LVC 3: Glossary of Notations

Recurring Notations from lectures 1 and 2:

L = The original user-item interaction matrix

L_{ij} = Likelihood of the i^{th} user matching with the j^{th} item in the user-item interaction matrix

L_i = The average of observed entries in the i^{th} row of the user-item interaction matrix

n_i = The number of observed entries in the i^{th} row of the user-item interaction matrix

L_j = The average of observed entries in the j^{th} column of the user-item interaction matrix

n_j = The number of observed entries in the j^{th} column of the user-item interaction matrix

x_i = Features of the i^{th} user

y_j = Features of the j^{th} item

U = A user embedding matrix $U \in R^{n \times r}$, where row i is the embedding for user i denoted by u_i

S = The sigma matrix; a diagonal matrix with shape $r \times r$, where r is the rank/number of latent features

V^T = An item embedding matrix $V \in R^{m \times r}$, where row j is the embedding for item j denoted by v_j

r = rank/number of latent features

s_k = The k^{th} value of the sigma matrix S

u_{ik} = The value in the i^{th} row and k^{th} column of the matrix U

v_{jk} = The value in the j^{th} row and the k^{th} column of the matrix V^T

Notations introduced in lecture 3:

$f_{obs}(x_i, y_j)$ = A mathematical function/model learned to make predictions using the observed features of users and items

$f_{latent}(u_i, v_j)$ = A mathematical function/model learned to make predictions using the latent features of users and items

L^{obs} = The matrix of values predicted by the function f^{obs}

L_{ij}^{obs} = Predicted value at i^{th} row and the j^{th} column of L^{obs}

L_{ij}^{diff} = Difference between the i^{th} row and the j^{th} column of matrix L and the predicted matrix L^{obs}

L^{ME} = Resultant matrix of matrix estimation on the matrix L^{diff}

$\widehat{L}_{ij}$ = Combined estimate value of the i^{th} row and the j^{th} column of L^{obs} and L^{ME}

$L_{ij}(t)$ = Value of the i^{th} row and the j^{th} column at time t of matrix L

$u_i(t)^T$ = The i^{th} latent feature at time t of matrix U

$u_i(t)^T$ = Transpose of the i^{th} latent feature at time t of matrix U

$v_j(t)$ = The j^{th} latent feature at time t of matrix V

X = The time Series data

$X(t)$ = Time Series data at a given time t

T = The time of the last instance of the time series data

R^d = Real numbers in the d-dimensional space

P = The page matrix

P_{ij} = The entry at the i^{th} row and the j^{th} column of the matrix P

$(T + 1 \, mod \, L)$ = The remainder after diving $T + 1$ by L

Z = Concatenation of page matrices for all users and items across time t

$\widehat{Z}$ = Result of performing matrix estimation over the matrix Z

k = Number of measurements

$\widehat{L}_{ij}(t)$ = Predicted value of the i^{th} row and the j^{th} column at time t

$f(u_i(t), v_j(t))$ = A mathematical function/model learned with inputs as the i^{th} latent feature of users at time t and j^{th} latent feature of items at time t

$L_{ijk}(t)$ = Likelihood of the i^{th} user matching with the j^{th} item for a given measurement k at some time t

$f^k_{obs}(x_i, y_j)$ = A mathematical function/model learned using the observed users and items features for a given measurement k

$f^k_{latent}(u_i(t), v_j(t))$ = A mathematical function/model learned over the latent features of users and items for a given time t and a given measurement k

Z^k = Stacked Page matrices for k measurements

$\widehat{L}_{ijk}(t)$ = Predicted likelihood of the i^{th} user matching with the j^{th} item in a user-item interaction matrix for a given measurement k at a given time t

$\widehat{L^{diff}}_{ijk}(t)$ = Result of matrix estimation on Z^k

L^{obs}_{ijk} = Predicted likelihood of the i^{th} user matching with the j^{th} item in a user-item interaction matrix for a given measurement k