

Bioinformatics Program (Bio)

Introduction

Academia Sinica has established the Taiwan International Graduate Program (TIGP) in collaboration with a consortium of key national research universities in Taiwan. The purpose of the program is to develop the research manpower pool in those modern multidisciplinary fields that are important in the future economic and social development of Taiwan and to enhance the innovative potential and academic standards of research in these and related fields.

TIGP will offer Ph.D. programs in only selected disciplines to be agreed upon between Academia Sinica and its national research universities partners. It is the objective of the Program to offer Ph.D. degree programs only in areas in the physical sciences, applied sciences, engineering, biological and agricultural sciences, health and medical sciences, and humanities and social sciences.



Academia Sinica will assume principal oversight of the academic options of the Program. It will provide the intellectual leadership, the research resources, and the research and physical facilities. Qualified and interested faculty members of the participating national research universities are invited to join the various programs as affiliated faculty of the Program, and participate in the teaching of courses, supervision of research, and mentoring of the international graduate students.



The TiGP Program on “Bioinformatics”

The Taiwan International Graduate Program has been established to attract highly qualified young researchers both from home and abroad in order to help jump-start the development of several frontier areas that are crucial to the future development in science and technology. Specific graduate programs have been developed to enhance the innovative potential and academic standards of research on these and related fields. Within this context, the graduate program on “Bioinformatics” is designed to offer specific training and research opportunities to Ph.D. students interested in working on this particular area.

The TiGP Program on Bioinformatics (BP) is a joint-degree program sponsored by Academia Sinica (Institute of Information Science, Institute of Statistical Science, and Institute of Biomedical Sciences), National Tsing Hua University, National Chiao Tung University, National Yang-Ming University, and National Taiwan University. Additional teaching support will be available from other major research universities in Taiwan. Unlike most Bioinformatics programs offered in other universities that adopt existing courses in various departments, our courses are specifically designed for BP students and taught by active and experienced researchers in bioinformatics. The program provides interdisciplinary training and research opportunities that seamlessly integrate the related areas so that students can be well-prepared for independent research in these new, fascinating areas of bioinformatics. We will focus on genetics and proteomics study and emphasize data transfer, data analysis, biological information and biological feature extraction, knowledge management using advanced computation methodologies and computer science technology.

Research Topics

- (1). Biological knowledge management: This area focuses on the integration of various heterogeneous databases, biological knowledge representation, automation of pipeline experiments, and the construction of various annotation databases. In addition, biological literature mining is also a crucial component.
- (2). Bioinformatics: This area focuses on developing software systems to automatically analyze and using existing tools to analyze high-throughput biological sequence data, microarray data, mass spectrometry data, image data, etc. Algorithms and probabilistic models will be established. Furthermore, statistical methods and data mining techniques will be also used to reach the goal of “information-driven biomedical research.”
- (3). Computational biology: This area focuses on the design of computational methods for sequence analysis, gene prediction, disease gene mapping, motif finding, gene network construction, protein structure prediction and classification, automated biomolecule docking, and molecular dynamics modeling.



Faculty Members

Academia Sinica Institute of Information Science

Dr. Hsu, Wen-Lian

Ph.D. Cornell University
Analysis of algorithms; Graph theory; Search methods in artificial intelligence; Bioinformatics; Computational biology; Computational linguistics; Natural language understanding; Intelligent agent systems

Dr. Sung, Ting-Yi

Ph.D. New York University
Bioinformatics for mass spectrometry-based proteomics; Bioinformatics for biomarker discovery; Computational biology.

Dr. Tsai, Huai-Kuang

Ph.D. National Taiwan University
Evolutionary algorithm; Bioinformatics; Regulatory mechanism; Metagenomics

Institute of Biomedical Sciences

Dr. Hwang, Ming-Jing

Ph.D. University of Pittsburgh
Bioinformatics; Computational biology; Systems biology

Dr. Jou, Yuh-Shan

Ph.D. Michigan State University
Cancer genomics; Molecular cancer biology; Bioinformatics

Institute of Statistical Science

Dr. Li, Ker-Chau

Ph.D. University of California Berkeley
Bioinformatics; Systems biology; Lung cancer studies; High dimensional data analysis; Large ensembles of time series; Medical image analysis; Machine learning; Statistical graphics; Bayesian computation; Regression; Censoring; Experimental design; Survey sampling

Dr. Shieh, Shwu-Rong Grace

Ph.D. University of Wisconsin-Madison
Analysis of next generation sequencing data (e.g. ChIP- seq) and genomics data; Using genetic interactions to develop cancer therapeutics; Constructing gene networks/predicting pathway components

Dr. Yang, Hsin-Chou

Ph.D. National Tsing Hua University
Statistical genetics/genomics; Disease gene mapping; Population genomics; Omics data analysis

Dr. Yuan, Shin-Sheng

Ph.D. University of California, Los Angeles
Microarray data analysis; Drug response mechanism; Medical imaging data analysis; Manipulating mass spectra database

Dr. Liu, Wei-chung

Ph.D. Imperial College London
Mathematical biology; Theoretical ecology; Quantitative epidemiology; Network biology; Sociology; Systems biology

Dr. Yeang, Chen-Hsiang

Ph.D. Massachusetts Institute of Technology
Cancer genomics; Molecular evolution

Dr. Huang, Yen-Tsung

MD National Taiwan University
Biostatistics; Integrative Genetics; Integrative Genomics

Dr. Chen, Hsuan-Yu

Ph.D. National Taiwan University
Bioinformatics; Epidemiology and biostatistics; Integrative cancer biology; Personalized medicine

Research Center for Applied Sciences

Dr. Lin, Jung-Hsin

Ph.D. University of Duisburg
Pharmacoinformatics; Computational biophysics; Bioinformatics; Structural biology; Molecular simulations
Biodiversity Research Center

Dr. Li, Wen-Hsiung

Ph.D. Brown University
Evolutionary genomics; Molecular evolution; Bioinformatics and computational biology; Population genetics; Human genetics

Dr. Tang, Sen-Lin

Ph.D. in Microbiology at University of Melbourne
Microbial ecology and diversity; Microbial genomics (Metagenomics); Computational biology

Dr. Wang, John

Ph.D. Stanford University
Genetics, genomics, behavior, and evolution of social insects; Evolution of genome size in nematodes

Dr. Wang, Dar-Yi

Ph.D. National Taiwan Ocean University
Metagenomics; Evolutionary genomics

Genomics Research Center

Dr. Yang, An-Suei

Ph. D. The Johns Hopkins University
Computational protein design; Recombinant antibody engineering; Protein-protein interaction; Computational structural biology; Structural bioinformatics; Phage display of antibody libraries; Synthetic antibody fragment library construction

Dr. Chuang, Trees-Juen

Ph.D. National Chiao Tung University
Bioinformatics and computational biology; Comparative & evolutionary genomics post-transcriptional modification; Systems biology; Primate evolution; Genome annotation

Institute of Plant and Microbial Biology

Dr. Hsing, Yue-le

Ph.D. Agronomy, University of Illinois
Construction of a tagged rice population for functional genomics analysis; Utilization/studies of the TRIM mutant resources; Analysis of advanced rice anther transcriptomes; Positional cloning and characterization of important rice mutants; Re-annotation of genes encoding LEA proteins in the rice and soybean genomes; Characterization of LEA proteins; Collection and characterization of wild rice and soybean in Taiwan; Sequencing of *Oryza nivara*, an annual wild rice

Dr. Chen, Pao-Yang

Ph.D. Oxford University
Next generation genetics; DNA methylation in plants; DNA methylation landscape in plants, animals, and human

Institute of Chemistry

Dr. Hsu, Chao-Ping

Ph.D. California Institute of Technology
Charge transport and energy transfer in advanced materials; Dynamic description of biological systems

Agricultural Biotechnology Research Center

Dr. Chen, Ho-Ming

Ph.D. Taiwan International Graduate Program, National Chung Hsing University
Small RNA Function; Genome of non-model organism

Institute of Molecular Biology

Dr. Lue, Jun-Yi

Ph.D. Yale University
Genetic incompatibility and speciation; Experimental evolution and genomic analysis of genetic buffering
National Tsing Hua University

Institute of Bioinformatics and Structural Biology

Dr. Yang, Lee-Wei

Ph.D. University of Pittsburgh
Structural and dynamics bioinformatics/biophysics, with a focus on predictions of protein/RNA conformational changes and allosteric effects using a spectrum of physics models including fine/coarse-grained MD simulations, elastic network models and linear response theories;

Theories and algorithm development for better prediction of correct druggable sites and protein-DNA/protein-protein docking interfaces; in-silico peptide design of which the efficacy is verified by experiments.

National Chiao Tung University Institute of Bioinformatics and Systems Biology

Dr. Lu, Horng-Shing Henry

Ph.D. Cornell University
Scientific computing; Image science; Bioinformatics

Dr. Yang, Jinn-Moon

Ph.D. National Taiwan University
Bioinformatics systems biology; Drug design; Systems biology

Dr. Chu, Jhih-Wei

PhD. Massachusetts Institute of Technology
Biosystems simulation; Drug discovery; Protein conformational dynamics

National Yang-Ming University Institute of Biomedical Informatics

Dr. Yang, Ueng-Cheng

Ph.D. Princeton University
Analysis of pathway; Bioinformatics analysis on disease candidate genes and mechanisms

Dr. Chang, Chuan-Hsiung

Ph.D. University of Southern California
Comparative genomics; Genome design and engineering; Synthetic biology

Dr. Huang, Hsuan-Cheng

Ph.D. National Taiwan University
Network biology; Systems biology; Bioinformatics

Dr. Wu, Kun-Pin

Ph.D. National Taiwan University
Algorithms; Computational proteomics

Dr. Huang, Jie-Rong

Ph.D. University of Cambridge
Structural biology; Intrinsically disordered proteins; Molecular dynamics simulation; NMR spectroscopy

Dr. Lin, Chen-Ching

Ph.D. National Taiwan University
Network Biology; Computational Biology; Bioinformatics

Dr. Huang, Yen-Hua

Ph.D. Cambridge University (The Wellcome Trust Sanger Institute)
NGS data analysis and integrated interpretation; Annotation of new genomes and comparative genomics; Human gene expression profile analysis and regulatory circuit reconstruction

National Taiwan University Graduate Institute of Biomedical Electronics and Bioinformatics

Dr. Lin, Charlie Chung-Pen

Ph.D. University of Texas
VLSI EDA; Microprocessor Design

Dr. Huang, Nien-Tsu

Ph.D. University of Michigan
Bio-MEMS; Optical-MEMS; Microfluidics; Bio-sensing; Cell Manipulation in Microenvironment; Micro/Nano Fabrication Techniques

Dr. Kuo, Po-Ling

Ph.D. Harvard University
Biophysics; Mechanobiology; Biomechanics; Tissue engineering; Medical ultrasound

Dr. Lai, Liang-Chuan

Ph.D. University of Illinois at Urbana Champaign
Using microarray or next generation sequencing to explore the cancer genomics

Dr. Lu, Tzu-Pin

Ph.D. National Taiwan University
Bioinformatics; Microarray and NGS data analysis; Computational Biology

Dr. Tseng, Y. Jane

Ph.D. University of Illinois, Chicago
Computational Chemistry and Toxicology; Metabolomics; Bioinformatics; Cheminformatics; Health informatics

Dr. Chen, Chien-Yu

Ph.D. National Taiwan University
Bioinformatics; Data Mining; Machine Learning

Dr. Oyang, Yen-Jen

Ph.D. Stanford University
Bioinformatics; Knowledge Engineering; Machine Learning

Dr. Chuang, Eric Y.

Ph.D. Harvard University
Biochip Bioinformatics; NGS; Radiation Biology; Cancer Biology; Bioinformatics

Dr. Lee, Hsin-Yu

Ph.D. University of California, San Francisco
Cellular Biology; Molecular Biology; Endocrinology

Dr. Sun, Wei-Zen

M.D. National Taiwan University
Pain medicine; Acupuncture and Moxibustion; Anesthesiology

Dr. Tsai, Mon-Hsun

Ph.D. National Taiwan University
Bioinformatics; Cell Biology; Microarray; Radiation Biology

Dr. Lin, En-Chung

Ph.D. Iowa State University
Bioinformatics; Functional Genomics and Proteomics; Biological Statistics; Animal Breeding

Dr. Huang, Hsiao-Chun

Ph.D. Harvard University
Molecular Cell Biology; Systems and Synthetic Biology; Biological Statistics; Cell Division

Dr. Juan, Hsueh-Fen

Ph.D. National Taiwan University
Genomics; Bioinformatics; Proteomics



Courses

There are four types of courses: (1) Required courses: courses to be taken by all students; (2) Core Courses I (Required): basic courses in molecular biology, computational methods, statistical methods, and programming; and (3) Core Courses II (Mandatory): advanced courses or related topics in molecular biology, computational methods, and statistical applications in biology; and (4) Elective Courses: any other courses offered by TIGP or partner universities that are approved by the Committee Board of BP.

*One additional course is required for students registered with National Chiao Tung University: Thesis in Bioinformatics

1. Required courses: Teaching Assistant

TA experience is recognized as an essential training in our program. Thus all students in TIGP-BP must serve as TA for at least one semester. TA is obligated to: 1) attend the orientation of TIGP-BP; 2) meet with students in the first class and announce TA office hours (Minimum hour: 2 hours per week); 3) respond to the students' questions and homework assignment on regular basis; 4) TA shall arrange a Review Session other than office hour upon students' request; 5) TA is obligated to show up during office hours regardless students' attendance; 6) Monitor midterm, final exam and qualifying exam.

Lab Rotation

Lab rotation is designed to help students familiarize with the potential advisor(s), research topics and their future working environment. This course is required to be taken for at least 1 year (2 semesters); students are welcome to take more than two semesters of Lab Rotation with different labs.

Student Presentation

This course aims to train students' skills in reading, thinking and presenting scientific papers. Students are asked to present papers and actively interact with other classmates and coaching teacher(s) in class. All students should join discussion actively, and 2 years (4semesters) of Student Presentation courses are required for graduation.

Seminar

Professors from Academia Sinica and Partner Universities will give talks in this course. Students can expect to learn the expertise and interest of studies of each professor in the Program. Students are required to take 3 years (6semesters) of Seminar Courses.

Chinese Class (Required for International Students)

All international students are required to take one year course of Mandarin Chinese.

2. Core Courses I:

- Basic Molecular for Bioinformatics I
- Biological Computing
- Fundamental Statistical Methods in Bioinformatics Programming (Python)

3. Core Courses II:

- Basic Molecular Biology for Bioinformatics II
- Advanced Algorithms
- Advanced Statistical Methods in Bioinformatics

4. Elective Courses:

- Any other courses offered by TIGP or partner universities that are approved by the Curriculum Committee of BP.

Academic System

Faculty members with different research expertise are invited to participate in the TIGP-BP program. This program adopts a team-teaching system, where each faculty member teaches one or several subjects according to his or her expertise. All courses are offered in English.

Students are required to advance to doctoral candidacy by the end of the third academic year.

A thesis advisor has to be a core faculty member of TIGP-BP. Except for National Yang-Ming University, students need to find another thesis advisor (or at least a co-advisor) at the collaborating department of the registered university if the main advisor is not a faculty member of the registered university.

Different graduation requirements will apply based on the university that students register at respectively:

	NTHU	NCTU	NYMU	NTU
1st Year	Find an advisor before the end of 1st year.			
3rd Year	1. Complete all course requirements. 2. Pass TIGP Qualifying Exam. 3. Students of NCTU has to pass Oral Exam on Research Plan			
4th Year	P a s s N T H U O r a l E x a m research plan.	-	-	-
5th - 7th Year	Graduation			

Degree Requirements

1. Students must publish at least two bioinformatics-related papers in international journals or conferences. The levels of the journals/conferences, quality of the paper, and other special cases will be assessed by TIGP-BP Academic Committee. Students must be the first author of the papers; TIGP Bioinformatics and the university which the student registers with must be listed in the author's affiliations section of the papers.
2. Ph.D. degree thesis.
3. Successful defense of the degree thesis, in which the candidate must show that she/he has made original and substantial scientific contributions

Admission to the Ph.D. Program

The Program only takes admission in every Fall semester. The following documents and qualification are required to complete admission application:

1. Bachelor or Master degree in biology, computer science, statistics or other related areas. Note: Students who only have Bachelor degree can only register at NYMU after admission
2. Fluency in English: A minimum TOEFL score of 550 (213 on computer-based), or IELTS score of 6. Applicants in Taiwan can take the General English Proficiency Test (GEPT) instead. Applicants are required to submit their High-intermediate level certificate when applying for admission. However, this can be waived for those who have obtained bachelor or master degrees from English-speaking countries.
3. GRE score from the general exam: For the Bioinformatics Program, an applicant may submit one of the following materials in place of a GRE general test score:

- Any evidence of research ability, such as papers published in international conferences or journals.
 - Satisfactory highly-esteemed performance in any course or project work related to computer algorithms or statistics, such as discrete mathematics, algorithms, computational complexity, data structure, probability, computer architecture, compiler, and computer programming.
4. Evidence of basic programming skills
 5. A Statement of Purpose that includes a research plan
 6. Applicant Self-Evaluation Form
 7. Official transcripts from academic institutions attended after senior high school
 8. Three letters of recommendation
 9. GRE score from related subject exam (highly recommended, but not mandatory)

Application can be submitted through the on-line application system (recommended) <http://db1x.sinica.edu.tw/tigp/index.php> or by post to:

Admissions Office

Taiwan International Graduate Program No. 128, Section 2, Academia Road Nankang, Taipei 11529 Taiwan

The submitted application materials will not be returned to applicants under any circumstances. The complete application materials should be received by TiGP before March 31st.



Student Status and Degree Conferral Policy

For administrative reasons, students will need to officially register at our partner institutions, i.e., National Tsing Hua University, National Chiao Tung University or National Yang-Ming University, depending on their research interests. Upon completion of the Ph.D. study, students will receive a diploma of Ph.D. degree from the designated partner institution and a certificate jointly signed by the President of Academia Sinica and the President of the partner institution.

Cost of Study

The payment of tuition fees (about US\$1,060 per year) is due upon registration. University does not accept a late payment. Students are required to find their own financial support prior to arriving in Taiwan.

Fellowship and Stipends

TIGP fellowship support of monthly NT\$34,000 (around US\$1,060) is guaranteed for the first year (except violation of the school policy or occurrence of serious misconducts). Students will be evaluated at the end of each semester, the amounts they receive in the subsequent two years may reduce subject to the students' performances. The stipend will be provided only for the first six semesters at maximum. The first fellowship will be given in the second month (October) after school starts.

From the seventh semester, thesis advisor will be responsible for the financial support.

Medical Insurance

Six months after the students receive their Alien Resident Certificate (ARC), the students will be qualified for Taiwan's National Health Insurance Program. The students are expected to pay the same premium as all the Taiwan citizens and will be entitled to the same medical coverage.

Living and Housing

On campus

Self-catering student dormitory providing single study bedrooms is available to TIGP students at reasonable costs (for details please visit the housing section of TIGP website: <http://tigp.sinica.edu.tw/Accommodation.html>).

Off campus

Private housing is generally more expensive. Rents for off-campus flats with 2-3 rooms range from NT\$12,000 - 20,000 (US\$375 - 625, facility expenses excluded) per month.

Correspondence and Information

For general information concerning TIGP, please contact:

Ms. Huan-Yi Shen Administrative Assistant

Taiwan International Graduate Program 128, Section 2, Academia Road Nankang, Taipei 11529, Taiwan
E-mail: tigp@gate.sinica.edu.tw Tel.: 886-2-2789-8050
Fax: 886-2-2785-8944

For general information concerning TIGP, please contact:

Dr. Wen-Lian Hsu

Program Coordinator & Director, Institute of Information Science E-mail: hsu@iis.sinica.edu.tw

Dr. Ting-Yi Sung

Admission Committee Chair
E-mail: tsung@iis.sinica.edu.tw

Ms. Rebecca Wu

Assistant to the Bioinformatics Program Institute of Information Science Academia Sinica
128, Section 2, Academia Road Nankang, Taipei, Taiwan 11529
E-mail: tigp.bio@gmail.com
Tel: 886-2-2788-3799 ext 2356
Fax: 886-2-2782-4814

Website Information

Taiwan International Graduate Program (TIGP), Academia Sinica
<http://tigp.sinica.edu.tw/>

TIGP-Bioinformatics Program
<http://tigbbp.iis.sinica.edu.tw/tigpbio/>

Institute of Information Science, Academia Sinica
http://www.iis.sinica.edu.tw/index_zh.html

