

EE5311 Assignment 2 (AY23/24 Semester 2)

This assignment counts toward 25% assessment for the course. This assignment is due for submission by **26 April 2024**.

The assignment problem below is open-ended and may admit many possible solutions. Bearing in mind that the assignment provides you an opportunity to practice what you learn in this course, it is recommended that you think about how **probabilistic programming techniques** you learn in the course might help you solve the problem.

You **may** discuss the assignment problem and the solution methodologies with other students and the instructor, but you are **not allowed** to share code or project report with other students. The Canvas discussion forum is a great place for discussions and/or clarification regarding this assignment.

Caution

Any copying or plagiarism will hamper your own learning, and may also result in disciplinary action against you.

Problem Statement

You work for a government organization that regulates fishing in coastal waters to ensure long term sustainability. The allowed fish harvest per year is reviewed every 5 years, and a stock (fish population) assessment is undertaken before the next review.

Based on historical data, the Salmon harvest and stock estimates are as shown in Table 1. **The estimates are known to be noisy** and the estimated accuracy is also shown in the table.

If the Salmon stock drops below 100,000, experts have advised that there is a high chance of population collapse due to over-fishing. Based on the historical data, your task is to recommend the maximum allowable harvest for the next 5 year period, such that the Salmon stock at the end of the 5 years will not drop below 100,000 **with a 90% confidence level**.

Table 1: Historical Salmon harvest and stock data

Harvest	Stock at end of 5 years
20,000	264,410 \pm 10,000
50,000	257,132 \pm 10,000
80,000	251,466 \pm 10,000

Harvest	Stock at end of 5 years
110,000	$218,014 \pm 10,000$
140,000	$199,986 \pm 10,000$

You may assume that the simple fisheries model presented in week 6 in class (see [presentation slides](#) for details) is consistent with Salmon population dynamics in your country. However, the maximum supportable population and reproduction rate for Salmon are not accurately known for your coastal waters. Estimate these parameters from the data, and **quantify the uncertainty of your estimates and recommendation**.

Submission requirements

(25 marks)

- Brief report (**page limit: 3 pages**) in pdf format, clearly outlining the method used for your recommendation, and your recommendation on allowable Salmon harvest. Explain how you obtained uncertainty estimates for the parameters and recommendation, and justify any assumptions made.
- Well-commented runnable code yielding the results to support your recommendation.