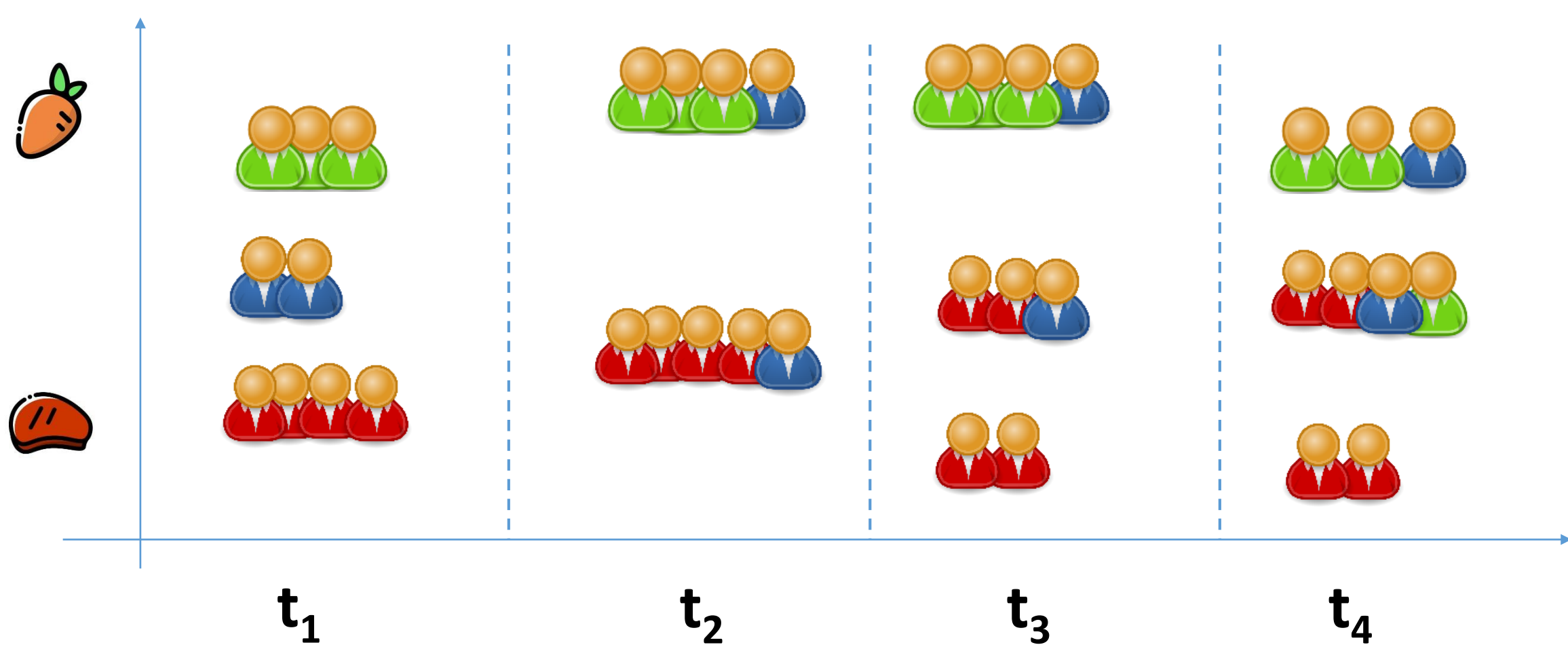


MOTIVATION

- Understand, attract and retain customers.
- Track dynamic customer purchase behaviour.
 - When and how does customer change their behaviour?
 - How many types of customers exist?
 - Whether a customer group is receptive to the promotion?



METHODOLOGY

- FC-CSM**: Bayesian non-parametric **customer segmentation model** based on the fragmentation-coagulation process.

$$\begin{aligned}\pi_1 &\sim \text{CRP}(A; \rho; 0) \\ \pi_{t+1} | \pi_t &\sim \text{FCP}(\pi_t; \rho; \delta) \\ x_{it} | \pi_t(i) = k &\sim \text{Poisson}(\lambda_{\pi_t(i)}) \\ \lambda_k &\sim \text{Gamma}(\alpha; \beta)\end{aligned}$$

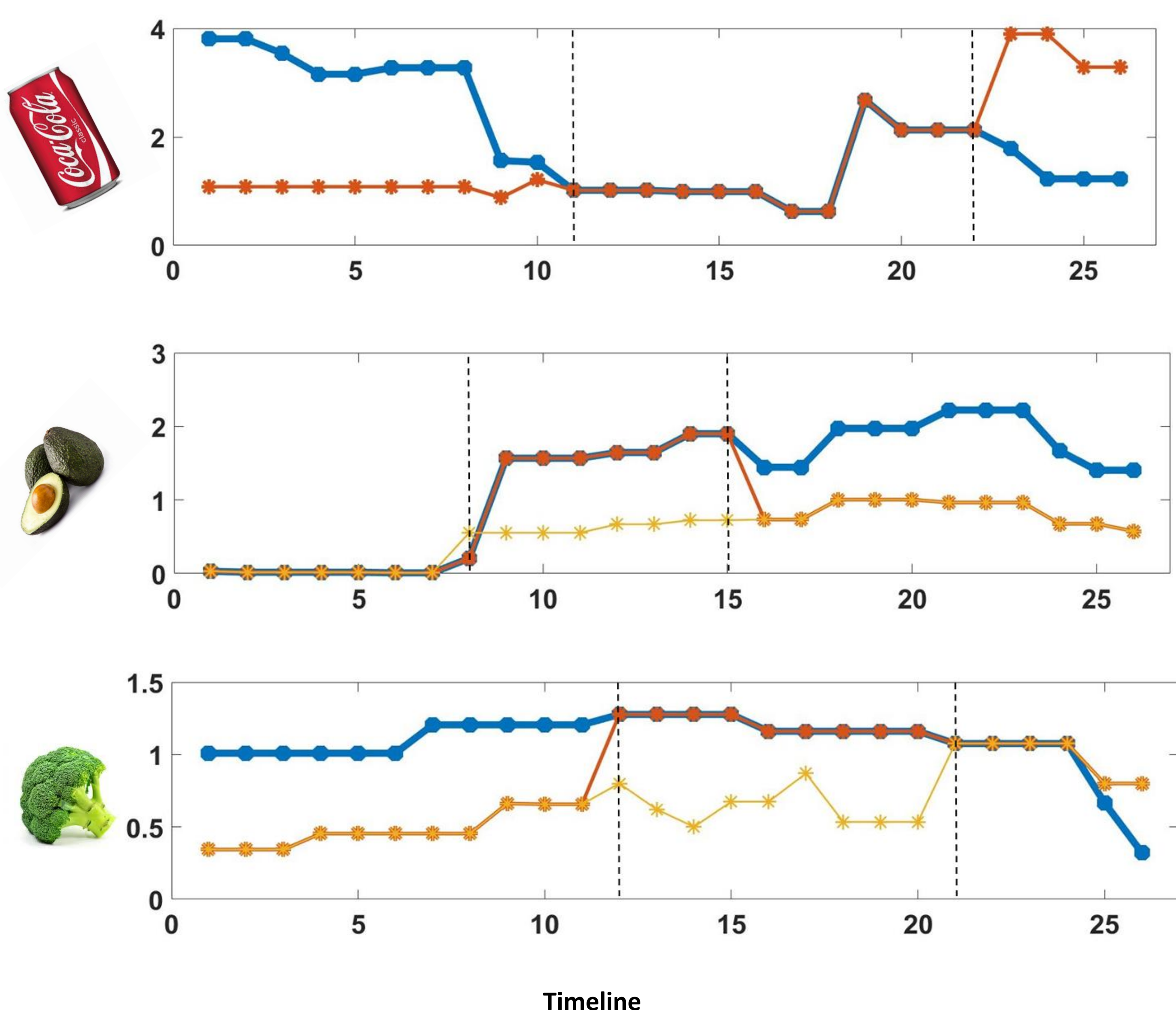
- π_t is the partition of customer set A at t
- CRP refers to Chinese Restaurant Process
- ρ controls the number of groups in a partition
- δ controls the temporal dependence between π_t and π_{t+1}

CASE STUDY

- Dataset: Purchase records collected by an Australian national supermarket chain.
- Duration: between Jan 1st and Dec 31st, 2014.
- Popular products from representative categories.

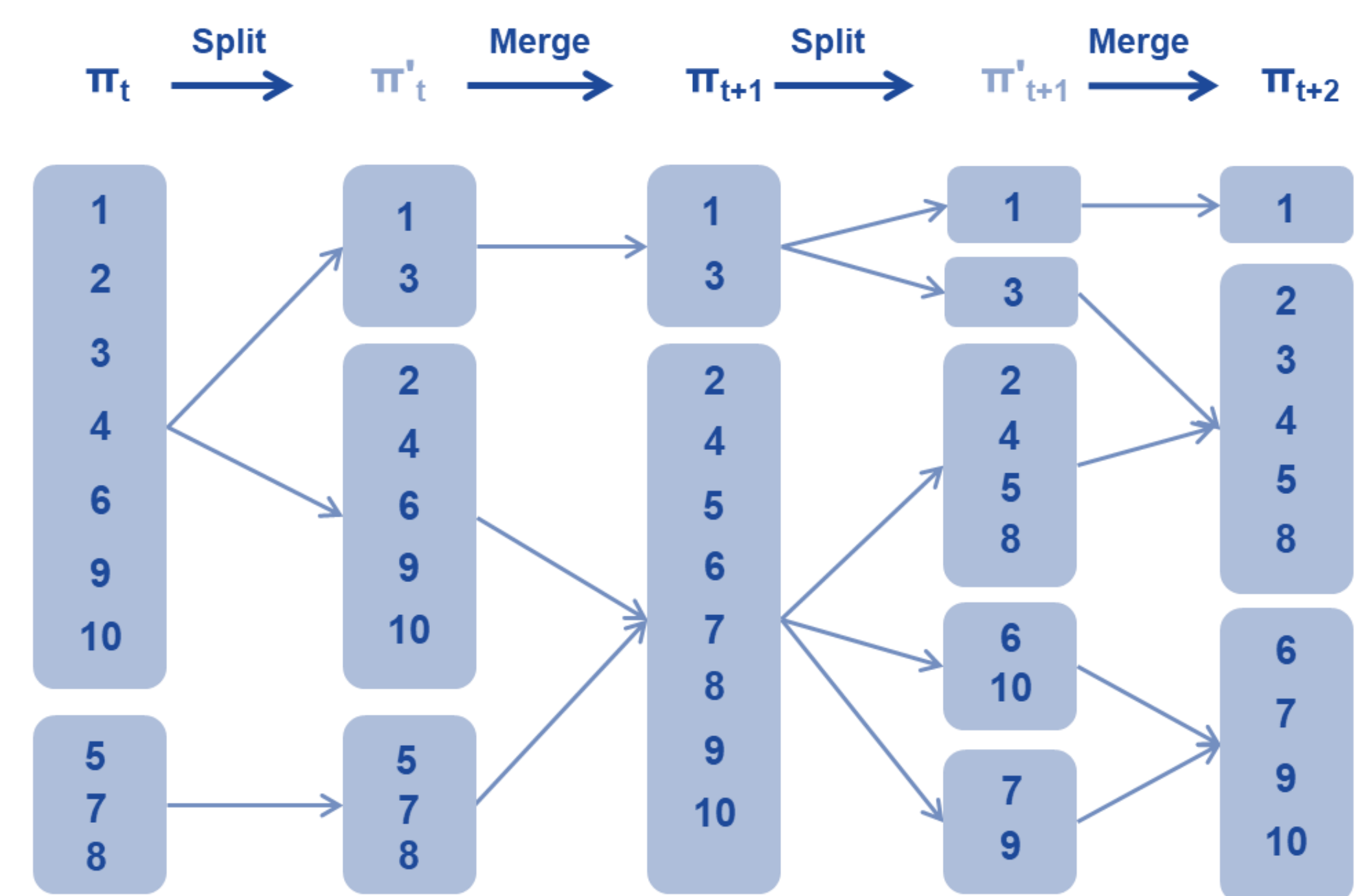
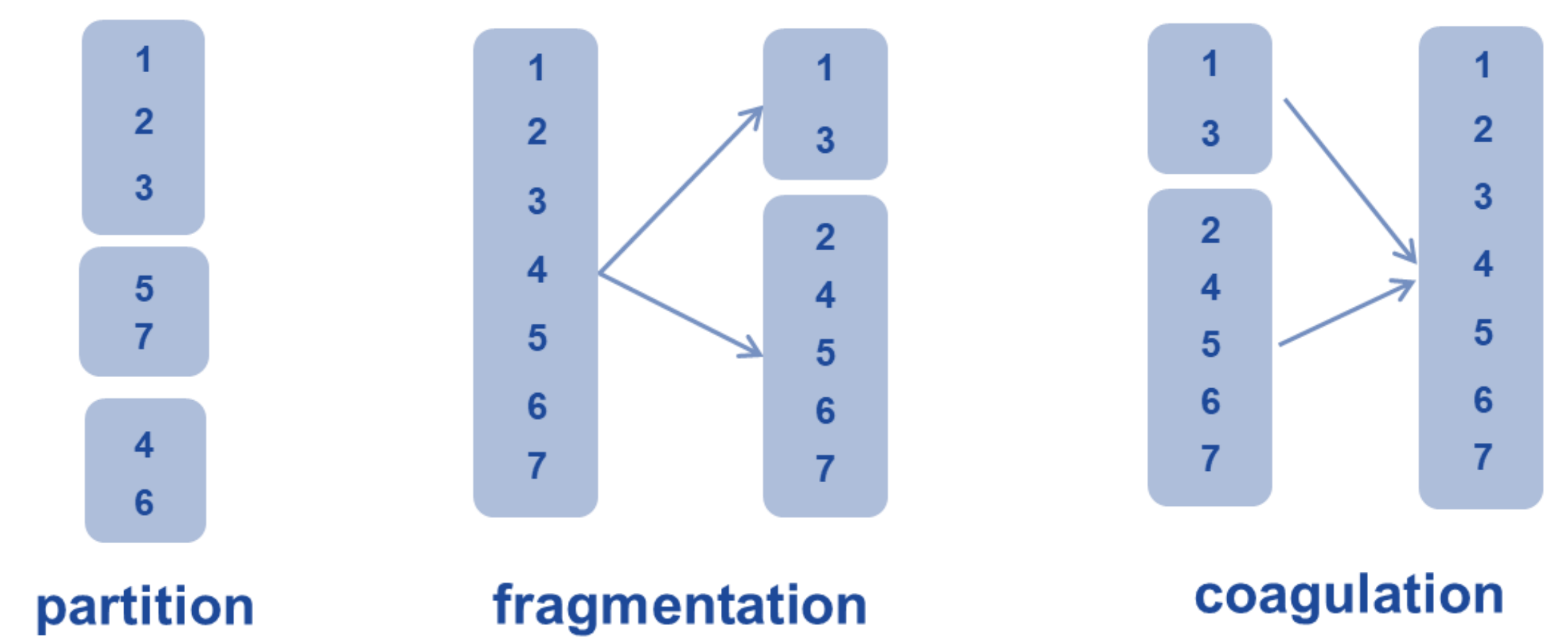
TRAJECTORY OF CUSTOMER BEHAVIOUR CHANGES

- Individual Customers**: with similar total purchase amount can have contrasting behaviour.



FRAGMENTATION-COAGULATION PROCESS

- Random partition process**: describe split and merge of groups.
 - Fragmentation**: one group can split into smaller groups, when members start to have **divergent** behaviour.
 - Coagulation**: several groups can merge, when members from different groups have **similar** behaviour.



- Track the evolution of customer groups.
- Capture the trajectories of customers shifting across groups.
- Customisable to other behavioural data.
- Support stakeholders to understand what triggers purchase behaviour changes and evaluate the effectiveness of these triggers → optimise the timing and focus of the promotion campaigns.

- Customer Groups**: tracking the evolution of groups – size, purchase rates, ancestors and descendants
- Stable behaviour (top)**; **affected by seasonal availability (middle)**; **customers shifting across groups (bottom)**.

