

Team SASH

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Time series models

A **time series model** specifies the joint distribution of the sequence $\{X_t\}$ of random variables.

For example:

$$P[X_1 \leq x_1, \dots, X_t \leq x_t] \text{ for all } t \text{ and } x_1, \dots, x_t.$$

Notation:

X_1, X_2, \dots is a stochastic process.

x_1, x_2, \dots is a single realization.

We'll mostly restrict our attention to **second-order properties** only:

$$EX_t, E(X_{t_1}, X_{t_2}).$$

Time series models

Example: White noise: $X_t \sim WN(0, \sigma^2)$.

i.e., $\{X_t\}$ uncorrelated, $EX_t = 0$, $\text{Var}X_t = \sigma^2$.

Example: i.i.d. noise: $\{X_t\}$ independent and identically distributed.

$$P[X_1 \leq x_1, \dots, X_t \leq x_t] = P[X_1 \leq x_1] \cdots P[X_t \leq x_t].$$

Not interesting for forecasting:

$$P[X_t \leq x_t | X_1, \dots, X_{t-1}] = P[X_t \leq x_t].$$

Data:

The given data is for 180 days.

User data includes four things:

1. Timestamps
2. Number of users
3. Session length
4. Event count

For our model purpose we could ignore the timestamp and try to find a relation between number of users, session length and event count.

Approach:

We aim to establish a relationship between number of users, session length and event count. Our model uses fb profit model to do time series forecasting of the event count. We also used simple neural network input to which is output of fb profit model and output is number of users and session length. When a new data is given we use this model to predict session length and if it is less than certain alpha we send warning signal to app developer.

Test and Results:

We divided the given data into test and train data. First 170 days were used for training purposes and remaining 10 days were used for testing our model. Mean square error for on testing was 43.

Future Work:

On comparing the predicted output and actual realtime data we will predict if an alert needs to be send to the user. If it is required then we send it through message or email.

This model was just a basic model on top of which we will build the advance model. With finer tuning of parameters we can achieve much more accuracy or less MSE.

Thank-You!!