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Machine learning applications in forensic pathology

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Background and aim

In forensic pathology, the cause and manner of death are determined through the integration of case circumstances, macroscopic autopsy findings, and ancillary investigations such as toxicology and histology. This assessment requires the interpretation of multiple findings that may support, be neutral with respect to, or argue against a particular cause of death. With the increasing availability of large forensic autopsy databases, machine learning approaches offer new possibilities for identifying patterns in complex forensic datastructures. The aim is to evaluate whether machine learning algorithms can classify manner and cause of death and predict cause of death from forensic autopsy data.

Methods

Supervised and unsupervised learning approaches will be applied to a large database of 20 000 forensic autopsy cases. Supervised models will be trained to identify patterns in autopsy findings that can be used to classify manner and cause of death. Unsupervised clustering methods will be used to explore latent structures within the dataset and to identify groups of cases with similar forensic characteristics. These clusters will be examined in relation to causes of death, diseases and other case variables to explore potential associations and previously unrecognized patterns of forensic relevance.

Results

For the supervised models of cause of death, the results will consist of the models themselves together with estimates of their predictive performance on previously unseen data. For the unsupervised models, the result will include clusters of cases with similar forensic characteristics and analyses of how causes of death are distributed across these clusters.

Conclusions

Machine learning approaches may provide new possibilities for analysing large forensic autopsy datasets and for identifying patterns in forensic findings associated with different causes of death. Such approaches could contribute to data-driven research and potentially support forensic pathologists in the assessment of autopsy findings.

Keywords: Cause of Death, Machine Learning