Reducing the Environmental Impact of Aviation: A Data Mining Approach to Instantaneous Estimation of Fuel Consumption

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The environmental impact of aviation is enormous given the fact that in the US alone there are nearly 6 million flights per year of commercial aircraft. This situation has driven numerous policy and procedural measures to help develop environmentally friendly technologies which are safe and affordable and reduce the environmental impact of aviation. However, many of these technologies require significant initial investment in newer aircraft fleets and modifications to existing regulations which are both long and costly enterprises. In this talk we present an anomaly detection method based on Virtual Sensors to help detect overconsumption of fuel in aircraft which relies only on the data recorded during flight of most existing commercial aircraft, thus significantly reducing the cost and complexity of implementing this method. The Virtual Sensors developed here are ensemble-learning regression models for detecting the overconsumption of fuel based on instantaneous measurements of the aircraft state. This approach requires no additional information about standard operating procedures or other encoded domain knowledge. We present experimental results on data sets from three large commercial operations. To the best of our knowledge, this is the first study of its kind in the aviation domain.