

# ATOC4500

# Data Science Laboratory

# Application Lab 3

Instructor:

Prof. Jennifer Kay

[Jennifer.E.Kay@colorado.edu](mailto:Jennifer.E.Kay@colorado.edu)

Spring 2022  
T/Th 11:30 am-12:45 pm

# Plan this week....

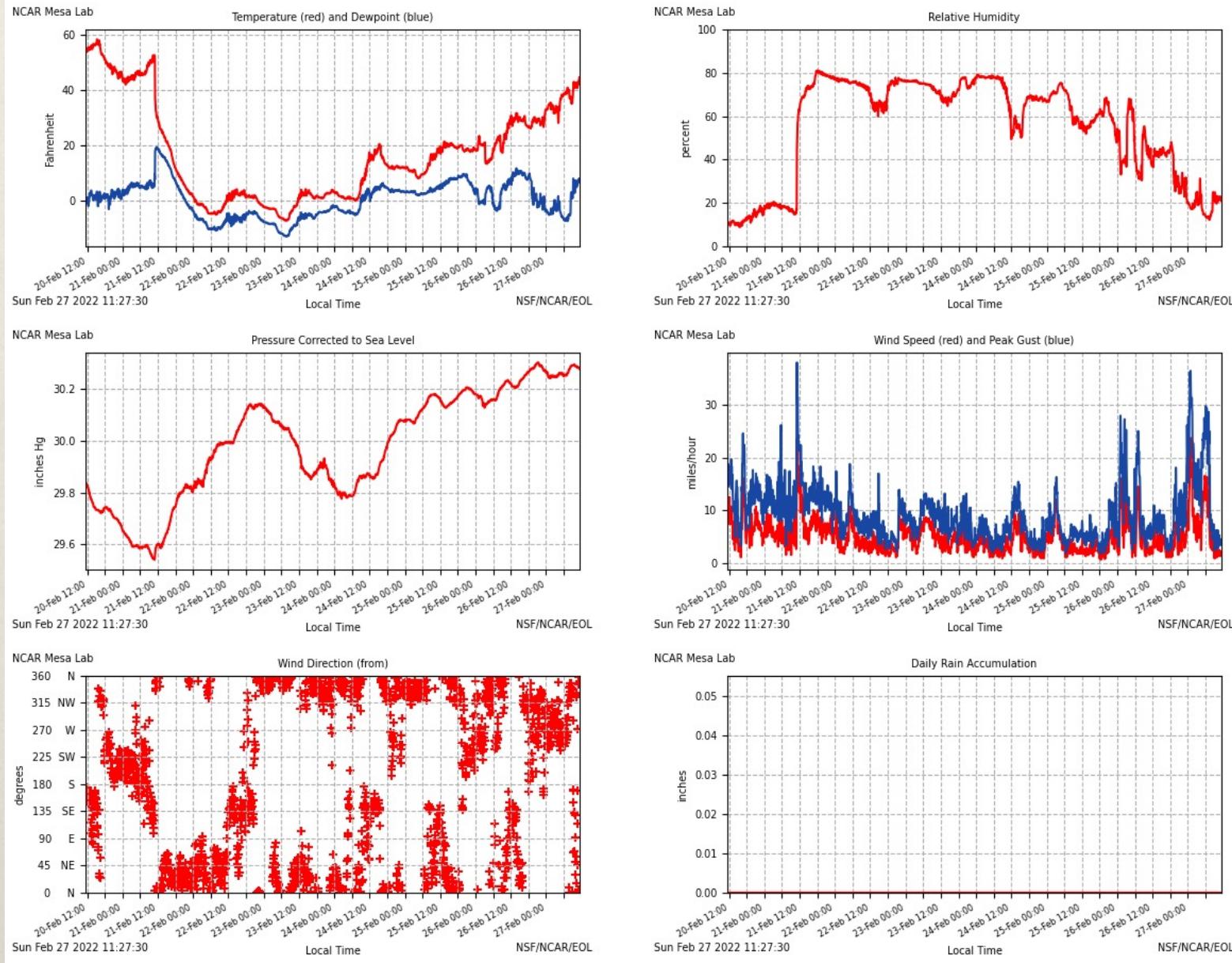
- 1) Application Lab #3
- 2) Start Homework #4

*You should finish Application Lab #3 and have started Homework #4 by the end of class on Thursday.*

*Let Prof. Kay and Giovanni know how it is going...Ask lots of questions! Coding, science, etc. - We are here to help and will be roaming around...*

# Was Feb. 20-27, 2022 “Winter” or “Spring”??

**Weather Plots (weekly, english units)**



# *Does “Fall” Exist along the Front Range?*

e.g., Boulder weather forecasts for Labor Day 2020...

## Extended Forecast for Boulder CO

Tonight	Friday	Friday Night	Saturday	Saturday Night	Sunday	Sunday Night	Labor Day	Monday Night
Clear	Sunny	Clear	Sunny	Clear	Hot	Mostly Clear	Sunny	Rain Likely
Low: 58 °F	High: 90 °F	Low: 59 °F	High: 96 °F	Low: 66 °F	High: 97 °F	Low: 62 °F	High: 89 °F	Low: 36 °F

## Extended Forecast for Boulder CO

Winter Weather Advisory								
Labor Day	Tonight	Tuesday	Tuesday Night	Wednesday	Wednesday Night	Thursday	Thursday Night	Friday
	40% → 100%	90%   70%	80%	40%   20%	40%	40%	40%	
Areas Smoke	Windy, Chance Rain then Rain/Snow	Rain/Snow and Breezy then Snow Likely	Snow	Chance Snow then Slight Chance Rain/Snow	Chance Rain	Chance Rain	Chance Rain	Slight Chance Rain then Mostly Sunny
High: 92 °F	Low: 33 °F	High: 34 °F ↴	Low: 28 °F	High: 43 °F	Low: 35 °F	High: 53 °F	Low: 40 °F	High: 68 °F

Pictures from September 6, 2020 – High that day 90 F  
“summer”?



# Pictures from September 8-9, 2020

## Snow, Lots of Tree Damage

## “winter”, “fall”, “spring”?



# ATO Weather Discussion

**Mountain Weather & Road Conditions**  
9/8/2020 8:43 AM

Sep/08/2020 \*08:34:48      Sep/08/2020 08:58:16

1.7 mi east of Rabbit Ears Pass      Hwy-14 Cameron Pass

US-40 Berthoud Pass      I-70 211.85 WB : 1.7 mi W of EJMT-RTR Upper (Unin)

I-70 Eisenhower Tunnel W

NWS Weather Forecast Office  
Denver/Boulder, CO

**NWS Boulder** @NWSBoulder  
A roundup of cams showing the arrival of winter this morning. The heaviest snow is now falling along/west of a line from Cheyenne, WY to Rocky Mountain National Park and Kremmling, CO. That heavier snow shifts eastward later this afternoon and evening. #COwx

8:46 AM - Sep 8, 2020 · Twitter Web App

37 Retweets 4 Quote Tweets 92 Likes

**WPF - CMAA #GBR** @bill... · 3h  
Replying to @NWSBoulder  
This would be why we left our favorite mountain spot a day early to get home. However, a very beautiful sight and much needed moisture! Lots of confused wildlife I am sure.

**Benedict Cumberbatch'** · 2h  
Replying to @NWSBoulder  
Thank god for this snow!

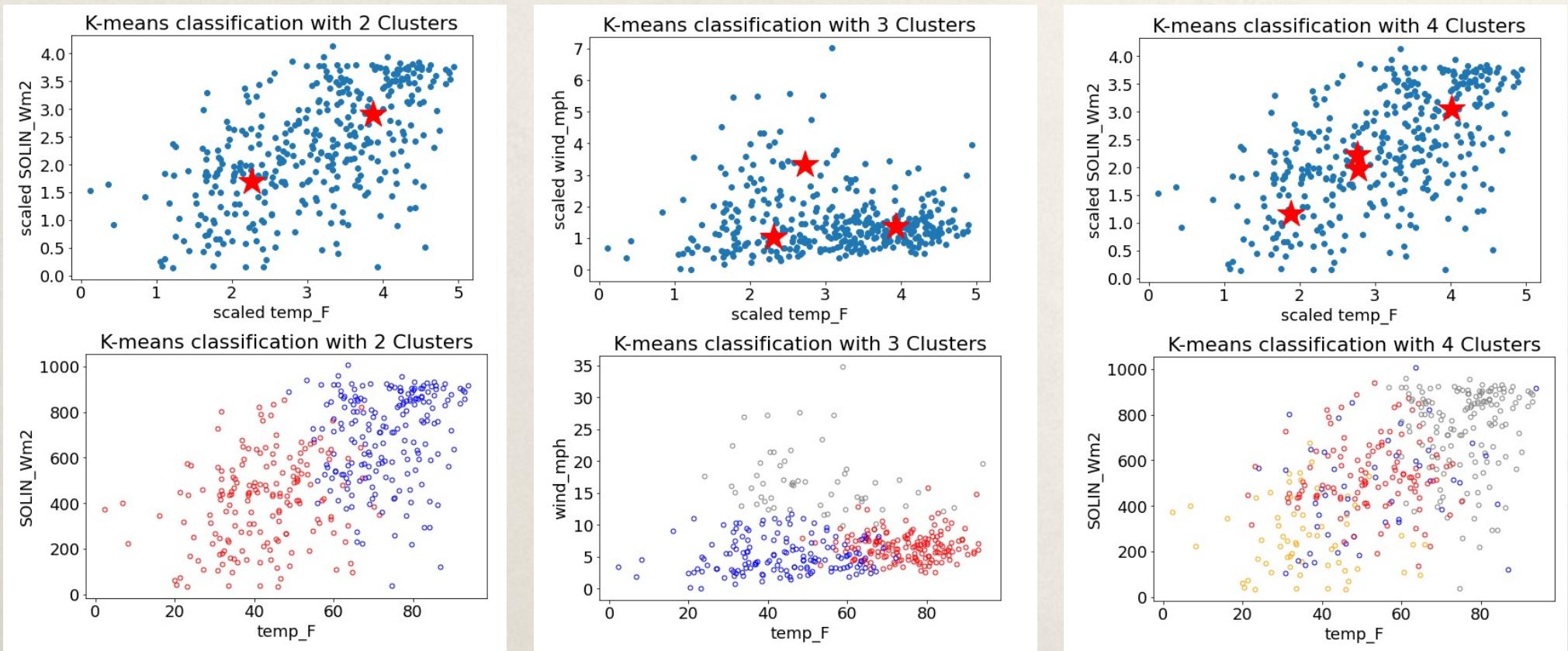
**CPI** @denvercpi · 1h  
Replying to @NWSBoulder and @theWXwoman  
Liquid gold for our #firefighters

**Andrew Winters**

*Prof. Andrew Winters (ATO) gave a special weather discussion about this crazy Labor Day 2020 weather that I uploaded to Canvas.*

*More recent discussions are here: <https://acwinters.weebly.com/atoc-wx-discussion.html>*

**Application Lab #2 – K-means clustering of weather observations: If we cluster the Christman dataset into 4 independent clusters – Does these clusters look like our four date-defined seasons (i.e., winter, spring, summer fall)? How many independent clusters (i.e., seasons) are there in the Christman dataset? How does this number depend on the input data (i.e., time of day, which variables are used)?**

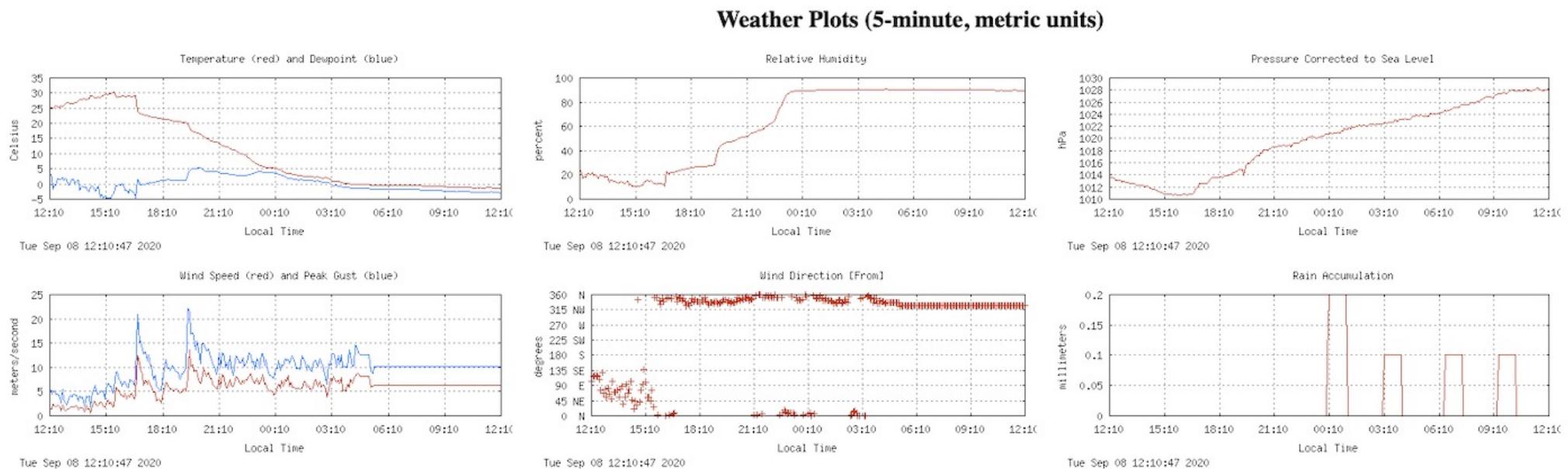


*cluster1=red, cluster2=blue, cluster3=grey, cluster4=orange*

# Unsupervised learning example: k-means Cluster Analysis of weather data.

*You will doing these calculations in homework #4! ☺*

Mesa dataset Variables (7, 2016-2021): Surface pressure, Surface temperature, Relative Humidity, Wind Direction, Wind Speed, Wind Gust, Rain accumulation



## Looking forward:

- Homework #4 is due next Thursday March 17.
- Next week we will have 3-minute homework presentations from each student. *Instructions provided on Canvas.*
- Contact Prof. Kay or Giovanni if you have any questions or concerns. Office hours are on this week:
  - Giovanni Monday 3-4 pm  
<https://cuboulder.zoom.us/j/96536534549> Passcode: letscode!
  - Prof. Kay Wednesday 4-6 pm <https://cuboulder.zoom.us/j/99769486583> Passcode: help

# **Assigned Groups Unit #4 - ATOC4500:**

## **Lecture #7, Application Lab #3, Homework #4**

**Group #1: Laura, Nate, Ania, Ben**

**Group #2: Sean, Jackie, Gillian, Alyssa**

**Group #3: Daphne, Sam, Erica**

**Group #4: Rachel, Devon, Fergus**

**Group #5: Victoria, Fergus, Jacob, Sydney**