Utah Transcriptome Pharmer

PROCESS BOOK

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Overview and Motivation

The input to our central nervous system (our brain / central processing unit) is the peripheral nervous system (PNS). This system is composed of thousands of single cells that send projections periphery to the central nervous systems (spinal cord and brain). Each cell in the PNS is different either in 1) where it innervates (finger tip, muscle, skin, hair), or 2) what it detects. These two factors determine the sensation of the cells. To sense/detect the environment, each cell has a constellation of ion channels, that when stimulated (by heat, touch, movement, cold, etc.) open and conduct ions through these specific channels into the cell, which activate the cell. The cell then transmits this signal back to the CNS. Studying this region of the body is important for developing new non-opioid drugs.

Drug discovery has two main avenues. 1) discovery of new ultra-specific molecules, 2) discovering new drug targets. To find novel drug targets enlisting the aid of transcriptomics is a new and exciting field. Past genomic work has focused on the genome of animals. The genome is the information that all cells follow to their fate (what they eventually end up doing). This information is useful for finding genome wide associations for mutations that may cause specific diseases. But, this information is useless for finding cell specific targets for drugs. This is because all cells have an identical genome, making it useless for the identification for unique drug target. The central dogma of biology that each cell follows to its function fate is,

genome/cDNA ==(transcription)==> **transcriptome/mRNA** ==(translation)==> **proteome/proteins**

During this process the genome becomes more informative, with the translation of cDNA to mRNA. During this process each cell (which has the same genome) develops an unique transcriptome specific to the function and sensation this cell has. The transcriptome is the information that the cell uses to define itself from all other cells. This information provides the instructions to build the proteins that that make the cell. This includes the ion channels that define the sensation of each cell. **Thus, each cell has a unique transcriptome that defines its functions/in this case what it senses**. Recent efforts have developed extensive databases of this information to aid researchers in the pursuit of new drug targets, but these databases are difficult for a general biologist or researcher in the pursuit of new drug targets to access.

Related Work

Anything that inspired you, such as a paper, a web site, visualizations we discussed in class, etc.

Questions

What questions are you trying to answer? How did these questions evolve over the course of the project? What new questions did you consider in the course of your analysis?

Data

Source, scraping method, cleanup, etc.

Exploratory Data Analysis

What visualizations did you use to initially look at your data? What insights did you gain? How did these insights inform your design?

Design Evolution

What are the different visualizations you considered? Justify the design decisions you made using the perceptual and design principles you learned in the course. Did you deviate from your proposal?

Implementation

Describe the intent and functionality of the interactive visualizations you implemented. Provide clear and well-referenced images showing the key design and interaction elements.

Evaluation

What did you learn about the data by using your visualizations? How did you answer your questions? How well does your visualization work, and how could you further improve it?