Big Data

Introduction

Big data is all around us, and it can be hard to understand. It's a huge amount of information that is collected from things like your phone, the store where you shop, and the music you listen to. People who work with this data look for patterns to help them predict what might happen next.

This can be really helpful, like when online stores show you ads for things you might want to buy. Doctors and police also use big data to help them do their jobs better. Farmers use It to drive their tractor! The goal is to find useful trends in all parts of our lives.

Key terms

- **Precision Agriculture -** Technology that allows a farmer to be very exact in the way they farm. Often this includes using computers, robots, and drones.
- **Cyberbiosecurity -** The combination of physical security like fence and locks, cybersecurity like passwords, and biological data like a chicken's temperature.

In biology, cells in our bodies talk to each other and work together in complicated ways. We can use math and physics to figure out how they communicate and function. This uses huge amounts of data to create detailed pictures and models of how living things work.

During COVID-19, we saw how big data can help in biology. A lot of information was collected about the virus and how it spread. Scientists used that information to track the pandemic and help people stay safe. Some phone apps even let you know if you were at risk of getting sick. This is an example of how big data can help in real life, right now.

Fun fact!

How can you tell if data is *big data*? Does It have the V's?

Volume - There needs to be a lot of It!

Velocity - It needs to come in fast!

Variety - There needs to be all kinds!

Big Data in Farming?

Farming today is very high-tech. Farmers have always kept track of changes on their farms. Now they can use computers to store their data, drive tractors, and keep track of animals. Putting this information into a computer helps them to predict what might happen in the future and get food to all of you.

Farmers are using new technology called **precision agriculture** to grow more food. Technology like robots and sensors help farmers figure out how to take care of their crops. Big data in farming will be more important than ever. Issues like climate change will need technology to help farmers.

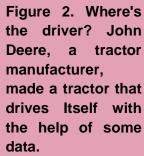**Figure 1. A farmer uses her phone to check the plants health.**
"Sita Kumari, farmer, uses mobile phone apps to enhance her yields and get access to markets and labor." by CGIAR System Organization is licensed under CC BY-NC-SA 2.0."

Cyberbiosecurity is all about keeping important information and technology safe. Specifically, data that links food and people. Farms, hospitals, and websites use this data to do amazing things. Farms can make more food. Hospitals know how to treat sick people. This data needs to be protected because it can directly impact people, animals, and plants.

Figure 2. Where's the driver? John Deere, a tractor manufacturer, made a tractor that drives Itself with the help of some data.
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Career connections

Data Scientist
Agricultural Consultant
Agribusiness Management

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 or email applytoCALS@vt.edu

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CAIA Scientist Spotlight

Dr. Anne Brown has a PhD in Biochemistry and works in the field of computational biology and applied biological data science. Her work involves working with big data sets to understand how atoms move, how biological mechanisms happen, and how trends impact data impact systems. She works with faculty from all over the Virginia Tech campus for their data needs and with partners at other universities. She likes to teach about how to work with data and make it useful for your life, no matter what discipline. Anne is a CAIA Affiliate Faculty.

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This definition of OER is provided by The William and Flora Hewlett Foundation.

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The main landing page for these resources is https://doi.org/10.21061/cyberbiosecurity.

This page includes a downloadable and editable Word document for the:
- Student fact sheet
- Student activity sheet
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