THE DEVELOPMENT OF AUTOMATED ANALYTICAL METHODS TO PREDICT FUEL PROPERTIES BY UNATTENDED SOFTWARE

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The Naval Research Laboratory, as part of the Navy Fuels & Lubes IPT rapid fuel quality surveillance initiative, is currently developing a stand-alone software package that can provide an accurate prediction of jet and diesel fuel specification properties using only *in situ* sensor data. Sensor data from near-infrared spectroscopy, Raman spectroscopy, and capillary gas chromatography are being used in this work. In order for this package to perform adequately regardless of operator expertise, automated data assessment and pretreatment tools need to be developed based on the requirements of the analysis itself. Automated tools such as these have critical prerequisites such as a universal or immediately quantifiable applicability, so that they can be used on either all of the sensor data or only certain facets of the data, at the software's own unattended discretion. It is also vital that the predicted specification properties be presented with a realistic measure of the associated uncertainty that would allow operators of all relevant skill levels to assess the reliability of the results. This involves the development of novel methodologies to propagate not only the modeling errors, but also data quality and the uncertainties inherent in the reference ASTM measurements that are used to develop the predictive models. Specific problems, such as the aforementioned error quantification, model creation and maintenance, and data preprocessing, have already been addressed. This presentation will discuss some of the analysis challenges encountered so far in the creation of the software package as well as the novel solutions that have been applied to overcome said challenges, focusing on the mathematical and statistical methodology.