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The Systems Biology Verification Endeavor: Harness the Power of the Crowd to Address Computational and Biological Challenges

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Abstract : Systems biology relies on large numbers of data points and sophisticated methods to extract biologically meaningful signal and mechanistic understanding. For example, analyses of transcriptomics and proteomics data enable to gain insights into the molecular differences in tissues exposed to diverse stimuli or test items. Whereas the interpretation of endpoints specifically measuring a mechanism is relatively straightforward, the interpretation of big data is more complex and would benefit from comparing results obtained with diverse analysis methods. The sbv IMPROVER project was created to implement solutions to verify systems biology data, methods, and conclusions. Computational challenges leveraging the wisdom of the crowd allow benchmarking methods for specific tasks, such as signature extraction and/or samples classification. Four challenges have already been successfully conducted and confirmed that the aggregation of predictions often leads to better results than individual predictions and that methods perform best in specific contexts. Whenever the scientific question of interest does not have a gold standard, but may greatly benefit from the scientific community to come together and discuss their approaches and results, datathons are set up. The inaugural sbv IMPROVER datathon was held in Singapore on 23-24 September 2016. It allowed bioinformaticians and data scientists to consolidate their ideas and work on the most promising methods as teams, after having initially reflected on the problem on their own. The outcome is a set of visualization and analysis methods that will be shared with the scientific community via the Garuda platform, an open connectivity platform that provides a framework to navigate through different applications, databases and services in biology and medicine. We will present the results we obtained when analyzing data with our network-based method, and introduce a datathon that will take place in Japan to encourage the analysis of the same datasets with other methods to allow for the consolidation of conclusions.

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