



Artificial Intelligence Assisted Intraoperative Anatomy Recognition During Laparoscopic Cholecystectomy: An Emerging Technology from a Public Tertiary Hospital in India

BACKGROUND

- Laparoscopic cholecystectomy is among the most commonly performed surgeries worldwide
- Bile duct injury occurs in 0.3–0.5% of cases, primarily due to anatomical misidentification
- Achieving the Critical View of Safety is subjective and challenging in acute inflammation and obesity
- Existing safety adjuncts are costly or inaccessible in resource limited public hospitals

OBJECTIVE

To evaluate AI assisted intraoperative anatomy recognition during laparoscopic cholecystectomy

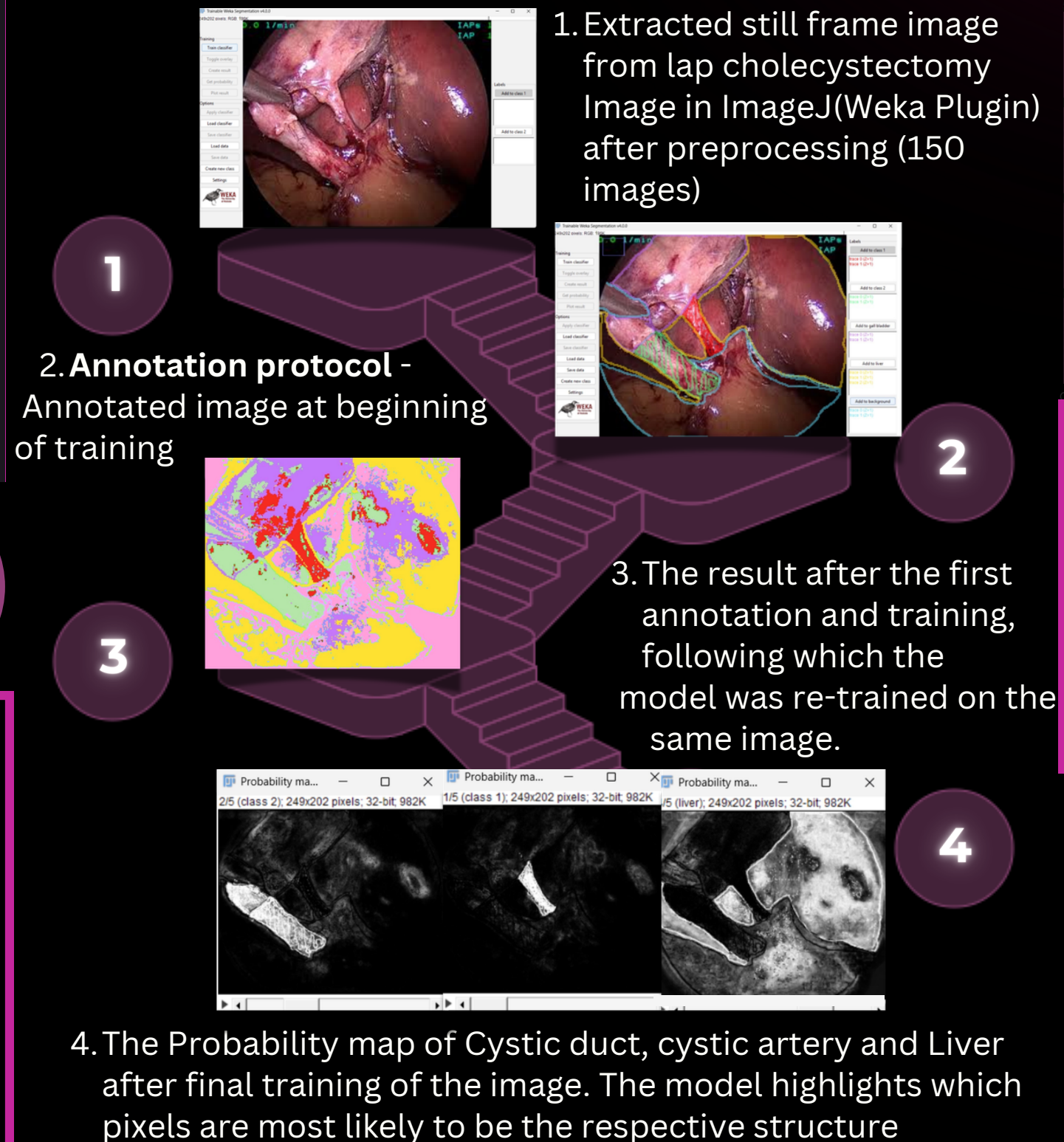
TECHNOLOGY

AI based image segmentation tool developed using ImageJ with Trainable WEKA Segmentation (TWS) plugin (Open Source)

- Runs on standard hardware
- Trained on real world data, including acute and obese cases



WORKFLOW



RESULTS

Structure	Dice Coefficient	IoU (Intersection over Union)
Cystic duct	0.74	0.60
Cystic artery	0.68	0.55
Gallbladder	0.78	0.68
Liver	0.82	0.72

- Clinically interpretable hepatocystic segmentation
- Usable in acute and obese cases
- Approached international benchmarks

CLINICAL IMPACT

- First AI study on intraoperative anatomical recognition in India
- Supports safer identification of critical structures reducing misidentification-related injuries
- Applicable in resource-limited public hospitals

CONCLUSION

AI assisted anatomy recognition during laparoscopic cholecystectomy is feasible and supports development of accessible intraoperative safety tools.

REFERENCES

