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### Letter of reference

To whom it may concern,

Vinay Bengaluru Ashwath Narayan Murthy is a student of mine, who I have supervised in his Master's thesis course within the study program Statistics and Machine Learning at Linköping University, Sweden. The title of his thesis is "Non-supervised classification of illegally produced alcohol using chemical fingerprinting" and it has been presented and defended at a final oral seminar. I have also commissioned his thesis project in my affiliation as statistician and forensic specialist at the National Forensic Centre of The Swedish Police Authority.

Vinay has in pursuing his thesis project worked very independently. All methods have been suggested by him alone, with no other guidance from me than the overall objective of the project: trying to find underlying groups in analytic measurements on seizures of illegally produced alcohol. In Sweden, a private person is not allowed to produce liquors (so-called moonshine) for private consumption or for selling (home-brewed wine and beer up to a certain percentage is allowed). Hence, in Sweden with high taxes on alcoholic products, producing your own moonshine is quite frequent, and the police must continuously endeavour to find these producers and confiscate both products and equipment for production. This work is aided by forensic investigations of whether seizures have similarities with each other (pairwise comparison), which may reveal links between producers.

However, there is no ground truth available for the data. The conclusion of the forensic investigation is reported on a scale reflecting the likelihood ratio of the proposition that two materials were produced with the same method under similar conditions (against the proposition of different production methods), but which proposition is the true one cannot be verified.

Vinay has done a great job finding promising ways of clustering the data, and further demonstrated the possibility to build a reasonable classifier for "new" materials based on the clusters identified. I therefore recommend Vinay for future employment and/or activities within this area of Statistics and Machine Learning.

Sincerely,



Anders Nordgaard

Reader and Forensic specialist in Statistics  
Linköping University and Swedish National Forensic Centre