CITS5502 Software Processes
Semester 2, 2019
Assignment 1 – Simulating a process

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This assignment is worth 20% of your final grade. It is due on Sunday, 8 September, 11:59pm, and should be submitted via `cssubmit`. All assessed work is to be done individually.

You are expected to have read and understood the University's guidelines on academic conduct. In accordance with this policy, you may discuss with other students the general principles required to understand this project, but the work you submit must be the result of your own effort.

You must submit your work before the submission deadline above. The penalties for late submission are described in the University's guidelines on assessment.

Overview

You are a project manager for Innovatotech, Inc, a software consultancy. Using data from the software maintenance process for a previous project very similar to your current one, you are charged with suggesting strategies for allocating resources to maintenance for your project and for quantifying progress on it.

Available information

A spreadsheet is provided containing data recorded from maintenance on a project very similar to your own. The maintenance process had two stages: *finding defects* and *fixing defects*. The table represents the rate of finding defects by one competent tester working 25 hours per week over a twenty-week period; 300 defects were discovered in that time. They were classified as having either a *major* impact on the usability of the system or only a *minor* effect. Each defect can also be classified as *hard* or *easy* to fix. The hard ones will take five hours to fix and an easy one can be done in two hours (on average).

For your current project, you have three experienced software engineers (each working 25 hours per week on your project) available for testing the system and fixing the defects. Users have stated that the major defects are "seven times as damaging" on average as the minor ones.

You are required to

- identify a model which predicts defect discovery, and estimates the total number of defects in the project;
- suggest strategies for repairing the defects;
- identify metrics for measuring progress on this task; and
- using simulations, show the effect of different strategies on the metrics.

What to submit

You should submit:

- A PDF report, the contents of which is detailed below in the "Report contents" section. It should meet the requirements given under "Report requirements".

  All work which you wish to submit for assessment – including charts, diagrams and tables – should be included in this report.

- A .zip file, containing any Excel spreadsheet or other code used for generating your charts and results. It should include a README file explaining how to reproduce them.

  However, this will only be looked at if the markers have queries about how your results were derived – do **not** put content you wish to be assessed in the spreadsheet or code. If you have created charts using Excel (or some other system) you will need to paste them into your report.

Tasks

1. Choose three possible models (i.e. equations) which might explain the number of defects found against time (i.e., the number of weeks).

   Perform curve fitting for each model, and assess the goodness of fit of each – do they fit well? Estimate how many defects are still in the system, after the 300 known defects have been found.

For the following tasks, select at least 3 metrics for measuring the test and repair process. Some possible metrics for showing progress in each week are:

   a. Estimated number of unfixed defects (both found and unfound) in the software.
   b. Total impact of found defects still to be fixed (where major defects have 7 times the impact of minor)
   c. The average time in the "to be fixed" queue of major defects which are still to be fixed
   d. The ratio of defects fixed to defects found.

2. Identify strategies for allocating staff to find and fix defects over multiple weeks, and for prioritizing defects to fix. For instance, one possible staff allocation is to have one person locating defects and two people fixing them. Because you have

limited resources (75 person hours per week), you cannot fix all the defects at once. Possible strategies for prioritizing defect fixing could be:

- fix defects in random order
- fix easy defects first
- fix hard defects first
- fix major defects first
- fix minor defects first
- fix defects in the order they are found
- ... something else (describe carefully)

3. Simulate, for at least three different strategies for allocating staff and prioritizing defect fixing, the detection and fixing process. Create graphs showing your selected metrics versus time for these three simulations.

   To reduce the number of graphs you need to produce, you may choose to overlay graphs. One possible approach is to stick to one staff allocation metric, and compare defect prioritization strategies; but you may select another if you wish.

4. Document your work in a report, as described in the following section.

Report contents

Your report should contain the following:

Defect detection (1-2 pages text content):

Explain how you performed curve fitting on the data. What software did you use, and did you have to make any assumptions? What models did you select?

For each model:

- Give the generic equation for the model
- State the values of the parameters as you have estimated them
- Include a chart showing a plot of the defect data and your fitted curve
- Give the goodness of fit measure you have calculated, and an English explanation of what it means (is this a good fit, or not?)
- Use the model to estimate the total number of defects in the past project, and how many remain after the 300 known defects are fixed, and explain how you did so
- Describe any assumptions required for making the estimation, and any limitations.

State which model you think is most plausible for the data, and why.

Chosen metrics (0.5 pages text content):

State what metrics you have selected for measuring the maintenance process.

Staff allocation strategies (0.5 pages text content):

Explain what staff allocation strategy you have selected for your simulation.

Simulation (1-2 pages text content):

Describe how you performed your simulations.

Show the graphs for your metrics for each simulation.

Identify any assumptions you needed to make, and any limitations in your approach.

Discussion (1-2 pages text content):

Relate the results you have found to *system reliability* and *customer satisfaction*. Is it possible to state which strategies would result in better reliability or satisfaction? If so, do so. If you wished to minimize the time for which major defects went unfound and unfixed, describe how would you allocate staff.

Report requirements

Your report should be in PDF format, and use A4 size pages. It should clearly show your name and student number.

The font for body text should be between 9 and 12 points. The report should contain numbered headings, with useful heading titles. Any diagrams, charts or tables used must be legible and large enough to read. All pages (except possibly the cover, if you have one) should be numbered. If you give scholarly references, you may use any standard citation style you wish, as long as it is consistent. Cover sheets, diagrams, charts, tables, bibliographies and reference lists do not count towards any page-count maximums.

It is suggested that reports be kept to under 10 pages of textual content.

Submission

Submit

- a PDF file via cssubmit, containing a report with your answers to the above tasks
- a zip file, containing any code or data needed for reproducing your results and graphs.

  This could be just an Excel file (if you have used only Excel for this assignment), or it could be program code and data.