



## Channing Microbiome Seminar

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## Global Metabolic Interaction Network of the Human Gut Microbiota

Despite recent advances in knowledge of the microbial diversity inside the human gastrointestinal tract, the global interaction structure between the myriad microbial species, and its influence on host health and disease remains poorly understood. To better understand the emergent properties arising from the interactions between human gut microbes, we constructed a global network model based on interspecies cross-feeding relationships. We used transport reaction information from public databases (e.g. KEGG, BioCyc, CAZy, TransportDB), from published genome-scale metabolic models, and from literature annotations to identify small-molecule metabolic compounds that are imported and/or exported by microbes found to reside in the human gut. Next, we defined an interaction between two microbes when one class of species can uptake a metabolic compound that is secreted by another (i.e. interspecies cross-feeding). Following this approach, we linked all interacting microbes into a global Microbe-Microbe Network. Using microbiome samples collected from patients across four clinical phenotypes, we super-imposed each sample's microbial abundance information upon our Microbe-Microbe Network, thereby removing low-quantity species (i.e. nodes), along with their interactions (i.e. edges). This led to interaction networks specific to individuals, and, in turn, networks specific to phenotype. Interestingly, we identified network-based topological features, as well as enrichment of biologically meaningful interspecies interactions, unique to each clinical phenotype.

*Short bio: Jaeyun's research interests lie primarily in the biomolecular complexity of human health and disease. His expertise lies in the large-scale analysis of biological "big data" to develop novel algorithms and network models for personalized medicine. Jaeyun received his BS in Chemical Engineering at the Georgia Institute of Technology, and his PhD in Chemical and Biomolecular Engineering from the University of Illinois at Urbana-Champaign. Currently, he works as a postdoctoral researcher at the Asia Pacific Center for Theoretical Physics (APTCP) at the Pohang University of Science and Technology (POSTECH) in Pohang, South Korea. His main work at APCPT involves taking a systems biology perspective into understanding and characterizing the intimate and vital relationship between humans and the microbial organisms living inside their bodies.*

Hosted by Yang-Yu Liu