

***Computational Theory and Statistics for Computing***

***PUSL2018***

***Coursework***

***2024–2025***

Term: Term 1

Submission Deadline: 2024-12-31

Coursework Type: Group Assignment

Element of Assessment: C1

Module Leader: Dr. Rasika Ranaweera

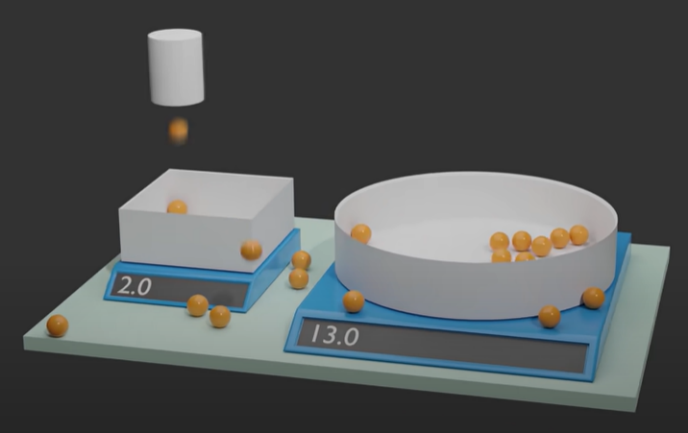
E-mail: [ranaweera.r@nsbm.ac.lk](mailto:ranaweera.r@nsbm.ac.lk)

**Coursework**

This coursework for PUSL2018 is worth 50% of the module marks and contains three parts: two programs, a report that outlines the individual contributions and explanations of the tasks below, and an Excel file with a simulation result. Everyone must form into groups of maximum eight members.

**Task 1: Monte Carlo Simulation**

Assume you have a marble dropping device[[1]](#footnote-1) that randomly moves around the table and drops marbles in to a rectangular and circular tray as shown in the figure below. Underneath the trays a counting devices are also installed therefore the number of marbles in each tray can be determined at any given time.

Your first task is to write a program to simulate the above scenario. You also need to compute the probability of dropping marbles in to a circular and/or rectangular trays. You may also consider the radius as 1 and the center as (0,0). Note that dropping can be considered as dropping anywhere in the circular area.

* Explain how you can use this simulation to estimate “pi.”
* Run your simulation for 1K (thousand), 10K, 100K, 100K, 1000K times (N) and plot the value of pi in an Excel sheet. Show in a graph the value of pi against N becoming closer to the exact when the simulation runs for many times.
* You need run each experiment for 10 times, record the values, compute mean, and mode. All values and computations should be recorded in the same Excel.

**Task 2: Statistics**

In a family with three children, what is the probability that, if at least one of the children is a girl, all are girls?

1. Find the probabilities manually and explain the mathematics and assumptions.
2. Write a Python simulation program, run it for 1000 times, and programmatically prove your answer.

“What is the probability that 10 dice throw add up exactly to 30?”

1. Calculate this exactly by counting all possible ways of making 30 from 10 dice.
2. Simulate throwing the dice (say *500* times), count the number of times the results add up to 30, and divide this by 500.

**Deliverables**

You should use Python language for your implementation/s. You need to prepare a report containing the questions and the answers, your code, and screenshots of results you obtained.

* Prepare two Python programs to simulate two tasks. The program must follow industry standards and should be able to be executed through a terminal.
* The program should facilitate arguments so that the simulation can be tested for *any number* specified by the user.
* The Excel file should contain the logs of the experiments, computations, and the plot of pi.
* Include all the discussions, mathematics, and program pseudocode in the report. The source code should be attached to the report as appendices.
* The report must also include evidence that the simulations work. Provide screenshots executing your program.
* Each member should include **a full page** of his/her contribution to the project.

**Detailed Assessment Criteria**

**(C1) Coursework – 100%**

|  |  |  |
| --- | --- | --- |
| **Category and Weighting** | **Criteria** | **LOs** |
| Simulation program  (60 mark) | The Python program should work without any errors  Use of libraries, standards, and conventions in the program  The program outputs the probability for various number (N) of experiments | LO1  LO2  LO3 |
| Report and Spread Sheet  (40 marks) | Proper discussion and mathematics behind the simulations  Professional style of writing and appropriate structure  Proper plot for pi against N for various number (N) of experiments  Individual contribution to the program and to the report | LO3  LO4 |

Individual categories are awarded marks based upon the above criteria.

**Submission Type**

The report should be a comprehensive Word document. Project report should be comprehensive report with minimum number of pages.

**Assignment Feedback:**

You will receive provisional mark and written feedback within 20 working days of the submission and presentation.

Notes:

* You must submit your coursework via the Digital Learning Environment portal. **Coursework must be submitted by the specified deadline.**
* You should give due consideration to your personal time management to ensure that coursework is submitted in plenty of time prior to the deadline.
* Coursework can be submitted at any time ahead of the deadline.
* Students who submit late, without approved extenuating circumstances, will receive a mark of zero. Once it is more than 59 seconds late it will receive a mark of zero.
* The report that you present should be supported (where relevant) by appropriate evidence. Any such information that you present must be appropriately cited and referenced in your report - if you are unfamiliar with referencing style, then a Google search using the term 'Harvard referencing' will help to enlighten you. (Please refer the teaching and learning handbook for more details)
* Although you will be expected to make significant use of printed and online literature in researching and producing your materials, it is not acceptable for you to simply cut and paste material from other sources (small quotes are acceptable, but they must be clearly indicated as being quotes and the source must be referenced appropriately).

**Academic offences:**

(the following is a fragment of Section AST10.2 from <https://www.plymouth.ac.uk/rails/active_storage/blobs/proxy/eyJfcmFpbHMiOnsibWVzc2FnZSI6IkJBaHBBbUJIIiwiZXhwIjpudWxsLCJwdXIiOiJibG9iX2lkIn19--37a68fa8e5e743f30feb74fba00d75e56ff5b46b/Academic_Regulations_22-23_v1.2.pdf>)

Academic offences occur when activity is undertaken which could confer an unfair advantage to any candidate(s) in assessment. The University recognises the following (including any attempt to carry out the actions described) as academic offences, regardless of intent:

1. Copying or paraphrasing of other people’s work or ideas into a submitted assessment without full acknowledgement (plagiarism).
2. Unauthorised collaboration of students (or others) in a piece of work (collusion).
3. Making false declarations in an attempt to obtain either modified assessment provisions or special consideration (e.g. of extenuating circumstances).
4. Persuading another member of the University or partner institution (student, staff, or other) to participate in any way in actions which would be in breach of these regulations.
5. Misrepresenting research outcomes and results.
6. Being party to any arrangement which would constitute a breach of these regulations.
7. The inclusion in a piece of assessed work (other than an examination or test) of material which is identical or substantially similar to material which has already been submitted for any other assessment within the University.
8. Any other activity which could confer an unfair advantage to any candidate(s).

For full details on the academic offences framework and procedures, consult Section AST10 from <https://www.plymouth.ac.uk/rails/active_storage/blobs/proxy/eyJfcmFpbHMiOnsibWVzc2FnZSI6IkJBaHBBbUJIIiwiZXhwIjpudWxsLCJwdXIiOiJibG9iX2lkIn19--37a68fa8e5e743f30feb74fba00d75e56ff5b46b/Academic_Regulations_22-23_v1.2.pdf>

**Extenuating Circumstances**

Extenuating circumstances are exceptional situations that:

• have an impact on your ability to attend or complete an assessment or a number of assessments at the usual time.

• are outside your control or beyond what you could have reasonably predicted

If you have been unable to meet a taught module coursework deadline due to an exceptional situation, please do not ask academic staff to grant you an extension since this is not within their power. You should complete an [extenuating circumstances form](https://liveplymouthac.sharepoint.com/sites/x70/SitePages/Extenuating-circumstances.aspx?CT=1660733543579&OR=OWA-NT&CID=b6a859fa-c247-a604-c46b-4bb735e1eb31)  You will find further guidance, including information regarding the types of claim that may or may not be approved by consulting the [Extenuating Circumstances Policy and Procedures 2024-2025.](https://www.plymouth.ac.uk/rails/active_storage/blobs/proxy/eyJfcmFpbHMiOnsibWVzc2FnZSI6IkJBaHBBNWRiZVE9PSIsImV4cCI6bnVsbCwicHVyIjoiYmxvYl9pZCJ9fQ==--11bdf9753735b78518e41b272aabed67b9f71f32/Extenuating_Circumstances_Policy_and_Procedures_2024-25%20clean%20copy.pdf) .

**Group assessment**: there may be instances where a member of your group whose ability to fulfil their role is affected by their own extenuating circumstances. We expect you to have contingency plans for your group to manage members’ absence, but sometimes the impact makes it impossible for the group to attend or complete the group assessment task. In this case, the member of the group affected by the circumstance should submit an extenuating circumstances form, as per the policy. Other members of the group may also each submit a claim, citing the absence of their group member due to extenuating circumstances as their reason for submitting their own claim. You should also discuss with the module leader or appropriate member of teaching staff whether the group may be able to carry on in this situation, to avoid unnecessary reassessment.

**Time bound assessments (in-class tests, exams, presentations etc.)**

The University operates a ‘fit-to-sit’ policy. If you think that your ability to attend or complete an assessment is being affected by extenuating circumstances, you must not sit or complete a time-specific assessment and must submit a claim for Extenuating Circumstances. If you attempt a time-specific assessment, then this is normally taken as your declaration that you consider yourself fit to do so. If your claim is approved, it will be for non-submission and you will have an opportunity to be assessed at a later date.

Claims for extenuating circumstances should be submitted no later than 5 working days after the deadline for submission or date of assessment.

**Long-term health condition**

A long-term health condition is a mental or physical condition that:

* lasts for more than twelve months
* may require you to seek support to complete some university activities
* may flare up

Please see2.4.2 of the [Extenuating Circumstances Policy and Procedures 2024-2025.](https://www.plymouth.ac.uk/rails/active_storage/blobs/proxy/eyJfcmFpbHMiOnsibWVzc2FnZSI6IkJBaHBBNWRiZVE9PSIsImV4cCI6bnVsbCwicHVyIjoiYmxvYl9pZCJ9fQ==--11bdf9753735b78518e41b272aabed67b9f71f32/Extenuating_Circumstances_Policy_and_Procedures_2024-25%20clean%20copy.pdf)

To tell us about a long-term health condition or report a change to an existing condition please contact the NSBM Programme Office or your Programme Leader

Once your long-term health status has been confirmed, you will not be asked to supply the same evidence again if you need to submit a claim for extenuating circumstances relating to that condition.

1. https://www.youtube.com/watch?v=7ESK5SaP-bc [↑](#footnote-ref-1)