

# Real-time prediction of massive transfusion in the operating room using intraoperative hemodynamic monitoring data

Seung Mi Lee, Garam Lee, Trang Le, Jie Hao, Hyung-Chul Lee, Dokyoon Kim

# Introduction

- Massive transfusion, which is a response to uncontrolled massive hemorrhage, is often encountered during operation
- As massive transfusion involves the preparation of a large amount of blood products and additional medical personnel early prediction of massive transfusion is essential for appropriate management
- We applied deep learning method for real-time prediction of massive transfusion using intra-operative hemodynamic monitoring data

# Materials and methods

- 19,017 patients who underwent surgery in Seoul National University Hospital from 2016 to 2019
- Selected predictors include mBP, heart rate, sBP, and dBP extracted from arterial line monitors and intraoperative laboratory measurements of hematocrit
- The subjects were divided into training and validation sets (7:3 ratio)
- For comparison, the prediction model with 24 preoperative variables including age, sex, and preoperative laboratory results were constructed

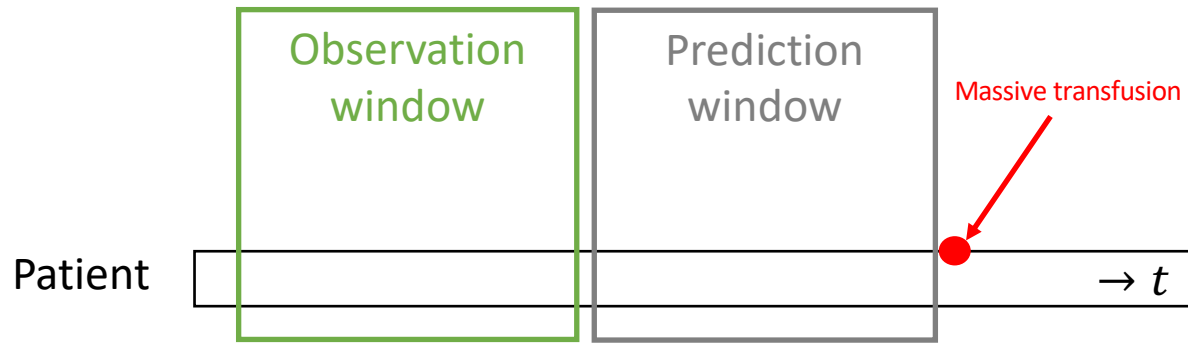


Figure 1. Prediction of massive transfusion prediction based on observations

- Data within observation window is used to predict
- Intraoperative data within prediction window is not used for prediction
- Observation and prediction windows are setup as 10 minutes
- The prediction model using logistic regression and multilayer perceptron (MLP) based on preoperative variables showed AUC=0.81
- Developed model using gated recurrent unit (GRU) based on intraoperative variables predicted massive transfusion successfully with AUC=0.906

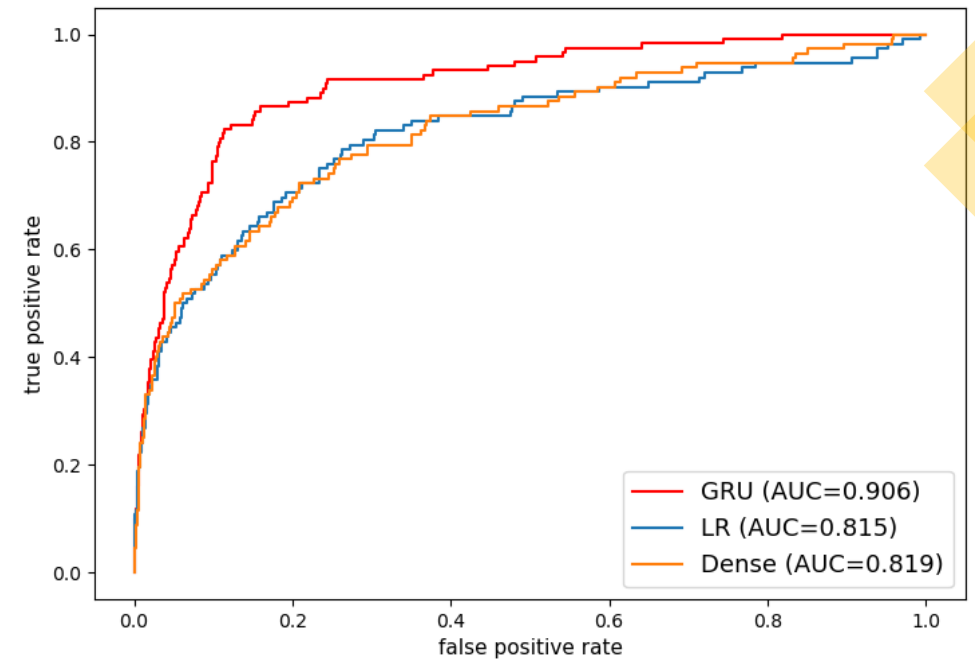


Figure 2. The AUC of prediction model

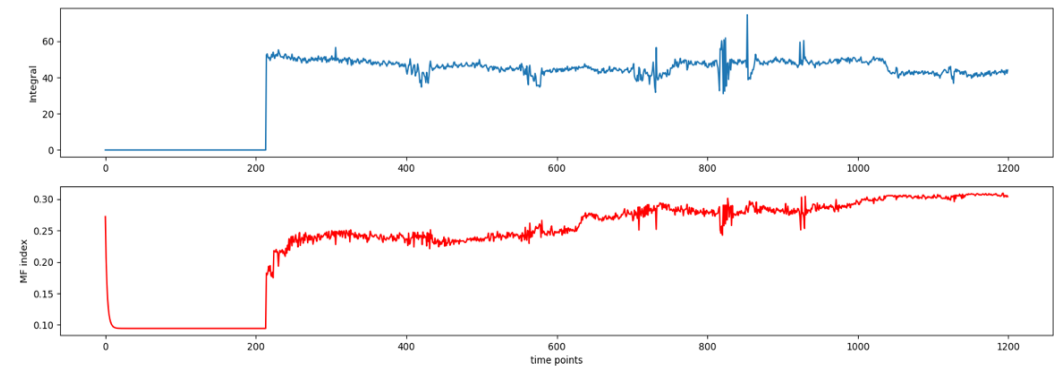


Figure 3. a patients that shows the massive transfusion index over time