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Artefact: An R Implementation of the AutoSpearman Function

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***Abstract*—This artefact is the implementation of `AutoSpearman`, an automated metric selection approach based on correlation analyses. The goal of `AutoSpearman` is to automatically mitigate correlated metrics prior to constructing analytical models. This artefact is implemented as an R package and is available in the GitHub repository. We provide descriptions and R code snippets for the installation of `AutoSpearman` and usage examples.**

***Index Terms*—Software Analytics, Feature Selection, Defect Prediction, Model Interpretation, Correlated Metrics.**

I. Introduction

The interpretation of defect models heavily relies on the software metrics that are used to construct them. However, software metrics often have strong correlations among themselves and such correlated metrics may have a negative impact on the interpretation of defect models [3]. Thus, to automatically mitigate correlated metrics prior to constructing analytical models, we propose `AutoSpearman`, an automated metric selection approach based on correlation analyses, in our recent work which is published at ICSME 2018 [4]. We implement `AutoSpearman` as an R package which consists of three functions, i.e., `loadDefectDataset`, `plotVarClus`, and `AutoSpearman`. Below, we provide descriptions and R code snippets for the installation of our R package and usage examples for the package's functions.

II. The Artefact

In this section, we discuss how to set up and install the artefact, and the three functions of the artefact.

Set up and Installing the Artefact. To set up and install this artefact, we use the `install_github` function as provided by the `devtools` R package. The function installs our R package from the GitHub repository [1]. Below, we provide an R code snippet to set up and install the artefact.

```
install.packages('devtools')
library('devtools')
install_github('software-analytics/Rnalytica')
```

The loadDefectDataset function loads a collection of publicly-available defect datasets. The detailed explanation for each defect dataset can be found in the online repository. Below, we provide an R code snippet that loads the `Eclipse Platform 2` dataset as provided by Zimmermann *et al.* [6].

```
library('Rnalytica')
Data = loadDefectDataset('eclipse-2.0')
```

The plotVarClus function measures pair-wise correlations among input metrics and presents a visualisation of the hierarchical cluster analysis on these correlations. Correlated metrics (i.e., metrics that have their correlation coefficient above the threshold) are highlighted in red, while non-correlated metrics are highlighted in green. The default setting of the correlation calculation is `spearman` (i.e., the Spearman rank correlation test) with a correlation threshold of 0.7, as suggested by Kraemer *et al.* [5] (i.e., a Spearman correlation coefficient of above *0.7 is considered as a strong correlation*). Below, we provide an R code snippet that applies the `plotVarClus` function on the `Eclipse Platform 2` dataset.

```
library('Rnalytica')
Data = loadDefectDataset('eclipse-2.0')
plotVarClus(dataset = Data$data, metrics = Data$indep,
    ↪ correlation = 'spearman',
    ↪ correlation.threshold = 0.7)
```

The AutoSpearman function identifies and mitigates correlated metrics based on the Spearman rank correlation test and the Variance Inflation Factor (VIF) analysis. The output of this function is the subset of metrics that do not have strong correlation among themselves. Similar to the `plotVarClus` function, the default setting of the Spearman correlation threshold is 0.7. Furthermore, the default setting of the VIF threshold is 5 as suggested by Fox [2]. Below, we provide an R code snippet that applies the `AutoSpearman` function on the `Eclipse Platform 2` dataset.

```
library('Rnalytica')
Data = loadDefectDataset('eclipse-2.0')
AutoSpearman(dataset = Data$data, metrics = Data$indep,
    ↪ spearman.threshold = 0.7, vif.threshold = 5)
```

References

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