

flowMatch

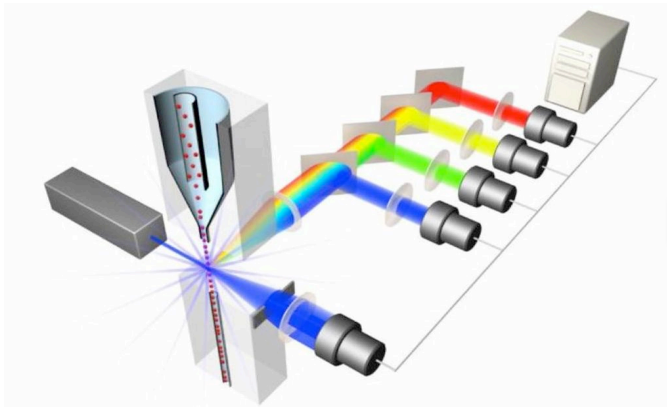
Meta-clustering based population matching

Ariful Azad, Saumyadipta Pyne, Alex Pothen

Department of Computer Science, Purdue University

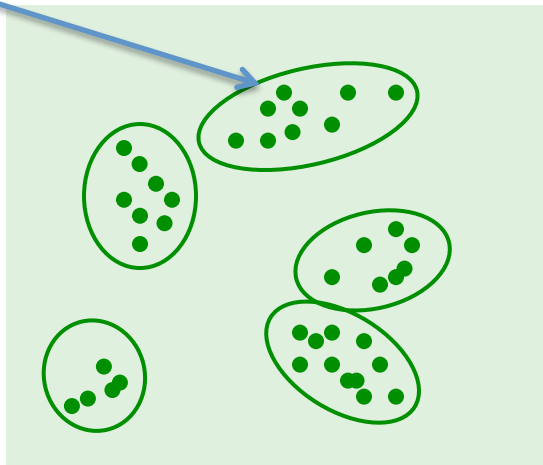
Dana Farber Cancer Institute, Harvard Medical School

Flow Cytometry – Toy example

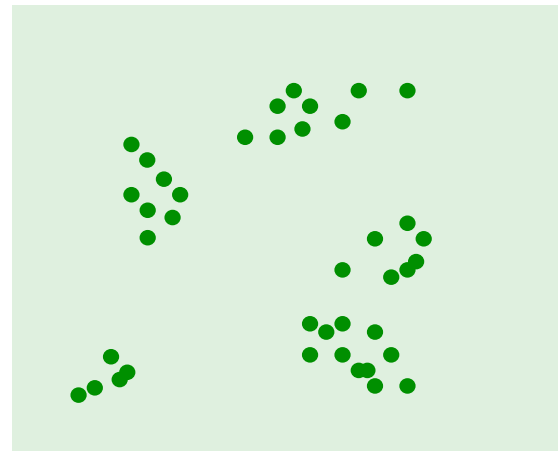


	CD4	CD8
Cell-1	3	1
Cell-2	12	1
Cell-3	3.3	4.4
.....

Population

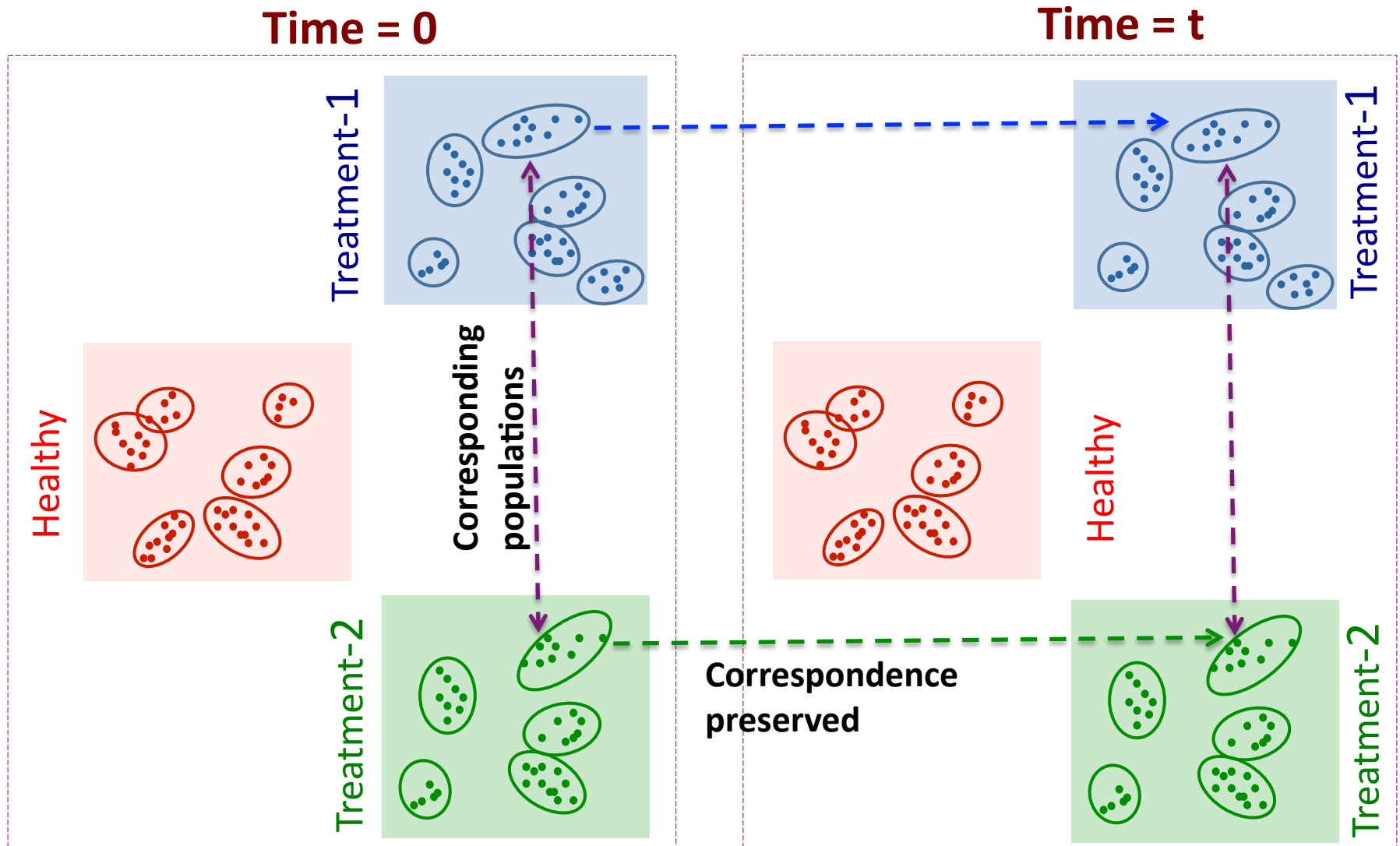


Clustering

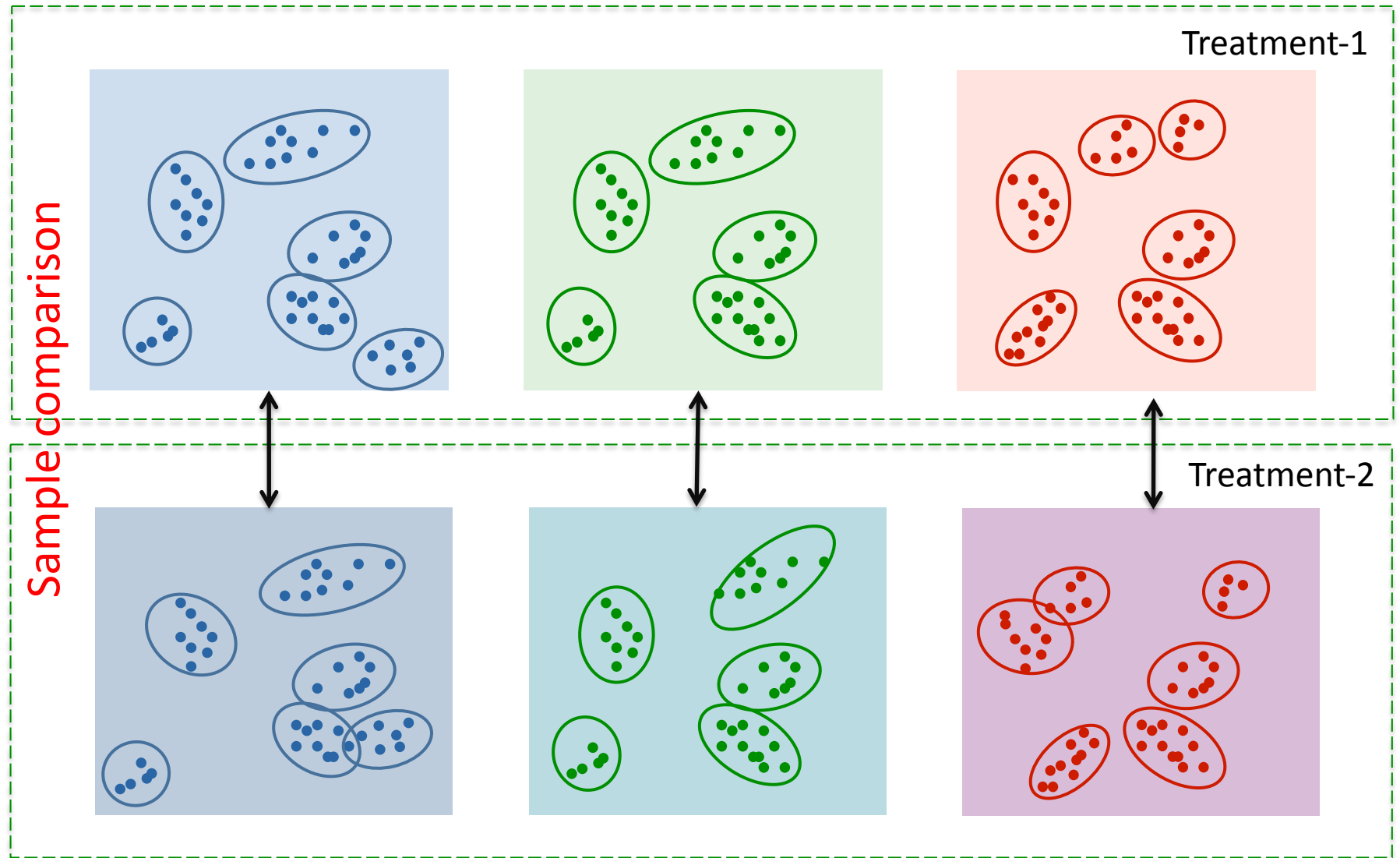


Scatter plot

Challenge-4: Correlated populations across treatment arms



Three samples of a class at each time point



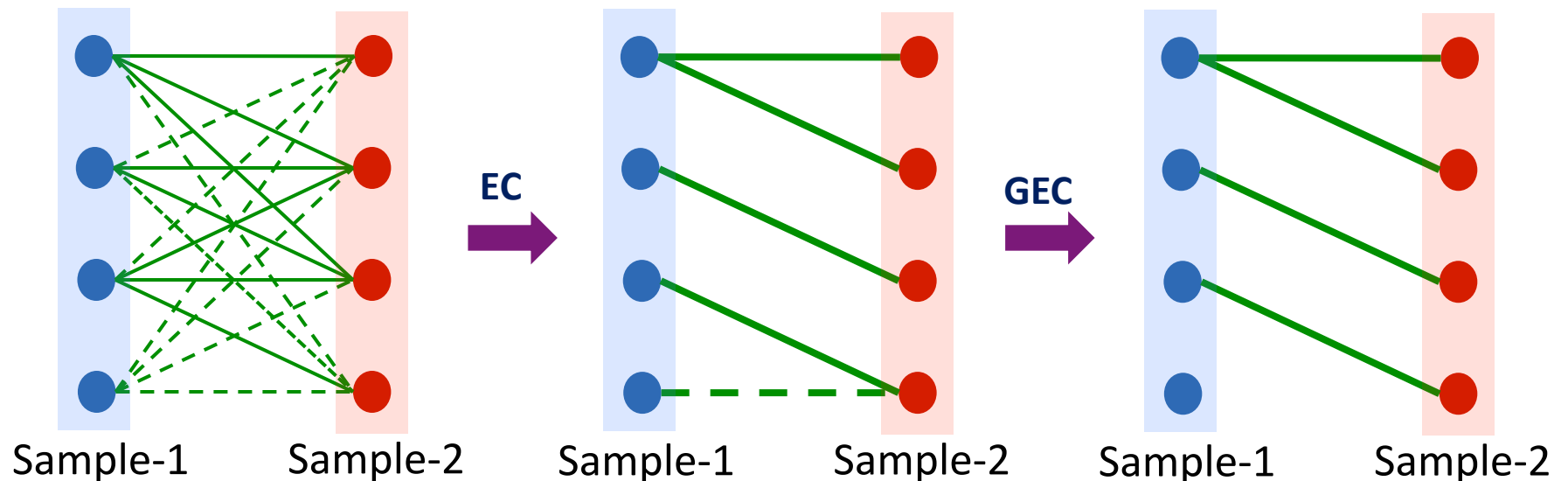
Approach: Two Levels

- 1. Lower Level:** Registration of populations (clusters) across each pair of samples
- 2. Upper Level:** Overall representation of samples of a particular class using Templates.

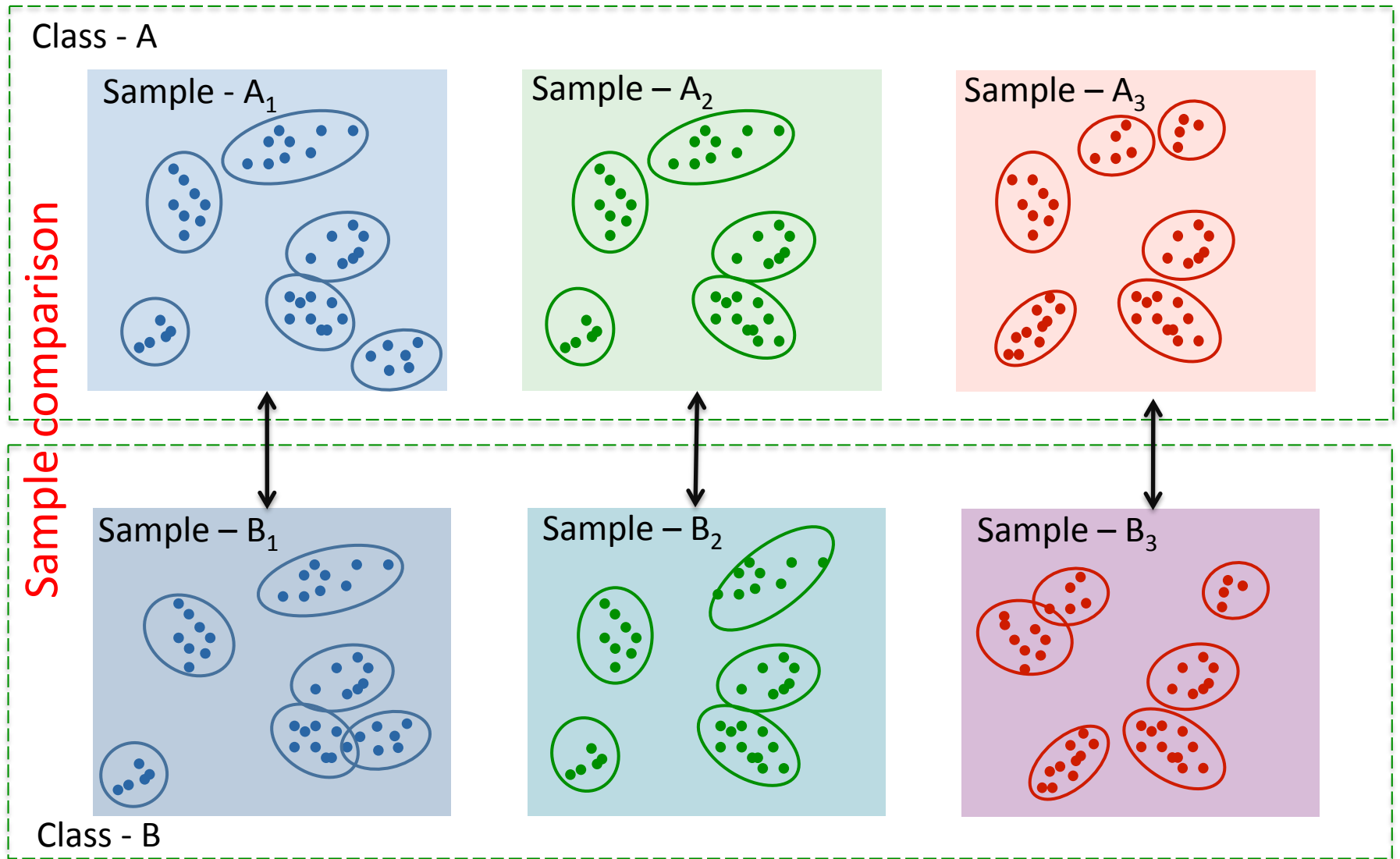
1. Registration/matching of population across a given pair of Samples

- A **generalized edge cover (GEC)** is an edge cover which allows few uncovered vertices at the cost of a penalty (λ).

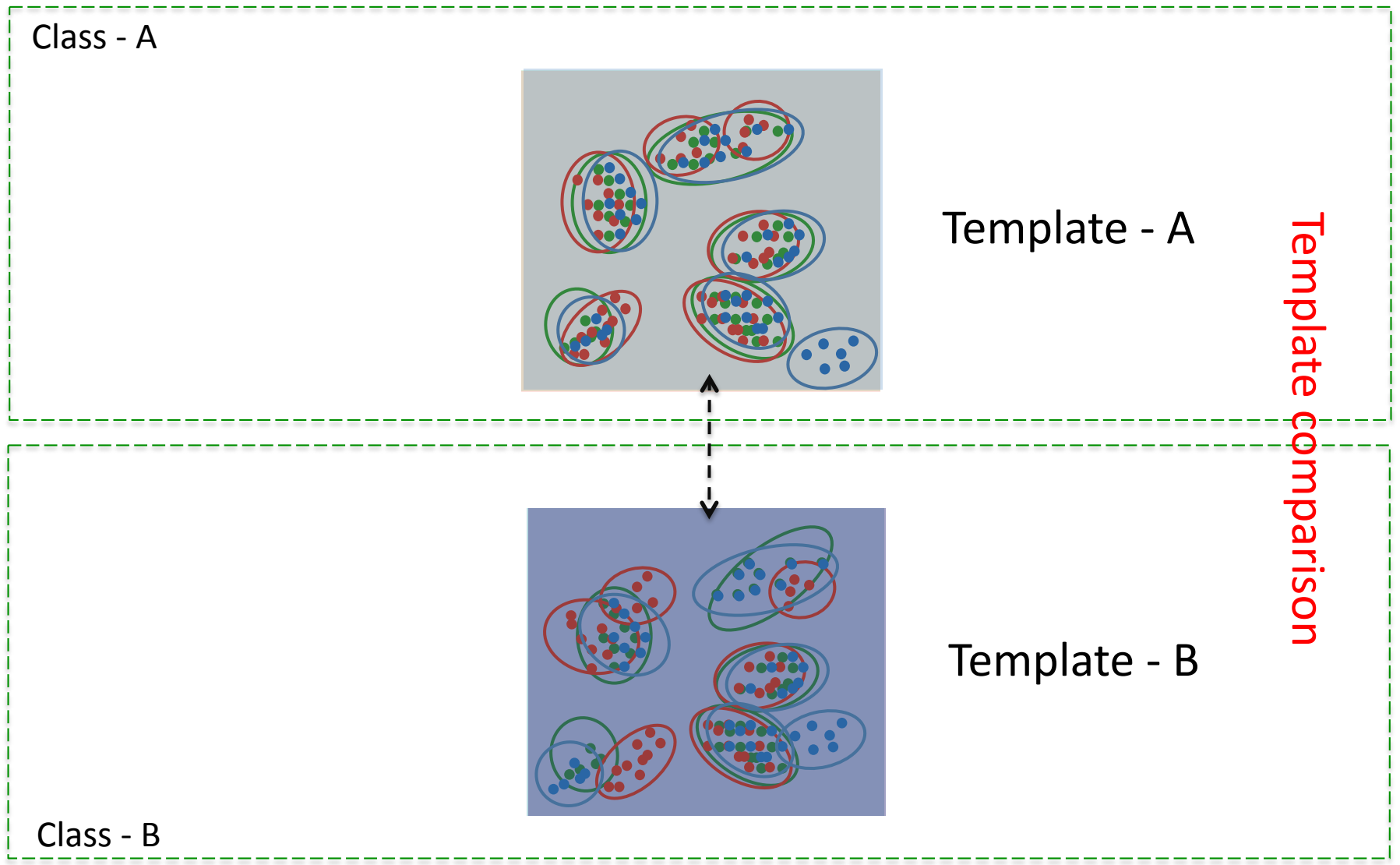
- Objective function:
$$\min \left(\sum_{(v_i, v_j) \in EC} c_{ij} + \lambda * |V_{uc}| \right)$$



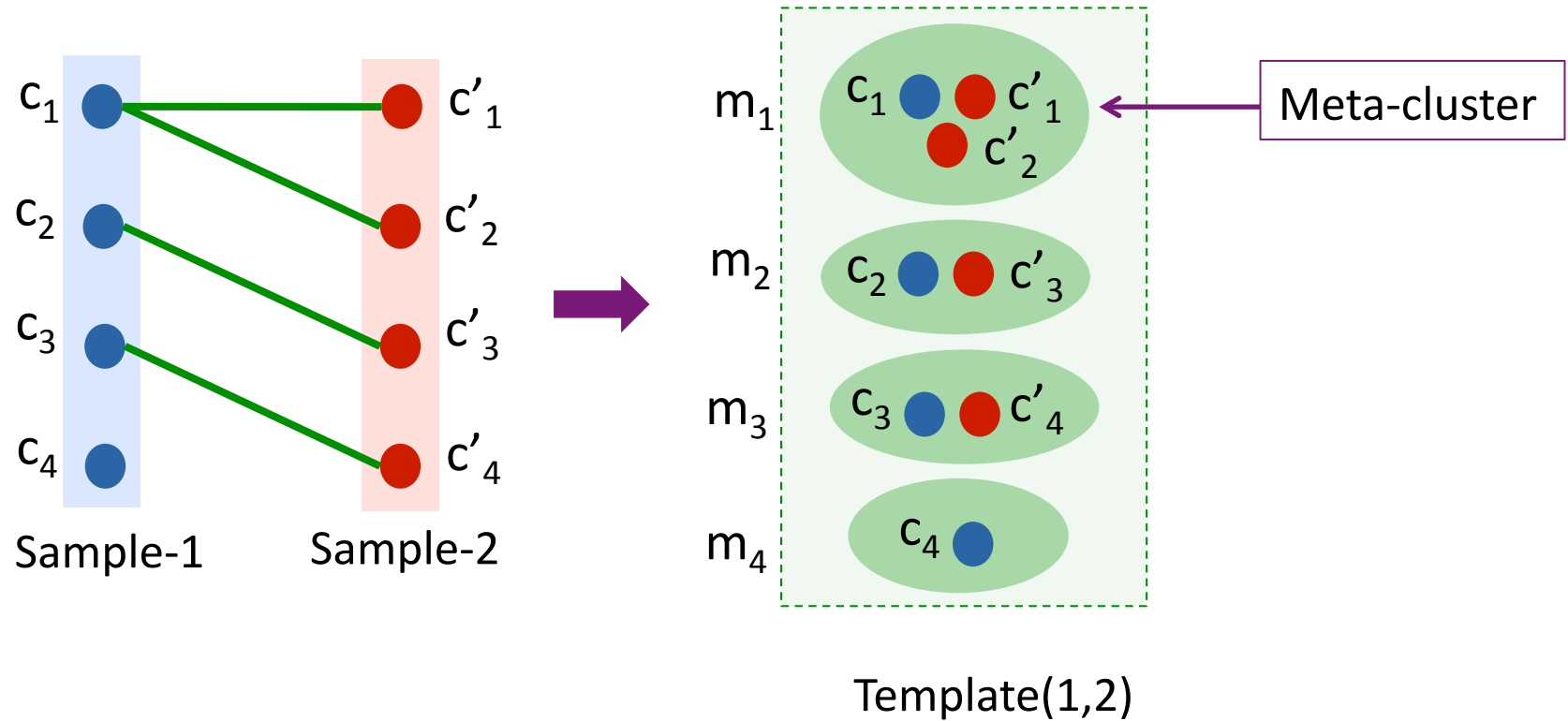
2. Instead of comparing populations/ clusters sample by sample ...



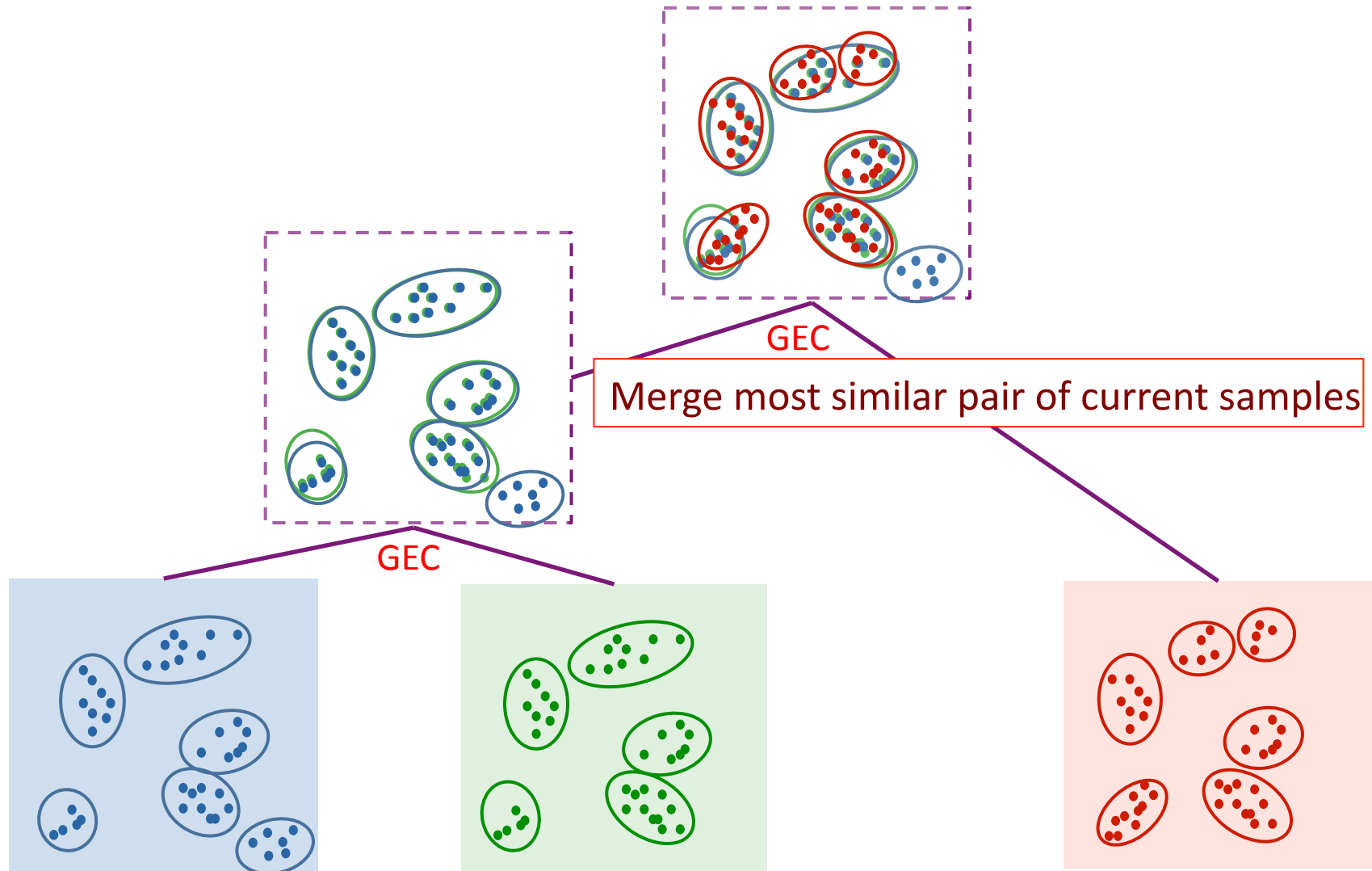
We can compare meta-clusters across templates



How to create a template from a pair of samples



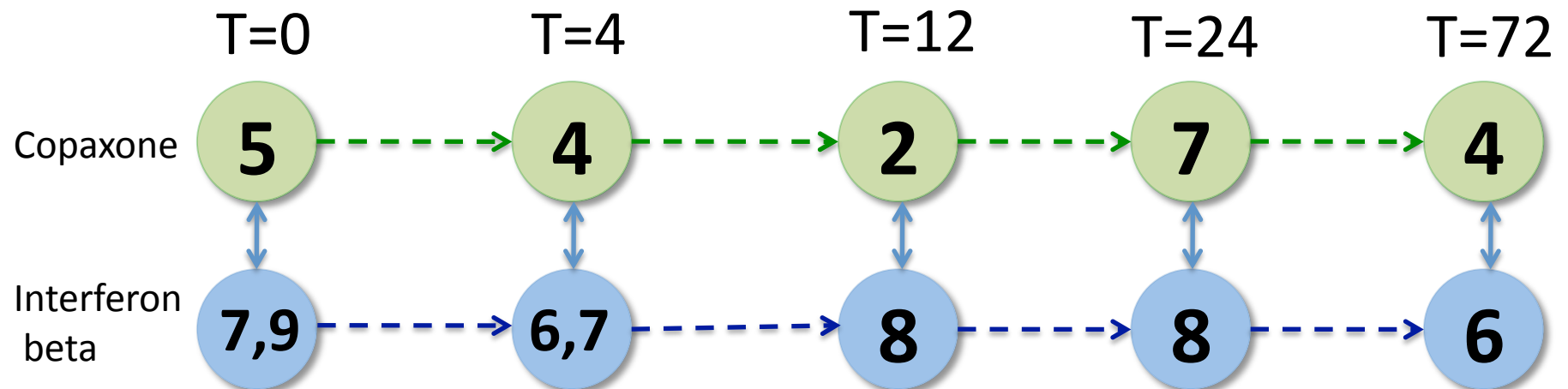
How to create template for a class by hierarchical merging



What we did: Correlated populations across treatment arms

- At each time point create distinct templates for each of the three classes of samples
- Match templates across time points to follow the progression of populations defined by the corresponding meta-clusters.
- Populations are correlated across treatment if correspondence of meta-clusters is preserved.

Correlated populations across treatment arms



- Each number is a meta-cluster at a time point.
- The correspondence is preserved in two treatment arms

Summary

- Any clustering can be used to start with
- Samples of a particular class can be represented using Templates
- Templates can be compared to find corresponding meta-clusters across classes.