

Towards Perceptual Optimization of the Visual Design of Scatterplots

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This supplement contains material related to the Evaluation study. In this study, there were three task types (Correlation, Class Separation, Outlier Detection) and four design methods (T, R, M, S; see paper for explanations). Section 1 reports the optimized and baseline plots used in the study, while Section 2 reports the box plot of the measured dependent variables for each design method and task type.

1 Evaluation Study: Optimized and Baseline Plots

The following figures show the stimuli used in this experiment:

- Figure 1. Correlation: Cars data set: Example 1.
- Figure 2. Correlation: Cars data set: Example 2.
- Figure 3. Correlation: Out5D data set.
- Figure 4. Correlation: Poverty data set.
- Figure 5. Correlation: Shock data set.
- Figure 6. Class Separation: Cars data set.
- Figure 7. Class Separation: Iris data set.
- Figure 8. Class Separation: PBC data set.
- Figure 9. Class Separation: actg320ncc data set.
- Figure 10. Class Separation: SenseYourCity data set.
- Figure 11. Outlier Detection: nhanes data set: Example 1.
- Figure 12. Outlier Detection: nhanes data set: Example 2.
- Figure 13. Outlier Detection: Shock data set
- Figure 14. Outlier Detection: Bank data set
- Figure 15. Outlier Detection: Bank data set

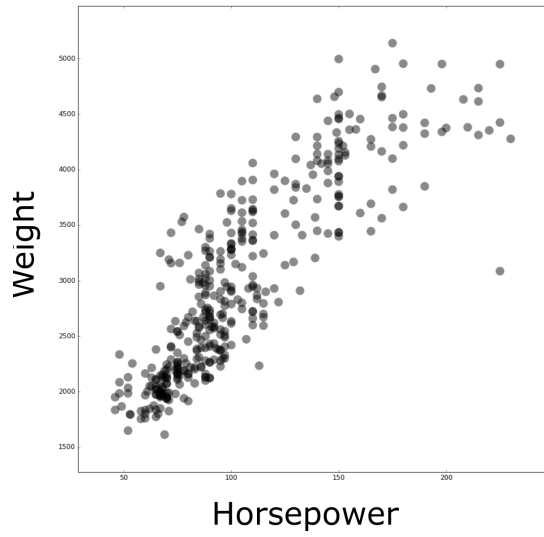
2 Evaluation Study: Box Plots

The following figures show box plots of the measured dependent variables for each design method and task type:

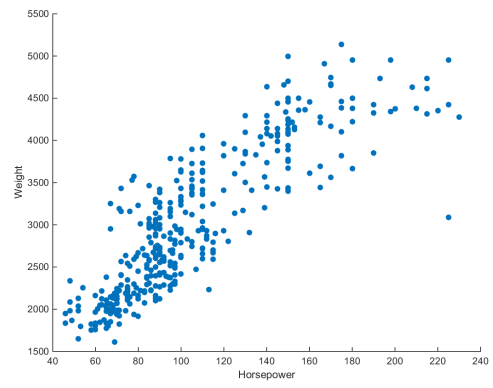
- Figure 16. Correlation
- Figure 17. Class Separation
- Figure 18. Outlier Detection

References

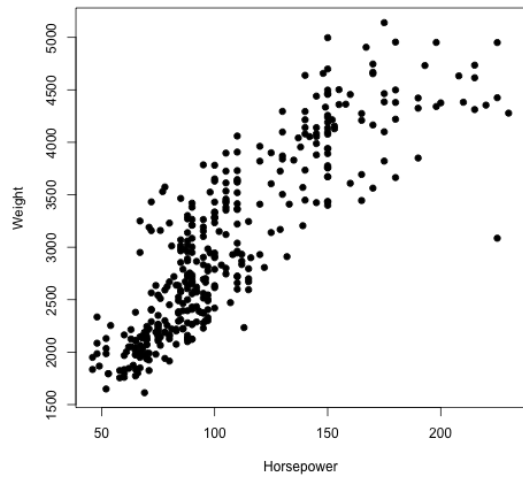
- [1] Data Canvas homepage, <http://map.datacanvas.org/#!/data>.
- [2] Statistical Software Information, University of Massachusetts Amherst,
<http://www.umass.edu/statdata/statdata/data/>.
- [3] UC Irvine Machine Learning Repository, <http://mlr.cs.umass.edu/ml/index.html>.
- [4] XmdvTool homepage, <http://davis.wpi.edu/xmdv/datasets.html>.



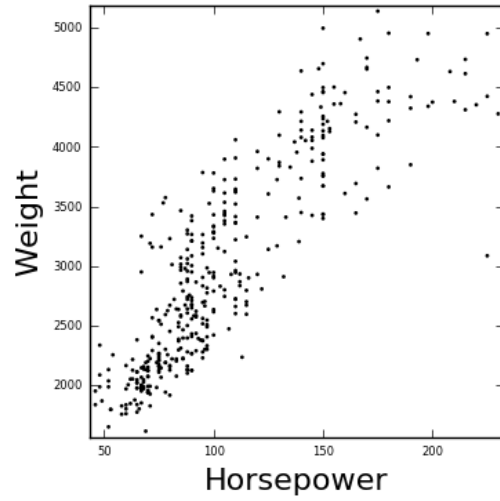
(a) Condition **T**.



(b) Condition **M**.

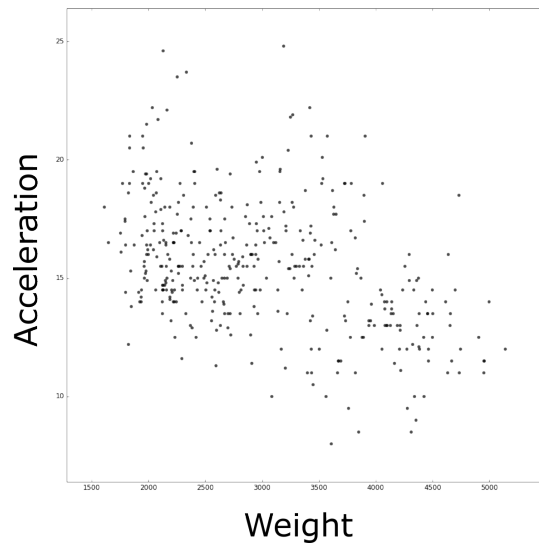


(c) Condition **R**.

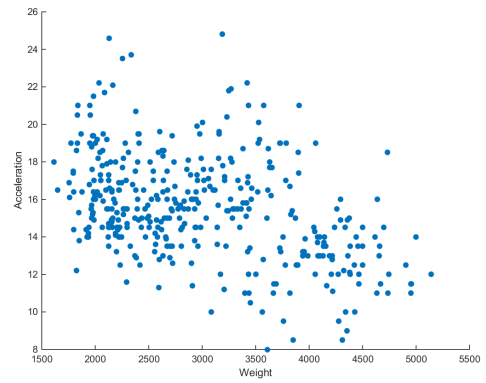


(d) Condition **S**.

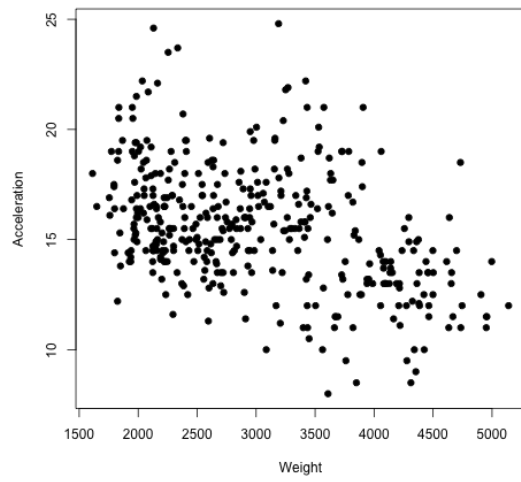
Figure 1: Question asked in the Correlation task from the Cars [4] data set.



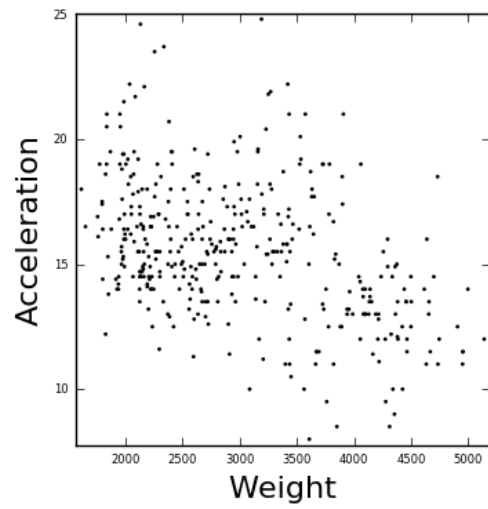
(a) Condition **T**.



(b) Condition **M**.

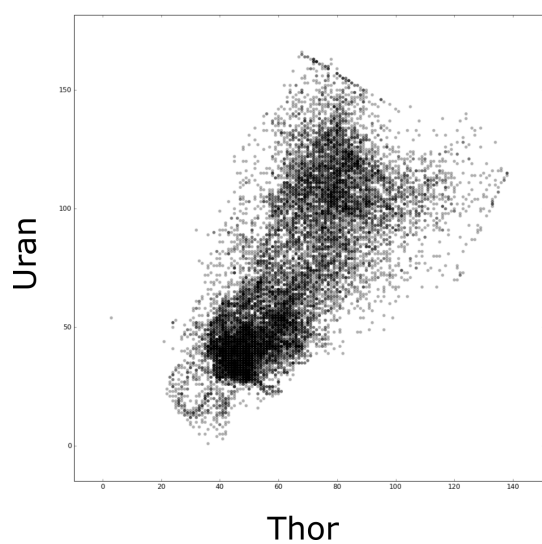


(c) Condition **R**.

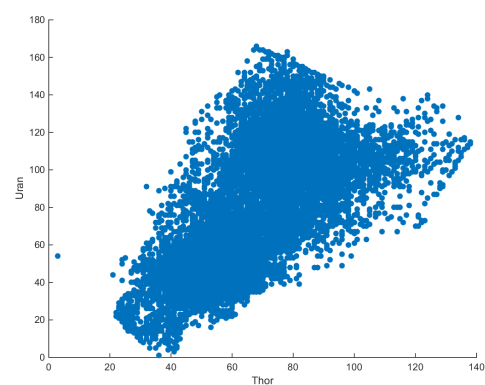


(d) Condition **S**.

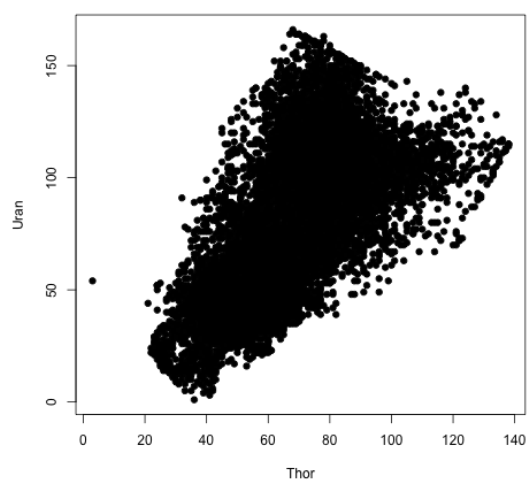
Figure 2: Question asked in the Correlation task from the Cars [4] data set.



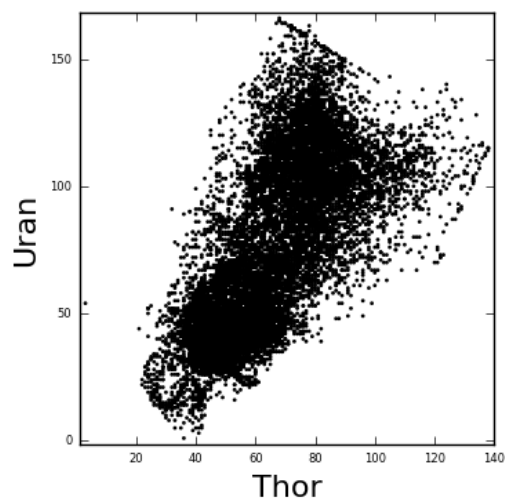
(a) Condition **T**.



(b) Condition **M**.

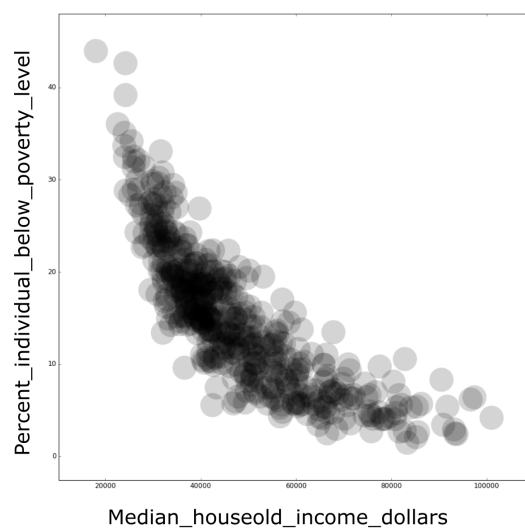


(c) Condition **R**.

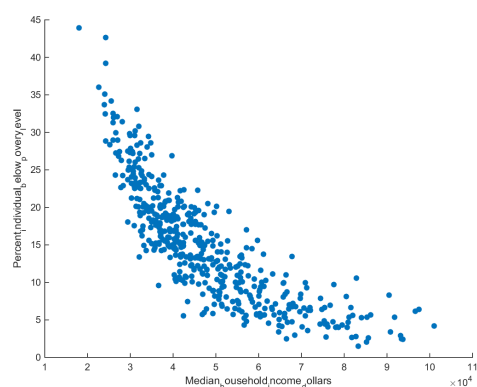


(d) Condition **S**.

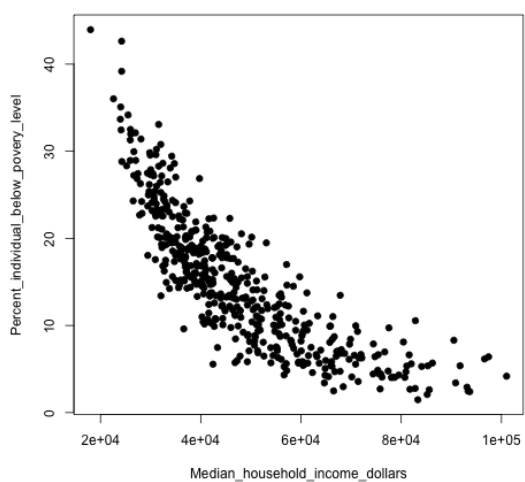
Figure 3: Question asked in the Correlation task from the Out5d [4] data set.



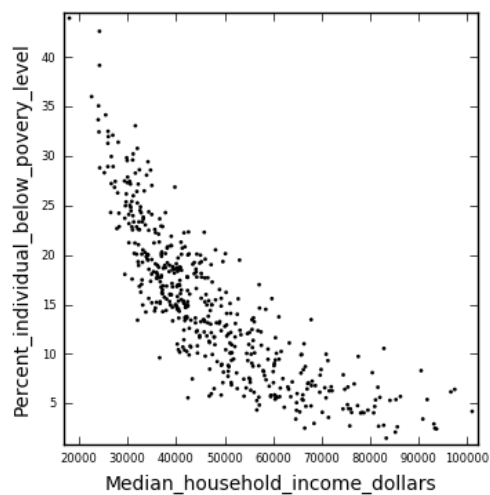
(a) Condition **T**.



(b) Condition **M**.

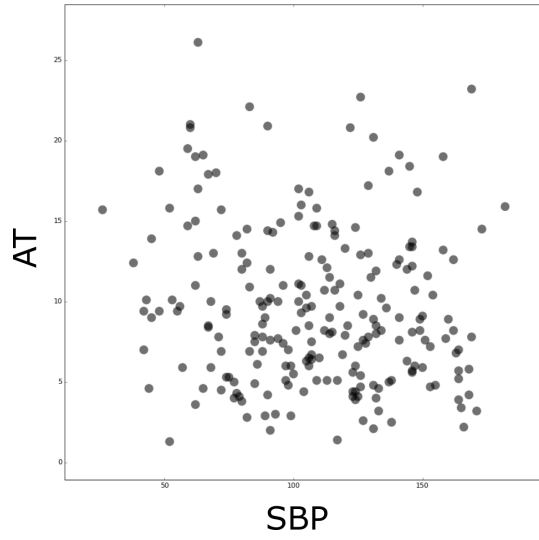


(c) Condition **R**.

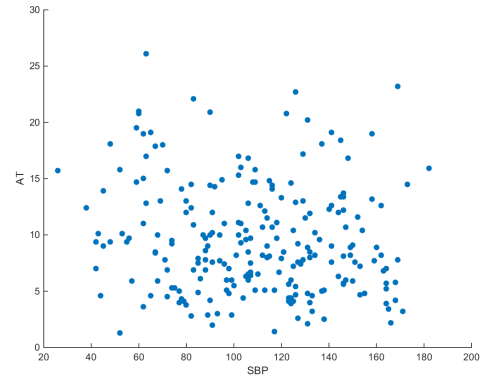


(d) Condition **S**.

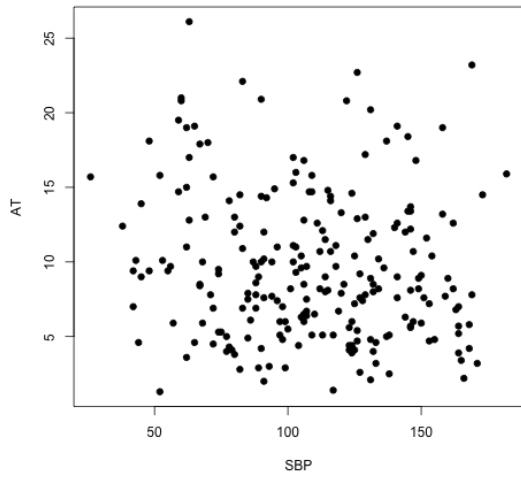
Figure 4: Question asked in the Correlation task from the Poverty [4] data set.



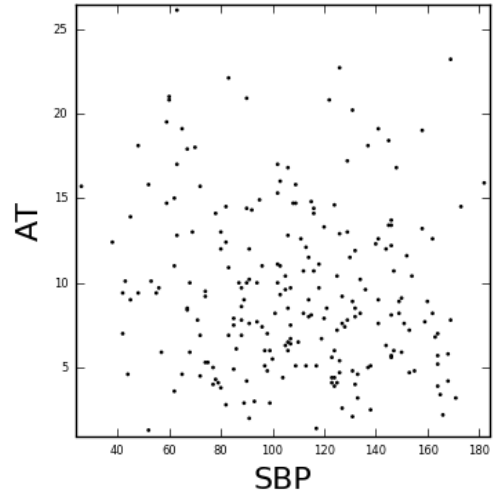
(a) Condition **T**.



(b) Condition **M**.

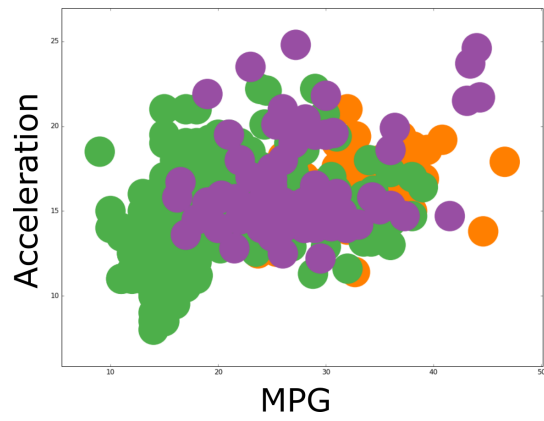


(c) Condition **R**.

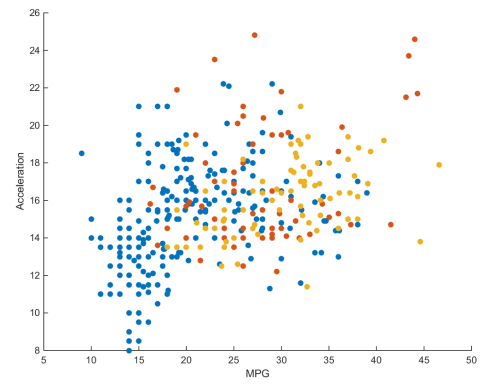


(d) Condition **S**.

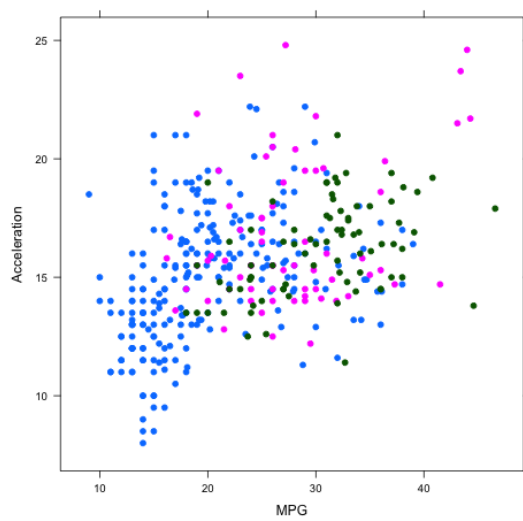
Figure 5: Question asked in the Correlation task from the Shock [2] data set.



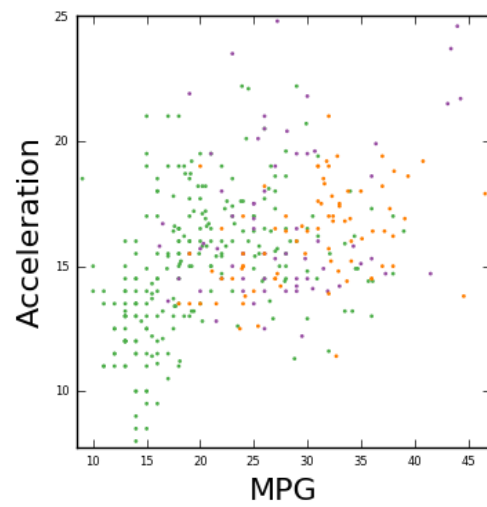
(a) Condition **T**.



(b) Condition **M**.

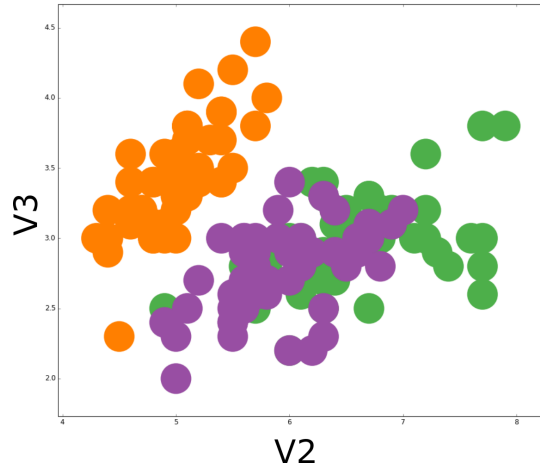


(c) Condition **R**.

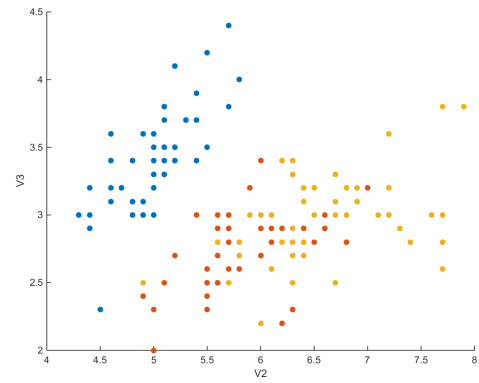


(d) Condition **S**.

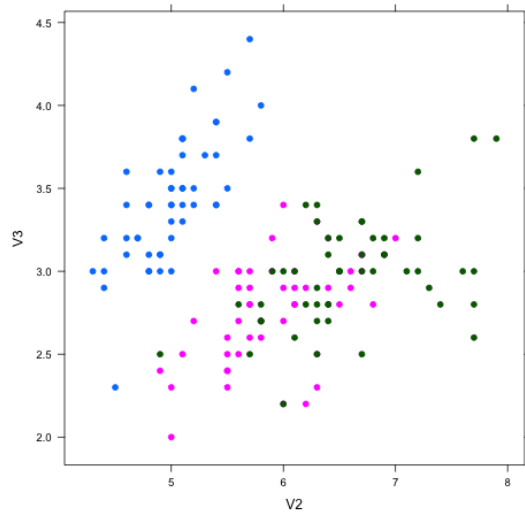
Figure 6: Question asked in the Class Separation task from the Cars [4] data set.



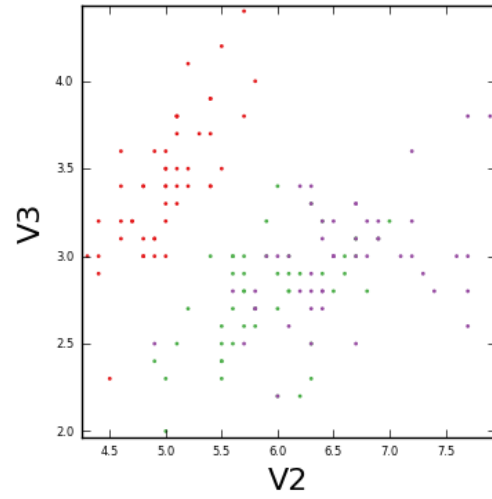
(a) Condition **T**.



(b) Condition **M**.

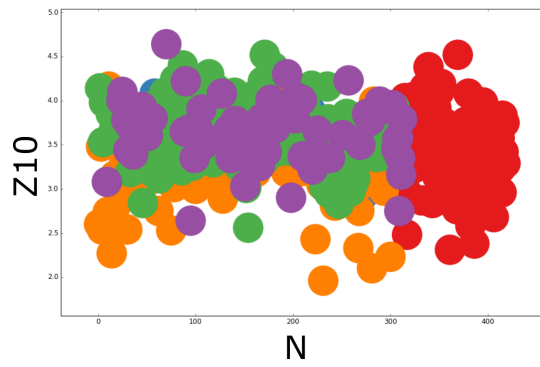


(c) Condition **R**.

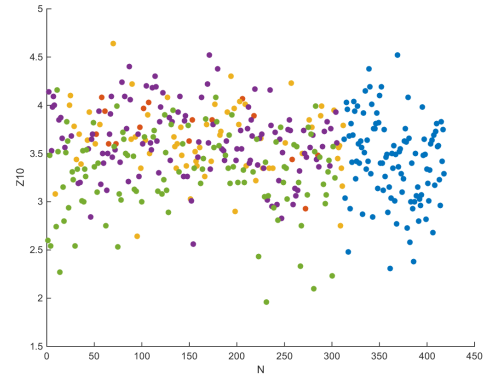


(d) Condition **S**.

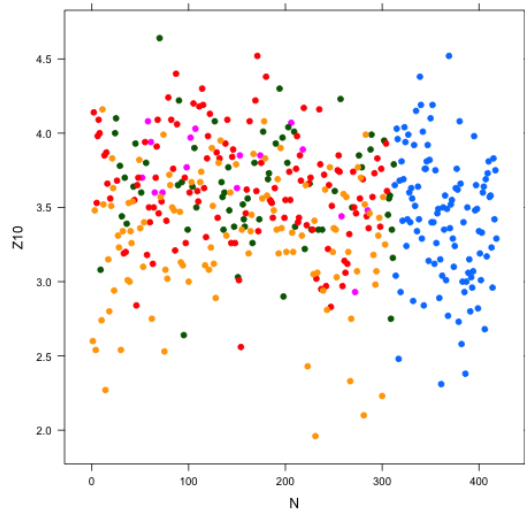
Figure 7: Question asked in the Class Separation task from the Iris [4] data set.



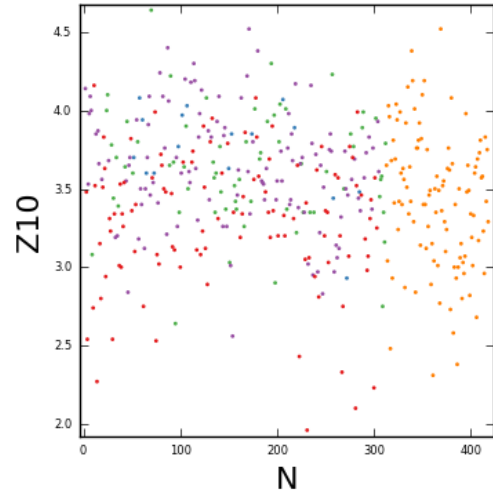
(a) Condition **T**.



(b) Condition **M**.

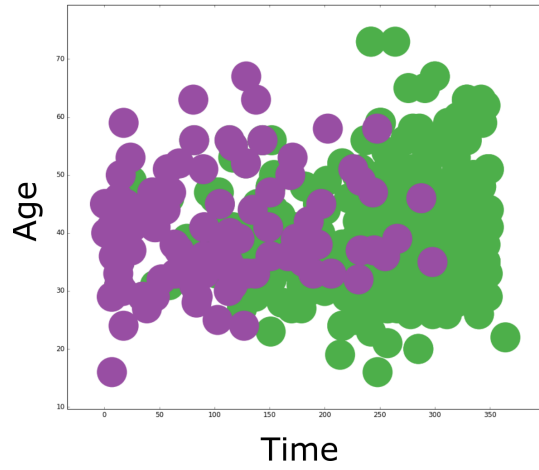


(c) Condition **R**.

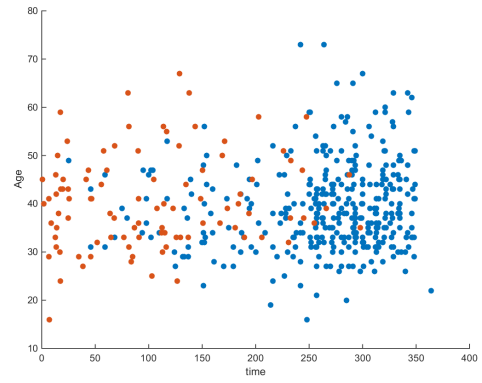


(d) Condition **S**.

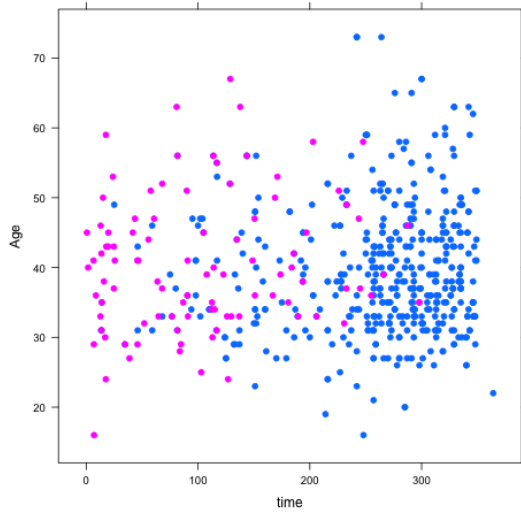
Figure 8: Question asked in the Class Separation task from the PBC [2] data set.



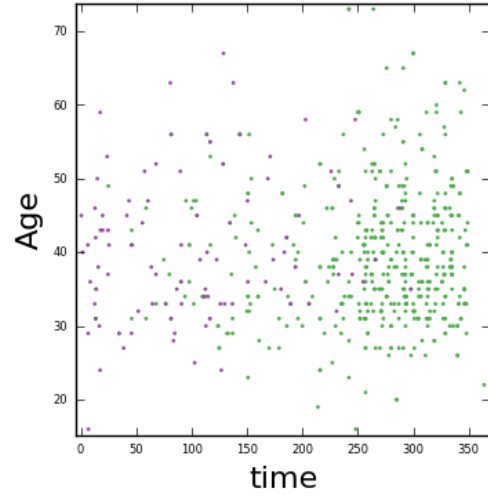
(a) Condition **T**.



(b) Condition **M**.

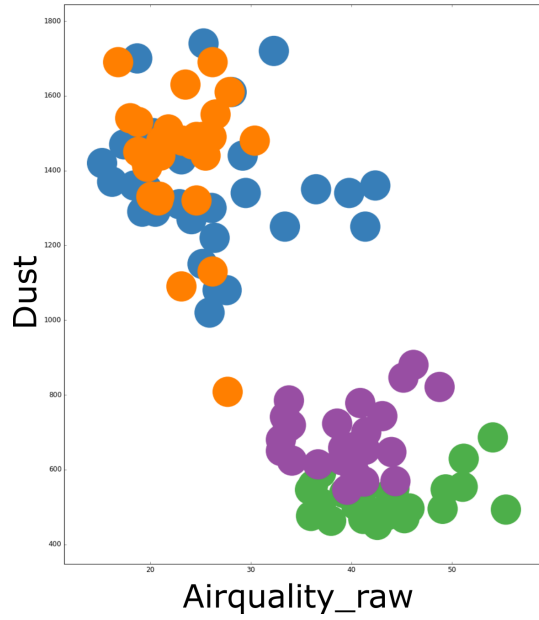


(c) Condition **R**.

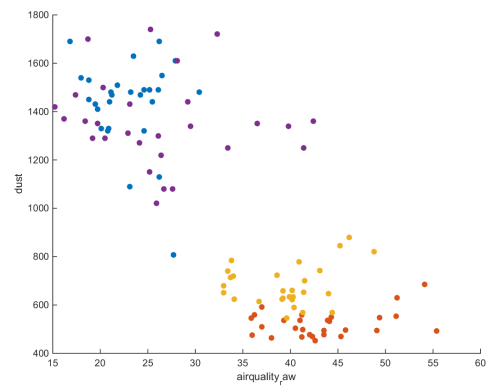


(d) Condition **S**.

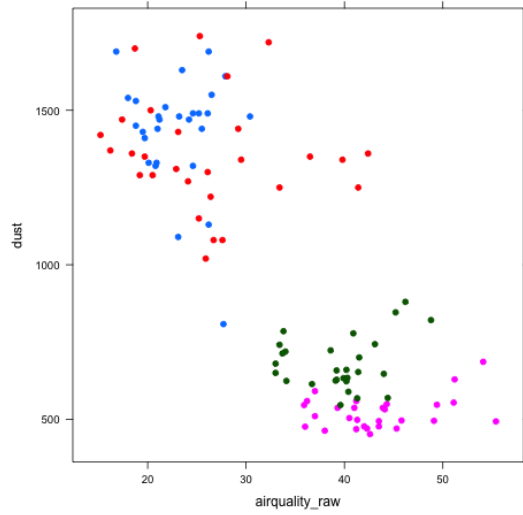
Figure 9: Question asked in the Class Separation task from the actg320ncc [2] data set.



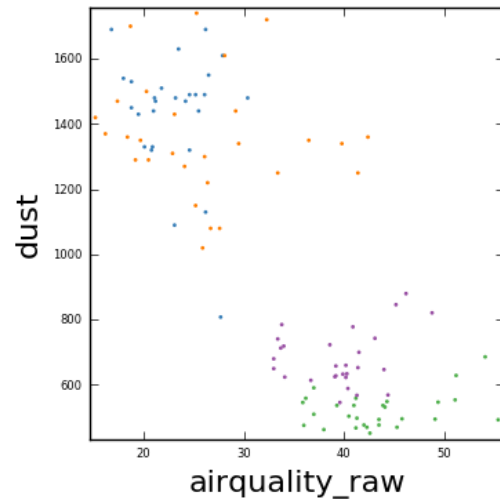
(a) Condition **T**.



(b) Condition **M**.

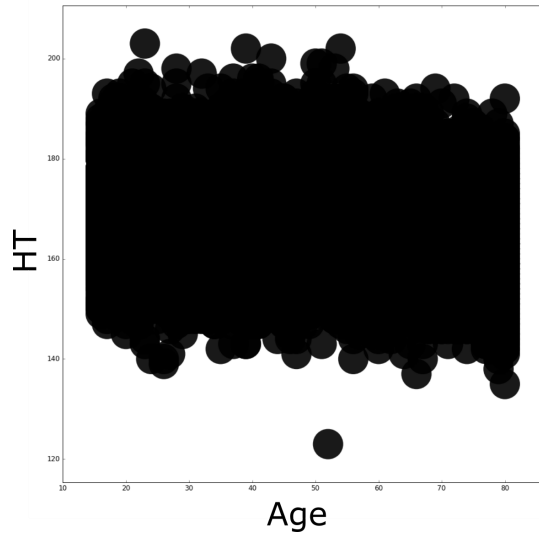


(c) Condition **R**.

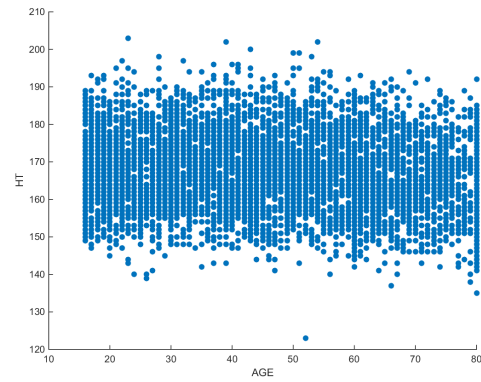


(d) Condition **S**.

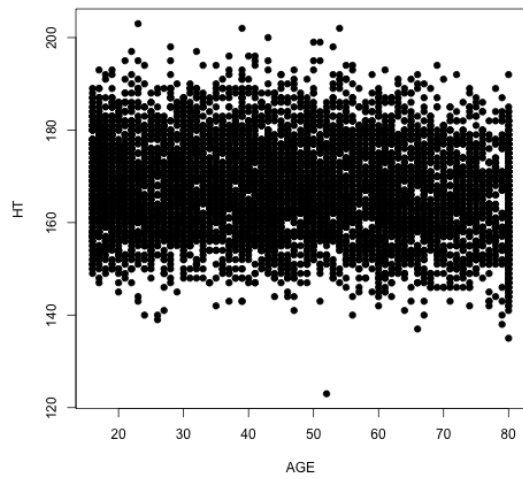
Figure 10: Question asked in the Class Separation task from the Sense Your City [1] data set.



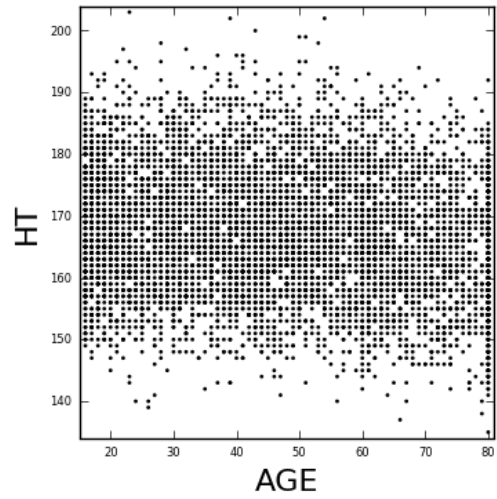
(a) Condition **T**.



(b) Condition **M**.

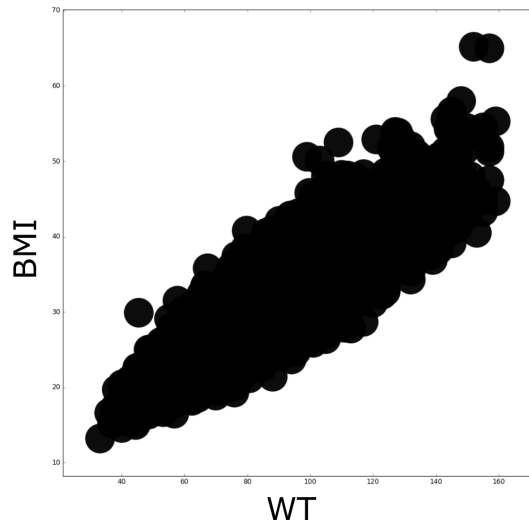


(c) Condition **R**.

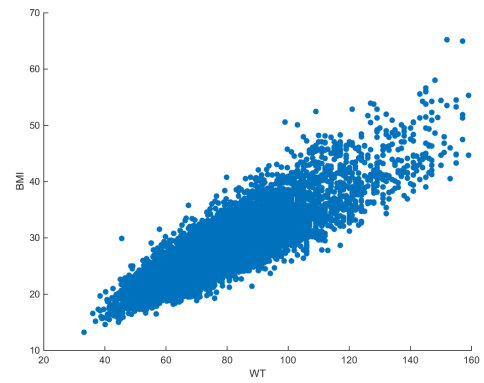


(d) Condition **S**.

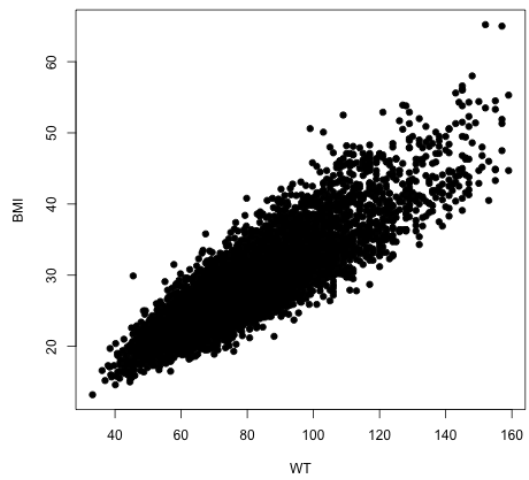
Figure 11: Question asked in the Outlier Detection task from the nhanes [2] data set.



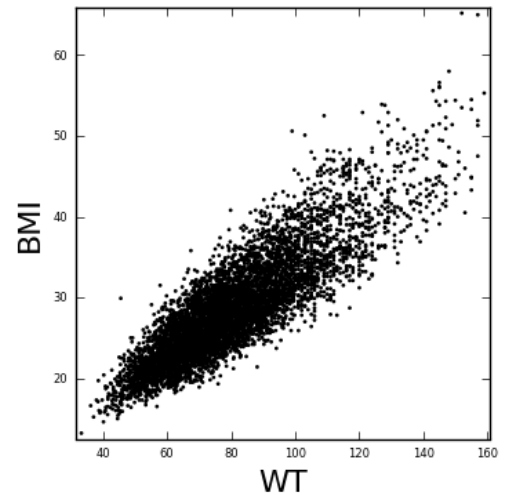
(a) Condition **T**.



(b) Condition **M**.

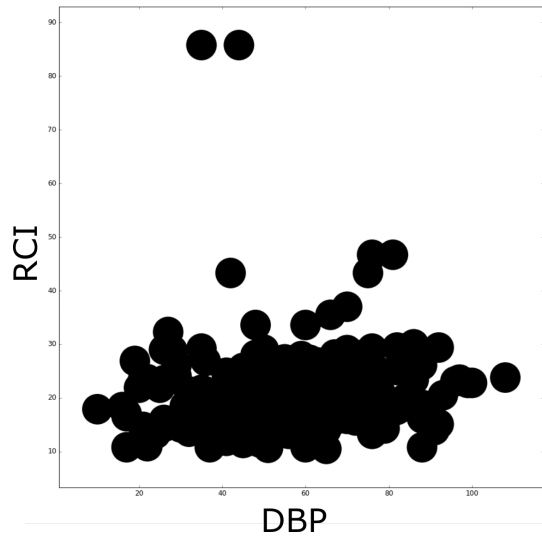


(c) Condition **R**.

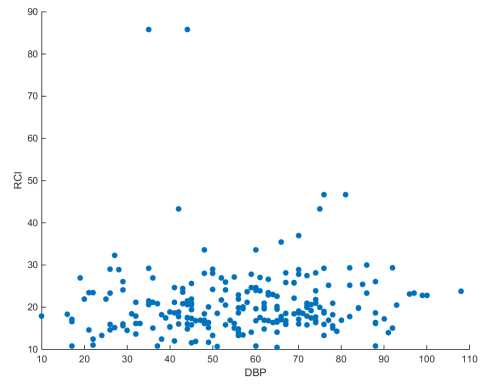


(d) Condition **S**.

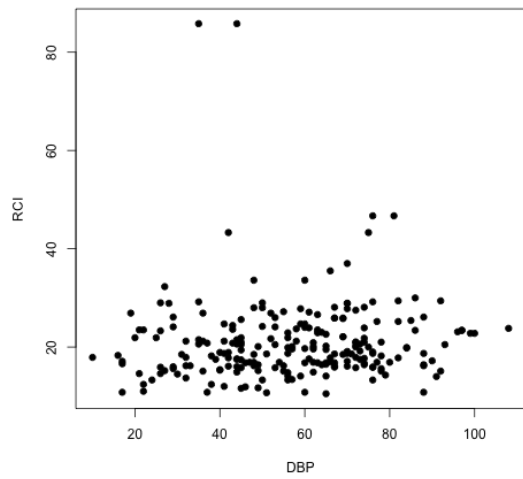
Figure 12: Question asked in the Outlier Detection task from the nhanes [2] data set.



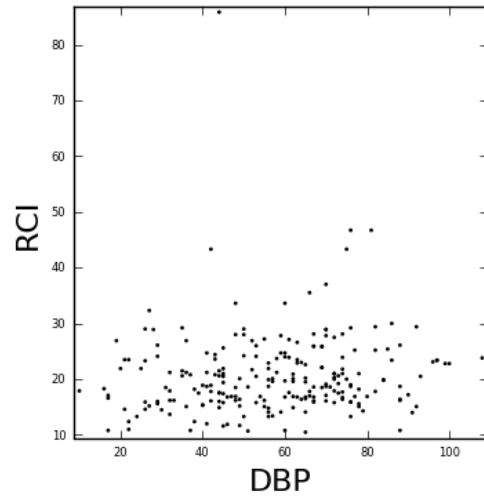
(a) Condition **T**.



(b) Condition **M**.

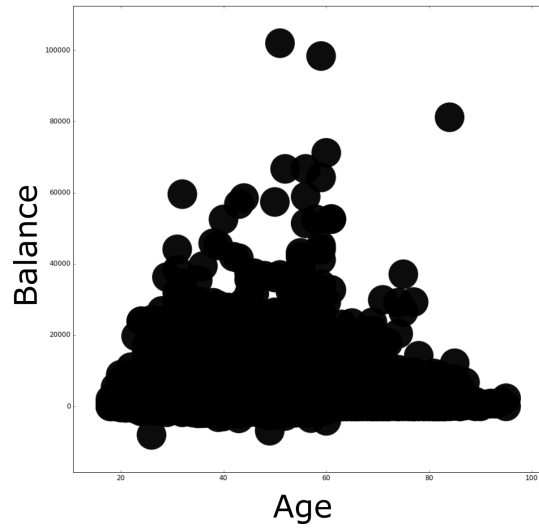


(c) Condition **R**.

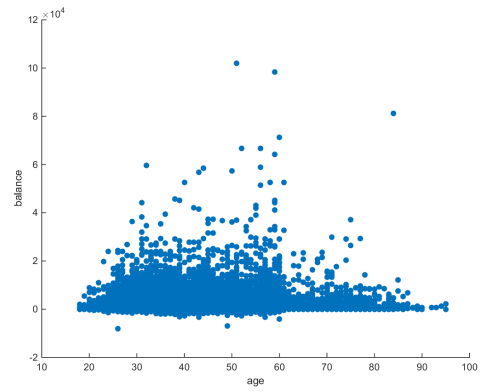


(d) Condition **S**.

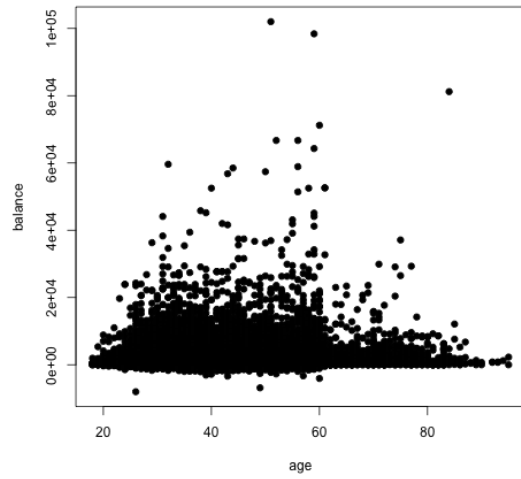
Figure 13: Question asked in the Outlier Detection task from the shock [2] data set.



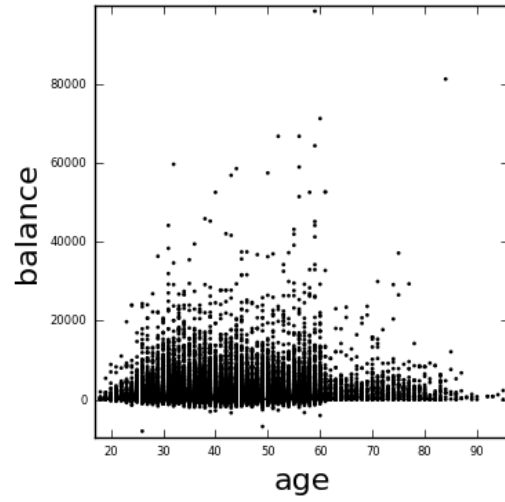
(a) Condition **T**.



(b) Condition **M**.

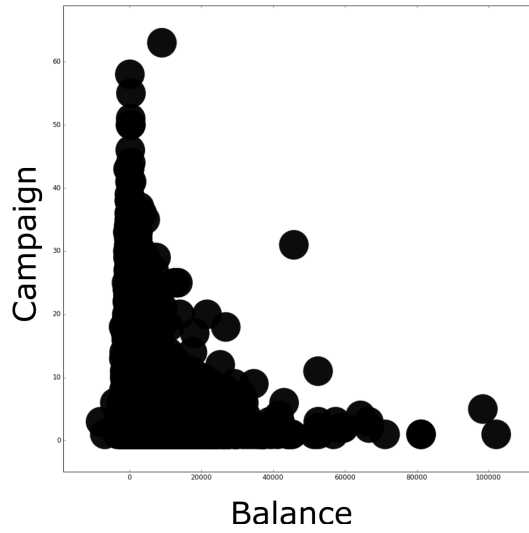


(c) Condition **R**.

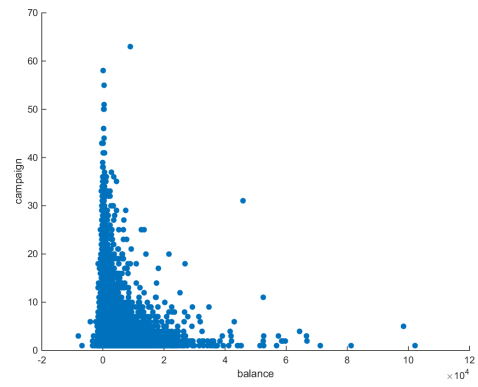


(d) Condition **S**.

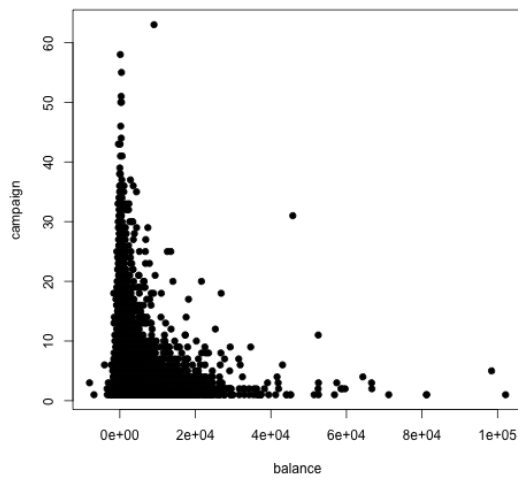
Figure 14: Question asked in the Outlier Detection task from the bank [3] data set.



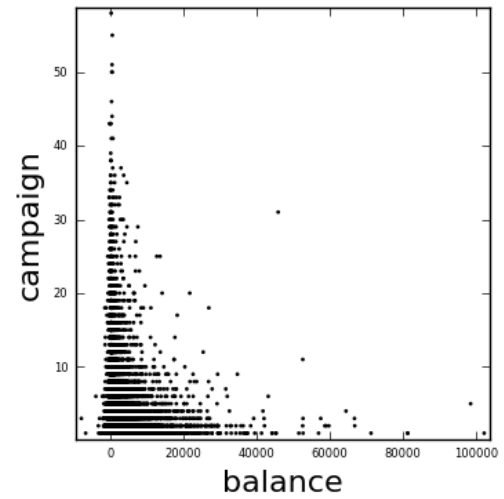
(a) Condition **T**.



(b) Condition **M**.



(c) Condition **R**.



(d) Condition **S**.

Figure 15: Question asked in the Outlier Detection task from the bank [3] data set.

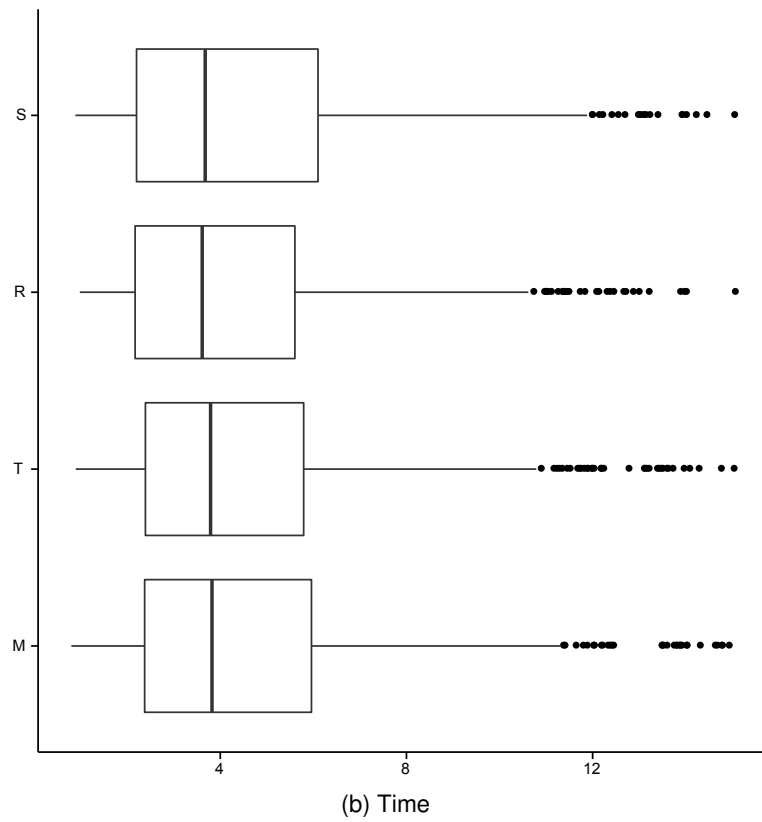
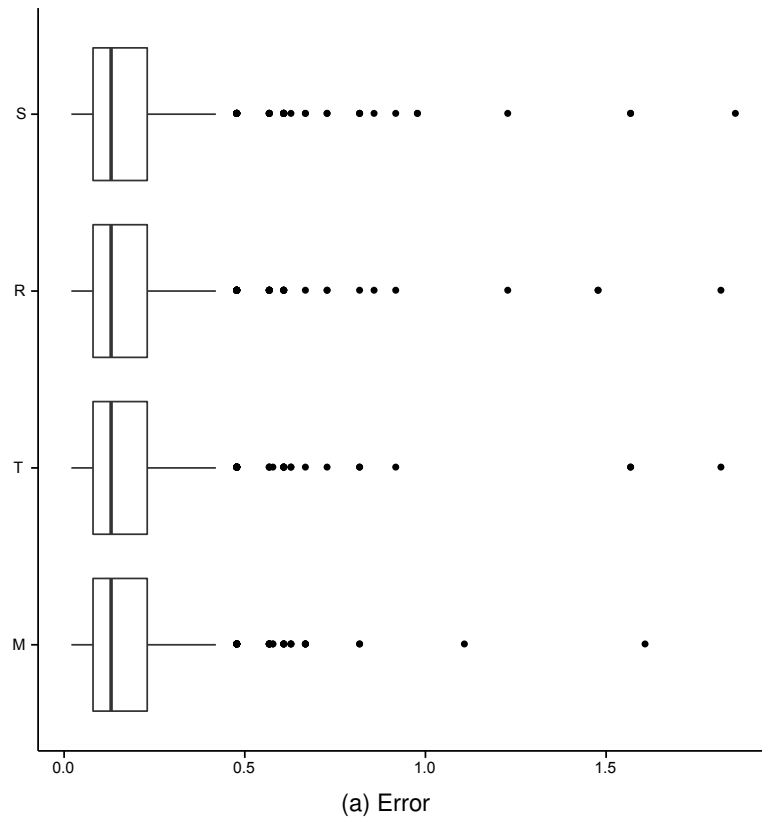
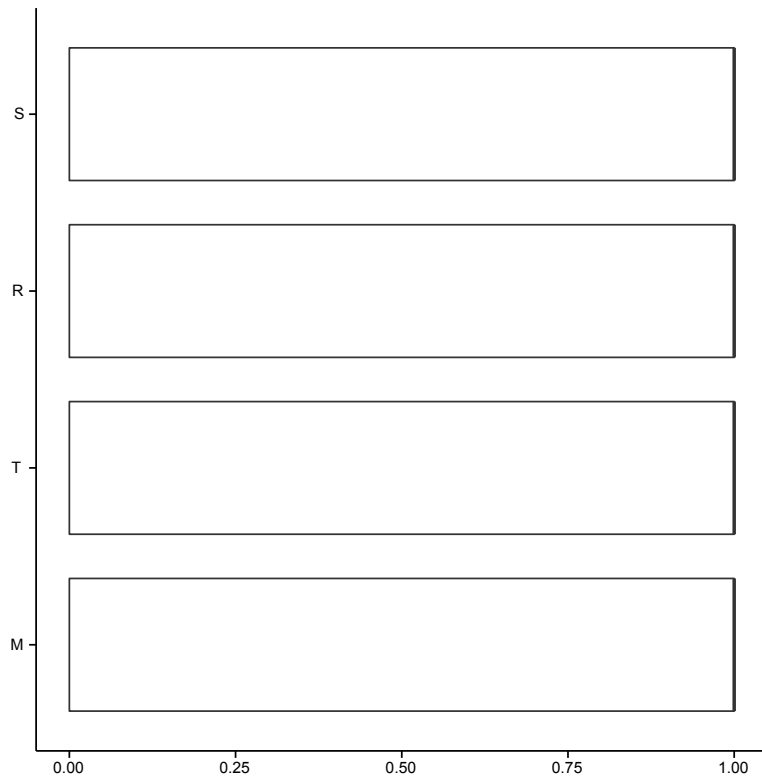
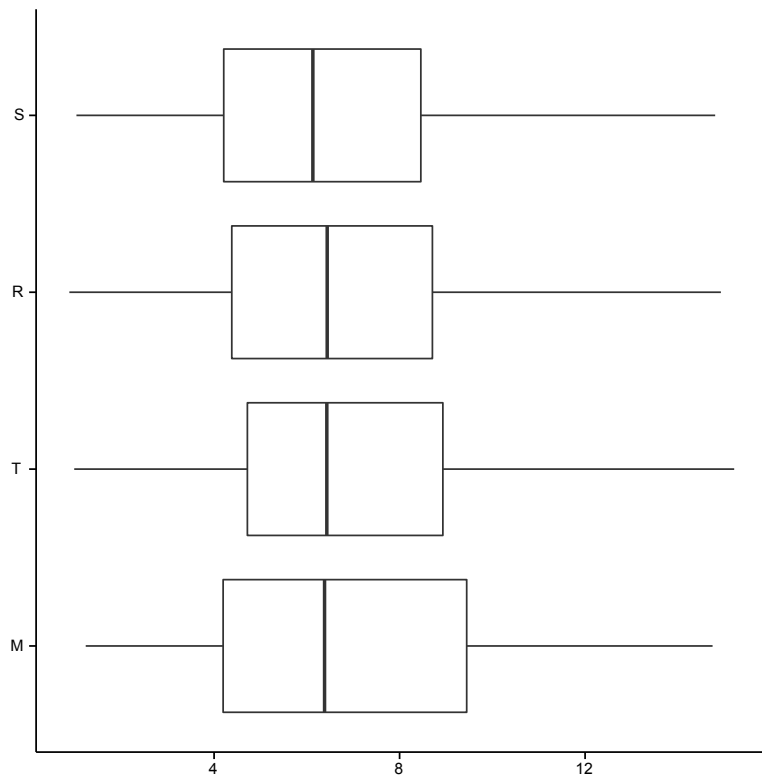


Figure 16: Box plot of the measured dependent variables (a) Error and (b) Time of each design method for the Correlation task type.



(a) Success



(b) Time

Figure 17: Box plot of the measured dependent variables (a) Success and (b) Time of each design method for the Class Separation task type.

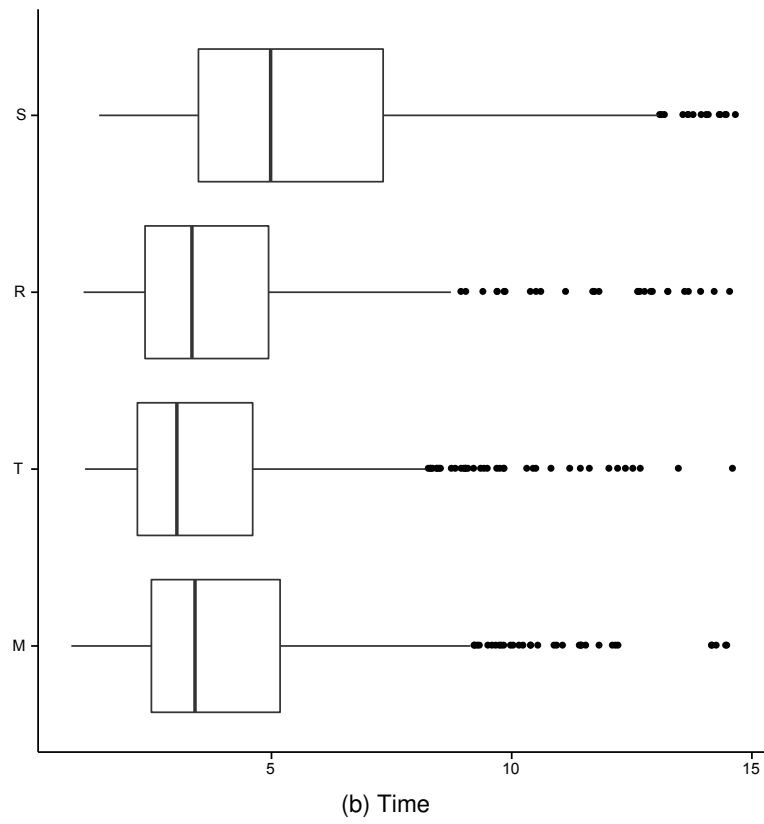
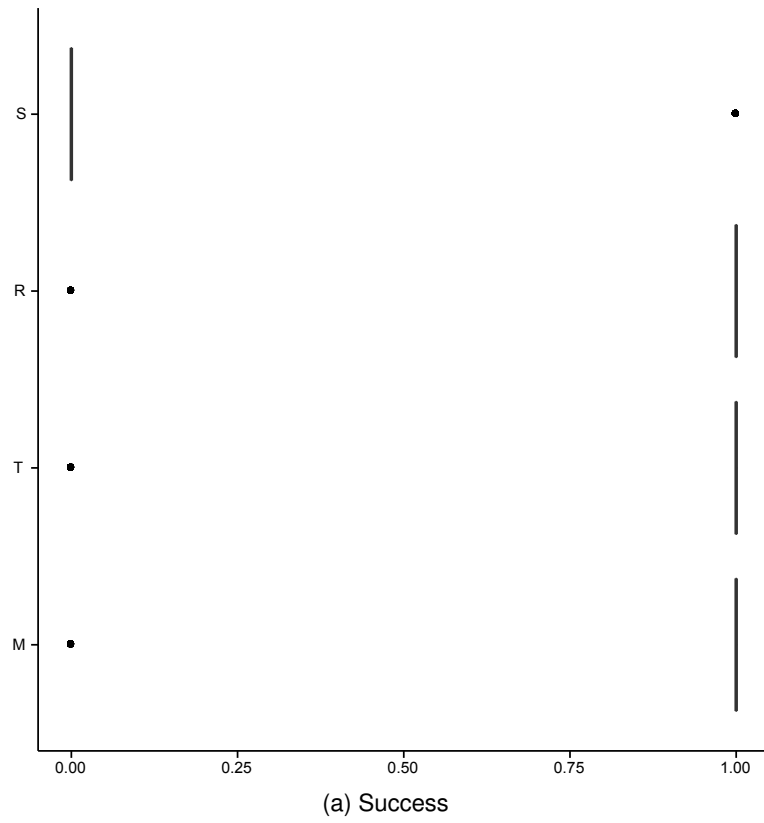


Figure 18: Box plot of the measured dependent variables (a) Success and (b) Time of each design method for the Outlier Detection task type.