

ACMS Statistics Seminar

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Tuesday, November 3
3:30 PM EST
(zoom link below)



Airflow recovery from thoracic and abdominal movements using Synchrosqueezing Transform and Locally Stationary Gaussian Process Regression

Airflow signal encodes rich information about the respiratory system. While the gold standard for measuring airflow is to use a spirometer with an occlusive seal, this is not practical for ambulatory monitoring of patients. Advances in sensor technology have made measurement of motion of the thorax and abdomen feasible with small inexpensive devices, but estimating airflow from these time series is challenging. We propose to use the nonlinear-type time-frequency analysis tool, synchrosqueezing transform, to properly represent the thoracic and abdominal movement signals as the features, which are used to recover the airflow by locally stationary Gaussian process regression. We show that, using a dataset that contains respiratory signals under normal sleep conditions, an accurate airflow prediction, and hence a physiological quantity, inspiration respiration ratio, can be achieved by fitting the proposed model in the feature space both in the intra- and inter-subject setups. We also apply our method to a more challenging case, where subjects under general anesthesia underwent transitions from pressure support to unassisted ventilation to further demonstrate the utility of the proposed method.

This is joint work with Yu-Min Chung (Math and Stat, UNC-Greensboro), Yu-Bo Wang (SMSS, Clemson), Jeff Mandel (Anesthesiology & Critical Care, UPenn), and Hau-Tieng Wu (Math and Stat, Duke).

The preprint of this work can be found at: <https://arxiv.org/pdf/2008.04473.pdf>

Zoom Link: <https://bit.ly/3e3RgEL>

Meeting ID: 946 0293 4721

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The Department of Applied and Computational
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