Bioinformatics Course on Microbial Genomics and Applied Artificial Intelligence
Department of Microbiology
Faculty of Medicine
The Chinese University of Hong Kong

Course Rundown

Monday 25 March 2024		
09:00 – 09:30	Registration	Administrator
09:30 – 09:45	Welcome event and Orientation	Department Chair Prof. Margaret IP
09:45 – 11:15	**Course 1: Principle of Next Generation Sequencing and Bioinformatics in Microbiome Study** *(This course introduces the principle of NGS and bioinformatics, study design, sample processing and library preparation etc.)*	Dr. Zigui CHEN
11:15 – 11:30	Coffee break	
11:30 – 13:00	**Course 2: Human Microbiome Shotgun Metagenomics** *(This course introduces the workflow how to analyze shotgun metagenomic sequences of stool samples, including QC trimming, taxonomy profiling using MetaPhylAn4, function prediction using HUMAnN3, de novo assembly using SPAdes, and long-read sequencing using PacBio and Nanopore platforms etc.)*	Dr. Zigui CHEN
13:00 – 14:00	Lunch break	
14:00 – 15:30	**Course 3: Principal of Applied Artificial Intelligence (AI) in Biomedicine** *(This course covers fundamental concepts of AI, including machine learning and deep learning algorithms, and their applications in various areas of biomedicine such as medical imaging, genomics, drug discovery, and clinical decision-making.)*	Prof. Dominik HEIDER
15:30 – 15:45	Coffee break	
15:45 – 17:15	**Course 4: AI in Antimicrobial Resistance and Infectious Disease Control** *(This course provides insights into the role of AI in disease surveillance, early detection, diagnosis, and prediction of drug resistance. It also explores ethical considerations, privacy concerns, and regulatory frameworks associated with implementing AI in infectious disease control.)*	Prof. Dominik HEIDER

Tuesday 26 March 2024		
09:30 – 11:00 11:15 – 12:45 (Elective 1)	**Computer Practice 1: AI Modelling** *(The course provides students with hands-on exercises and real-world case studies and learn how to apply AI modelling techniques to solve complex problems in areas such as data preprocessing, feature engineering, model selection, and predictive analytics)*	Prof. Dominik HEIDER
11:00 – 11:15	Coffee break	
12:45 – 14:00	Lunch break	
14:00 – 15:30	**Course 5: Principal of Molecular Evolution and Phylogeny in Microbiome Study** *(This course introduces the theory, principle and practices of human microbiome molecular evolution and phylogeny, including sequencing alignment, phylogenetic tree construction etc.)*	Dr. Sishuo WANG
15:30 – 15:45	Coffee break	
15:45 – 17:15	**Course 6: Bacterial Metagenome-Assemble and Molecular Genomics** *(This course introduces how to generate human microbiome metagenome-assembled genomes using de novo assembly and binning algorithms, followed by gene annotation, bacterial pan genome analysis, virulence factor and microbial resistance gene identification)*	Dr. Sishuo WANG

Wednesday 27 March 2024		
09:30 – 11:00	**Course 7: Human Microbiota 16S Amplicon Sequencing and Statistical Learning** *(This course introduces human microbiota 16S amplicon NGS and bioinformatics, including OTU generation using QIIME2 and function prediction using PICRUSt2, and Alpha-/Beta-diversity analyses using multiple biostatistical methods)*	Dr. Zigui CHEN
11:00 – 11:15	Coffee break	
11:15 – 12:45	**Course 8: Human Virome Transcriptome in Infectious Diseases** *(This course introduces the workflow of human virome transcriptome profiling using RNAseq and bioinformatics pipelines. We will take SARS-CoV-2 NGS sequences as example to assembly the virus whole genome, subgenomic RNAs, and gene expressions)*	Dr. Zigui CHEN
12:45 – 14:00	Lunch break	
14:00 – 15:30 15:45 – 17:15 (Elective 2)	**Computer Practice 2: Microbial Metagenomics and Bioinformatics** *(The course provides practical training in analyzing microbial communities using metagenomic data analysis pipelines and computational approaches to study microbial diversity and functions)*	Dr. Zigui CHEN
14:00 – 15:30 15:45 – 17:15 (Elective 3)	**Computer Practice 3: Molecular Evolution and Phylogeny** *(The course provides practical experience in analyzing genetic sequences, constructing phylogenetic trees, understanding evolutionary relationships within microbial communities, and exploring the diversity and evolutionary dynamics of microorganisms in the context of microbiome studies)*	Dr. Sishuo WANG
15:30 – 15:45	Coffee break	
17:15 – 17:45	Certificate presentation and closing ceremony	Department Chair Prof. Margaret IP