

8.2: Read up on Machine Learning

What is the title of the paper?

The title of the paper selected for research is "Avoiding Pitfalls When Using Machine Learning in HCI Studies" by Vassilis Kostakos and Mirco Musolesi from 2017.

As the title indicates, the two authors describe what to look for when using machine learning (ML) specifically in human-computer interaction (HCI) studies. They also provide an exhaustive list of possible uses.

What are some common use cases for machine learning in practical applications or research prototypes?

In their paper, Kostakos and Musolesi mention some areas of HCI where ML is used. For example, ML can be used to model human behaviour or to predict future user behaviour. The authors also identify the development of new user interface techniques as an important area of ML. As practical examples they give gesture recognition, the optimization of system resources or the development of intelligent notification systems.

Which problems of machine learning do the authors of the paper identify? Explain one of them in detail.

The authors identify a wide range of problems that can arise when dealing with ML.

On the one hand, ML can be incorrectly used for conclusions, although the results of ML are usually difficult to interpret. Instead, mostly classical statistical methods should be used. They even emphasize that correlation or causality analysis and classical hypothesis testing must still be performed and cannot be replaced by ML prediction accuracy.

When using ML, it is also important not to forget to consider various factors: The training set must be chosen wisely and results of both - the personalized and the generic models - must be reported. For ML that is not trained with labeled data, even more caution must be exercised. As with other methods, the type of experiment - controlled or non-controlled - must be considered when choosing the ML method and care must be taken not to confuse causality with correlation.

Moreover, it may be necessary to report differences in the performance of the overall population, accuracy, baseline performance, sensitivity and specificity. Furthermore, visualization may be helpful in interpretation.

Considering the problem that outcomes are often not based on causality but on correlation, it has to be emphasized again that this is not only a problem of ML. However, an additional problem with ML is that most results from ML methods give insights into association relationships and not causality relationships. This problem is further deepened by the fact that study data are often not collected classically in study settings, but are collected through crowdsourcing, for example - In non-controlled studies, proving causality is even more difficult.

In Conclusion, it is important for the authors to create an awareness that researchers need to have a basic understanding of how ML works when using it, especially with respect to ML tools that offer little insight into their design.

What are the credentials of the authors with regard to machine learning? Have they published research on machine learning (or using machine-learning techniques) previously?

Vassilis Kostakos is Professor of Human-Computer Interaction at the University of Melbourne, head of the Human-Computer Interaction Group and has published a great many papers. According to the google Scholar website, he has an h-index of 44.

As an HCI professor, he has of course already done a lot of research in the field of HCI. In addition, he deals with ubiquitous and social computing. He has also published papers dealing with ML. An exemplary list of papers on the topic of ML or papers that involve the use of ML methods is listed below:

- Van Berkel, N., Luo, C., Anagnostopoulos, T., Ferreira, D., Goncalves, J., Hosio, S., & Kostakos, V. (2016, May). A systematic assessment of smartphone usage gaps. In *Proceedings of the 2016 CHI conference on human factors in computing systems* (pp. 4711-4721).
- Lopez, M. B., Hadid, A., Boutellaa, E., Goncalves, J., Kostakos, V., & Hosio, S. (2018). Kinship verification from facial images and videos: human versus machine. *Machine Vision and Applications*, 29(5), 873-890.
- Van Berkel, N., Goncalves, J., Hettiachchi, D., Wijenayake, S., Kelly, R. M., & Kostakos, V. (2019). Crowdsourcing perceptions of fair predictors for machine learning: A recidivism case study. *Proceedings of the ACM on Human-Computer Interaction*, 3(CSCW), 1-21.

Mirco Musolesi is Professor of Computer Science at University College London and at the University of Bologna. In 2017, however, he was a Turing Fellow at the Alan Turing Institute. His work, for example, deals with machine intelligence, autonomous systems and ubiquitous computing. According to the google Scholar website, he has an h-index of 53.

In addition to the paper presented here, he also published many other papers, including papers on the topic of ML or papers that involve the use of ML methods. An exemplary list of these is listed below:

- Mehrotra, A., Musolesi, M., Hendley, R., & Pejovic, V. (2015, September). Designing content-driven intelligent notification mechanisms for mobile applications. In *Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (pp. 813-824).
- Baron, B., & Musolesi, M. (2017). Interpretable Machine Learning for Privacy-Preserving IoT and Pervasive Systems. *arXiv preprint arXiv:1710.08464*.
- Mehrotra, A., Hendley, R., & Musolesi, M. (2017). Interpretable machine learning for mobile notification management: An overview of preminer. *GetMobile: Mobile Computing and Communications*, 21(2), 35-38.

Other sources, besides the papers listed above:

Home Page of Vassilis Kostakos: <https://people.eng.unimelb.edu.au/vkostakos/index.php> [last downloaded 2021-06-22]

Mirco Musoles – Google Scholar: <https://scholar.google.de/citations?hl=de&user=8t4SqVwAAAAJ> [last downloaded 2021-06-22]

Mirco Musoles: <https://www.mircomusolesi.org/> [last downloaded 2021-06-22]

Vassilis Kostakos – Google Scholar: <https://scholar.google.com/citations?user=JnWGV4kAAAAJ&hl=en> [last downloaded 2021-06-22]