

Project Proposal

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2025-03-12

1. Team members

This is an individual project. Only Jessie Liang (student number: 52819596) is involved in doing it.

2. Project theme

This project will address the theme called `time series and state-space models`.

3. GitHub repo link

<https://github.com/jessie-liang/447-project.git>

4. Two real-world datasets

4.1 Monthly consumer price index (CPI) aggregated for all items in Canada (2000 - 2024)

URL: <https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1810000401>

(Source: Statistics Canada)

```
##   year month  cpi
## 1 2000     1 93.5
## 2 2000     2 94.1
## 3 2000     3 94.8

##   year month  cpi
## 298 2024    10 161.8
## 299 2024    11 161.8
## 300 2024    12 161.2
```

4.2 Vancouver daily average temperature (June 15, 2022 - March 10, 2025)

URL: <https://vancouver.weatherstats.ca/download.html>

(Source: Weather Dashboard for Vancouver)

```
##           date avg_temperature
## 1 2022-06-15           13.8
## 2 2022-06-16           15.0
## 3 2022-06-17           14.2

##           date avg_temperature
## 998 2025-03-08           8.10
## 999 2025-03-09           7.20
## 1000 2025-03-10           5.15
```

5. Summary of a potential approach

My main goal is prediction, specifically using past data to forecast future values. For this, the main steps are:

- (1) Split the data set into a training set (relatively large) and a testing set (relatively small).
- (2) Use MCMC (ideally Stan) to fit a model on the training set, setting observations in the testing set as latent variables.
- (3) Obtain the posterior mean of these latent variables as point forecasts.
- (4) Compute RMSE using the point forecasts and real data in the testing set to assess prediction performance.