Characterizing dominance in free stall housed dairy cattle based on competitive behavior at the water trough

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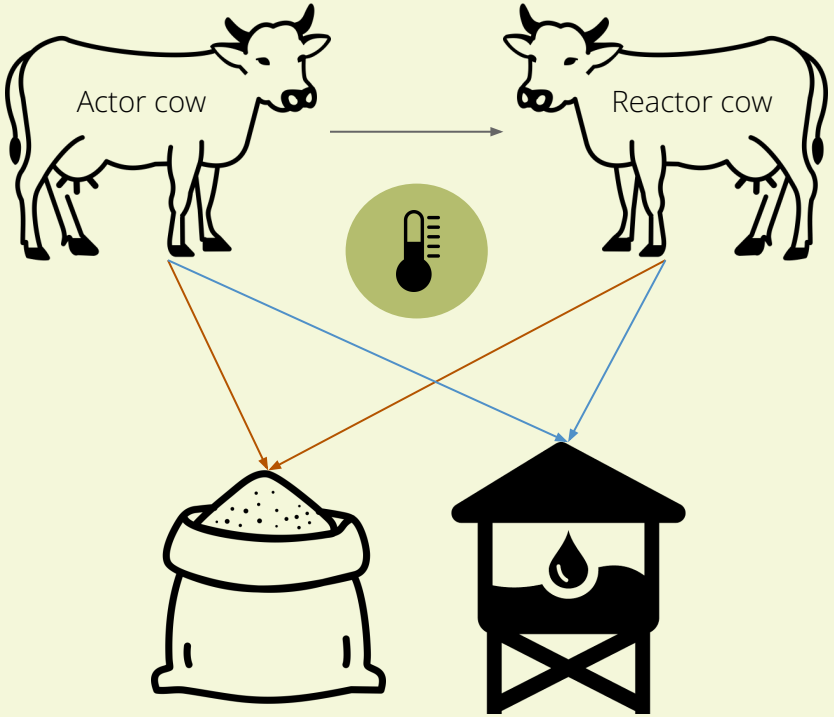
STAT450: Case Studies in Statistics

Introduction

The association between dairy cows' social hierarchy and their involvement in agonistic interactions (replacements) among feed bins and water bins.

Objectives

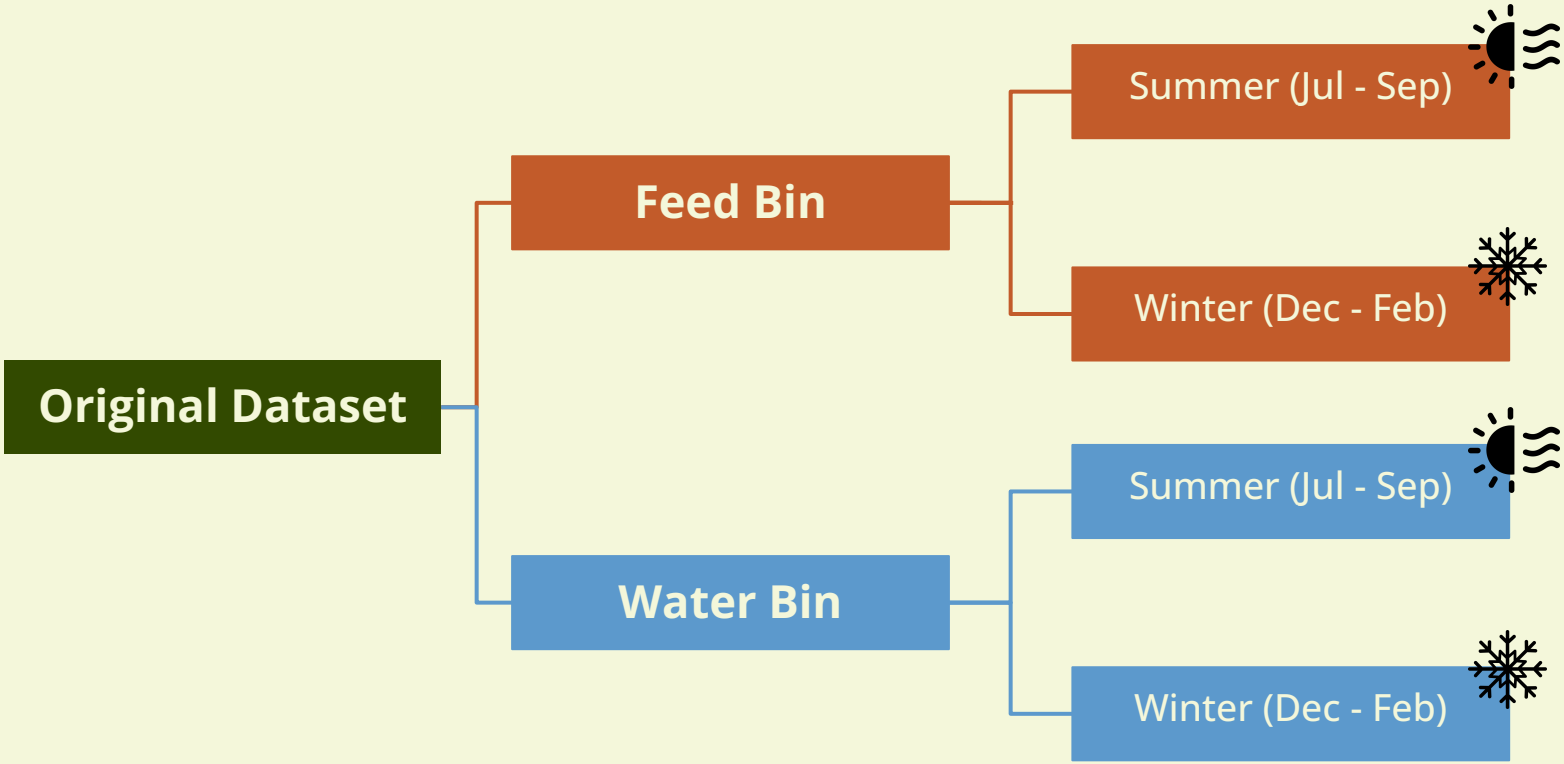
Address and compare how the dominance measures estimated at water bins associate with the ones estimated at the feed bins and whether different THI levels affect this association.



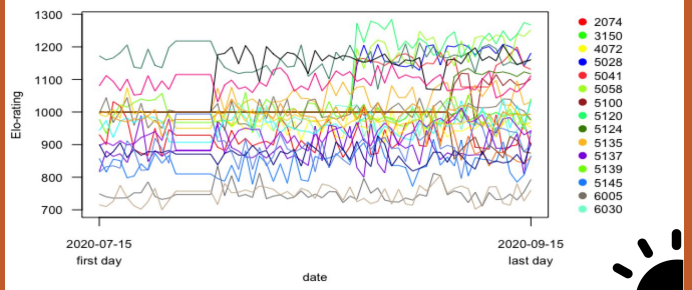
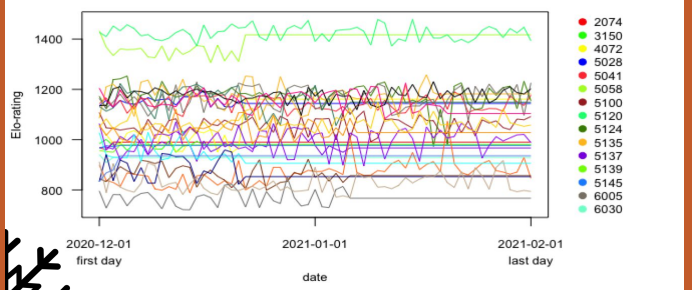
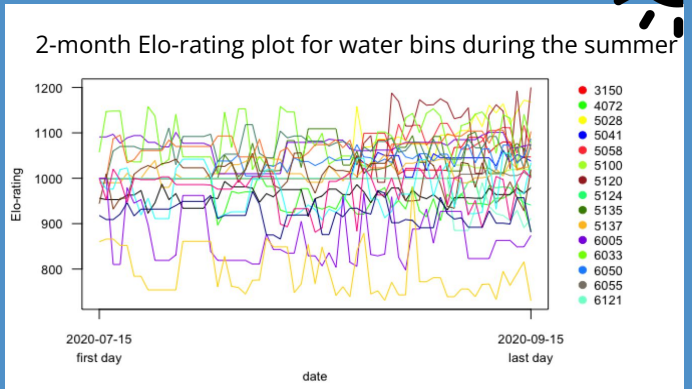
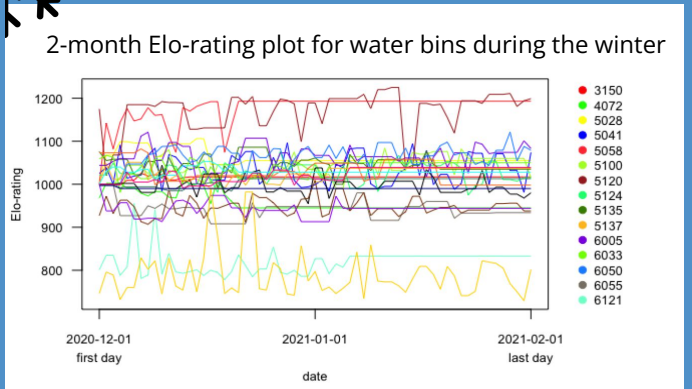
Data

- Actor Cow: The cow initiates the replacement (winner)
- Reactor Cow: The cow being replaced (loser)
- Bin Type: Water bin and feed bin
- Date: July 2020 to May 2021, 10 consecutive months
- Hour: Hourly timestamp from 0 to 24
- THI: Temperature humidity index

Exploratory Data Analysis



Exploratory Data Analysis (cont.)

	Summer	Winter
Feed	2-month Elo-rating plot for feed bins during the summer 	2-month Elo-rating plot for feed bins during the winter 
Water	2-month Elo-rating plot for water bins during the summer 	2-month Elo-rating plot for water bins during the winter 

Statistical Analysis Plan

Proposed approach: **Spearman's rank correlation**

- **Objective 1**: Feed bin vs Water bin
- **Objective 2** : THI effect
- **Method** :
  - Calculating Elo-rating score ranks for both objectives.
  - Test the null hypothesis : the correlation between two variables is near 1, indicating a strong similarity in rankings.
  - Using Spearman's correlation formula for calculation.
  - Using P-value to decide whether rejecting the null hypothesis or not.

Reference

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