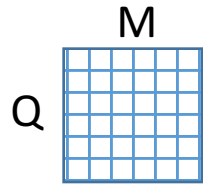
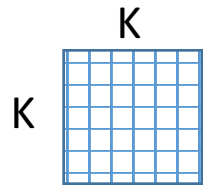


Data from the content tagging

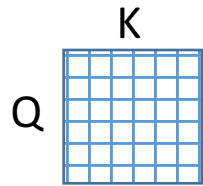
U: # users
Q: # items
K: # knowledge components
M: # adaptive modules



scope: boolean, shows items belonging to adaptive modules



m_w : numeric (0-1), shows pre-requisite relations among knowledge components



$m_{tagging}$: integer (0 or 1), shows tagging of items with knowledge components

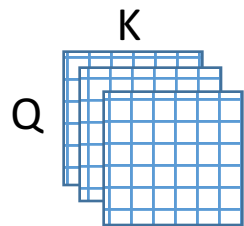


difficulty: numeric (0-1), shows tagging of items with difficulty levels

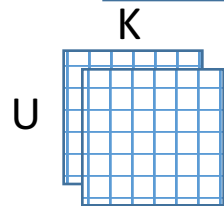
*The ordering of users, items, knowledge components and adaptive modules never changes.
Their indices serve as internally used IDs.*

Data initialized by us

U: # users
Q: # items
K: # knowledge components
M: # adaptive modules

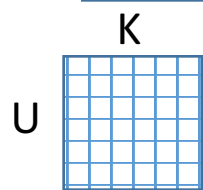


m_guess, m_slip, m_trans : numeric (≥ 0), odds of guessing, slipping, knowledge transfer



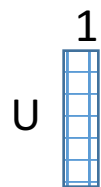
m_L_i : numeric (≥ 0), initial odds of mastery

m_L : current odds of mastery, in the beginning of the algorithm initialized equal to m_L_i



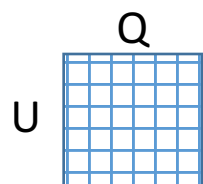
$m_exposure$: integer, # exposures to a KC, initialized with all 0s

$m_confidence$: numeric (≥ 0), exposure relevance to a KC, initialized with all 0s

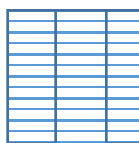


$last_seen$: integer, the ID of the item last served to a user.

Initialized with -1s (or any other value not encountered among item IDs)



m_unseen : boolean, shows which items have been served to a user, initialized with all "True"



$transactions$: data-frame containing columns [user, item, time, score], each row records a transaction.

Initialized with zero rows.

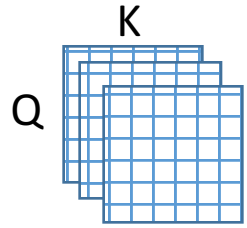
Data derived for convenience

U: # users

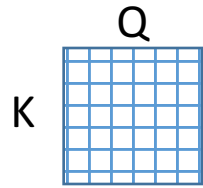
Q: # items

K: # knowledge components

M: # adaptive modules



$m_guess_neg_log, m_p_guess, m_slip_neg_log, m_p_slip, m_x0_mult, m_x1_0_mult, m_k$: numeric



$m_difficulty$: numeric, derived from *difficulty*

Parameters

epsilon: numeric (e.g. 1e-10), a convenience cutoff

eta: numeric (e.g. 0.0), relevance threshold

M: numeric (e.g. 20.0), information threshold

r_star: numeric (e.g. 0.0), forgiveness threshold

L_star: numeric (e.g. 2.2), mastery certainty threshold (for logarithm of mastery odds)

W_r, *W_c*, *W_d*, *W_p*: numeric, importance weights of recommendation sub-strategies

stopOnMastery: boolean, a recommendation strategy parameter