Analysis of Embryo Cell Trajectory with Co-clustering Techniques

WU Zihan

February 29, 2024

Introduction to Embryo Cell Trajectory Analysis

- Objective: to analyze the trajectory of cells in an embryo and its relationship with cell fate or cell category.
- Importance: highlight the importance of understanding cell trajectories for advancing developmental biology and potential medical applications.

Methodology Overview

- **Stochastic Modeling:** e.g. Drift-diffusion model, Heston model, etc.
- **Classification and Analysis:** the stochastic models can reveal an expected trajectory pattern and variance characteristics, which can be used to classify embryos and cells based on observable trajectories.

Feature Analysis

- **Local Features:** Features that are pointwise and related to time, thus related to fate of the embryo. e.g. curvature, torsion, etc.
- **Global Features:** Features that are related to the overall trajectory of the cell, such as the winding number, basic group, etc.

Co-clustering and Connections

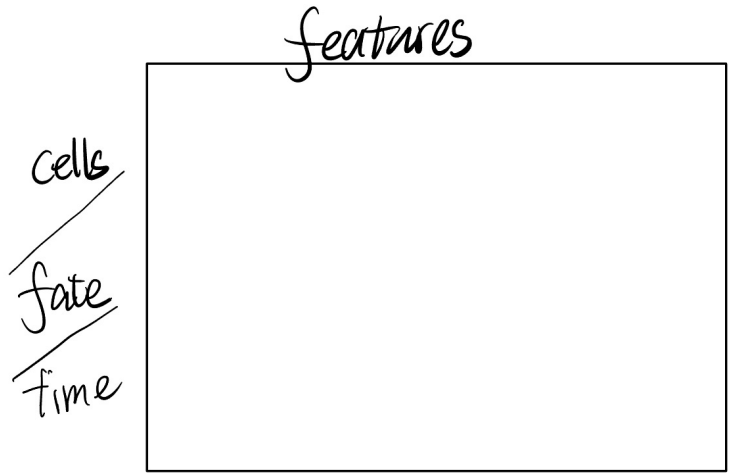

Figure: Co-clustering matrix

Conclusions and Discoveries

- **Cell prospective:** e.g. Cell of category A tends to have a trajectory with a higher winding number, etc.
- **Time/Fate prospective:** e.g. During the phase changing, the variance of the trajectory tends be maximum, etc.