Title:

Joint Modeling of Exercise Response and Circadian Pattern in Transcriptome Dynamics   
for 15 Rat Tissues

Abstract:

In the Molecular Transducers of Physical Activity Consortium (MoTrPAC), we seek to understand the acute exercise response at the molecular level. In our first multi-omics dataset—a 15 tissue dataset from 6-month-old rats—there was evidence that circadian rhythms were contributing to data signatures, and thus, our ability to differentiate these circadian patterns from our primary measurement—the acute exercise response. To quantify the effects, we created distinct models for acute exercise response and circadian rhythm. We combined the models and allowed them to simultaneously compete for the percent variance explained of gene expression patterns in bulk RNA sequencing data. Analyses were performed on every gene and every tissue. Preliminary evidence suggests that our models were on the right track; for instance, the variances of many known circadian genes (in human and mouse) were primarily explained by the circadian model. However, more analyses are required to rigorously vet these models. We hope these techniques of competing models encourage others to employ similar strategies to distinguish unintended cofounding factors in experiments.