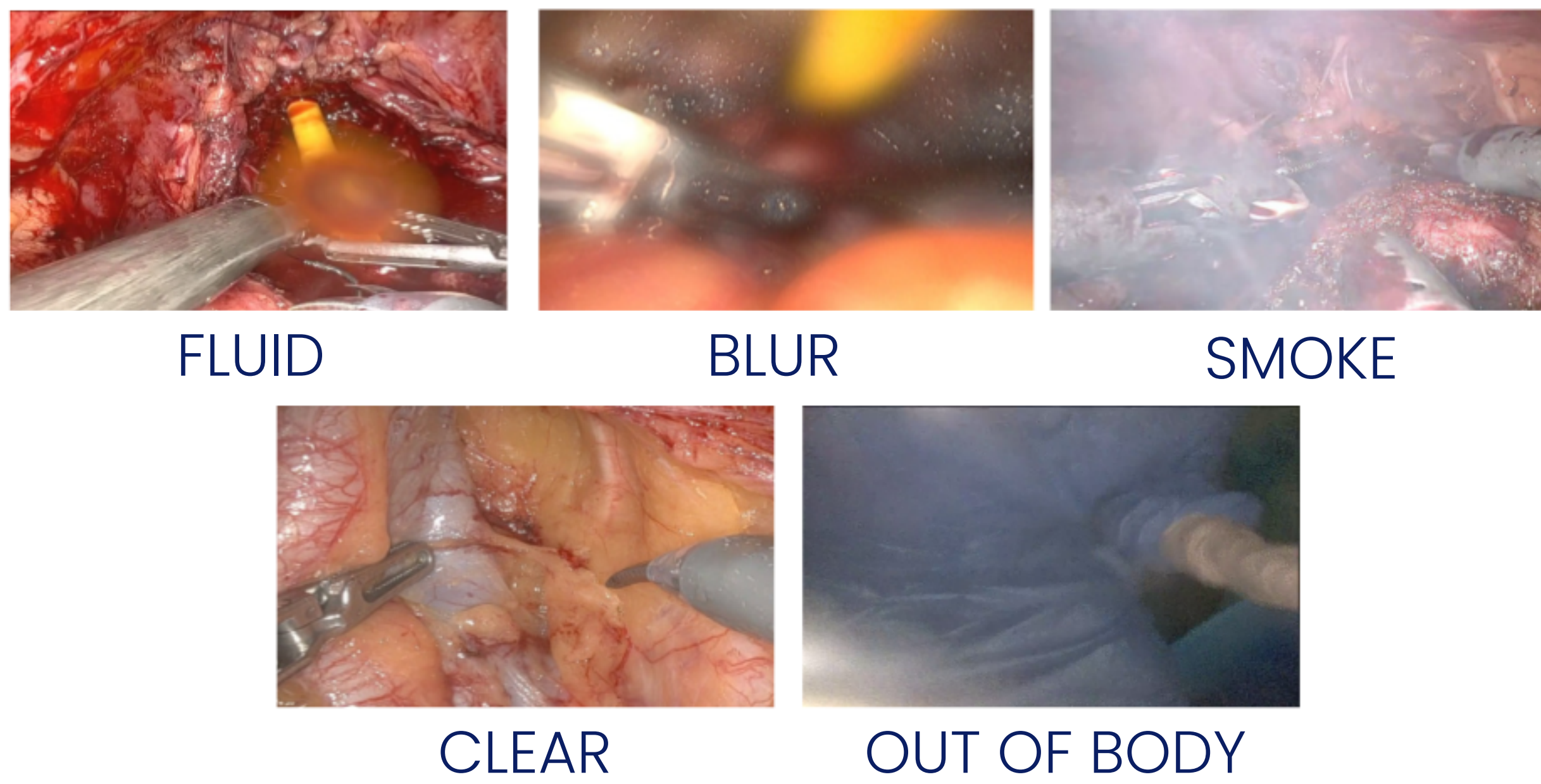


Fig. 1. Examples of each contaminant class

	Blur	Clear	Fluid	Other	Smoke
Blur	21	2	0	0	9
Clear	0	728	2	0	3
Fluid	0	23	90	0	0
Other	2	0	0	248	6
Smoke	0	24	0	1	311

Fig. 2. Confusion Matrix for the test set

Results

- On the test set, the classifier achieved an overall accuracy of **95.1 %**
- Accuracy by platform was **98.18%** on the da Vinci and **92.94%** on the Medtronic Hugo
- *Fluid* was most often misclassified as clear, due to its subtle nature (Fig 2)

Conclusion

- The classifier demonstrates strong performance in **detecting common visual obstructions**
- Future work will analyse the presence and duration of visual obstructions, to determine correlation with task efficiency and procedure time