Predict Optimal Debulking Outcomes in Advanced Ovarian Cancer: A PET-based Radiomics and Suidan Model-Based Approach

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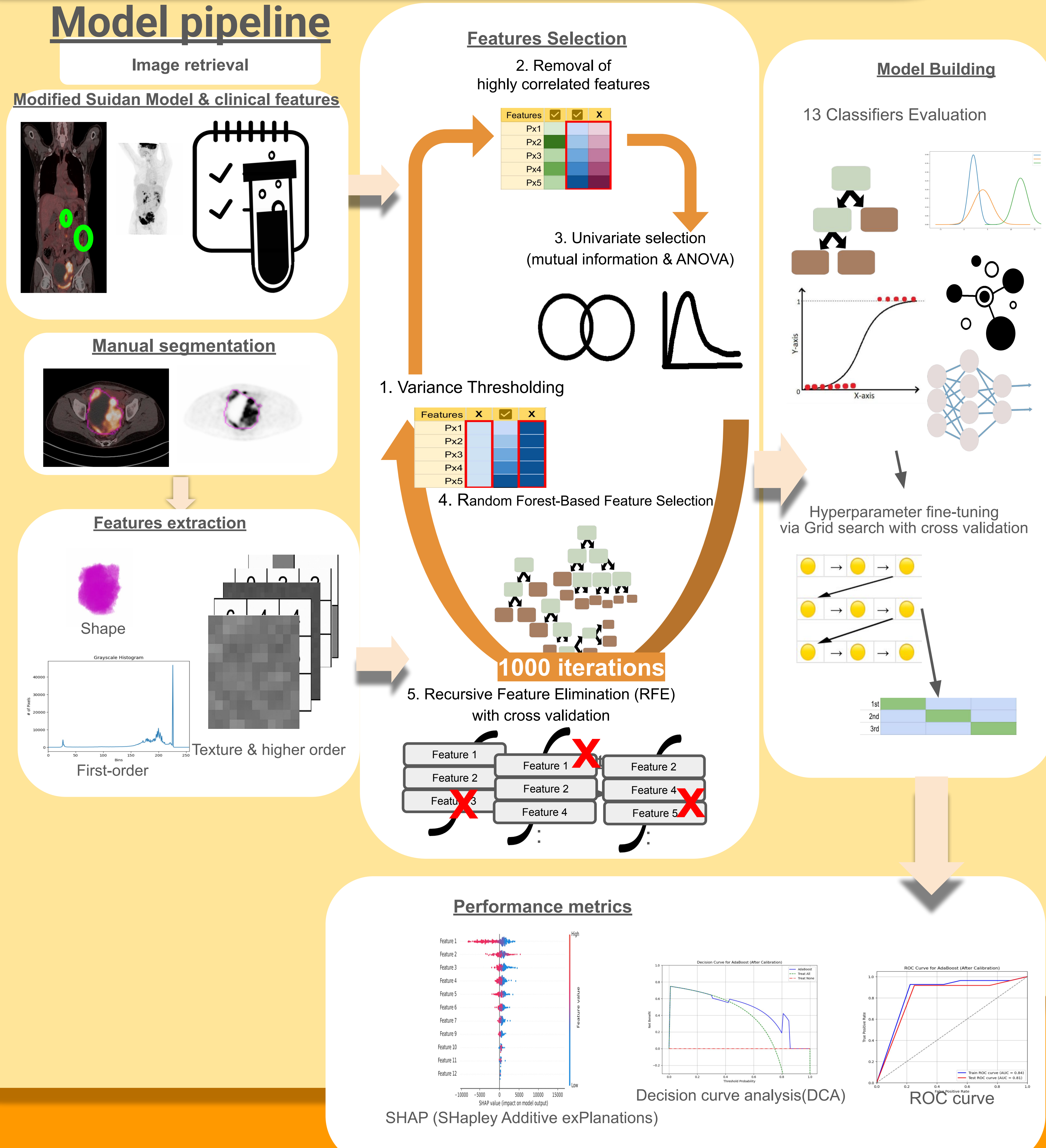
Objective

To evaluate whether integrating **PET-based radiomics** with the existing **Suidan model** improves the **preoperative prediction** of optimal debulking outcomes in patients with **advanced-stage (III–IV) ovarian cancer,** and to develop a predictive model for identifying suitable surgical candidates.

Methodology

- **Pretreatment PET scans** of **54 patients** were **retrospectively** analysed, who underwent either **upfront debulking surgery or interval debulking surgery**.
- Radiomic features were extracted from PET images using **LifeX**.
- Feature selection was carried out with a **5-stage pipeline** involving recursive feature elimination. These features were then correlated with surgical outcomes.
- **Machine learning prediction models** with an **array of classifiers** were constructed, and model performance was subsequently reviewed

Model pipeline



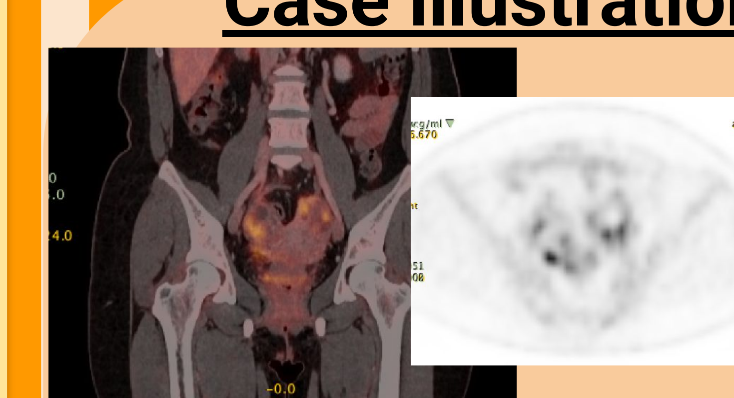
Results

- Our analysis revealed that **4 intensity and texture radiomic features** were significantly correlated with optimal debulking outcomes.
  →GLSZM normalised zone size non uniformity
  →Intensity-based_minimum intensity
  →Intensity-based_10th intensity percentile
  →GLSZM small zone high grey level emphasis_laws filter
- **Neither the Suidan model nor clinical factors were selected** for the model building.
- The **Extra Trees** model demonstrated a strong ability to identify surgical candidates, with an **AUC of 0.831 and an F1 score of 0.889**
- Followed by the **Random Forest** model achieving an **AUC of 0.785 and an F1 score of 0.9429**.

Conclusions

- **Promising results** in PET radiomics to predict treatment outcomes of cytoreductive surgery in ovarian cancer
- Well established **clinical models** can be **explored in radiomics study** to enhance interpretability
- **Tree-based classifiers** showed strength in radiomics task
- Insufficient sample size, the risk of overfitting and interpretability remain **limitations** in radiomics studies

Case illustrations



←A patient with an optimal surgical outcome had a NormZoneSizeNU of 0.179 and a Minintensity of 0.488 .

↓A patient with a suboptimal surgical outcome had a NormZoneSizeNU of 0.207 and a Minintensity. of 0.112.

Visual interpretation and radiomics reviewed patient with suboptimal surgical outcome has a more heterogeneous texture pelvic mass with metabolic inactive spots(Minintensity).

This suggested complicated microenvironment and necrosis, which might relate to the extent of disease.