Statistical Computing and Artificial Intelligence: A Smart Health Project as An Example

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The Academia Sinica funded Smart Health project (http://sites.stat.sinica.edu.tw/SH/) is composed of researchers from three institutes (Biomedical Science, Information Science, and Statistical Science) with two primary data sources, the Taiwan Biobank (TWB, https://www.twbiobank.org.tw/index.php) and the Taiwan Precision Medicine Initiative (TPMI, https://tpmi.ibms.sinica.edu.tw/www/en/). TWB is collecting blood/urine/genetic data with surveyed phenotypes and medical images of 200,000 community-based participants across Taiwan. In comparison, TPMI will have genetic profiles and clinical information of 1,000,000 participants from 33 hospitals in Taiwan. It is possible to link the TWB participants to the National Health Insurance Research Database (NHIRD), Taiwan, with almost all 23 million population. On the other hand, with more than 30 working groups, each with a specific combination of diseases and treatments, the TPMI aims to optimize the clinical practice of precision medicine and identify genetic risks for diseases in Taiwan. Besides TWB and TPMI, the Smart Health project is also establishing a network with the major medical centers in Taiwan for collaborative research and developing real-world products in smart health.

In this talk, we shall report how statistical computing and artificial intelligence interact in analyzing the vast and complex data from TWB and TPMI and developing related real-world medical informatics products for the collaborating hospitals in the Smart Health project. We shall also try to touch the following additional interplays: between academia and medicine, between data scales, between projects and expertise, between academia and industry, and between knowledge and real-world applications.