Class 6
Lesson – 6.10
From Hunting-Gathering to Growing Food - Chapter 2

Parameters	Description	Note for teachers
Chapter Covered	Chapter 2: From Hunting-Gathering to Growing Food	
Name of the Book	NCERT, Social Science Textbook for Class VI	
Learning Objectives	In this chapter, students will learn about the history and development of agriculture. They will explore the transition from hunting and gathering to growing crops and raising animals for food, and the impact this had on the growth of human societies and the development of civilizations. Students will gain a better understanding of the evolution of agriculture, and its role in shaping human societies and the environment. They will also learn about the importance of responsible resource management and the impact that our choices have on the environment. To enable learners to: **Scholastic:** **Stage 1: Conceptualization** • Learn about the transition from hunting and gathering to growing food as a way of sustenance. • Explore the history and evolution of agriculture and its impact on society. **AI + Tinkering** **Stage 2: Apply Design Thinking** • Understand the connection and working of a circuit • Learn interfacing circuits with sensors • Collect data using sensors • Generating insights from collected data **Stage 3: Creating a circuit system to get all the parameters** • Use Arduino and interface multiple sensors to collect the data about cow's body parameters and store them in a CSV based file. **Stage 4: Making a data-driven AI model that predicts if the cow is "Healthy" or "Not Healthy"** • Collect information about the body parameters of a cow. • Create a classification model to classify if the cow is Healthy or Unhealthy based on the data collected.	
Time Required	5 periods of 45 minutes each	

Classroom/ATL Arrangement	Theory session: 1 period with regular classroom seating Hand-on activity session: 4 periods of group activity, while learners sit in pair	
Material Required	**Scholastic:** • Smart class setup • White board and marker **AI and Tinkering:** • Heart Rate sensor • Temperature sensor • Arduino UNO • Jumper Wires • Breadboard	
Pre – Preparation Activities	**Scholastic:** • Basic knowledge about human evolution • Understanding about how parameters like Body Temperature and Heart Rate values play an important role in determining the health of any living being **AI and Tinkering:** • Basic knowledge about the working of a circuit	
Previous Knowledge	The learner should: **Scholastic:** • Have an idea about the evolution of human societies from hunting-gathering to growing food. • Know about the different ways in which humans have obtained their food over time, including through agriculture, animal husbandry, and trade. **Tinkering** • Know the impact of food production and distribution, and how health has changed over time. • Know the role of technology in determining the health of animals.	
Methodology	**Stage 1: Conceptualization Scholastic: (Social Science teacher**) • In the first session, the teacher will explain the transition from hunting and gathering to growing crops and raising animals for food, and the impact this had on the development of civilizations and the growth of human societies. • The various sources of food and the importance of resource management, including the proper use and disposal of materials will also be discussed. The chapter also covers the impact of agriculture on the environment, which would be explained by the teacher. • The facilitator will then explain the various sources of food, including plant-based sources like grains, fruits, and vegetables, and animal-based sources like meat, dairy, and eggs, followed by the discussion on the importance of understanding	

and managing resources, including the proper use and disposal of materials, and the impact of agriculture on the environment.

- Similarly, more ideas would be given on how the development of agriculture also led to the growth of human populations. With a more reliable source of food, people were able to have larger families and live longer, healthier lives. This, in turn, led to the growth of human societies, as more people meant more resources and labor to support the needs of the community.
- Next, the discussion can be about how other humans and animals have evolved and the techniques used to determine their health. How a lot of things have changed over time. Some examples could be added to this.

Contextualization:
AI and Tinkering:

Stage 2: Apply Design Thinking framework to the given scenario (Social Science teacher & ATL in-charge)

Problem Statement/ Scenario:
Ramu is a curious farmer who loves to learn about technology and how it can be used to improve his farm. One day, Ramu noticed that one of his cows seemed to be feeling unwell, and he wasn't sure how to tell if the cow was really sick or just a little under the weather. Ramu hopes to be able to identify any potential health issues early on and take the necessary steps to ensure the cow's well-being.

Empathize: The students brainstorm and analyze the problem faced by Ramu in identifying the matter with his cow. The students are asked to ponder on the following questions:

- How does Ramu feel about the cow's health issues?
- What kind of problem do you think he is facing in determining the cow's health?
- How does the cow's health impact, Ramu?
- Why is it important for him to identify any potential health issues early on?
- What is some advice that he might get from other farmers or experts in the field?

Define: The students will now be introduced to the use of sensors and machine learning to monitor the health of cows. Students will also explore the tools that can be used to track the cow's heartbeat and temperature, and how this information can be used to identify potential health issues. Here are some points that can be covered:-

- What are some common ailments that cattle suffer from?
- What are some symptoms of sickness in cows?
- How can I use technology, like sensors and machine learning, to monitor the health of my cow and identify any potential issues early on?
- How can one use the data collected by sensors to make informed decisions about the cow's care and prevent potential health issues from arising?

Ideation: Students will brainstorm ideas for a project to investigate the use of sensors and machine learning to monitor the health of cows. They will consider different methods for collecting and analyzing data, such as using sensors to collect data and developing machine

learning models, and will think about how Ramu can use this information to improve the overall health and well-being of his cows.

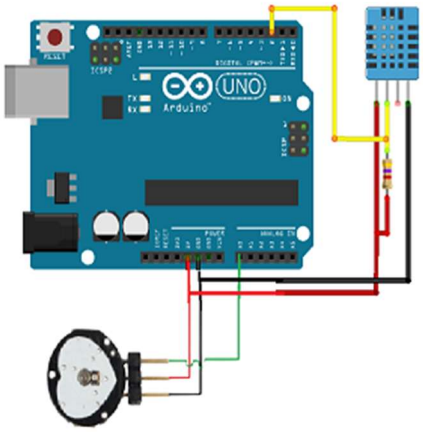
Stage 3: Creating an Arduino circuit to get the Heart Rate and Temperature values, as well as create a data file of these values for applying Machine Learning (Social science teacher & ATL In-Charge)

The teacher will connect the following circuit in the classroom to give the students an understanding of sensors and basic working of the circuit.
Here is a video to get started with Arduino Uno:
https://www.youtube.com/watch?v=ELUF8m24sZo
Introduction to DT11 and Pulse rate sensor, how they work and does the output look like:
https://www.youtube.com/watch?v=OogldLc9uYc
https://www.youtube.com/watch?v=aKus0FV4deU
We will store all the sensor values into a "comma separated values file"(also called CSV file). To know more about 'CSV files' and how to create a CSV file, here is a video link:
https://www.youtube.com/watch?v=X11dtWlrii8.

3.1 Take the Pulse rate sensor and connect the pins as shown in the circuit below. Make sure that the last pin is connected to A0 on the Arduino Uno board. Similarly, the DT11 should be connected to Pin 2 on Arduino UNO.

3.2 The rest of the pins should be connected to GND and Vcc for the power supply.

3.3 This is how the completed circuit would look like:



3.4 Now, let us start the code upload on Arduino Uno Board. Here is a quick tutorial on how to do that: https://www.youtube.com/watch?v=ELUF8m24sZo

3.5 Copy the code provided below and upload it to the board.

```
#include <PulseSensorPlayground.h> // Includes the PulseSensorPlayground Library.
#include "DHT.h"
// Variables
const int PulseWire = 0; // PulseSensor PURPLE WIRE connected to ANALOG PIN 0
int Threshold = 550; // Determine which Signal to "count as a beat" and which to ignore.
```

```
// Use the "Gettting Started Project" to fine-tune Threshold Value beyond default setting.
// Otherwise leave the default "550" value.
#define DHTPIN 2     // what pin we're connected to

 // Initialize DHT sensor for normal 16mhz Arduino
DHT dht(DHTPIN, DHTTYPE);

PulseSensorPlayground pulseSensor; // Creates an instance of the PulseSensorPlayground object called "pulseSensor"
void setup() {

Serial.begin(9600); // For Serial Monitor
// Configure the PulseSensor object, by assigning our variables to it.
pulseSensor.analogInput(PulseWire);
pulseSensor.blinkOnPulse(LED13); //auto-magically blink Arduino's LED with heartbeat.
pulseSensor.setThreshold(Threshold);

// Double-check the "pulseSensor" object was created and "began" seeing a signal.
if (pulseSensor.begin()) {
Serial.println("We created a pulseSensor Object !"); //This prints one time at Arduino power-up, or on Arduino reset.

Serial.println("DHTxx test!");
dht.begin();

}
}

void loop() {

int myBPM = pulseSensor.getBeatsPerMinute(); // Calls function on our pulseSensor object that returns BPM as an "int".
// "myBPM" hold this BPM value now.
if (pulseSensor.sawStartOfBeat()) { // Constantly test to see if "a beat happened".
Serial.println("♥ A HeartBeat Happened ! "); // If test is "true", print a message "a heartbeat happened".
Serial.print("BPM: "); // Print phrase "BPM: "
Serial.println(myBPM); // Print the value inside of myBPM.

// Reading temperature or humidity takes about 250 milliseconds!
  // Read temperature as Celsius
  float t = dht.readTemperature();

  // Check if any reads failed and exit early (to try again).
  if (isnan(t)) {
    Serial.println("Failed to read from DHT sensor!");
    return;
```

```
 }
 Serial.print(" %\t");
 Serial.print("Temperature: ");
 Serial.print(t);
 Serial.print(" *C ");

}
```

3.6 Open the serial monitor on Arduino, the output should be printed there. Both Heartbeat and Temperature values should be printed. To get these values for the cow, place the sensors on the neck of the cow as shown:

3.7 Now that we have the values, we are ready to save the values. We want to train AI that will automatically predict if the cow is healthy or unhealthy just by the sensor values. Follow the 'CSV file' creating process as shown in the link above.

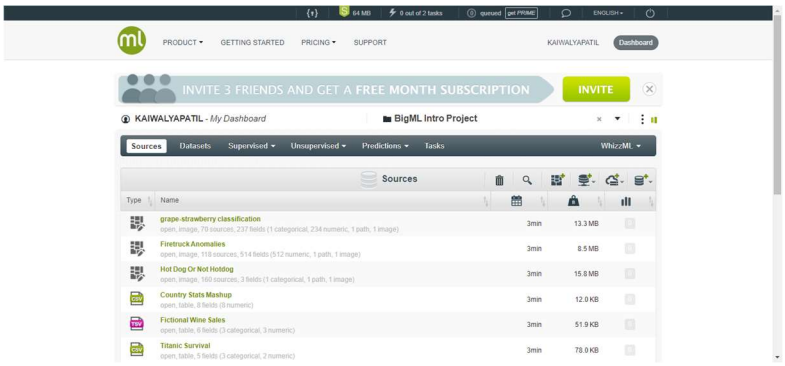
3.8 If the body temperature of the cow is out of this range: 37.8-39.2°Celsius or the heart rate count is out of this range: 48 and 84 BPM, we would say the cow is unhealthy. Record the values in the CSV file and write if the cow is healthy or unhealthy. This is how the file should look like:

	A	B	C
1	Heartbeat	Temperature	Condition
2	96	38.90059441	unhealthy
3	48	37.96710734	healthy
4	88	38.0236333	unhealthy
5	94	38.62902234	unhealthy
6	47	38.64628221	unhealthy
7	88	38.50644411	unhealthy
8	75	38.23132821	healthy
9	95	37.96872789	unhealthy
10	46	39.02567078	unhealthy
11	91	38.54613235	unhealthy
12	88	38.83194216	unhealthy
13	92	39.17274395	unhealthy
14	67	38.22260838	healthy
15	59	38.09855655	healthy

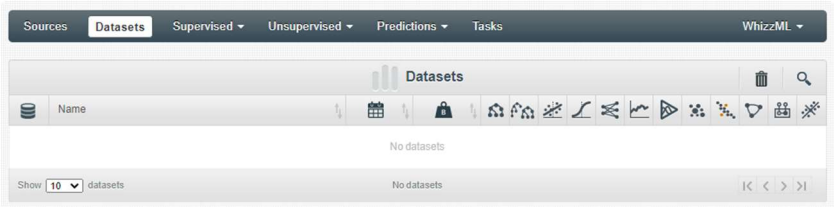
We are now ready to go ahead and train our AI model!

Stage 4: Making an AI model that can predict if the cow is healthy or unhealthy using Heartbeat and Temperature(Social Science teacher and AI Faculty)

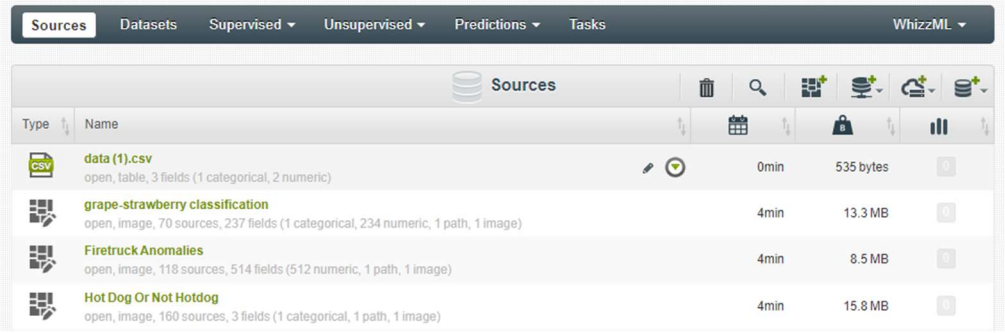
4.1 To begin, go to https://bigml.com/ and sign in to keep all the projects stored in one account. Once done this is how the page looks like:



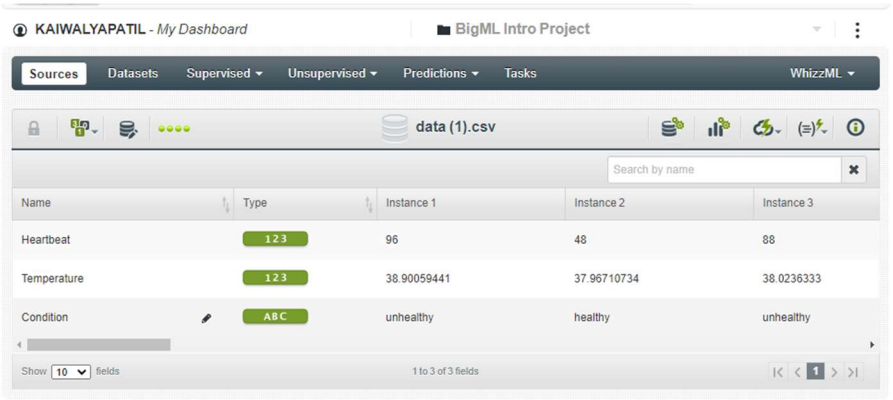
4.2 Then click on “Datasets” and drag the “CSV” file that we created above:



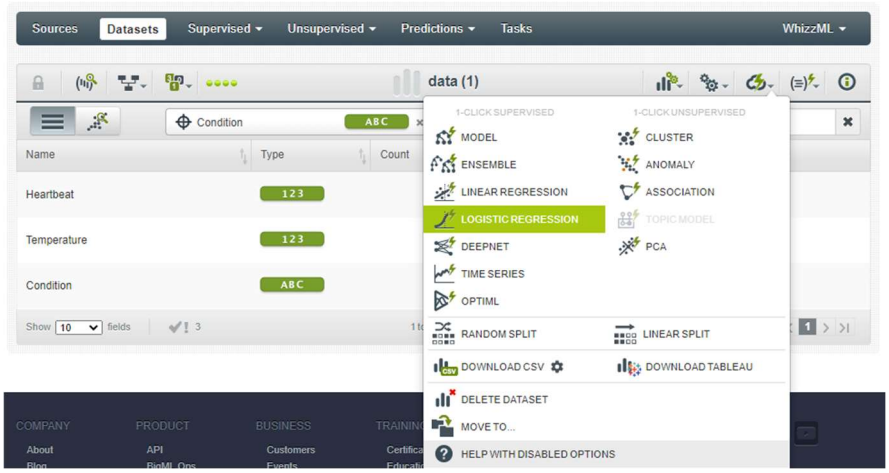
4.3 Go back to the “Sources”, you will now be able to see the “data.csv” file:



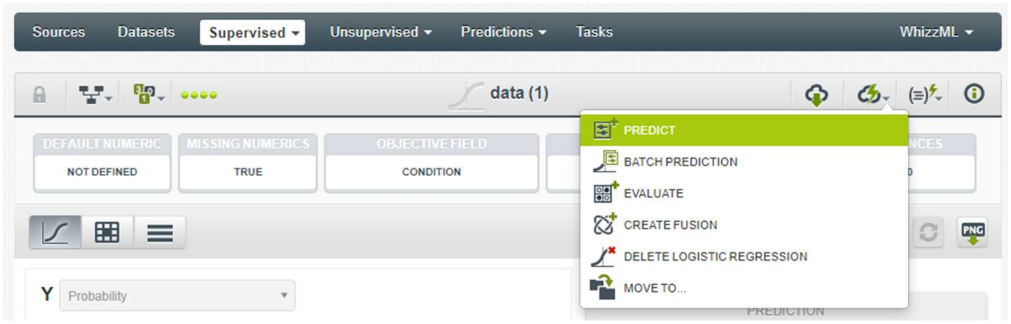
4.4 Click on the uploaded dataset. In this case, it is “data (1).csv”



4.5 Hover the mouse pointer on the “Gear Icon” and then select “Logistic Regression”

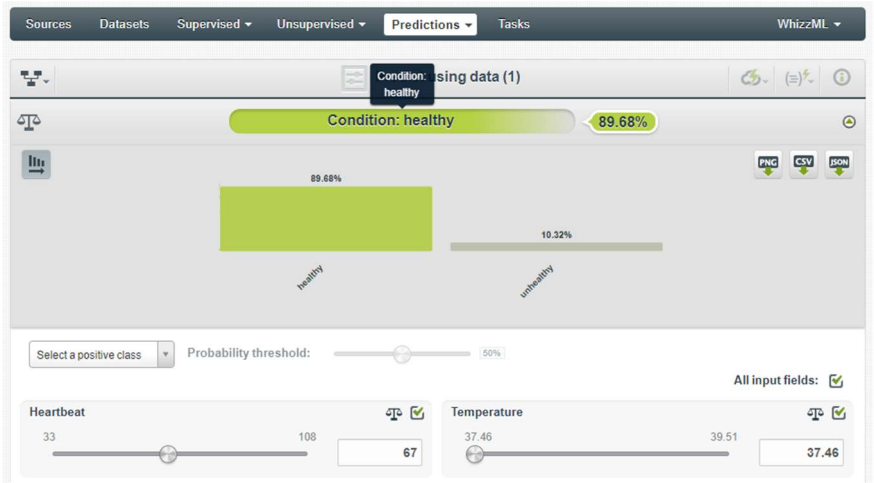


4.6 Once done, the training will start. You would see “Processing” written on the screen. Once the training is done, click on the “Cloud” like button and click on “Predict”.



4.7 Now, we are at a stage where we have made an AI model, and we are ready to predict the health of the cow.

4.8 The “Predict” page would look like this:



4.9 In the two fields, Heartbeat and Temperature input the values which the sensor is providing and change the value accordingly. Based on the values, the prediction would be reflected, saying Healthy or Unhealthy.

	This way, we predict the health condition of the cow using AI.
Learning Outcomes	The learner: • locates distribution and extent of different climatic regions on the world map or globe • describes different components of the environment and the interrelationship between them • analyses factors contributing to pollution in their surroundings and lists measures to prevent it • reasons and factors leading to diversity in flora and fauna, e.g., climate, landforms, etc. • reflects on the factors leading to disasters and calamities • shows sensitivity to the need for conservation of natural resources– air, water, energy, flora, and fauna • draws interrelationship between climatic regions and life of people living in different climatic regions of the world, including India • analyses factors that impact the development of specific regions
Glossary	• **BigML**: The function of BigML is to provide a user-friendly interface for working with machine learning models. It allows users to upload data, explore and visualize the data, create and train machine learning models, and deploy the models for prediction or classification tasks. • **Machine Learning:** A subfield of artificial intelligence, which is broadly defined as the capability of a machine to imitate intelligent human behavior. Artificial intelligence systems are used to perform complex tasks in a way that is similar to how humans solve problems. • **Data Acquisition:** It involves collecting authentic data from reliable sources. There are various ways to collect data, such as through sensors or by manually inputting data into a system. Once the data has been collected, it is important to explore it in order to understand patterns, relationships, and trends. This can be done through data visualization techniques such as diagrams, charts, and graphs. • **Data Exploration:** In order to understand the health condition of a cow using its heartbeat and temperature, it is important to explore the data to understand patterns, relationships, and trends. This process, known as data exploration, involves visualizing the data through techniques such as diagrams, charts, and graphs. By exploring the data, it is possible to gain a clear understanding of the dataset and make informed decisions about which machine learning model to use in the next stage of the project. Data exploration is crucial in the process of using artificial intelligence to understand the health condition of a cow, as it helps to ensure that the chosen model is appropriate for the task at hand. • **Data Modelling:** To understand the health condition of a cow using its heartbeat and temperature, machine learning models can be utilized. In the process of machine learning, the data is split into a training set and a testing set. The model is then trained on the training set, during which it develops its own rules for decision-making and prediction based on the data. The model is then evaluated on the testing set to determine its accuracy and refine the model as needed. By learning from its own mistakes and experiences, the machine is able to make informed

	decisions and predictions on its own, which is a key characteristic of artificial intelligence. Data modeling is an important step in the process of using machine learning to understand the health condition of a cow.
Reference Links	• DHT11/DHT22 Humidity and Temperature Sensor With Arduino: https://randomnerdtutorials.com/complete-guide-for-dht11dht22-humidity-and-temperature-sensor-with-arduino/ • Pulse Rate (BPM) Monitor using Arduino & Pulse Sensor: https://how2electronics.com/pulse-rate-bpm-monitor-arduino-pulse-sensor/#:~:text=The%20Pulse%20Sensor%20is%20a,and%20noise%20eliminating%20circuit%20sensor.
Skill outcomes	**Tech Skills** • Digital Literacy • Data Gathering • Model Optimization **Design Thinking** • Ideation • Innovation **AI Domains** • AI for Data **Social Impact Solution Building** • Problem Identification • Problem-Solving • Prototyping the AI solution