

# Preoperative Prediction of Incisional Hernia Using CT Imaging and Hybrid Intelligence

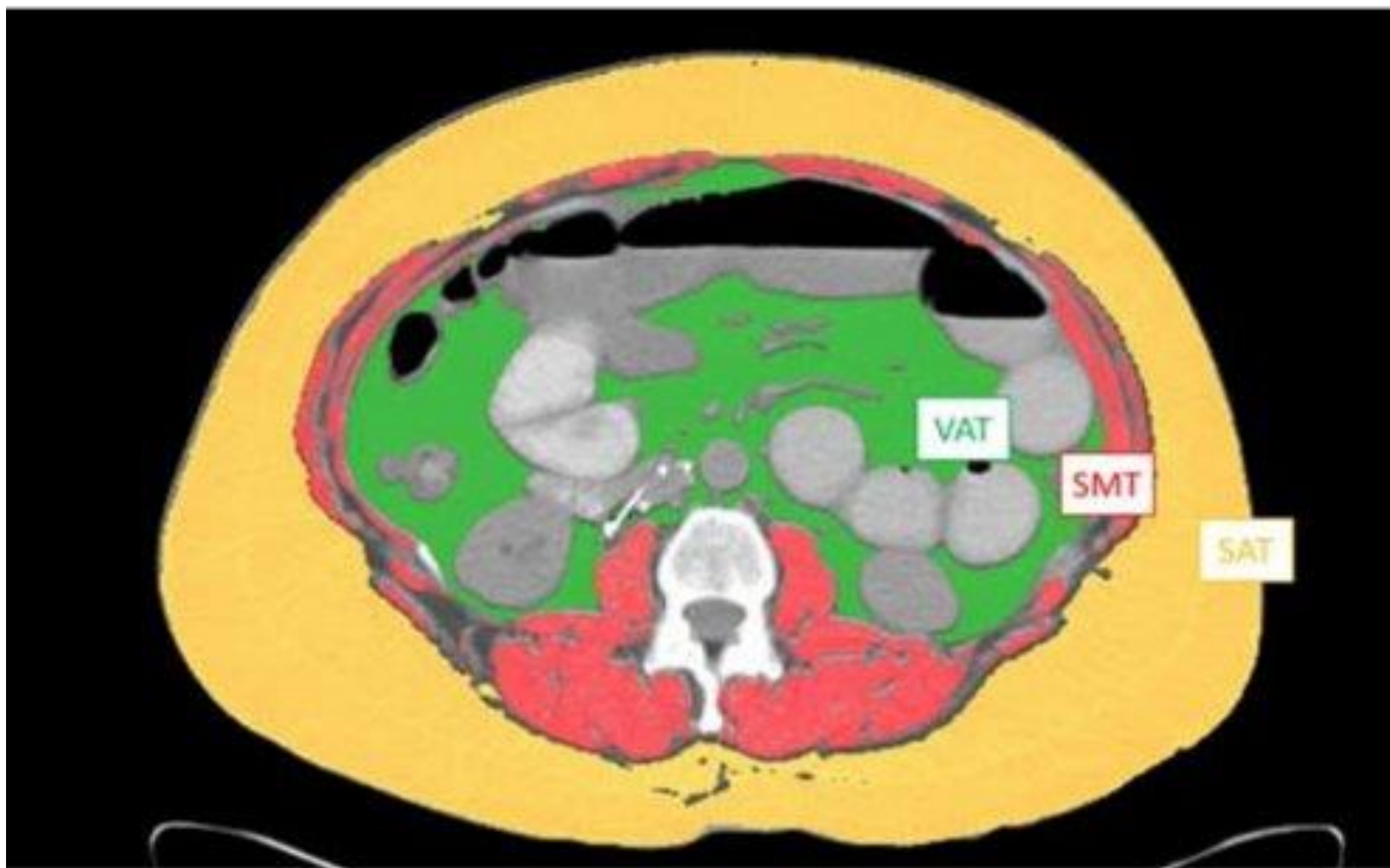
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## INTRODUCTION

- **Clinical problem:**
  - Incisional hernia (IH) occurs after 10-30% of abdominal surgeries<sup>1,2</sup>
  - High recurrence, morbidity, and cost<sup>3</sup>
- **Knowledge gap:** Drivers of IH poorly understood
- **Opportunity:** CT imaging = underutilized predictive data
- **Current method limitations:**
  - Optimal biomarker (OBM) – limited hand-crafted features<sup>4</sup>
  - Deep learning (DL) – strong performance, poor interpretability

## OBJECTIVE

To develop a Hybrid Intelligence (HI) framework combining OBM and DL methods to improve incisional hernia prediction AND feature interpretability

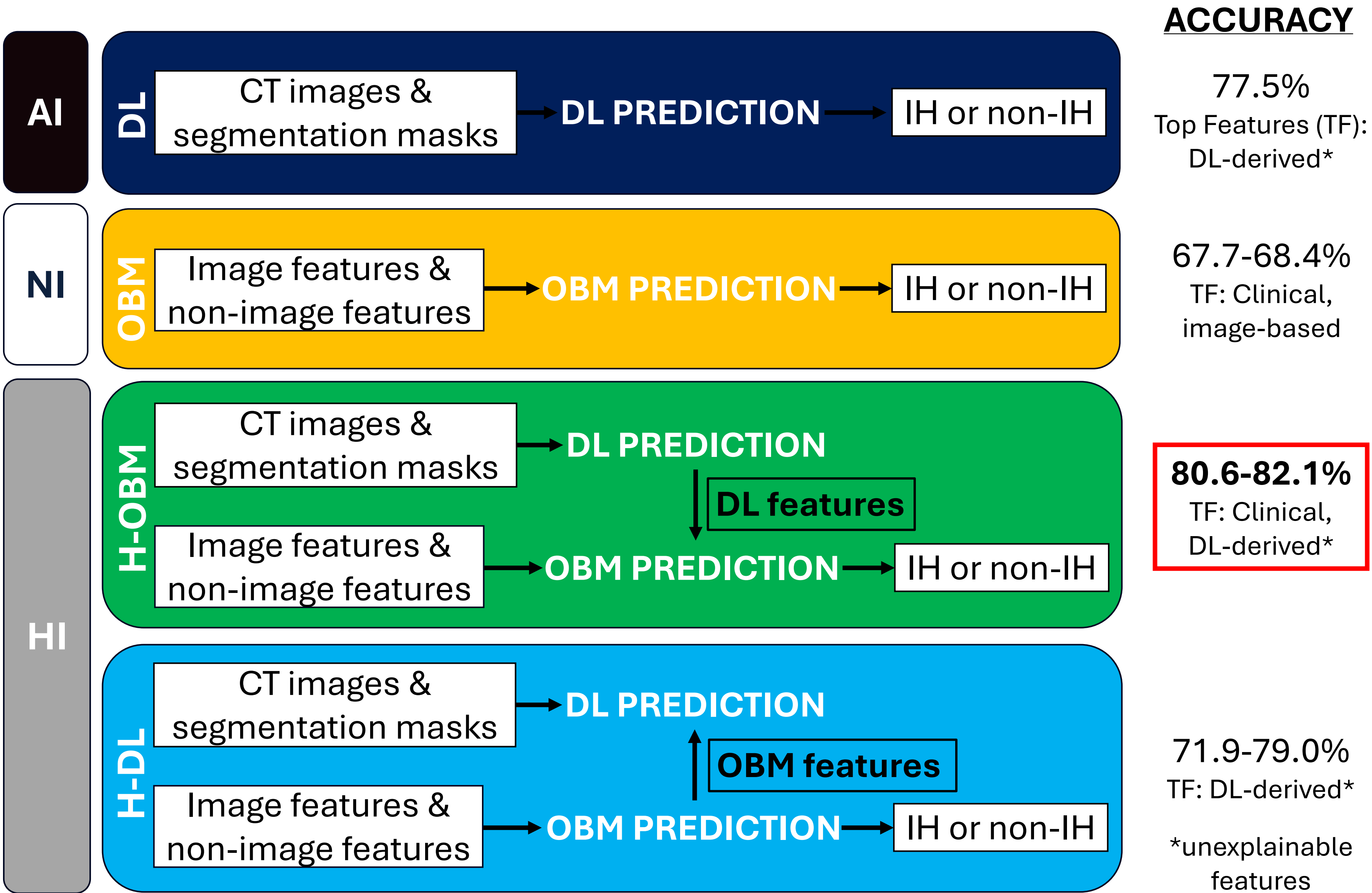


CT AUTOSEGMENTATION

\*McAuliffe 2022

## METHODS

- **Cohort:**
  - 420 CRS patients (157 IH+, 263 IH-)
  - Matched on age, sex, surgical approach
- **Feature generation:**
  - Preop CT autosegmentation → 1,065 hand-crafted OBM features
  - Convolutional Neural Network → 1,024 DL features
- **Models:**
  - DL only; OBM only
  - Hybrid OBM (DL → OBM pipeline); Hybrid DL (OBM → DL pipeline)
- **Correlation study:**
  - Top 10 OBM- and 128 DL-derived features



## RESULTS

- **Best performance:** Hybrid OBM at 82.1% accuracy
- **Key findings:**
  - Hybrid models > OBM or DL methods alone
  - Top features = mix of clinical and DL features
- **Feature correlations:**
  - DL features highly correlate with each other
  - OBM features minimally correlate with each other
  - DL features are minimally correlated with OBM → limited interpretability

## CONCLUSIONS

- Hybrid intelligence improves incisional hernia **prediction AND feature explainability**
- DL and OBM capture **distinct, complementary information**
- Combining both is more powerful than either alone

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