

Using machine learning to find causality between errors in log reports

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- In the future, we may be able to explain why some errors happened.

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Current step of the research

- Bibliographical review to find the state-of-the-art in log causality.
- Planning of possible approaches to finding causality.
- Searching for the viability of possible datasets.



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Bibliographical Review

- Most approaches use heuristics to track causality.
 - Aguilera et. al. (2003) use the connections between system calls in their dataset.
 - Mace, Roelke and Fonseca (2018) use Lamport's happened-before relation.
 - Thereska et. al. (2006) use timestamps and breadcrumbs of their reports.

Bibliographical Review

- Recently, some researchers have begun using machine learning to help in this task.
 - Chen, Qi and Hou (2016) use a Bayesian algorithm.
 - Yen, Moh and Moh (2018) use a model combining a Convolutional Neural Network (CNN) and a Long Short-Term Memory (LSTM) network.
 - Zhou et. al. (2021) use a Hierarchical Attention Network.

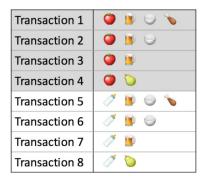
Possible approaches

• Use machine learning to track association rules in the dataset, using market basket analysis.



Market basket analysis

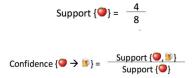
• Given a dataset with transactions, we try to find the associations between the items.



Source of the pictures: https://nextjournal.com/associationrule-mining/filter-association-rules

Market basket analysis

• Then, we find the rules are outweigh our support (proportion of transactions in which the given item/itemset/association rule holds true) and confidence (the proportion of itemsets that contain both X and Y, out of all itemsets that contain X).



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Challenges and future steps

- Continue the review, since significant discoveries in the field have been published in the last few months.
- Finding alternative approaches, in case the association rules method proves ineffective.
- Avoiding overspecialization to a specific dataset.



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Thank You



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