

Tips for organizing data for upload into Tuva

Below are two tables of soil temperature data, downloaded from a website featuring activities using Vernier probes. They are the same dataset, but are organized differently.

How students organize data in a spreadsheet makes a difference in how they will be able to visualize it in Tuva, and what kinds of questions their graphs can help answer.

A. Each sensor temperature is considered to be a different attribute. (So there are five attributes: Time (numeric), and four temperature attributes (all numeric).

	A	B	C	D	E
1	Time (hours)	Sensor 1 Temp (C)	Sensor 2 Temp (C)	Sensor 3 Temp (C)	Sensor 4 Temp (C)
2	0:00:00	21.733	21.767	21.733	21.367
3	1:00:00	21.667	21.733	21.7	21.3
4	2:00:00	21.667	21.733	21.667	21.333
5	3:00:00	21.633	21.667	21.633	21.233
6	4:00:00	21.6	21.7	21.6	21.233
7	5:00:00	21.6	21.667	21.6	21.133
8	6:00:00	21.6	21.667	21.6	21.133
9	7:00:00	21.533	21.633	21.533	21.1

Questions for A

- How did temperatures for each sensor change through time?
- What is the relationship between S-3 and S-4 temperatures?

Questions for B:

- How did temperatures for each sensor change through time?
- Is one sensor consistently different from the others?

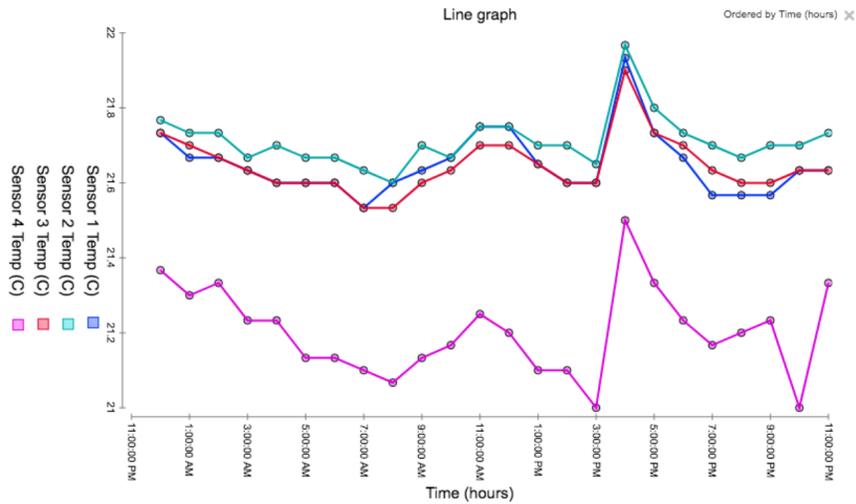
*Sensor number is a number, but the numbers are used as labels here, so it's categorical).

B. Sensor number is added as an attribute, and there is just one attribute for temperature. So there are three attributes: Time (numeric), Sensor Number (*categorical), and Temperature (numeric).

Time (hours)	Sensor Number	Temperature (C)
0:00:00	1	21.733
1:00:00	1	21.667
2:00:00	1	21.667
3:00:00	1	21.633
4:00:00	1	21.6
5:00:00	1	21.6
6:00:00	1	21.6
0:00:00	2	21.767
1:00:00	2	21.733
2:00:00	2	21.733
3:00:00	2	21.667
4:00:00	2	21.7
5:00:00	2	21.667
0:00:00	3	21.733
1:00:00	3	21.7
2:00:00	3	21.667
3:00:00	3	21.633
4:00:00	3	21.6
5:00:00	3	21.6
0:00:00	4	21.367
1:00:00	4	21.3
2:00:00	4	21.333
3:00:00	4	21.233
4:00:00	4	21.233
5:00:00	4	21.133
6:00:00	4	21.133

Graphs from Dataset A:

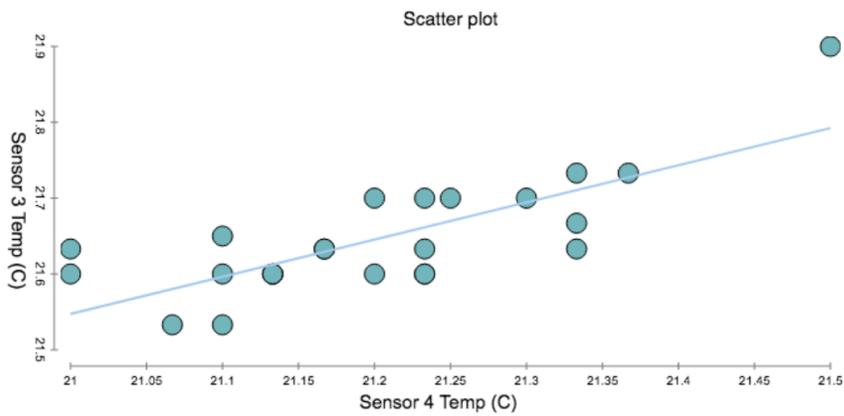
- How did temperatures for each sensor change through time?



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SOURCE: -

- What is the relationship between S-3 and S-4 temperatures?

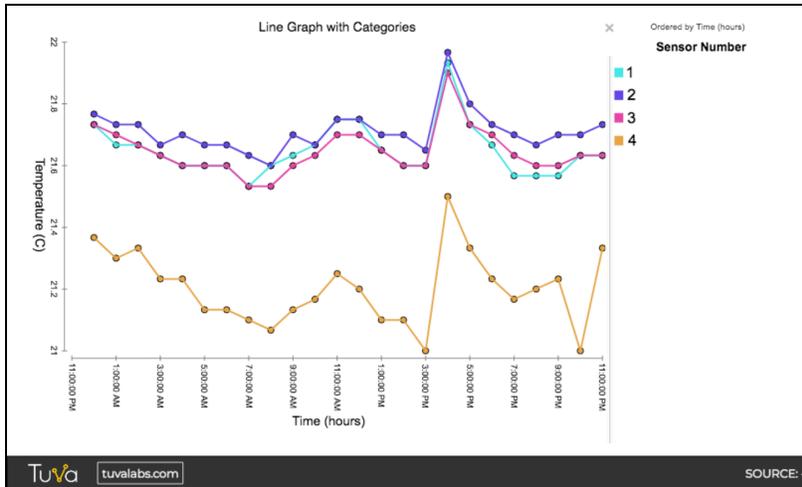


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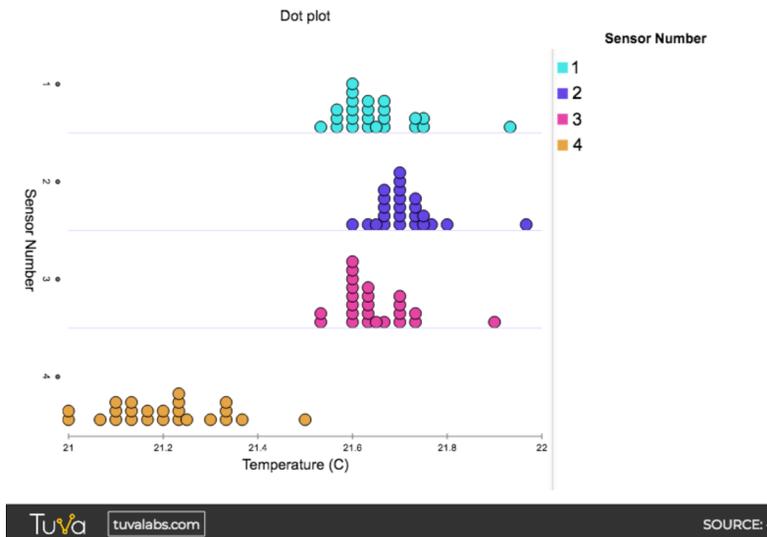
SOURCE: -

Graphs from Dataset B

- How did temperatures for each sensor change through time?



- Is one sensor consistently different from the others?



Take-home message: How to organize a dataset and how to graph the data depend on what you want to find out. There is no one right way to organize a dataset -- *students have a choice*.

Version B allows students to visualize variability within groups, or to look for relationships between numeric attributes across all groups. Version A allows them to show relationships between individual sensors.

Data source: Teach Engineering - University of Colorado, Boulder

URL: <https://www.teachengineering.org/activities/view/nds-1741-statistical-analysis-temperature-sensors-accuracy>