



Development and Validation of a Machine Learning Model for Predicting Checkpoint Inhibitor Pneumonia in Patients With Non-Small Cell Lung Cancer

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INTRODUCTION

- **Background:** CIP is a potentially fatal immune-related adverse event in ICIs-treated NSCLC.
- **Gap:** Early risk prediction remains an unmet clinical need.
- **Aim:** We aim to develop and temporally validate a model to enable early identification of high-risk CIP patients.

METHODS

- **Study Cohort:** Single-center retrospective study of 397 NSCLC patients on ICIs (52 CIP events).
- **Data Split:** 7:3 training/internal test sets via CIP-stratified sampling; independent temporal cohort (n=100, 18 events) for external validation.
- **Predictor Selection:** Selected via multi-method approach; included systemic inflammation markers.
- **Model Development:** Six machine learning algorithms compared; optimal model evaluated by AUC, calibration, DCA, SHAP, and nomogram.

DISCUSSION AND CONCLUSION

Actionable Take Away Message

- **Effective Prediction:** Weighted logistic regression accurately predicts CIP risk in NSCLC patients on ICIs.
- **Dynamic Reassessment:** post-ICI corticosteroid use as a time-updated variable, enabling real-time risk tracking during immunotherapy.

Future Direction for Research

- **Validation:** Prospective validation in multicenter cohorts is warranted to confirm generalizability.

REFERENCES & ACKNOWLEDGEMENTS

Key References:

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RESULTS

Our model provides an accessible and validated tool for early identification of high-risk CIP patients:

- **Model:** Weighted logistic regression (7 predictors: ILD, COPD/emphysema, post-ICI steroids, AAbs, IL-6, IL-8, IL-10; Fig1). **(Fig1)**.
- **Internal:** AUC 0.834/0.841 (Train/Test); Sens 73.3%, Spec 78.6% **(Fig2)**.
- **External:** AUC: 0.794; Sensitivity: 77.8%; Specificity: 76.8% **(Fig2)**.
- **Utility:** Good calibration & positive net benefit across thresholds **(Fig2)**.
- **Interpretability:** COPD/emphysema was the most influential predictor (SHAP); a nomogram was constructed for bedside use **(Fig3)**.

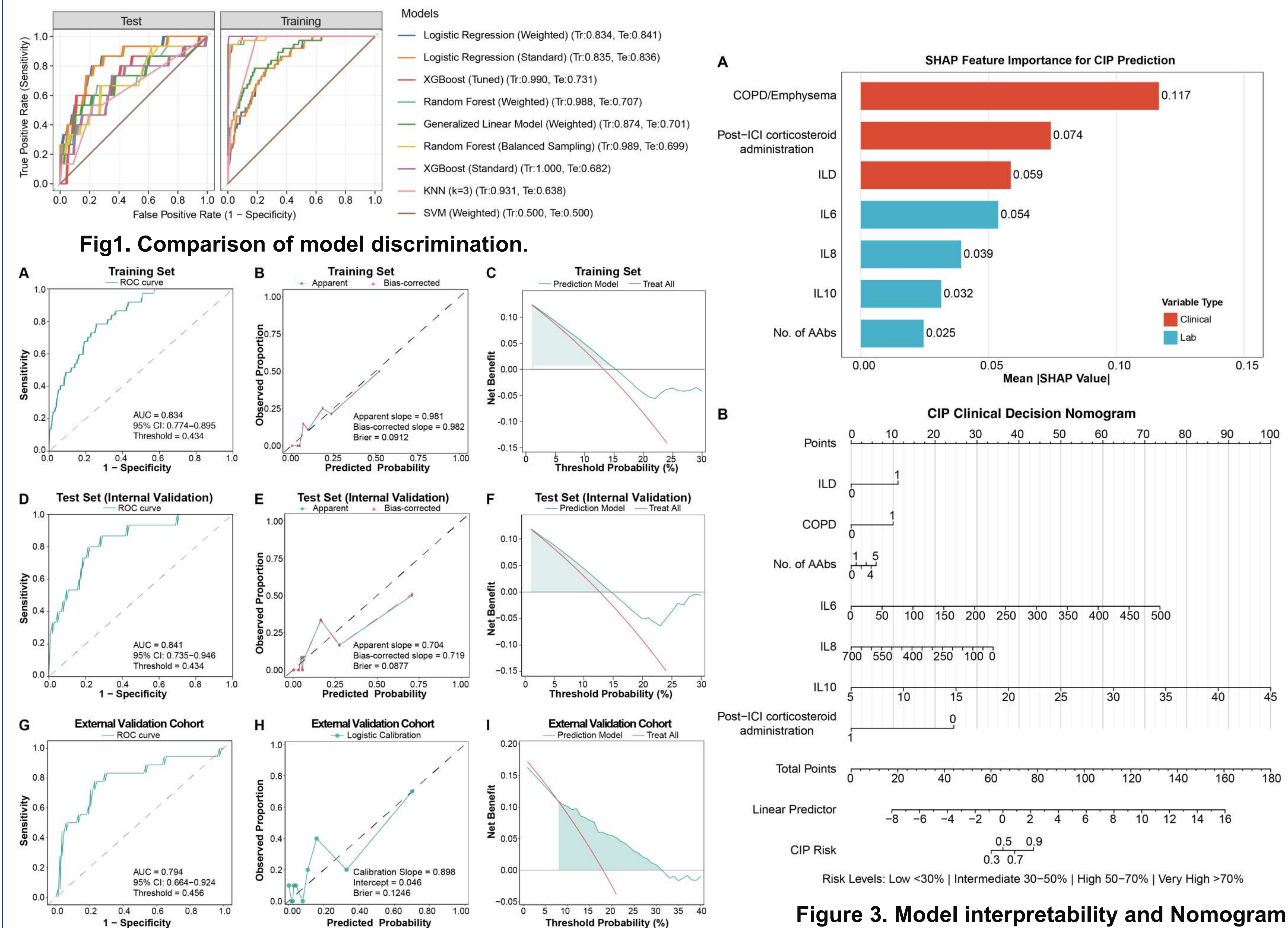


Figure 3. Model interpretability and Nomogram.