Statistical interpretation of chemical evidence pertaining to fire debris

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Stellingen/Propositions

1. The use of peak tables as a means for performing multivariate analysis of chromatographic data leads to unnecessary information loss.

2. Peak detection for chromatographic data is not necessarily a decision problem; rather it is a matter of assessing the probability of observing particular patterns in a signal, given specific assumptions.

3. Baseline correction methods for chromatography frequently couple assertions regarding peak versus non-peak regions with the task of estimating the shape of a baseline; while peak locations are helpful in estimating a baseline, the baseline shape need not influence peak detection.

4. The quality of likelihood-based assertions regarding forensic hypotheses is inherently determined by the quality and appropriateness of the forensic reference collection considered; scientifically sound probabilistic assertions in forensic casework can not be made without extensive reference data.

5. Complex chemically dissimilar classes can be statistically modelled by proxy via pairwise comparisons between similar and dissimilar classes.

6. Score-based and feature-based likelihood ratios present numerical evidential values to different forensic questions. The comparison of these numbers as alternative approaches to the same question is categorically erroneous.

7. Meaningful features for forensic comparison of fire debris can be extracted from GCxGC-MS data without the use of peak detection methods.

8. Lack of information is in and of itself informative.

“Information becomes knowledge only when its placed in context. Without it, we have no way to differentiate the signal from the noise, and our search for the truth might be swamped by false positives.”


“He won’t go far as an academic; too many tattoos”.
Nobel Laureate Daniel Kahneman, on the topic of prediction by representativeness as not statistically optimal.