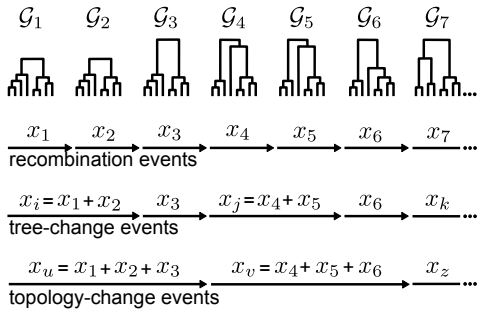


(a) Proposed ARG



(b) Extract genealogies between each event type

$$G_r = [\mathcal{G}_1, \mathcal{G}_2, \mathcal{G}_3, \dots] \quad (\text{recombination events})$$

$$G_g = [\mathcal{G}_1, \mathcal{G}_3, \mathcal{G}_4, \dots] \quad (\text{tree-change events})$$

$$G_t = [\mathcal{G}_1, \mathcal{G}_4, \mathcal{G}_7, \dots] \quad (\text{topology-change events})$$

(c) Extract waiting distances for each event type

$$X_r = [x_1, x_2, x_3, \dots] \quad (\text{recombination events})$$

$$X_g = [x_i, x_3, x_j, \dots] \quad (\text{tree-change events})$$

$$X_t = [x_u, x_v, x_z, \dots] \quad (\text{topology-change events})$$

(d) Calculate MS-SMC rate parameters

$$\Lambda_r = [\lambda_{r1}, \lambda_{r2}, \lambda_{r3}, \dots] \quad (\text{recombination events})$$

$$\Lambda_g = [\lambda_{g1}, \lambda_{g3}, \lambda_{g4}, \dots] \quad (\text{tree-change events})$$

$$\Lambda_t = [\lambda_{t1}, \lambda_{t4}, \lambda_{t7}, \dots] \quad (\text{topology-change events})$$

(e) Calculate likelihoods of waiting distances

$$\mathcal{L}(X_r | \Lambda_r) \quad (\text{recombination events})$$

$$\mathcal{L}(X_g | \Lambda_g) \quad (\text{tree-change events})$$

$$\mathcal{L}(X_t | \Lambda_t) \quad (\text{topology-change events})$$

$$\mathcal{L}(X_g | \Lambda_g) * \mathcal{L}(X_t | \Lambda_t) \quad (\text{tree \& topo-change events})$$