MINE法を用いた新規振動物質検出法の開発

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Circadian rhythm, a physiological phenomenon that oscillates in a cycle of 24 hours, is an endogenous system widely observed ranging from fungi to mammalians. Molecular-level relationships among circadian rhythms and various psychiatric disorders, such as mental illness and sleep disorder, have been proved. The elucidating molecular networks consisting oscillating molecules taking use of quantitative molecular profiling techniques, such as proteomics, is important to understand both biological systems and develop novel medical treatments. However, classical analytical methods are not enough accurate to analyze quantitative omics datasets with low sampling frequency. Thus, the development of novel analytical methods to detect oscillating molecules for low sampling frequency datasets is required. Here, we developed new algorithm named Maximal information coefficient-based oscillation prediction (MICOP) for estimating oscillating molecules robust against noise and low frequency. First, receiver operating characteristic curve showed that the MICOP has the same performance as the existing method widely used. Second, we indicated that MICOP is compatible for low sampling frequency such as 12 sampling points per day. Finally, we reanalyzed mice time series proteome data and identified novel oscillating protein candidates. MICOP provides high accuracy and sensitive oscillation detection approach to analysis molecular networks of quantitative molecular profiling techniques.