TIGP Bio 2021 Spring Syllabus
Advanced Statistical Methods in Bioinformatics (S2)

Place: Room 107, New Building of the Institute of Information Science, Academia Sinica.

Time: Thursday 9:00-12:00

Chair: Dr. Grace S. Shieh (gshieh@stat.sinica.edu.tw)

Outline: Introduction to useful and advanced statistical methods in computational biology. The topics include: Analysis of next generation sequencing (NGS) Data (e.g., RNA-Seq and ChIP-Seq), maximum likelihood estimation, the EM algorithm, Bayesian inference, Monte Carlo methods, Resampling (Bootstrap & permutation test), Human Genetics, clustering and classification, dimension-reduction and missing data.

Textbook: N/A

Reference book: papers will be given by instructors

TA: N/A **(Please refers to the lectures respectively shall you have any questions of each class)**

E-mail: Contact the Lecturers Directly.

Office hours: N/A

Grades: Midterm exam 50%. Final exam 50%.

Note: For **Non-BP student** to register/sit-in any BP course, it is required to gain course chair's permission and follow the steps:

(1) Submit the hard copy or PDF file of the completed TIGP Bioinformatics Course Registration Consent Form to the TIGP BP office

(2) Provide the information via the google form at BP Class Enrollment Information.

The deadline for above requirement is the 4th week of each semester. Signature of corresponding BP Course Chair should be collected and incomplete form will not be accepted.

※Course grade will **NOT** be given (even class enrollment is completed at school) if fail to follow the above procedures.

For the most up-to-date syllabus, please visit https://tigpbp.iis.sinica.edu.tw/tigpbio/index.html

Week	Date	Topics/Brief Description	sub-topics/Detail Descriptions	Lecturers
1	2021/02/25	Analysis of NGS data I	N/A	Dr. Hao Ho
2	2021/03/04	Analysis of NGS data II	N/A	Dr. Hao Ho
3	2021/03/11	Maximum likelihood estimates and the EM algorithm I	Maximum likelihood estimates	Dr. Yen-Tsung Huang
4	2021/03/18	Maximum likelihood estimates and the EM algorithm II	The EM algorithm	Dr. Yen-Tsung Huang
5	2021/03/25	Bayesian methods	Bayesian methods	Dr. Grace S. Shieh
6	2021/04/01	Monte Carlo Markov Chains	Monte Carlo Markov Chains	Dr. Shin-Sheng Yuan
7	2021/04/08	Resampling methods I	Bootstrap	Dr. Grace S. Shieh

8	2021/04/15	Midterm Exam		
9	2021/04/22	Resampling methods II	Permutation test, jacknife	Dr. Grace S. Shieh
10	2021/04/29	Clustering, classification and data visualization (I)	Clustering: K-Means, Hierarchical Clustering, Cluster Validation	Dr. Han-Ming Wu
11	2021/05/06	Clustering, classification and data visualization (II)	KNN, Decision Tree, Support Vector Machine, Data visualization in R	Dr. Han-Ming Wu
12	2021/05/13	Statistics in Human Genetics I	Concept of Statistical Genetics, International Genomic Projects, Linkage Analysis	Dr. Hsin-Chou Yang
13	2021/05/20 @Webex	Statistics in Human Genetics II	Genetic Association, Gene-Gene interaction, Rare Variant Analysis	Dr. Hsin-Chou Yang
14	2021/05/27 @Webex	Advanced regression and dimension reduction I	N/A	Dr. Shin-Sheng Yuan
15	2021/06/03 @Webex	Advanced regression and dimension reduction II	N/A	Dr. Shin-Sheng Yuan
16	2021/06/10	Final Exam		