

# Time Series Analysis using 3D Tensors

## Time Series Analysis with 3D Tensors

In time series analysis, especially in the context of machine learning, organizing data in a multi-dimensional structure, like a 3D tensor, is common. This structure is particularly useful for representing complex datasets where multiple variables are tracked over time for different entities or profiles.

### Reorganized Tensor Structure:

- First Dimension (Time): 7 days (Day 1 to Day 7)
- Second Dimension (Profiles): 3 patients (Patient 1, Patient 2, Patient 3)
- Third Dimension (Metrics): 2 metrics (Heart Rate, Blood Pressure)

### Visualization:

The tensor is visualized as a series of matrices, one for each day, with each matrix containing data for all patients and their corresponding metrics. For example, the data structure for Day 1 would include heart rate and blood pressure readings for all three patients.

### Accessing Data:

- Heart rate of Patient 1 on Day 4: `Tensor[3][0][0]`
- Blood pressure of Patient 3 on Day 6: `Tensor[5][2][1]`

### Advantages in Time Series Machine Learning:

This structure is advantageous for many time series machine learning tasks. It aligns with the sequential processing of models like RNNs, LSTMs, and GRUs, facilitates batch processing with the temporal dimension first, and allows for straightforward feature analysis across different entities and time points.