



Criminalistics Section – 2008

B135 Statistical Discrimination of Liquid Gasoline Samples From Casework

Nicholas D.K. Petraco, PhD, John Jay College of Criminal Justice, Department of Science, 899 10th Avenue, New York, NY 10019*

After attending this presentation, attendees will be given a demonstration of how techniques from computational pattern recognition and statistical learning theory can be applied to evidence analysis.

The intention of this study was to differentiate casework liquid gasoline samples by utilizing multivariate pattern recognition procedures on data from gas chromatography-mass spectrometry. A supervised learning approach was undertaken to achieve this goal employing the methods of principal component analysis, canonical variate analysis, orthogonal canonical variate analysis and linear discriminant analysis.

The study revealed that the variability in the sample population was sufficient enough to distinguish all the samples from one another knowing their groups a priori. Canonical variate analysis was able to differentiate all samples in the population using only three dimensions while orthogonal canonical variate analysis required four dimensions. Principal component analysis required ten dimensions of data in order to predict the correct groupings. These results were all cross-validated using the "jackknife" method to confirm the classification functions and compute estimates of error rates. The results of this initial study have helped to develop procedures to use multivariate analysis applicable to fire debris casework.

Gasoline, Chromatography, Multivariate Pattern Recognition