

## Agricultural Cyberbiosecurity

# Data Literacy

### What is Data?

Data is everywhere and used for many things, like deciding when to grow crops, finding cures for diseases, or making personalized playlists on Spotify. Data is the information we get by observing people, things, or objects. There are two types of data: numerical data and descriptive data. **Numerical** data are numbers. For example, counting how many grapes are in a bowl. **Descriptive** data are words—for example, the color of the grapes in the bowl. We can get data from almost anything. For example, how many students are in your class? What are the colors of your neighbor's shirt? Knowing the type of data, you are collecting is essential to understand how to use it correctly.

### What is Data Literacy

Before we use data, we need to understand it. Data literacy can help us do that. Data literacy is a skill. It takes practice and time. Data can be shown to us in a lot of different ways. Data is shown to us in graphs, percentages, or descriptions. Knowing how to recognize data is a big part of data literacy. Another big part is understanding the value of the data. Not all data is good data. Some data needs to be more accurate, and some need to be corrected. Practicing how to understand data helps us make decisions in the future.

### Key terms

- **Agronomists:** an expert in the science of soil management and crop production.
- **Big Data:** Data sets that are increasingly large and complex, in which we can find helpful trends that would not be otherwise apparent.
- **Phishing Scam:** A type of online scam that targets consumers by sending them an e-mail that appears to be from a well-known source – an internet service provider, a bank, or a mortgage company.
- **Ransomware:** a type of malicious software designed to block access to a computer system until a sum of money is paid.

## What is Ethical Data?

Did you know that one out of every three sheep have two tails? Does that surprise you? If so, that's because I lied! This is an example of **unethical** data. **Unethical** data is data that is made up or changed. Data is considered ethical when it is reliable, accurate, and honest. With many resources available online, it's always important to consider the trustworthiness of the data you see. Also, it's important to use ethical data. That way, we can all trust the data we are seeing.

**Fabrication** — is when data is changed or left out to help support a hypothesis.

**Falsification** — is the addition of data or observations that never happened.

**Plagiarism** — is when you represent other work as your own.

## Data in Agriculture

Farmers have always used data. Farmers record what they see on their farms, like when plants bloom or how much water they use. Over time, farmers start to see patterns in their data and can use them to help them make decisions. Recently, farming has become a lot more high-tech. Using technology in agriculture means that farmers can collect more data than ever. As a result, farmers can use data and new technologies to make work easier or cheaper. Using data, farmers can produce more food than ever before!

## Data Collection

We already know that data is all around us. Data are the numbers and words that describe the things we're interested in. To use data, we must collect it. Data is collected in many ways. Scientists collect data by conducting experiments and surveys. You could collect data by taking notes in class. But there are other ways data can be collected. Some ways that might surprise you! Cell phones, computers, and tablets collect an enormous amount of data! The data from phones and apps are used to detect problems, sell you things, or improve service. These devices always produce data to create the biggest data group possible. This is referred to as Big Data. Collecting large amounts of data help researchers to find information that we might not have been able to before.



**Figure 1: Conservationists recording data on corn.**

"Conservation agriculture in Chiapas: Data time" by CIMMYT is licensed under [CC BY-NC-SA 2.0](#).

## Data Storage

Now that we collected data, what do we do with it? First, we have to keep it somewhere safe. Data can be stored in a variety of ways. Traditional forms of data like handwritten notes, film, or publications can be stored at the library or in file cabinets. This makes them easy to project but much harder to share. This was the way we stored data for a long time.

Since computers came along, we've had to change how we store data. Digital data makes storing lots of data in a small space much easier. Digital data exist as a computer file. While computer files are not something we can hold, they still need to be stored in a physical object. It could be on your computer, on **server** thousands of miles away, or on a hard drive in a safe. Digital files are much easier to share because they exist on computers. We can use the internet to send data to people on the other side of the world if we want to!

## Connection to Cyberbiosecurity

Having digital data does not mean it's safe. While physical data is harder to share, it's also easier to protect. If you lock a book in a safe, someone who wants that book will need the combination. Digital data is much easier to share. The internet allows us to do a lot of great things. But it also poses some risks. Having a computer connected to the internet means that files on your computer can be accessed through the internet. If someone wants a piece of data, they can use the internet to get to it. That is why we have more steps to protect digital data. Where a book can be locked with a single combination, digital data need to use **encryption**, **passwords**, and **dual authentication** to keep digital data safe.

Having data literacy can help to keep digital data stays safe. Being data literate means knowing what data is, how to use it, and how to protect it. This is a very important skill for anyone to have. It's a big part of all the jobs we all do. This includes your teacher, astronauts, and farmers. Everyone uses data, and everyone needs data literacy.



**Figure 2. Facebook data storage center**

File: Intel Team Inside Facebook Data Center.jpg" by Intel Free Press is licensed under CC BY 2.0.



## Career connections

Artificial Intelligence Specialist

Data Scientist

Software Developer

Engineer

Robotics

Consultant

Operations Manager

Support Analyst

Did you know? The College of Agriculture and Life Sciences at Virginia Tech has nearly 70 program options! Find your career connections at [cals.vt.edu](https://cals.vt.edu) or email [applytoCALS@vt.edu](mailto:applytoCALS@vt.edu)



# CAIA

## Scientist Spotlight

**Jordan Allen** is from New Jersey and holds a bachelors and master's degree in food science and technology. She is currently a Senior Chemist at Ingredion and her research specializes in plant protein characterization. With a strong commitment to data accuracy, her work is vital for understanding plant protein properties and applications. Recognizing the risks of compromised data, her research contributes to both cyberbiosecurity and the field of sustainable food technology while merging scientific insight with data integrity for a more secure and informed future. Jordan was a CAIA Graduate Student Affiliate.



## References

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# Acknowledgements

## This resource was developed by faculty and students at Virginia Tech:

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This factsheet was partially created through the use of ChatGPT, a large language model artificial Intelligence. ChatGPT was given reference material found in a ~12<sup>th</sup> grade reading level version, and prompted with, "convert to a 6th grade reading level" before additional edits from the authors.

## This resource is presented on a template developed by Kindred Grey. How to cite this template:

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This project is an outreach effort of the Virginia Tech Center for Advanced Innovation in Agriculture. This work is supported, in part, through the CCI Southwest Virginia Node Cyberbiosecurity Seed Grant program and the USDA National Institute of Food and Agriculture, Women and Minorities in Science, Technology, Engineering, and Mathematics Fields (WAMS) Grants Program, award #2020-38503-31950.



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This definition of OER is provided by [The William and Flora Hewlett Foundation](#).

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- Student fact sheet
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## How to cite this version

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