Time-to-Event Prediction with ML

Random Survival Forests

Tree 1   Tree 2   Tree N

Ensemble

$S(t)$
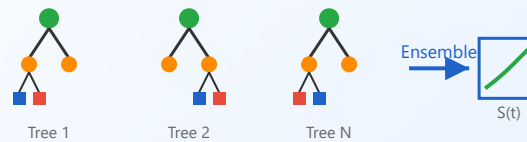
Splits on survival time & censoring

Ensemble method, handles non-linearity, feature importance

DeepSurv

Input   Output

Features

log $h(t|x)$

Cox Loss
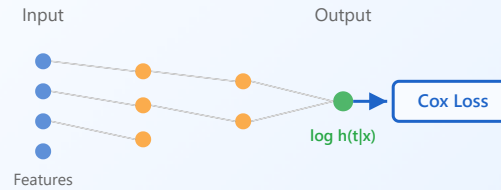
Deep learning + Cox regression

Neural networks for survival, learns complex patterns

Discrete Time Models

$P(T > t_i \mid T > t_{i-1})$

Binary Classification per Interval

t_1	t_2	t_3	t_4	t_5+
0.95	0.88	0.72	0.45	0.20
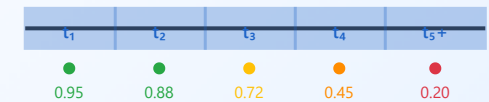
Logistic regression per time interval

Evaluation Metrics

C-index (Concordance)   Time-dependent AUC   Calibration plots   Brier score   Integrated Brier Score