

Multi-lineage inference from vector integration sites in gene therapy essay

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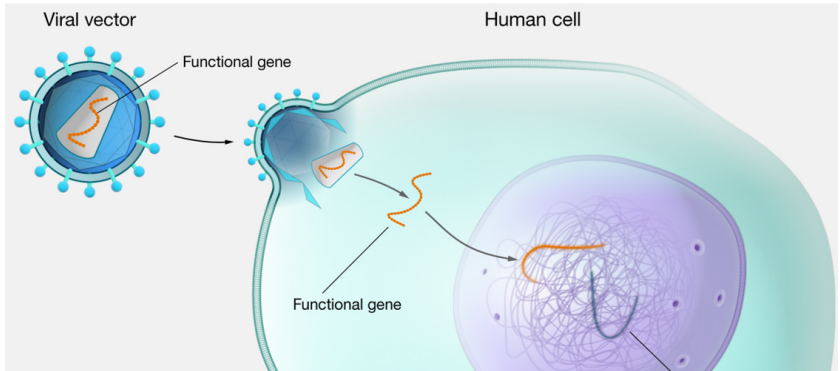
Problem description

Gene therapy

Gene therapy applications are employed to recover the functionality of a defective gene, causing a disease in the patient.

Specifically, a viral vector is used to insert in the patient cells genome, the correct sequence of the defective gene, to restore its functionality.

During cell replications, the cells with the “missing” gene will be replaced by the cells carrying the correct sequence.

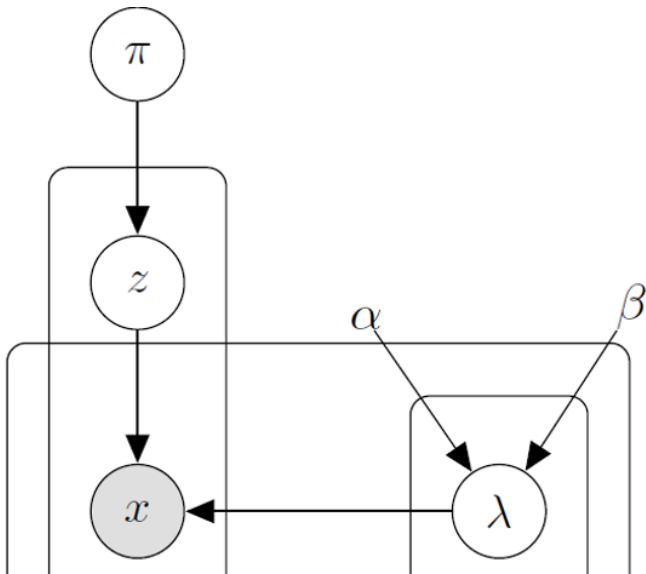


Model description

- ▶ mixture model main idea
- ▶ why poisson mixture model
- ▶ why multivariate normal

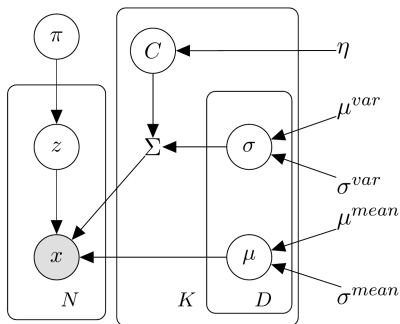
Poisson mixture model

- ▶ probabilistic graphical model
- ▶ why it did not work



Multivariate Normal mixture model

► model specifications ecc



$$\begin{aligned}\pi &\sim \text{Dirichlet}(\alpha), \alpha = (\alpha_1, \dots, \alpha_k) \\ z_n &\sim \text{Categorical}(\pi) \\ \mu_{k,d} &\sim \text{Normal}(\mu^{mean}, \sigma^{mean}) \\ \sigma_{k,d} &\sim \text{Normal}(\mu^{var}, \sigma^{var}) \\ C_k &\sim \text{LKJ}(\eta) \\ x_n &\sim \text{MVN}(\mu_{z_n}, \Sigma_{z_n})\end{aligned}$$

Figure 2: Probabilistic graphical model.

Stochastic Variational Inference

- ▶ Why it's used \rightarrow to approximate the posterior
- ▶ the main formula

Pyro implementation

- ▶ model and guide ecc

Results

- ▶ application of the models ecc