



# Article presentation

## Unit 2: Advanced

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# Context

- Title: Temporal Event Sequence Simplification
- Date: 2013
- Authors: Megan Monroe, Rongjian Lan, Hanseung Lee, Catherine Plaisant, and Ben Shneiderman
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Paper citations: 172.



# Research

Main question:

*“How can we best leverage the things that have already happened to inform our future actions?”*

- Electronic Health Records (EHR): large and noisy datasets -> Reduction



# Organization

- Introduction
- Previous work (background)
- Complexity
- Simplification methods
- Impact



# Introduction

## TEMPORAL EVENT SEQUENCE :

Sequence comprises of time stamped events or say events happens during the motion of time value.



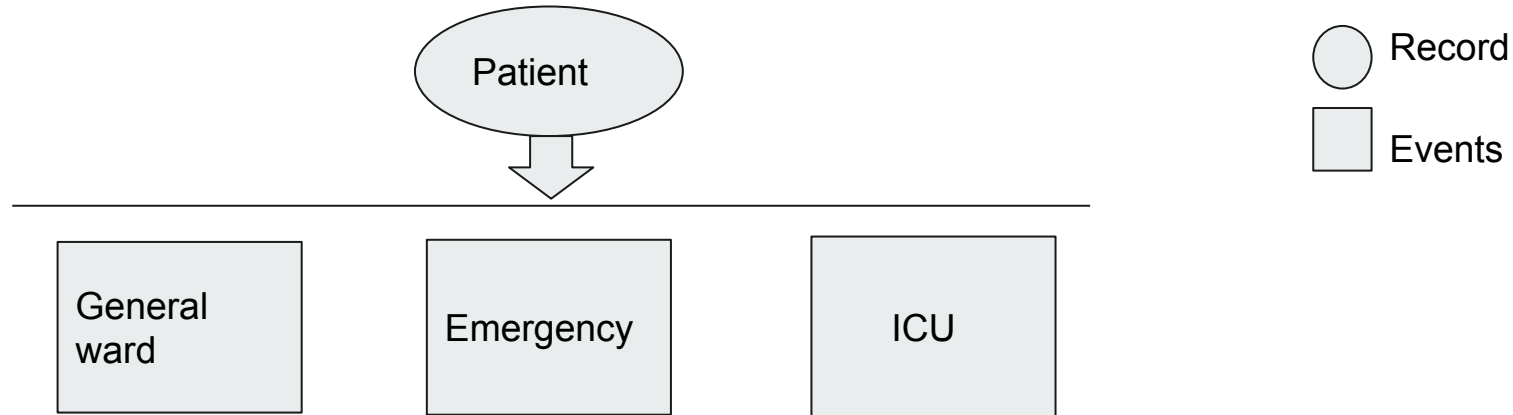
# Types of understanding

Temporal event sequence contains two subtypes for understanding:

1. Intra Record Understanding
2. Inter Record Understanding

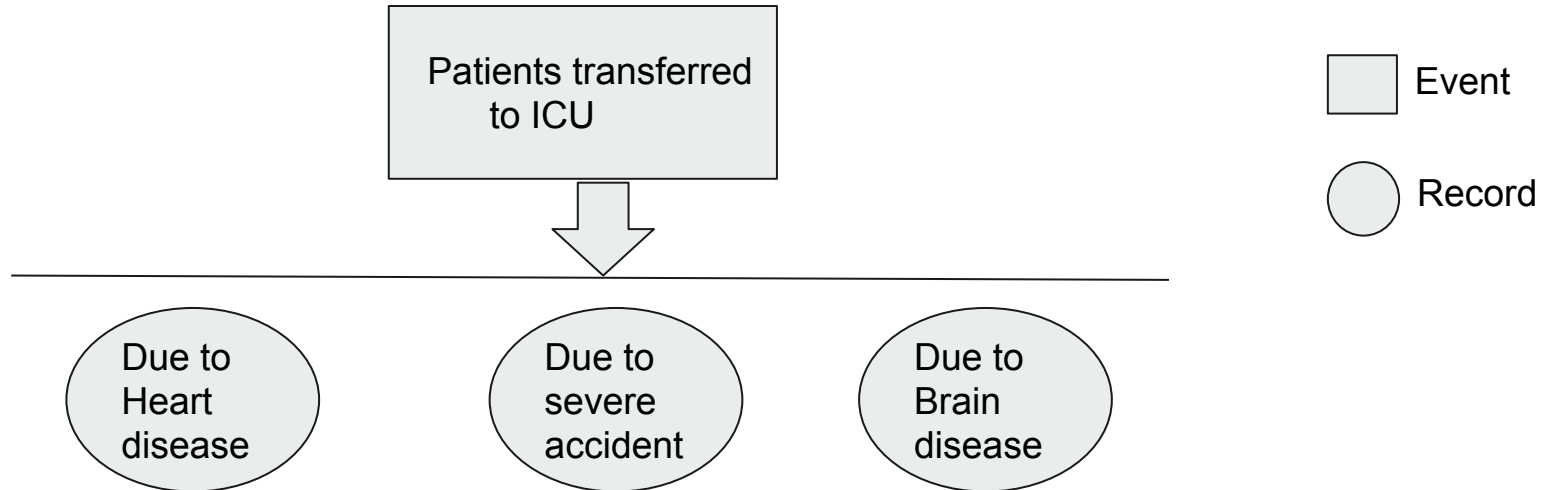
# Intra record Understanding

Comprises of many events but with a single record.



# Inter Record Understanding:

Comprises of many record with single event:







## **Simplification methods:**

1. Filtering based Simplification
2. Transformation based Simplification
3. Universal Simplification System
4. Opioid Misclassification



## **Filtering based simplifications:**

Use only meaningful information from the dataset so that data can be visualised easily.



## Filtering types:

1. Filtering by Record
2. By Timestamp
3. By Category
4. With Attributes



## Filtering by Record:

Filter records either by selecting useful records or by removing useless records.

For example: Selecting only one record from a set of multiple records

i.e record of patients transferred to the ICU due to heart attack.



## Filtering by category:

It works on intra record type.

Also helps in removing categories of records so that we can aggregate events having same category.



## Filtering by timestamp:

It helps in visualizing a limited time window slice.

Also we can calculate the difference between two events by the measure of their timestamp.



## Filtering by attributes:

In this type, user have the ability to choose among both record and event by their attribute value.

Also User can perform both Inter-record and Intra-record simplifications by removing records or events by their attribute values.



## Filtering based on Transformation:

Simplification based on transformation helps in manipulating the data not by removing the events but by transforming the way it is represented.

The process of filtering with respect to transformation also called as **Data Wrangling**

Three types:

1. Interval event Merging
2. Category Merging
3. Marker Event Insertion





## Interval Event Merging:

In this, windows of time interval having same category are merged together to get a large interval having more information.

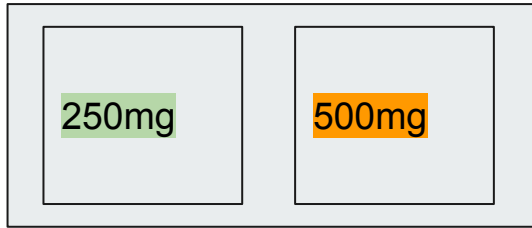
Two ways:

1. Eliminating gaps of certain duration
2. Eliminating overlaps of certain duration..

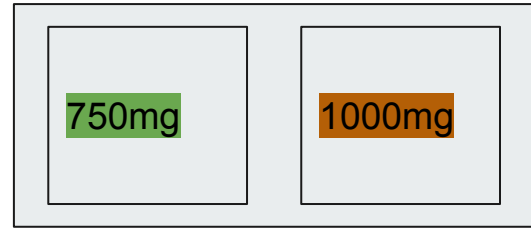
# Category Merging:

Combining multiple event category into a single meta category.

For example:



Paracetamol tablet(Low Dose)



Paracetamol tablet(High Dose)



## Marker Event Insertion:

When repeating Event types occurs then a **Marker** is inserted throughout the records which will help in decrease of Visual Elements.



# Universal Simplification System:

An Advanced Query System is to developed for Simplification.

By using it,user can select either the event that match their query or the events that did not match their query.

User can remove the selected records from the dataset.

It works more precisely on Inter-record Simplification.



## Find & Replace feature:

To perform Universal simplification on Intra-Record simplification advance query system was developed with Replace feature.

This feature not only help to find the sequence of events but also help to replace the event sequence of their choice.

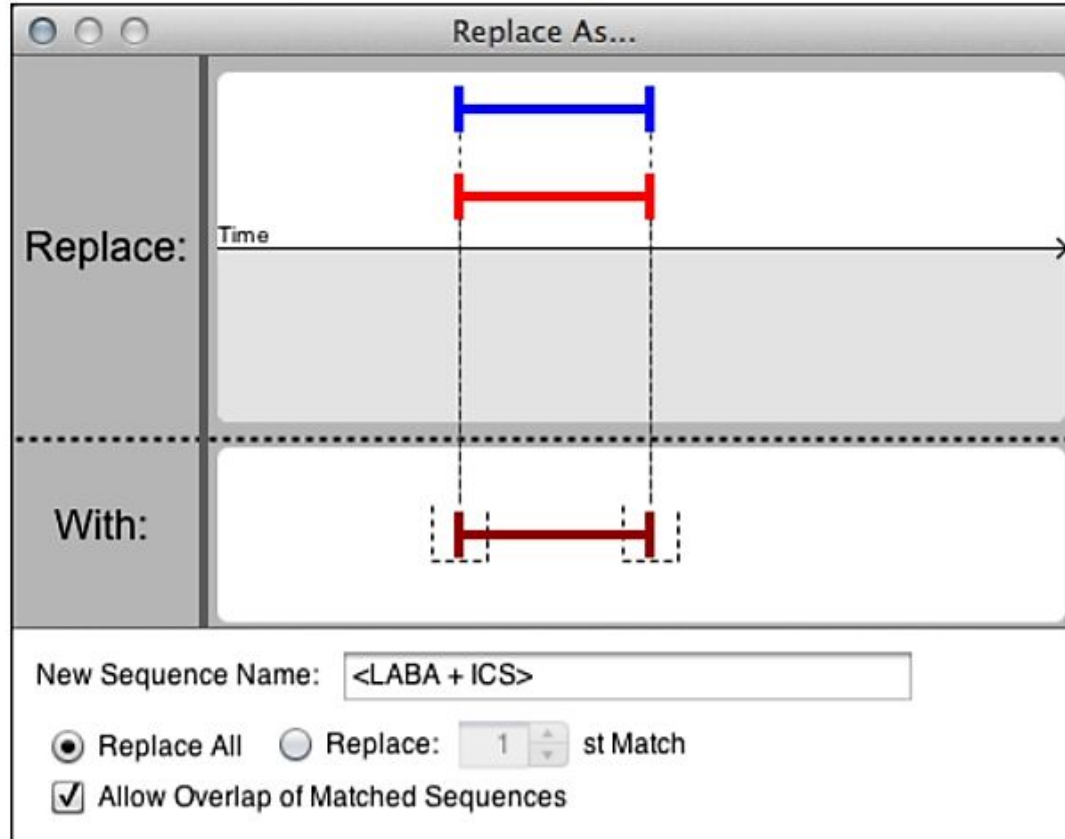


Figure: Treatment for LABA (light red) and ICS (light blue) and their prescriptions are replaced by a single interval (dark red)



## **OPIOID Misclassification:**

In this category, replacement is done in various stages according to the requirement and treatment used.

Fig 1: Raw  
prescription data

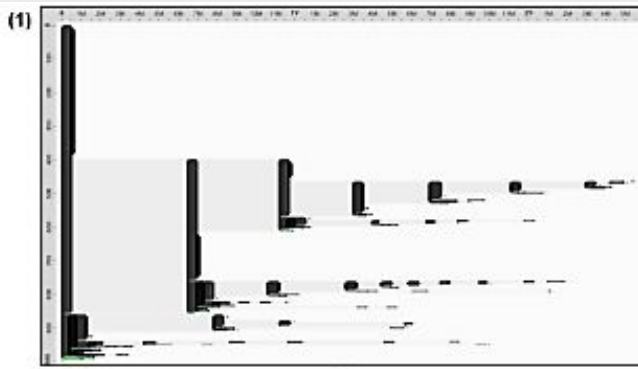


Fig 2: acute(red),  
intermediate(blue)  
chronic(red)

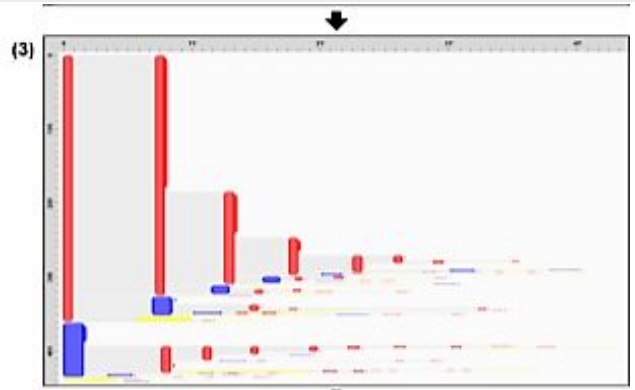
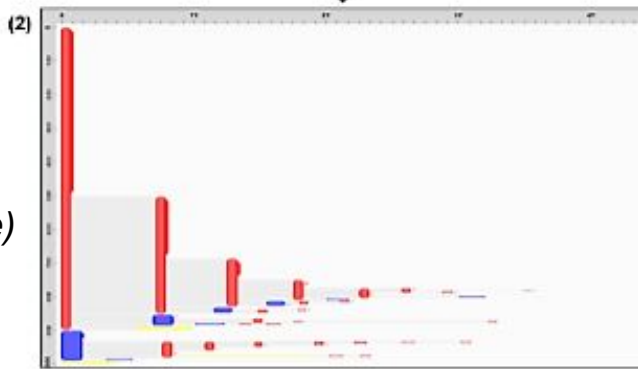


Fig 3: Patient  
that have only  
one acute  
episode have  
removed

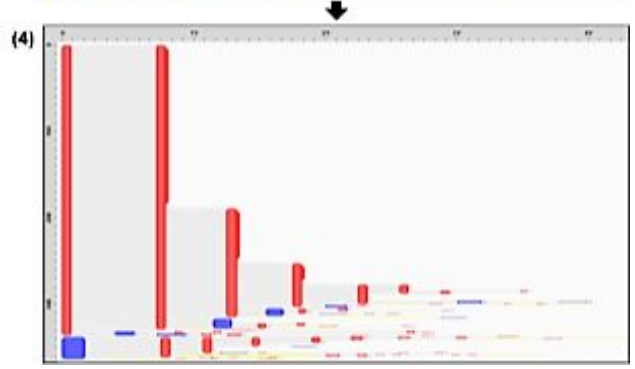


Fig 4: Patients  
without  
consecutive  
acute are  
removed

# OPIOID Misclassification





# Impact

Powerful way to analyse temporal datasets

Reduce the visual complexity by 80%

Future:

- save simplification process
- less time to load very large datasets



# References

- Megan Monroe, Rongjian Lan, Hanseung Lee, Catherine Plaisant, and Ben Shneiderman. [Temporal Event Sequence Simplification](#). [IEEE Transactions on Visualization and Computer Graphics](#), Vol. 19, No. 12, 2227 - 2236, December 2013.
- [IEEE Xplore](#)
- Google Scholar