BACKGROUND

Average temperatures in East Africa are relatively high. These high temperatures affect livestock.

These temperatures favor the breeding of ticks. They consequently cause tick fever(ECF) in cattle which is acute, often fatal disease in East Africa.

In East, Central and Southern Africa, about 28 million cattle in the region are at risk and the disease kills at least 1 million cattle per year.

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PROBLEM

- ECF causes a lot of financial losses during treatment and also due to less productivity
- Death of a cow
- Vaccines not reliable due to genetic and antigenetic diversity of the parasites. They are strain specific.

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PROBLEM CONT …

A cow infested with East Coast Fever
The symptoms of ECF are:
Fever, labored breathing, nasal
discharge, enlarged lymph glands,
stoppage of feeding and frequent
coughs.
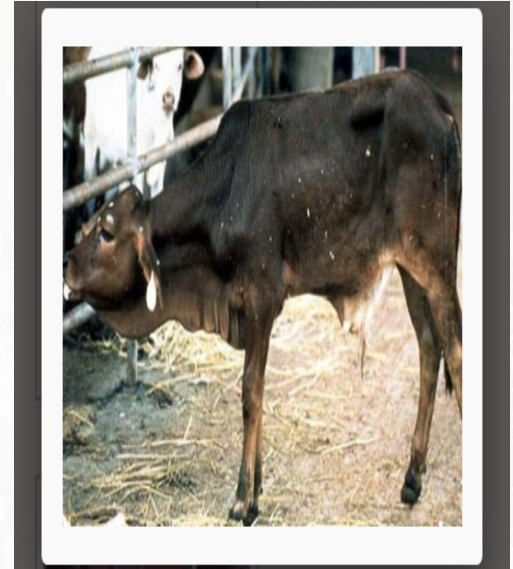
STUDY/PROJECT OBJECTIVES

Main Objective: Detecting the early signs of ECF using machine learning

Specific Objectives:

- Gathering sensor data
- Implanting sensors on cattle bodies
- Sending sensor data to an ML algorithm

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PROBLEM CONT ...

- Selecting an appropriate Machine Learning algorithm for correct inference
- Based on the data fed to the Machine Learning model, it predicts the presence of ECF.
- Sending a notification to the farmer when there is a case of ECF

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BACKGROUND LITERATURE

- Using implantable sensors to monitor dairy cattle core body temperatures in real time and the prediction of the core body temperature by applying ML to measure sub-dermal temperature.

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BACKGROUND LITERATURE CONT ...

- TinyML, Machine Learning with TensorFlow Lite on Arduino and Ultra-Low-Power Microcontrollers
- Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow

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BACKGROUND LIT CONT ...

- Genetic Characterization of tick-borne parasite *Theileria parva* Straints
- A Review on Cattle Health Monitoring in Wireless Sensor Networks (WSN)
- Epidemiology of East Coast Fever in Kenya: past, present and the future

METHODOLOGY

Measuring the
cattle temperature

METHODOLOGY CONT ...

Data on cattle temperature was gathered and stored in
3 periods of 25 mins:
(i). Morning
(ii). Noon
(iii). Afternoon

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RESULTS / OUTPUTS

Data gathered for machine learning was based on temperature

	created_at	entry_id	Temp
1	created_at	entry_id	Temp
2	2023-01-25T15:55:37+03:00	39	31.77
3	2023-01-25T15:56:02+03:00	40	31.77
4	2023-01-25T15:56:39+03:00	41	31.77
5	2023-01-25T15:57:00+03:00	42	32.80
6	2023-01-25T15:57:18+03:00	43	31.77
7	2023-01-25T15:59:13+03:00	44	32.31
8	2023-01-25T16:01:24+03:00	45	31.89
9	2023-01-25T16:02:29+03:00	46	31.89
			31.89

Sheet1 Sheet2 Sheet3

B2   27.26

	aft. Temp	noon temp	morn. Temp	D
1	aft. Temp	noon temp	morn. Temp	
2	31.77	27.26	25.3	
3	31.77	26.77	25.3	
4	31.77	26.77	3.42	
5	32.8	26.35	24.81	
6	31.77	26.35	24.81	
7	32.31	27.26	24.43	
8	31.89	27.26	24.85	
9	31.89	26.93	77.22	
10	31.89	26.93	24.85	
11	31.77	27.26	24.81	
12	32.8	27.26	25.3	
13	32.31	26.46	3.42	
14	31.77	26.77	24.43	
15	31.89	26.77	25.3	
16	31.33	26.35	25.3	
17	31.77	26.35	24.85	
18	31.89	26.6	24.85	
19	32.31	26.6	24.43	
20	32.31	26.93	25.3	
21	32.31	26.93	25.3	
22	32.31	26.93	24.43	
23	31.77	27.26	3.42	
24				
25				

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RESULTS / OUTPUTS CONT ...

After obtaining the data, it was labeled as either normal or sick cow
Unfortunately, the cow used for sampling did not have symptoms of ECF.

Out[14]:

	aft. Temp	noon temp	morn. Temp	Health Status
0	31.77	27.26	25.30	Normal
1	31.77	26.77	25.30	Normal
2	31.77	26.77	3.42	Normal
3	32.80	26.35	24.81	Normal
4	31.77	26.35	24.81	Normal

DISCUSSION / IMPLICATIONS

- **Batch ML** - The system is trained using all the available data instead of being done incrementally

- **Supervised ML, classification (Logistic Regression, Decision Tree and Random Forest classifier)** - After collecting the data, it was labeled after the problem was chosen as a classification one, whether there is ECF or not.

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CONCLUSIONS

The project is a work in progress and the first stage of data acquisition was in progress. Data from temperature sensors were gathered and were still being gathered.

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FUTURE WORK / DIRECTIONS

- ECF manifests in various symptoms, sensors for the other symptoms are being researched on and being procured.

- The appropriate sensor and sensor location to be implanted on the cattle body for accurate measurement of cattle temperature

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FUTURE WORKS / CONT …

An inclusive microcontroller (Arduino Nano BLE sense) with temperature, motion, humidity and vibration sensor, microphone, camera connection and machine learning capability should be purchased for an all-in-one use on a cattle's body.

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