**Project Title:** Dynamic prediction and time-dependent ROC curve

**Team member:**

Scott Sun

Claude Hu

Costa Stavrianidis

Yvonne Feng

Jingya Cheng

**Overview paragraph:**

Our project aims to investigate the use of dynamic prediction for longitudinal and time-to-event data. We will employ a dynamic design, allowing model parameters to vary over time, and the distributions of their estimates to change with respect to the population under study. To achieve this, we will use landmarking [1] as an alternative to static modeling, such as regular Cox regression. We will also extend landmark modeling to a streaming version to increase scalability. To evaluate the performance of our model, we will explore the use of time-dependent ROC curves [2] as a metric and compare the original version with the streaming version. Through numerical simulations, we will compare the two versions of landmarking with the static model. While our project is primarily focused on methodological research in machine learning and survival analysis, we aim to apply our findings to a real-world dataset from PhysioNet [3], which will require significant time and effort for data integration. Overall, our project aims to advance the field of machine learning and survival analysis by exploring dynamic prediction and alternative modeling approaches.

**Deliverables:**

Scripts for methods and simulation

Technical report

**Reference:**

[1] Van Houwelingen, H. C. (2007). Dynamic prediction by landmarking in event history analysis. *Scandinavian Journal of Statistics*, *34*(1), 70-85.

[2] Heagerty PJ, Lumley T, Pepe MS. Time‐dependent ROC curves for censored survival data and a diagnostic marker. Biometrics. 2000 Jun;56(2):337-44.

[3] Silva I, Moody G, Scott DJ, Celi LA, Mark RG. Predicting in-hospital mortality of icu patients: The physionet/computing in cardiology challenge 2012. In2012 Computing in Cardiology 2012 Sep 9 (pp. 245-248). IEEE.