

Supplemental Material for ISPOR 2026 Poster “From Real-World Data (RWD) to Digital Twins: Building Models for Patient-Level Counterfactual Prediction in Oncology”

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Feature Importance Plots for Additional Models

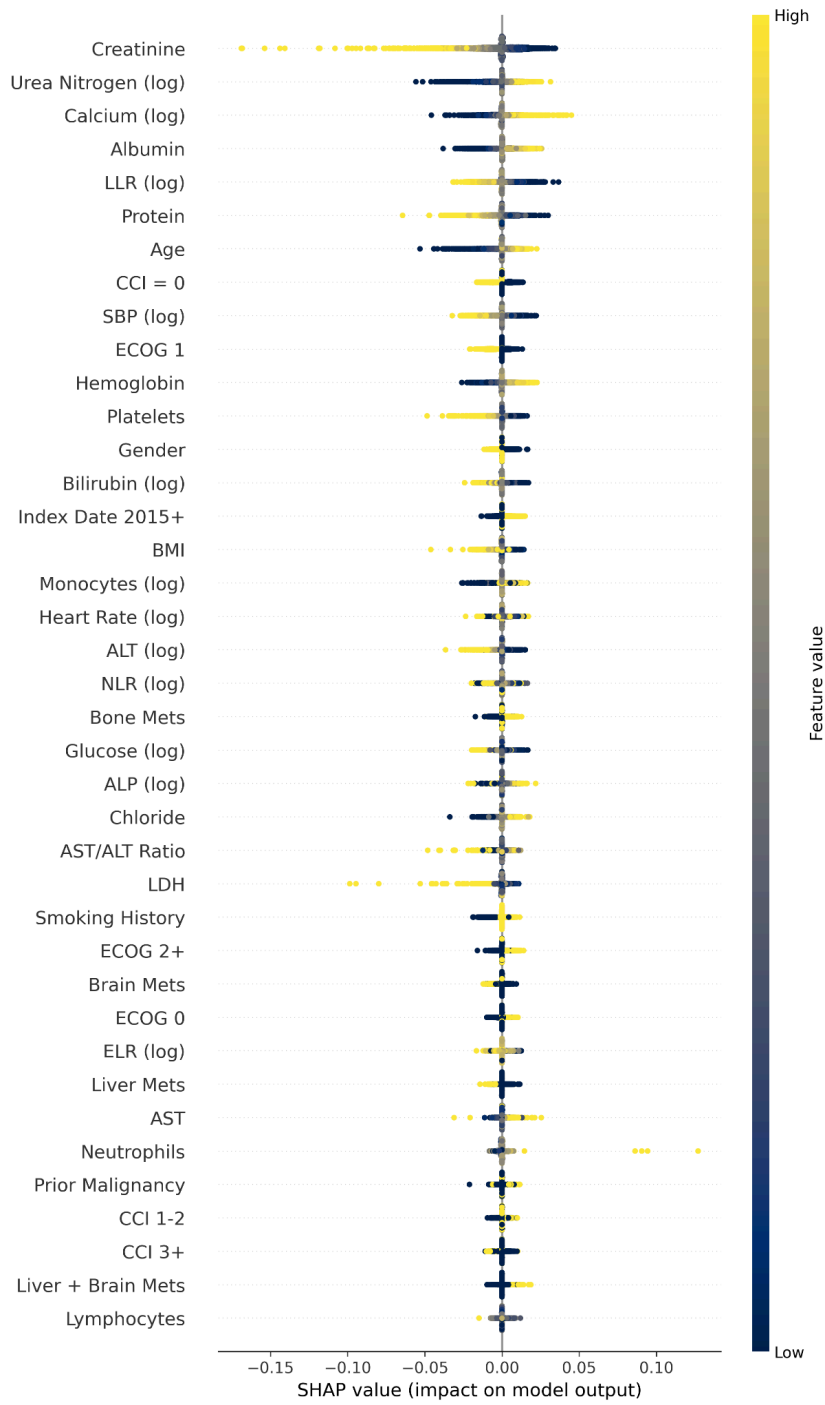
Supplemental Figures 1-3 contain beeswarm plots of the distribution of SHAP values showing feature effects on model predictions in the test set. The y-axis indicates the average impact of each feature on the model's predictions. The features are ranked from top to bottom by their overall importance to the model, with features at the top having the largest average impact on the model's predictions. The x-axis indicates the SHAP value, representing the impact of the feature on the model output. Points to the right of the center line indicate worse survival outcomes for patients. Points to the left of the center line indicate better survival outcomes, i.e., protective effects. The color scale indicates the value of the feature for each patient. Yellow points in the graphs indicate that the patient has higher values for that feature and blue points indicate lower values for that feature. For binary variables, the reference category is represented with blue points. SHAP values are dependent on the prevalence of the feature in the dataset; low-prevalence binary features can produce larger per-patient SHAP magnitudes for the minority class than higher-prevalence features with comparable effect sizes

Variable definitions

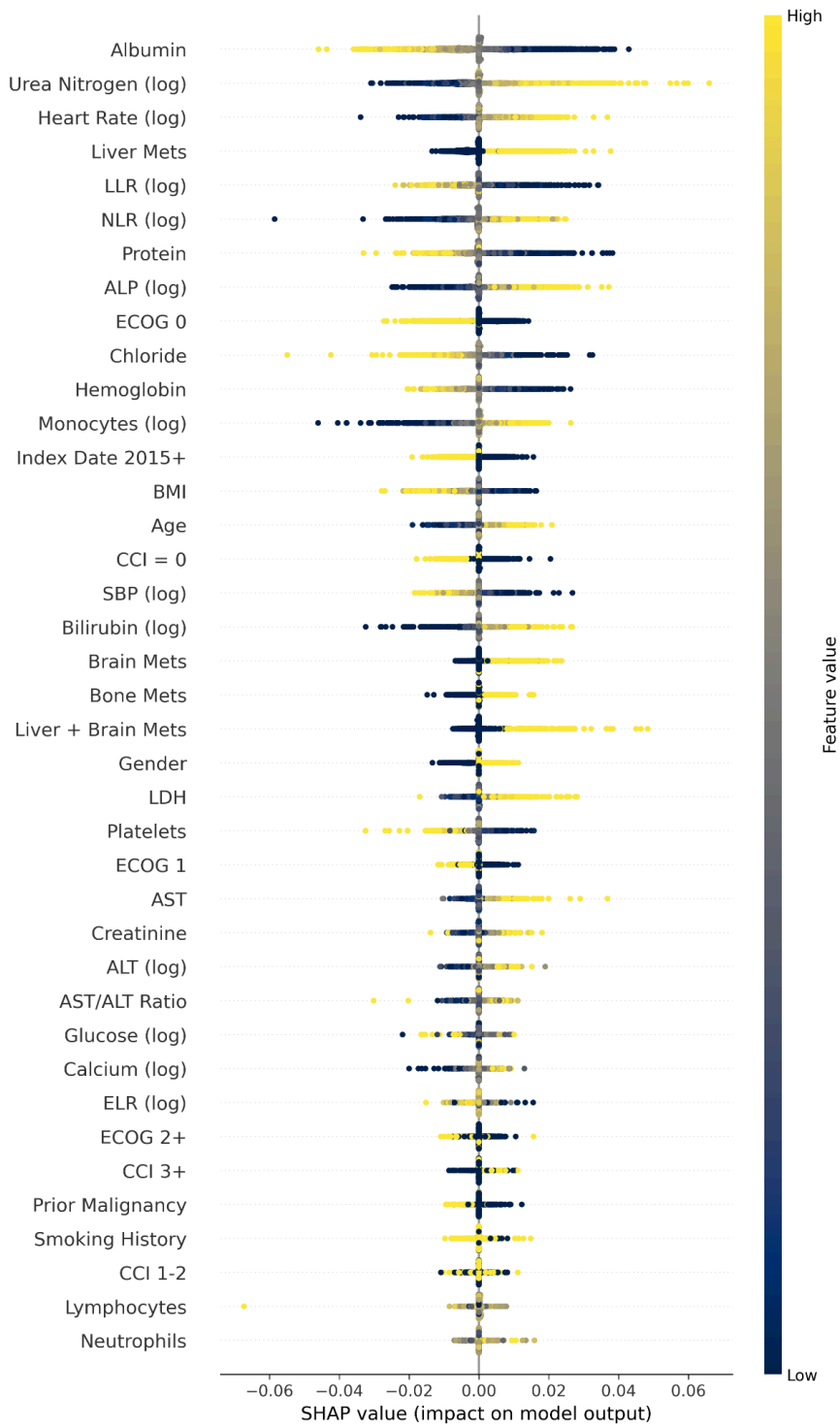
Sites of Metastases (SOM) variables follow a hierarchical definition: Liver + Brain mets = both liver and brain mets; Liver mets = liver mets w/o brain mets; Brain mets = brain w/o liver mets; Bone mets = bone w/o liver or brain mets; reference category = other mets w/o liver, brain, or bone mets. Reference categories for other categorical variables: female gender, no history of smoking, no prior malignancy.

Abbreviations: mets, metastases; CCI, Charlson Comorbidity Index; ALP, Alkaline Phosphatase; LDH, Lactate Dehydrogenase; NLR, Neutrophils to Lymphocytes ratio; HCV, Hepatitis C Virus; AST, Aspartate Aminotransferase; ALT, Alanine Aminotransferase; ELR, Eosinophils to Leukocytes ratio; BMI, Body Mass Index; SBP, systolic blood pressure; HBV, Hepatitis B Virus; LLR, Lymphocytes to Leukocytes ratio.

Supplemental Figure 1: Graph Attention Network (GAT)



Supplemental Figure 2: Multi-layer Perceptron (MLP)



Supplemental Figure 3: XGBoost (XGB)

