A MODEL AND PARAMETER DETAILS

A.1 Preferential Attachment Preference (IBP)

The IBP model with parameters $\alpha > 0$, $\sigma \in [0, 1)$, and $c > -\sigma$ is defined as follows [21]:

(1) The first user likes Poisson(α) items.
(2) User $(n + 1)$ likes previously-known item i with probability $\frac{m_i - \sigma}{n + c}$ (where m_i is the number of users who like item i) and likes Poisson($\alpha \frac{\Gamma(1+c)\Gamma(n+c+\sigma)}{\Gamma(n+1+c)\Gamma(c+\sigma)}$) new items.

c controls how likely the user is to rate new vs. old items. σ governs the power0law behavior of the generated preference matrix; $\sigma = 0$ yields a traditional IBP, with larger values yielding stronger power-law distributions of item popularity. α controls the density of the generated preference matrix. When $\sigma > 0$, the process generates on average $\alpha |U|^\sigma$ items; when $\sigma = 0$ and $c = 1$, it generates approximately $\alpha(\log|U| + \gamma)$ items on average [21], where γ is Euler's constant [12].

A.2 Correlated Preference (LDA)

The LDA generation process [4] with K latent features operates as follows:

(1) Draw K feature-item vectors $\vec{\phi}_k \in [0, 1]^{|I|}$ from Dirichlet(β).
(2) For each user:
  (a) Draw a latent feature vector $\vec{\theta}_u \in [0, 1]^K$ from Dirichlet(α).
  (b) Draw n_u (the number of items) from Poisson(λ).
  (c) Draw items $i_1, \ldots, i_{n_u}$ liked by user u by drawing feature $k_x \sim$ Multinomial($\vec{\theta}_u$) and i_x from Multinomial($\vec{\phi}_{k_x}$).
(3) De-duplicate user-item pairs to produce implicit user preference samples.

To reduce the number of parameters for fitting efficiency, we use symmetric LDA, where α is a constant vector with all values equal to $a > 0$, and likewise β is constant $b > 0$. These parameters a and b control the breadth of user preferences; when $a < 1$, the values of $\vec{\theta}_u$ concentrate on a few of the K dimensions, making the userâĂŹs preferences concentrate on a few items if $b < 1$. The parameter λ controls the average number of items each user likes. The parameter K controls the size of the latent feature space, affecting the diversity of user-item preference patterns in the whole true preference data.