Biol 342 Project Proposal Form

This form is should be submitted online by 11:59pm on the day of your lab in Week 4.

Group members (with email addresses) please * contact person:

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Hypothesis (or hypotheses)

Seasonal temperatures and precipitation in Vancouver have shown changes over recent decades, indicating potential climate shifts. The hypothesis is that winter temperatures have increased, and precipitation patterns have shifted, signaling a broader impact of climate change on Vancouver's seasonal climate dynamics.

Design (Include detailed outlined of procedure, and controls, replicates, treatments, as necessary)

This project will focus on time-series analysis of historical temperature and precipitation data for Vancouver. Data will be collected for monthly average temperatures and total monthly precipitation over several decades (if possible). Each variable (temperature and precipitation) will be analyzed as an independent time series to identify trends and seasonal patterns. Forecasting models (e.g., ARIMA or Prophet) will then be applied to project future temperature and precipitation values, allowing an examination of potential seasonal shifts in the coming years.

Steps:

- **Data Collection:** Gather historical monthly temperature and precipitation data from a reliable source (e.g., Environment Canada).
- **Data Processing:** Clean the data for consistency, addressing any missing values.
- **Time-Series Analysis:** Apply ARIMA or Prophet models to identify trends, seasonality, and forecast future values for both temperature and precipitation.
- **Comparison:** Compare seasonal trends to identify if specific seasons show stronger changes over time.

No physical controls or replicates are needed, as the analysis will be based on available historical data.

Equipment (Attach list)

- Computer with statistical software (e.g., Python with libraries for time-series analysis, R, or similar).
- Access to online climate data sources for Vancouver's historical weather records.

Continue on other side

Data Collection and Analysis (Include what data you will collect, example of data tables, what statistical analysis you will do)

Data Collected:

- Monthly average temperatures and monthly total precipitation for Vancouver over a multi-decade span.

Data Analysis:

- Conduct time-series decomposition to examine seasonal components of each variable.
- Use ARIMA or Prophet models to analyze long-term trends and forecast future values.
- Data tables will include columns for month, year, temperature, and precipitation.
- Expected Output: Trend lines and seasonal forecasts for each variable to identify if Vancouver's climate has shifted over time.

Sources of Error and Variation (Include expected sources of error and variation and how you will minimize these)

- **Data Gaps:** Missing data points in historical records may impact the accuracy of forecasts. Interpolation techniques will be used to address minor gaps.
- **Station Differences:** Data from different stations might introduce variability. Consistent data from a single station will be prioritized if possible.
- **Model Limitations:** Time-series models rely on historical trends, which may not fully capture future shifts if unexpected climate factors come into play.