

Using the codes

In addition to sample data and impulse response files, two open-source MATLAB codes are provided from (Pendar et al., 2016) so that a user can perform the extended Tikhonov and the dimension reduction methods with their own experimental data. To calibrate the methods, it is necessary to find the impulse response of the system; this has been explained in detail previously in (Pendar and Socha, 2015). Briefly, to find the impulse response in a flow-through respirometry system, a short pulse of CO₂ should be injected into the respirometry chamber, and this injection should be recorded concurrently with the data recorded by the gas analyzer. The recording should be continued until the CO₂ signal completely vanishes. The recorded signal is the impulse response of the system, and it is specific to each custom respirometry setup (i.e., tubing connection, respirometry chamber, flow rate, etc.). The signal should be saved as a text file with the name 'ImpulseResponse.txt'. This file should contain two columns: time and CO₂ concentration. The sampling rate should be as same as the data-recording rate during the experiments. After finding the impulse response, the experimental data from the organism of interest can be corrected using the two methods described here. The experimental results should be saved in a text file with the name 'Data.txt' and it should contain two columns: time and gas concentration. The executed code recovers the true signal and saves it as a text file with the name 'Recovered_Tikhonov.txt' or 'Recovered_DimensionReduction.txt', based on the method of choice. The output file contains three columns: time, original signal, and the corrected signal.

Pendar, H. and Socha, J. J. (2015). Estimation of Instantaneous Gas Exchange in Flow-Through Respirometry Systems: A Modern Revision of Bartholomew's Z-Transform Method. *PLoS ONE* **10**, e0139508.

Pendar, H., Socha, J. J. and Chung, J. (2016). Recovering signals in physiological systems with large datasets. Submitted manuscript. <https://github.com/TheSochaLab/Extended-Tikhonov-and-Dimension-Reduction-methods-for-data-recovery>.