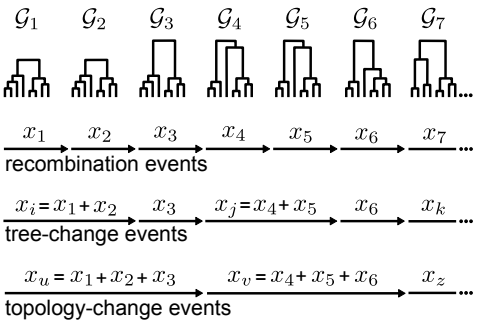
(a) Proposed ARG




(b) Extract genealogies between each event type

$$\boldsymbol{\mathcal{G}_r} = [\mathcal{G}_1, \mathcal{G}_2, \mathcal{G}_3, ...] \text{ (recomb events)}$$
$$\boldsymbol{\mathcal{G}_g} = [\mathcal{G}_1, \mathcal{G}_3, \mathcal{G}_4, ...] \text{ (tree-change events)}$$
$$\boldsymbol{\mathcal{G}_t} = [\mathcal{G}_1, \mathcal{G}_4, \mathcal{G}_7, ...] \text{ (topo-change events)}$$

(c) Extract waiting distances for each event type

$$\boldsymbol{X_r} = [x_1, x_2, x_3, ...] \text{ (recomb events)}$$
$$\boldsymbol{X_g} = [x_i, x_3, x_j, ...] \text{ (tree-change events)}$$
$$\boldsymbol{X_t} = [x_u, x_v, x_z, ...] \text{ (topo-change events)}$$

(d) Calculate MS-SMC rate parameters

$$\boldsymbol{\Lambda_r} = [\lambda_1, \lambda_2, \lambda_3, ...] \text{ (recomb events)}$$
$$\boldsymbol{\Lambda_g} = [\lambda_1, \lambda_3, \lambda_4, ...] \text{ (tree-change events)}$$
$$\boldsymbol{\Lambda_t} = [\lambda_1, \lambda_4, \lambda_7, ...] \text{ (topo-change events)}$$

(e) Calculate likelihoods

$$\mathcal{L}(\boldsymbol{\Lambda_r} \mid \boldsymbol{X}_r) = \prod_{i=1}^{n} f(x_i \mid \lambda_{r_i})$$
$$\mathcal{L}(\boldsymbol{\Lambda_g} \mid \boldsymbol{X}_g) = \prod_{i=1}^{n} f(x_i \mid \lambda_{g_i})$$
$$\mathcal{L}(\boldsymbol{\Lambda_t} \mid \boldsymbol{X}_t) = \prod_{i=1}^{n} f(x_i \mid \lambda_{t_i})$$