Software Analytics LTAT.05.008

Homework HW2: Experiments & SPC

Inst. of Comp. Science, University of Tartu

Spring 2018

Submission deadline: Homework solutions must be submitted within seven days, i.e., not later than on the following Monday, at 23:59 hours.

Late submission policy:
• 50% of the total marks deducted for submission up to 24 hours late
• 100% of the total marks deducted for submission more than 24 hours late
• You must use the submit button on the course wiki page; make sure to submit

Maximum amount of points is ten (10).

You must use the submit button on the course wiki page; make sure to submit

Task T1 [5 marks]

Conduct a review of the following article (available from the course web-page) and make an assessment of the quality of the controlled experiment reported in the article.

• Article A1: 'Experimental evaluation of an object-oriented function point measurement procedure' by Silvia Abrahao and Geert Poels

Do the following:

For your assessment, fill in the checklist provided on the course web-page and used during the in-class exercise in lecture 4 [1]. For each of the nine items on the checklist, provide a brief justification, i.e., by referring to information given in the paper – or missing in the paper – explaining why you scored 'fully' or 'mostly' or 'somewhat' or 'not at all'.

The article can be downloaded from the course wiki (Lab 3).

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Literature:
[1] Checklist for Assessing the Quality of Papers Reporting Controlled Experiments in Software Engineering Research (available on coursewiki, Lecture 4 and Lab 3)

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No solution sketch; see feedback notes on your submitted homework solution.
Task T2 [5 marks]
Apply Statistical Process Control (SPC) to defect data from a continuing inspection (or test) process in an organization. The data is provided on the course wiki (lab 3).

a) Use the data and construct the following charts:
- p-Chart
- c-Chart
- u-Chart

Provide the charts and show how you calculated the plotted data, the control line (CL), and the upper and lower control limits (UCL, LCL). Make sure that you chose the appropriate data for each type of chart!

b) For the p- and c-charts discuss whether there are any patterns that hint to some problem in the process.

Solution sketch:

**p-chart**:

Relevant data for p-chart: ‘Sampled Modules’ and ‘Defective Modules’

\[
p\text{-value} = \frac{\text{Defective Modules}}{\text{Sampled Modules}}
\]

\[
p\text{-bar} = \frac{\text{Sum}(p\text{-values})}{30} = 0.42
\]

\[
\text{UCL} = p\text{-bar} + 3\sqrt{\frac{p\text{-bar}(1 - p\text{-bar})}{5}} = 1.082178224
\]

\[
\text{LCL} = p\text{-bar} - 3\sqrt{\frac{p\text{-bar}(1 - p\text{-bar})}{5}} = -0.242178224 \quad \text{Note: LCL = 0 is also correct.}
\]
c-chart:

Relevant data for c-chart: ‘Day’ and ‘Total Defects’

c-values = Total_Defects / Day

\[ c-bar = \text{Sum(c-values)} / 30 \approx 3.57 \]

\[ \text{UCL} = c-bar + 3 \times \text{Sqrt}(c-bar) = 9.232352856 \]

\[ \text{LCL} = c-bar - 3 \times \text{Sqrt}(c-bar) = -2.099019523 – \text{Note: LCL = 0 is also correct.} \]
u-chart:

Relevant data for u-chart: ‘Total KLOC’ and ‘Total Defects’ – Note: ‘Total Modules’ instead of ‘Total KLOC’ is formally also ok.

u-values = Total_Defects / Total_KLOC
u-bar = Sum(u-values) / 30 = 0.71
UCL[Day] = u-bar + 3*sqrt(u-bar/Total_KLOC[Day])
LCL[Day] = u-bar - 3*sqrt(u-bar/Total_KLOC[Day]) – Note: LCL = 0 for negative values is also correct.