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**Machine learning analysis of the exhaled human breath** MUKESH K, RAHUL TRIPATHI, MAHESH V. PANCHAGNULA, RAGHUNATHAN REN-GASWAMY, Indian Institute of Technology Madras — Human exhaled breath is predominantly turbulent. During exhalation, air is forced to flow out of the lung through the trachea as a result of the contraction of diaphragm. The air passes through the throat and oral cavity. We attempt to validate the hypothesis that turbulent exhaled flow carries a signature of the source of generation i.e., the geometry of the upstream flow region. Based on this hypothesis, we explore the possibility whether humans can be classified based on the turbulent signatures in their exhaled breath. We employ machine learning practices to test the hypothesis. Features from the available time series data were extracted using MFDDFA, a technique widely used for determining the fractal scaling properties and long-range correlations in the time series. The features are attributes of the multifractal spectrum of exhaled velocity data. Machine learning algorithms such as logistic regression, decision trees, boosting trees were used in an ensemble model for classification in our study. The accuracy in binary classification of a majority of subject combinations was above 75% which signifies the existence of some uniqueness in an individual's exhaled breath. This could be used as a tool to characterize the person-to-person variation in extrathoracic morphology.

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