

Rapid Response System

Nguyen Trong Nghia

Adviser:
Prof. Kim Soo Hyung

January 13, 2022

Table of Contents



1 Proposed Method

2 Experimental Results

3 Plan

Overall of Deep Early Warning System



- **Input:** Window time D contains the measurement features of patient in n timepoints (in the figure, $n = 8$)
- **Output:** abnormal/normal status of patient at timepoint t_n
- **Window interval processing:** keeping time series meaning
- The window time D will slides for every timepoint for each patient
- With $n = 8$, for each patient, we should wait 8 hours for the first output
- After that, the system will predict once every hour

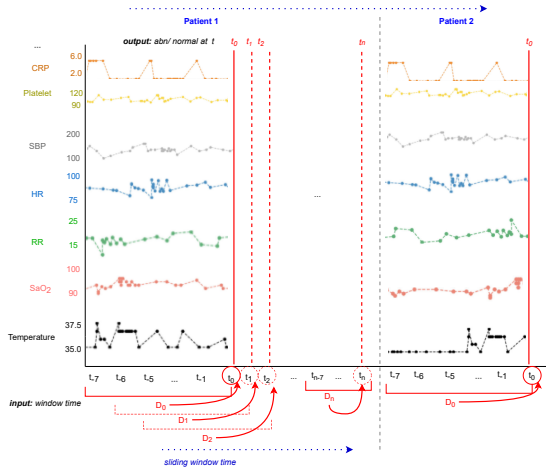


Figure: The overall of proposed framework

- Because missing values and false labels problem on 10 year data, we temporary experiment on 3 year data.
- 3 year data (317,006 timepoints)
- Window interval processing:
 - For each patient, using first 7 timepoints for making window time
 - Total 2,615 patients
 - Number timepoints after processed: $317,006 - (2,615 * 7) = 298,701$ timepoints
- Splitting 70% for train, 20% for test, 10% for validation

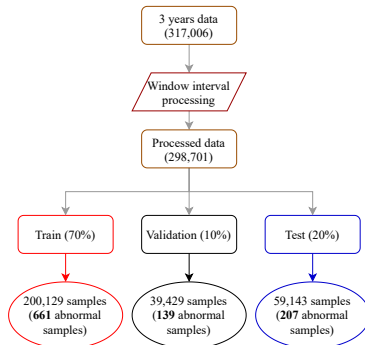


Figure: Study Pipeline

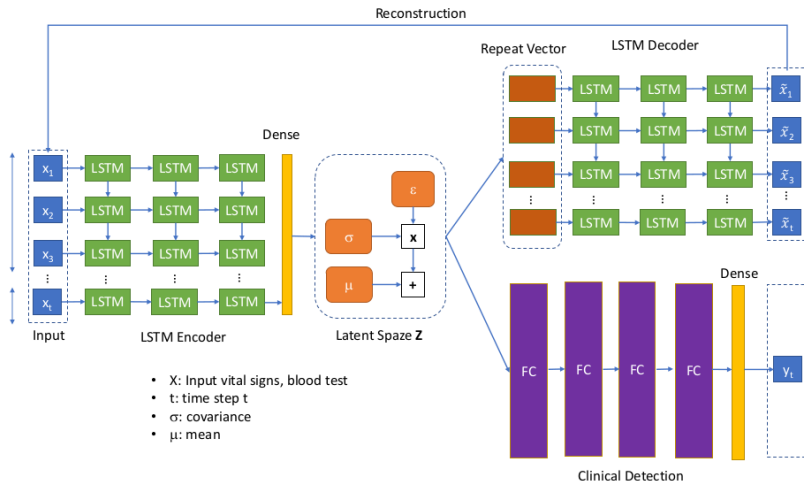


Figure: Temporal Variational Autoencoder (TVAE)

Table of Contents

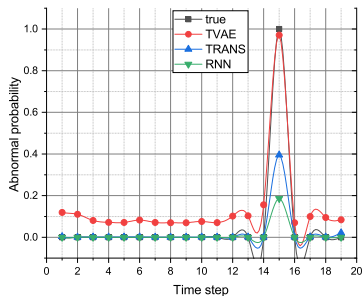


- 1 Proposed Method
- 2 Experimental Results
- 3 Plan

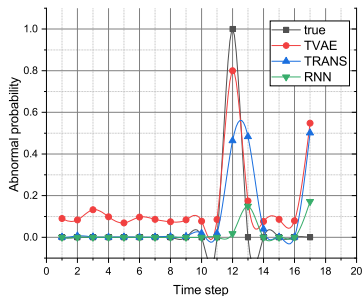
Table: Experimental results on CNU 3 years dataset

Window time	Model	AUROC (+)	AUPRC (+)	False Alarm (-)	Late Alarm* (-)
8	RNN	0.876	0.822	18	51
	Transformer	0.882	0.593	215	48
	TVAE	0.917	0.869	17	34
16	RNN	0.892	0.826	21	40
	Transformer	0.799	0.538	121	74
	TVAE	0.943	0.893	17	21

- (+): higher is better
- (-): lower is better
- (x): incomplete experimental results
- (*): important score
- False alarm (number of samples): Number of samples that ground truth is normal, system detect as abnormal
- Late alarm (number of samples): Number of samples that ground truth is abnormal, system detect as normal



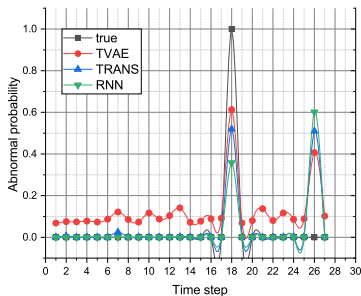
(a) Sample 1



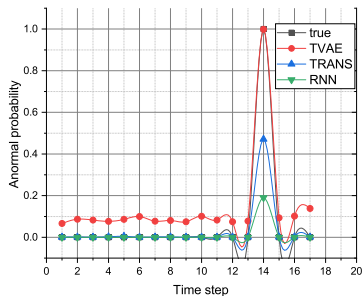
(b) Sample 2

Figure: Abnormal probability results (window time = 16 hours); Threshold = 0.6

Abnormal probability results



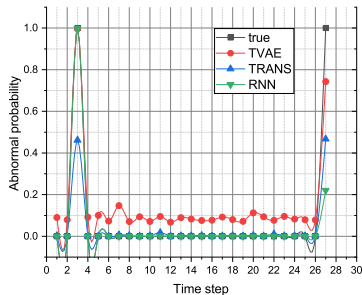
(a) Sample 3



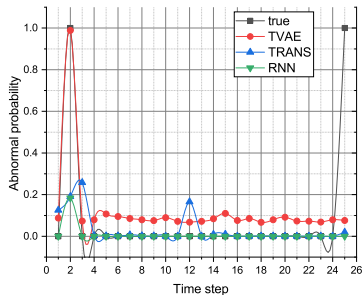
(b) Sample 4

Figure: Abnormal probability results (window time = 16 hours); Threshold = 0.6

Abnormal probability results



(a) Sample 5



(b) Sample 6

Figure: Abnormal probability results (window time = 16 hours); Threshold = 0.6

- 1 Proposed Method
- 2 Experimental Results
- 3 Plan

- Implement the model to improve the system's performance.
- Experiment with window time = 24 hours.

Thank you!