Sunday Aghamie

University of Northern Colorado
USA

IPCW-Weighted Ensemble of DeepSurv, VAE and Bayesian Neural Mixture Models for Personalized Prognostic Subtyping on the METABRIC Breast Cancer Cohort

Abstract:

Accurate, patient-specific prognosis in breast cancer is hindered by high-dimensional data, heterogeneous risk factors and right-censoring. We present an ensemble framework that leverages inverse-probabilityof-censoring weights (IPCW) to train three complementary DeepSurvbased architectures on the publicly available METABRIC cohort (n 1,980; up to 10-year follow-up):

- A baseline DeepSurv network predicting log-hazard scores,
- A DeepSurv network fed with low-dimensional embeddings froma variational autoencoder, and
- A DeepSurv network whose final layer is a Bayesian neural mixture head.

Each model is optimized under an IPCW-weighted Cox partial-likelihood loss; their risk outputs are then stacked via a meta-learner and converted into calibrated survival probabilities through Platt scaling. On held-out test data, our ensemble achieves a concordance index of 0.784 (±0.012) and an integrated Brier score of 0.183, outperforming all individual components. Time-dependent AUC at 5 years increases by up to 5%, and decision-curve analysis demonstrates higher net benefit across clinically relevant thresholds. This IPCW-weighted ensemble delivers fine-grained, uncertainty-aware prognostic subtypes that can guide personalized surveillance and treatment planning in breast oncology.

Biography

Sunday Aghamie is a Ph.D. student and Graduate Assistant in the Department of Applied Statistics and Research Methods at the University of Northern Colorado (UNC) in Greeley, Colorado