

## 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?

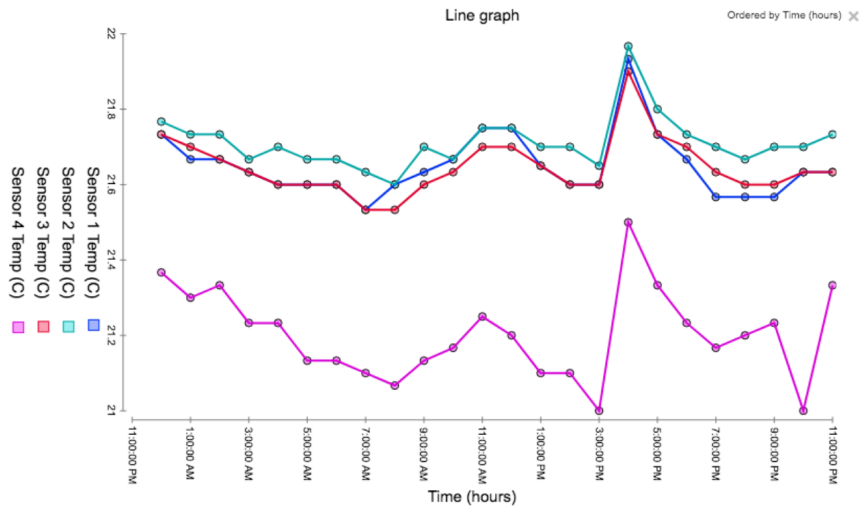
\*Sensor number is a number, but the numbers are used as labels here, so it's categorical).

**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          |

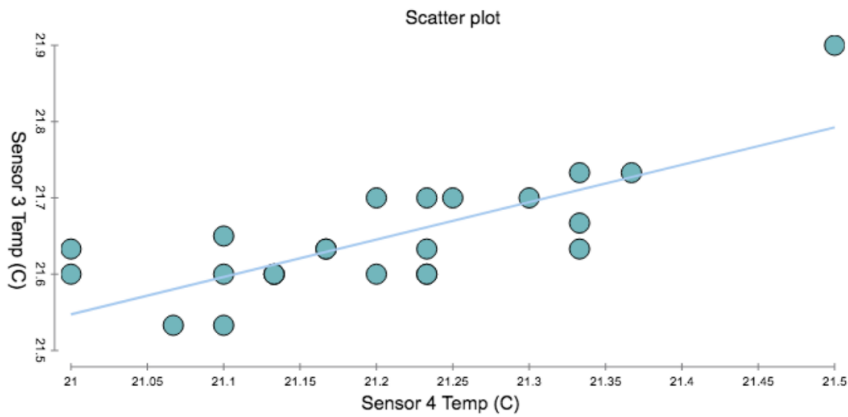
## Graphs from Dataset A:

- How did temperatures for each sensor change through time?



Tuva tuvalabs.com SOURCE: -

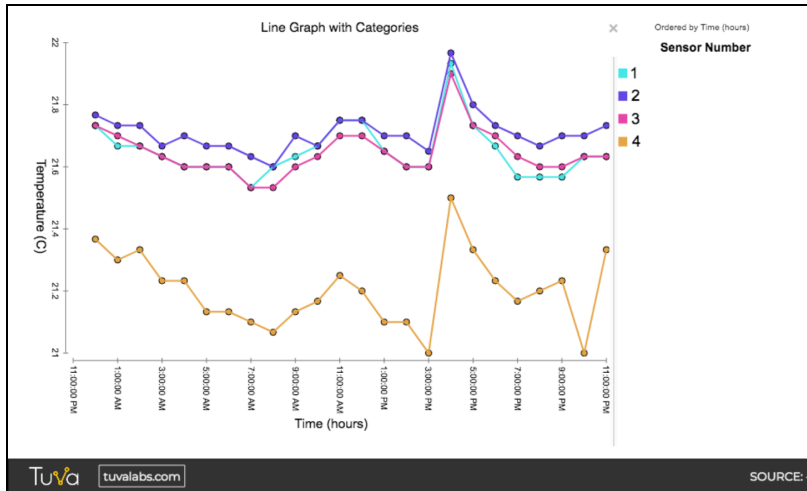
- What is the relationship between S-3 and S-4 temperatures?



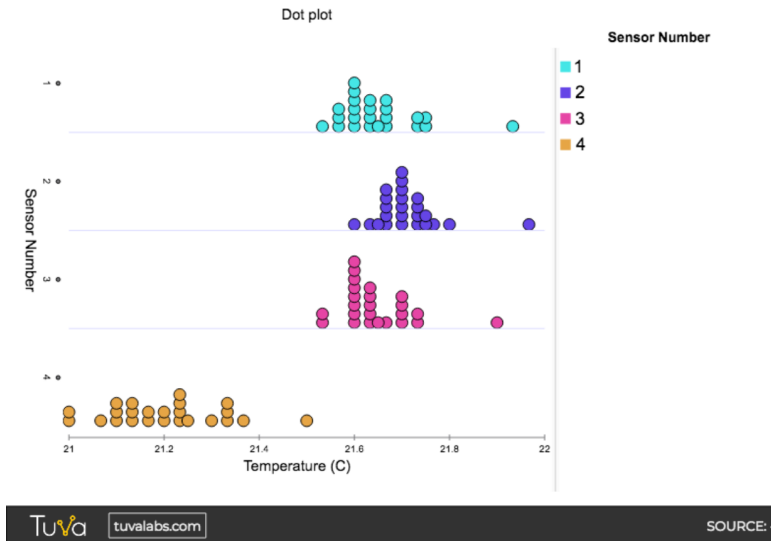
Tuva tuvalabs.com SOURCE: -

## 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.