

CN Assignment 4

Name: Erwin Wu
Affiliation: Koike Lab
Student ID: 17M38147

Impression on Gene Expression Regulatory

The class held on Jan.18th talked about regulatory of gene expression. As we all know, gene is a sequence of DNA or RNA which codes for a molecule that has a function. While gene expression is the process by which information from a gene is used in the synthesis of a functional gene product. During gene expression, the DNA is first copied into RNA. The RNA can be directly functional or be the intermediate template for a protein that performs a function.

As a result, gene expression is a step for DNA becoming proteins (or RNAs), several steps in the gene expression process may be modulated. While gene expression regulatory gives the cell control over structure and function and is the basis for cellular differentiation, morphogenesis and the versatility and adaptability of any organism.

Gene expression can be regulated by complex network, which can be called as gene regulatory network (GRN). It is a collection of molecular regulators that interact with each other and with other substances in the cell to govern the gene expression levels of mRNA and proteins. During the classes, the teacher introduced several examples of GRN. One of them is the Gene Regulatory Network of WNT, giving a figure of signaling pathway with RNA Seq. data, from which I learnt that estimation of causality is more important than finding co-expressions.

Another network introduced by the teacher is Bayesian Network. It is a probabilistic graphical model that represents a set of variables and their conditional dependencies via a directed acyclic graph, which means it is good at dealing with node dependencies. That's why the teacher mentioned a paper about "Using Bayesian Network Inference Algorithms to Recover Molecular Genetic Regulatory Networks"^[1]. Which let us know that Bayesian Network and mutual information are effective to extract gene expression regulatory networks.

For my research, since I am in the field of deep learning algorithms, it's quite

important to learn different data's feature to design the deep learning network. Recognizing that gene expressions are often highly correlated, I believe it is also possible to apply deep learning to Gene Expression Regulatory. Through this class, I gain great knowledge about how Complex Network is related with Genome Science especially for gene expression. And I also learned that the complex network analysis is also applicable to gene expression regulatory networks. Which means we can use the same methods dealing with them in the future.

[1] YU, Jing, et al. Using Bayesian network inference algorithms to recover molecular genetic regulatory networks. In: International Conference on Systems Biology. 2002.