Application of Bioinformatics in Genetics Research

Instructors:

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Course web page: http://zhoulab.net/GMS6014/home.html for classroom practices, lecture notes, homework, etc.

Application of Bioinformatics in Genetic Research

Time and location:

MWF : 12:00-1:00

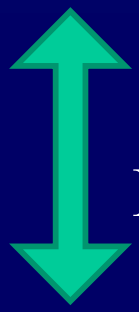
CGRC-291

Evaluation

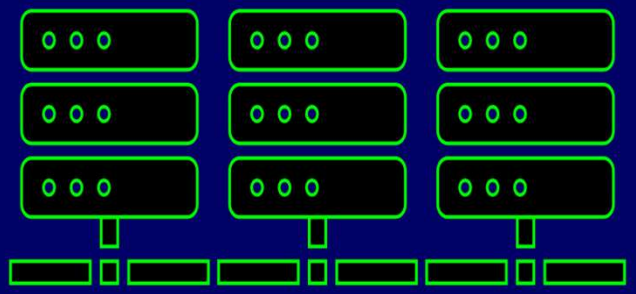
- 50% classroom participation
  - Discussion.
  - Be ready to share your screen.
- 50% homework

Required facility

- **Your own laptop**
  - **Browser(s)**
  - **text editor**
  - **Some programs**



FTP programs such as **FileZilla**



- **HiPerGator**
  - **All Linux/Unix programs**
  - **Large dataset processing.**

Practice

Practice: Download and install a text editor

Rule of thumb for managing a bioinformatics project:

- Make a folder for each program / project.
  - Make a GMS6014 folder for the class
- Do NOT have space in folder and file name, consider using "_" to separate words.

History of bioinformatics – sequence analysis

- Sequence comparison
    - Similarity search
    - Phylogenetic analysis
- Structure predication
- Gene prediction
- Genomics, omics, and systems biology

Bioinformatics in the post genome era

The opportunity provided by genome sequence and genomic / proteomic technology is matched by the challenge to bioinformatics / computational biology

- **Information Representation.**

  - many new types of data, such as *Function*, *Location*, *Interaction*, *Regulatory pathway*, *Expression profile, etc. needs to be recorded*

- **Data Management**

  - Infrastructure for inputting, managing, access and retrieval of relevant information in a "sea of databases". Cloud computing.

- **Systematics**

Bioinformatics in the post genome era

- Whole genome sequencing - SNP and whole genome wide association studies.
- Genomic/proteomic expression profiling (RNA and protein levels, single cell sequencing).
- Epigenomics, Comparative genomics, …
- Regulatory pathway simulation – systems biology.

Overwhelmed by data?

Objectives of GMS6014

- Basic skills for retrieving and storing data, using web-based bioinformatics tools.
- Ability to install and run standalone local applications.
- Understanding the basis of bioinformatics applications using sequence similarity search as the example.
- An introduction to HTS analysis & HiPerGator
- Power of AI in the new era of bioinformatics