

# Can CT Radiomics Predict Recurrence in Head and Neck Cancer? Early Results from a Prospective Imaging Trial



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Abstract No: OT 21

### INTRODUCTION

- Head and Neck Cancers have a high risk of disease recurrence despite curative treatments, impacting survival and quality of life.1
- Clinical factors such as tumor size, subsite, and stage provide limited predictive power for recurrence, making it challenging to identify highrisk recurrence patients.2
- Radiomics extracts quantitative image descriptors or features (e.g tumor texture, shape, and intensity) from radiological images and when integrated with ML techniques has shown to improve outcome prediction. 1,2

## AIM

Evaluate the potential of CT-based radiomics to identify individual risk of locoregional recurrence (LRR) at one-year post-treatment in head and neck cancer.

## **KEY FINDING**

- Naive Bayes model provided the best balance between training and testing performance in predicting locoregional recurrence (LRR) in head and neck cancer patients.
- The performance of the models may be limited by the small sample size, which will be evaluated further as the data matures.

#### **METHOD Prospective patients** Dataset **Features** recruited from Feature Selection Metrics 2020 - 2024X (N = 445)Clinical Features Clinical Data Radiomics Data split 80:20 Test cohort (n=26) **Patients excluded** Training cohort (n=102) No Recurrence=65 (64%) No Recurrence=16 (62%) 1- year follow-up not Recurrence=37 (36%) Recurrence=10 (38%) available ROC\_AUC Curve Modelling Lost to follow-up Texture (N = 317)Accuracy **Logistic Regression** Specificity **Support Vector Machine** Sensitivity Naïve Bayes Intensity 2000 **Cross validation** Final Cohort (N=128) **Bootstrap Estimates** Planning CT Hyperparameter Optimization **No Recurrence = 81 (63%)** Shape **Recurrence = 47 (37%)** varian |Eclipse™ **PyRadiomics** Scikit <u>fearn</u> 💨 python" + HIS

## **RESULTS**

Top 5 Features

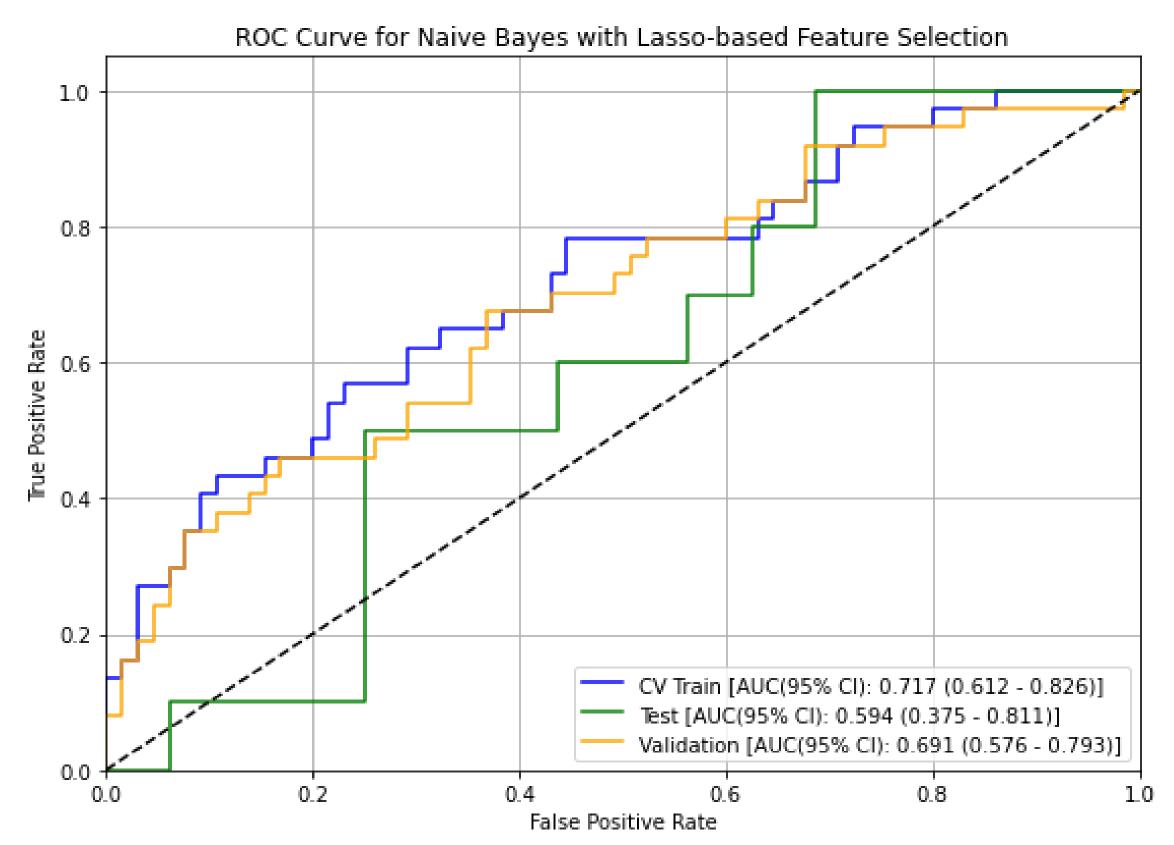
2.Shape\_Maximum2DDiameterRow

1.GLCM\_Imc1

3. NGDTM\_Coarseness

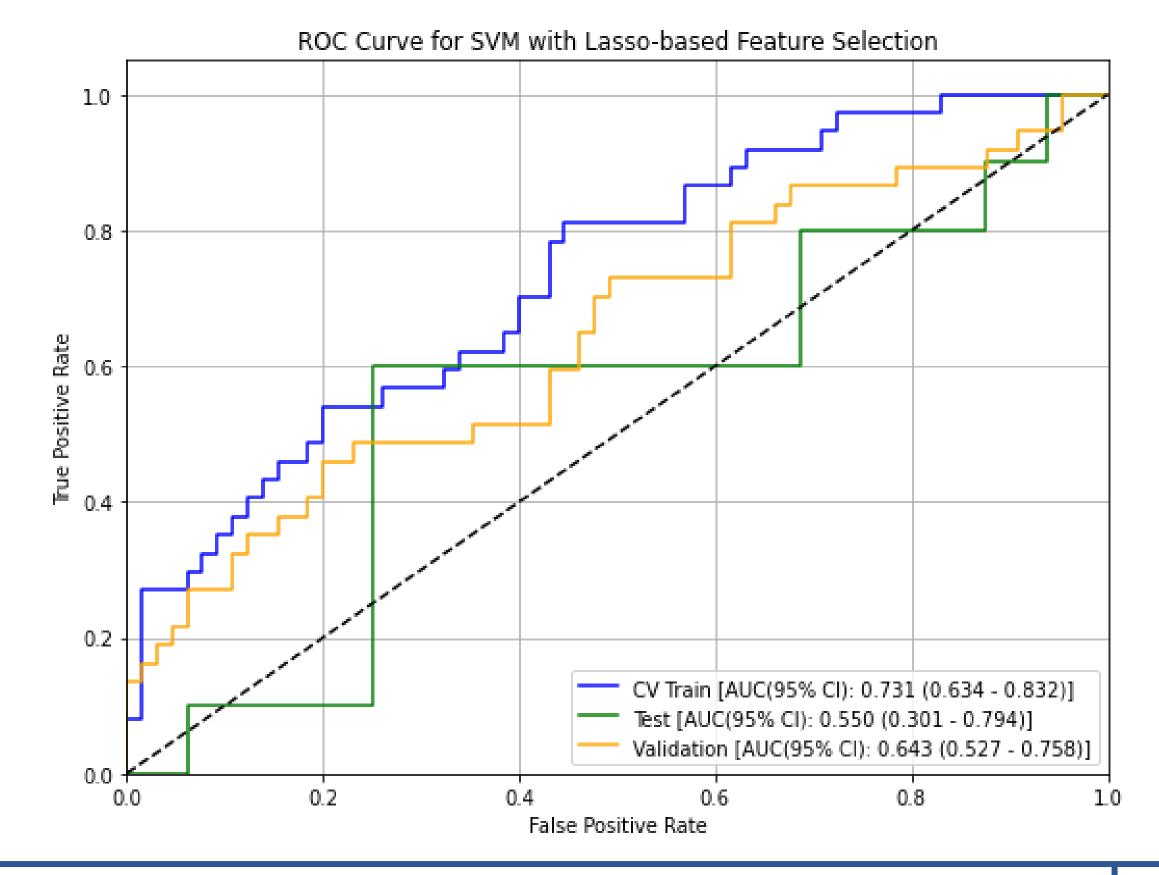
4.Shape\_Maximum2DDiameterSlice

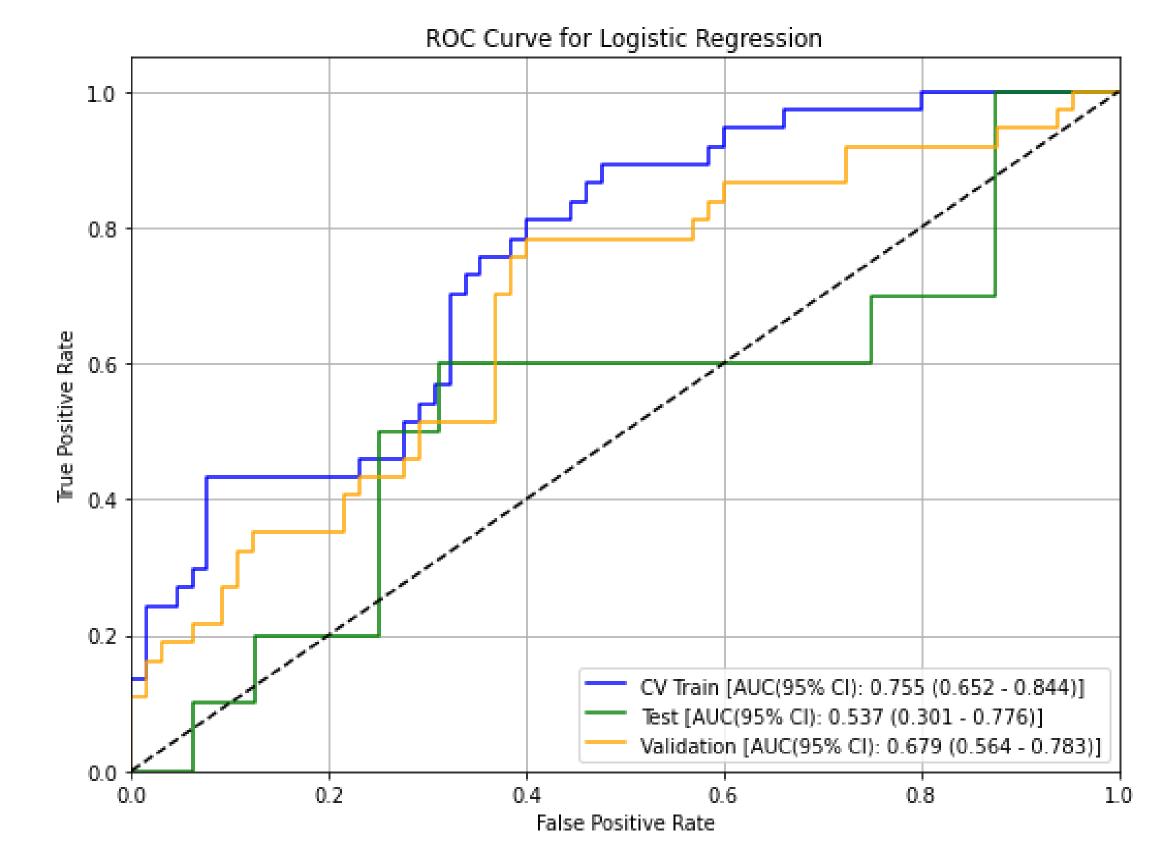
5. Shape\_Sphericity



#### Model **Test Accuracy Training ROC AUC Training Accuracy Test ROC AUC** Logistic Regression 0.74 (0.66-0.84) 71.57% 0.54 (0.30-0.78) 57.69% 57.69% Support Vector Machine 0.73 (0.63-0.83) 69.61% 0.55 (0.30-0.80) 72.55% 61.54% Naïve Bayes 0.72 (0.61-0.83) 0.60 (0.38-0.81)

Dell Precision 5820 Tower Workstation





## CONCLUSION

- Due to the limited dataset, we used simple machine learning models, but as the outcome data matures, we may be able to improve results.
- Future work will focus on enhancing predictive accuracy by including clinical and radiomics features.

## REFERENCES

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- 2. Devakumar D, et al. Framework for Machine `Learning of CT and PET Radiomics to Predict Local Failure after Radiotherapy in Locally Advanced Head and Neck Cancers. *J Med Phys.* 2021;46(3):181-188.

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