

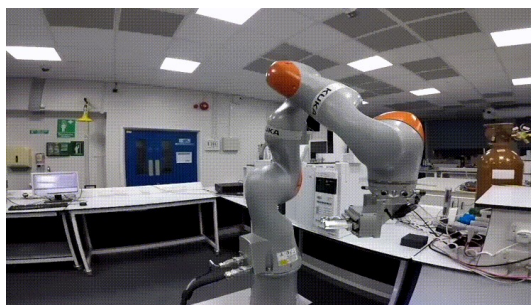
How's the Air Out There? Using a National Air Quality Database to Introduce First Year Students to the Fundamentals of Data Analysis

David Hall & Jessica D'Amico
Recorded on 2021-07-23

Whether we like it or not we are living in an age of automation and the world of chemistry is no exception



1970's UofT analytical chemist, UofT Archives



Mobile robot chemist, Burger et al.

Undergraduate labs need to reflect the reality
centric research, often they fail to do so



1970's UofT undergraduate lab, UofT Archives

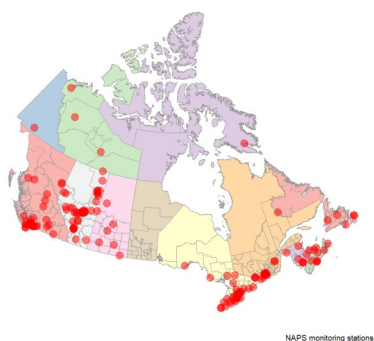


Modern UofT Undergraduate lab,

Teaching objectives

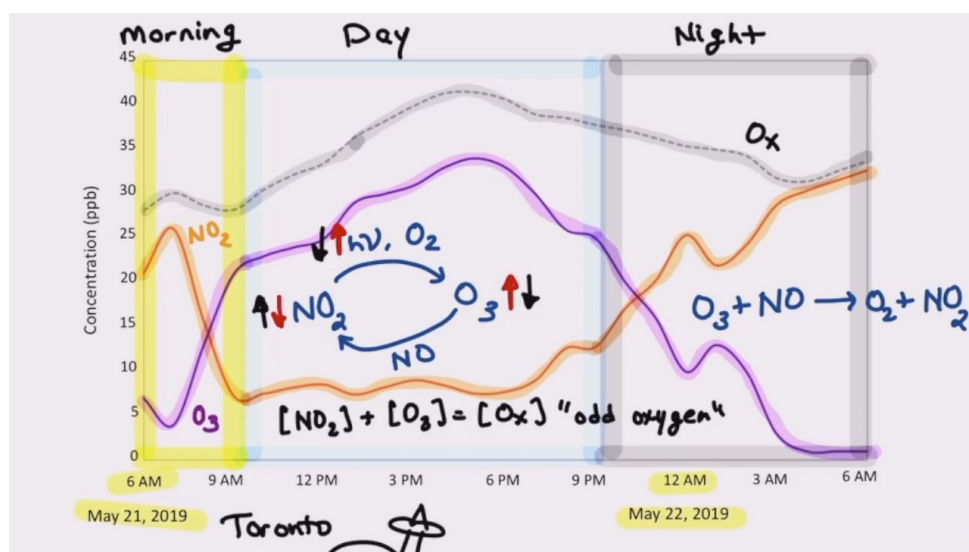
- Explicitly introduce data analysis workflows and skills **at the onset** of intro chem labs (*E.* graphicacy, etc.)
- Apply these skills to the analysis of real world data

National Airborne Pollutant Surveillance prog
ideal source of real data for students



Peter Power, Toronto Star

We created videos and other material to intrc
relevant atmospheric chemistry to 1st year s



J. D'eon, 2020

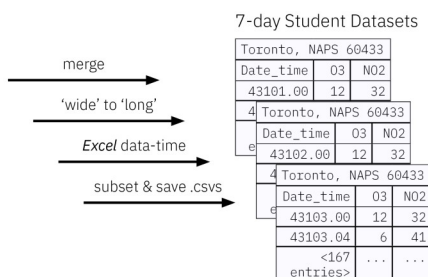
Students analyzed 7-day chunk of monolithic data; datasets and TA answers auto-generated

2018 Hourly O₃ NAPS dataset

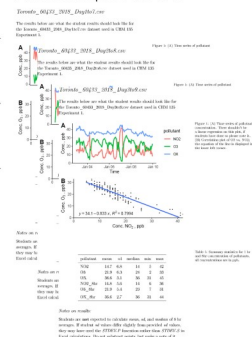
Pollutant	NAPS	City	Date	H01	<26 columns>
O3	10102	St Johns	20180101	35	...
O3	10102	St Johns	20180102	34	...
<84,321 entries>	...	...	...	...	...

2018 Hourly NO₂ NAPS dataset

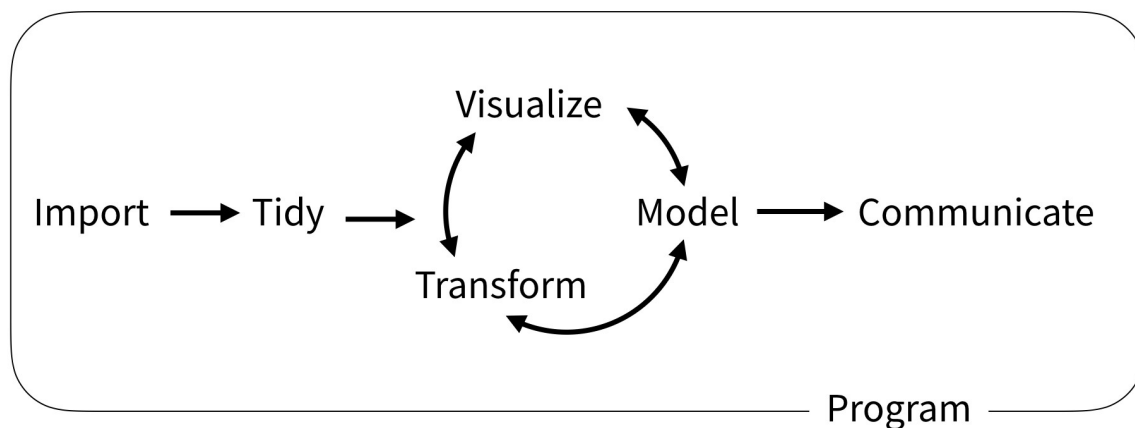
Pollutant	NAPS	City	Date	H01	<26 columns>
NO2	10102	St Johns	20180101	5	...
NO2	10102	St Johns	20180102	5	...
<68,626 entries>	...	...	...	...	...



Answer report for TAs

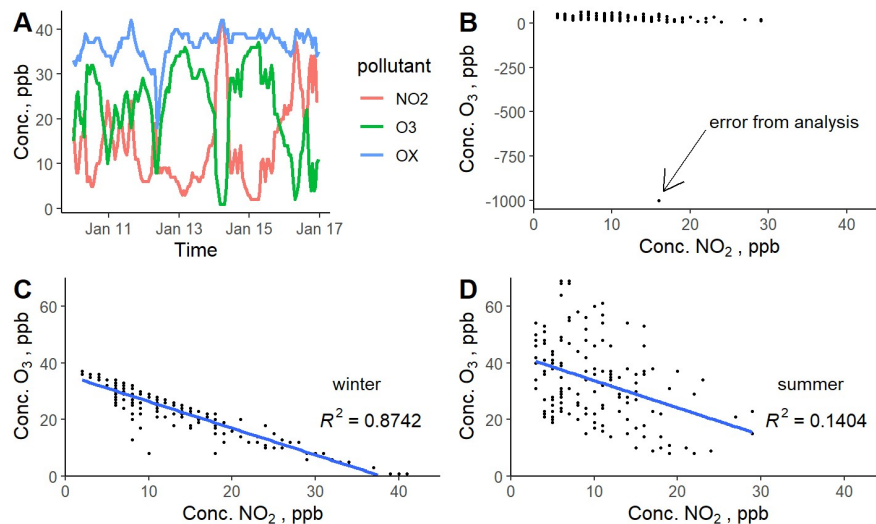


Instructions walked students through assignment data analysis workflow

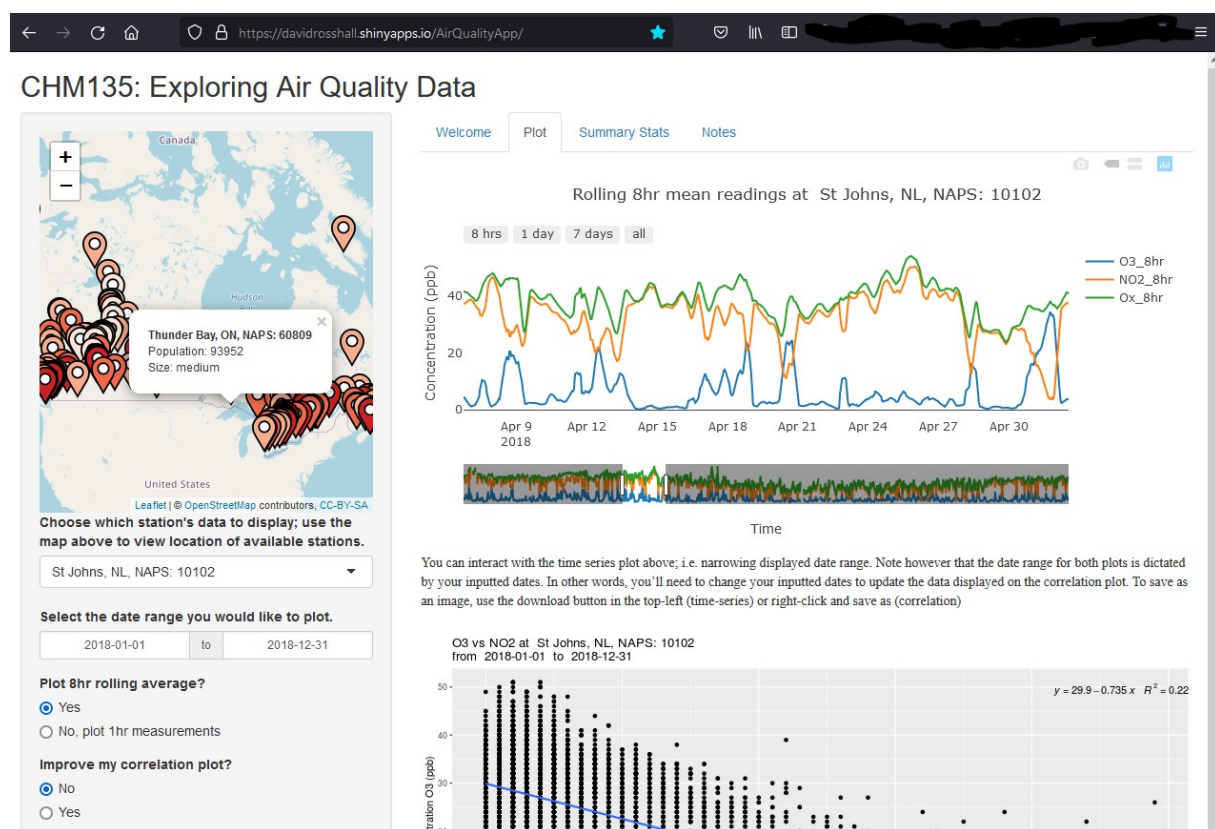


from Wickham & Golemund, 2021

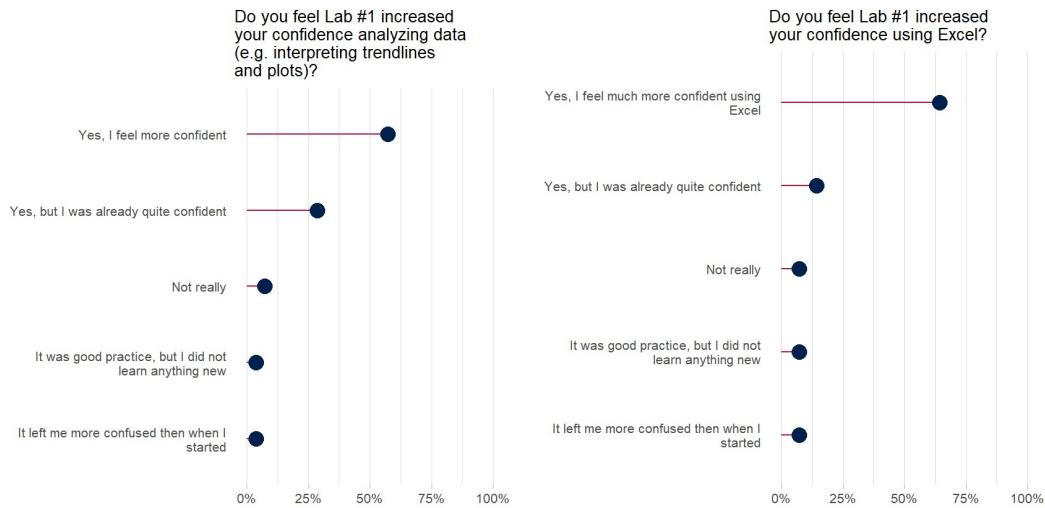
Ultimately students produces visualizations t
investigated correlation between $[O_3]$ and $[N$



We created a Shiny app so students could ex
beyond their assigned data & generate hypot



Student responses were positive and appreciate the utility of lab content wrt other courses



Conclusions

- Continuing with lab in post-Covid setting
- Refining schedule/deadlines to alleviate burden on students
- Expanding data analysis with *R* for upper-year courses

Questions

Live Q&A Aug. 19th from 11:30am to 12:20pm in Virtual Meeting

Please reach out with any inquiries/questions:

- David Hall: davidross.hall@mail.utoronto.ca
- Jessica D'eon: jessica.deon@utoronto.ca

Code for the dataset generation and Shiny app are openly available here:

- https://github.com/DavidRossHall/CHM135_Exp1Data
- <https://github.com/DavidRossHall/AirQualityApp>