Compression algorithms to optimize battery consumption in precision livestock farming.

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Team

Maria Isabel Arango

Isabella Montoya

Andrés Agudelo

Simón Marín

Mauricio Toro

https://github.com/imontoyah/ST0245-002/tree/master/proyecto

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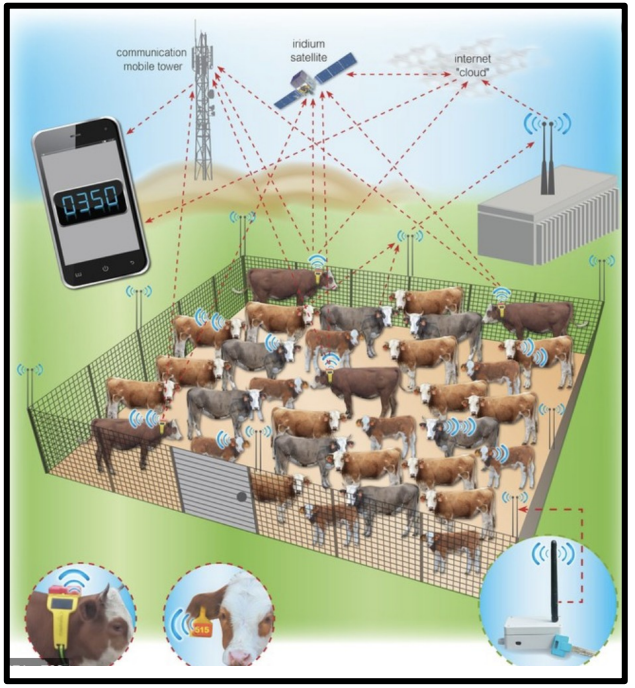
How we felt doing the project?

Problem

Livestock products contribute 33% of the human diet

Precision livestock farming



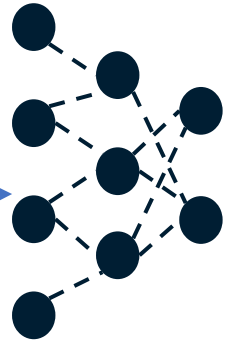
Training Process

Sick-Cattle Images

Healthy-Cattle Images

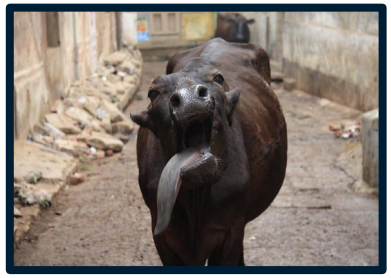
Convolutional Neural Network

Classification Algorithm

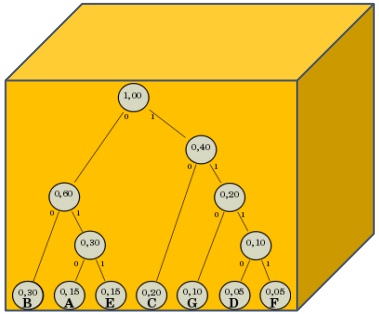


Classification Model

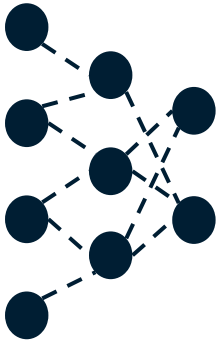
Testing Process



Cattle Image



Fast Fourier Transform
Huffman Coding



Classification
Model

Output

Tested Compression Algorithms

ORIGINAL IMAGE

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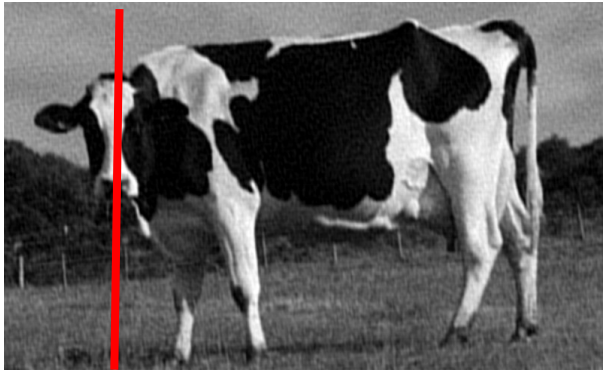
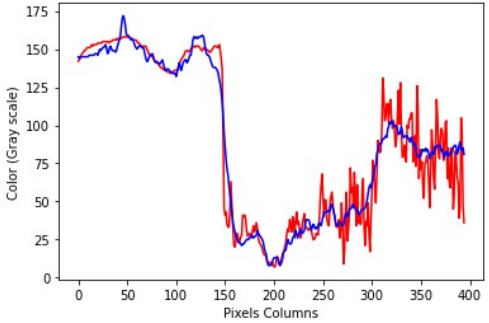
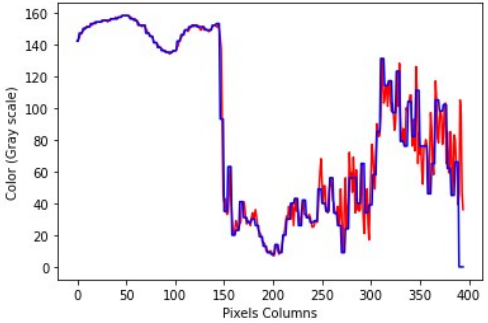
Tested Lossy-Compression Algorithms



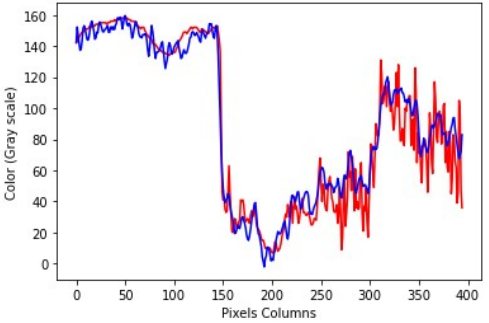
Nearest Neighbor



Fast Fourier Transform



Singular Value Decomposition



We compressed the image in a 95% using the three algorithms mentioned above.
Also, the graphics represent the relation between a specific column of the matrix and the values of the color it can takes being deep black the lowest and deep white the highest.

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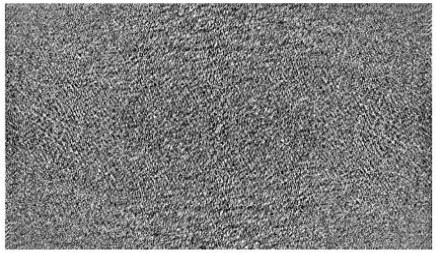
Lossy-Compression Algorithm Design

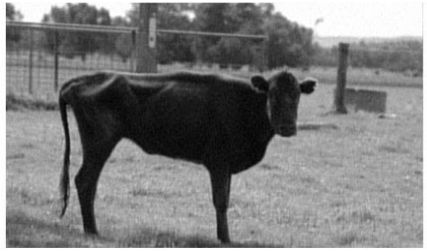
FAST FOURIER TRANSFORM (FFT)

FFT Transform



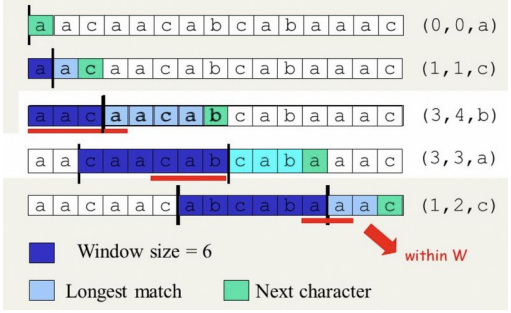
Threshold the Fourier coefficients

Inverse FFT Transform

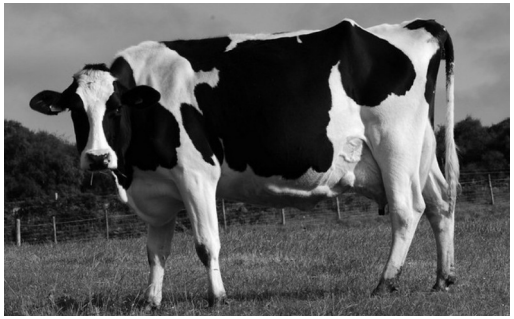


Tested Lossless-Compression Algorithms

LZ77

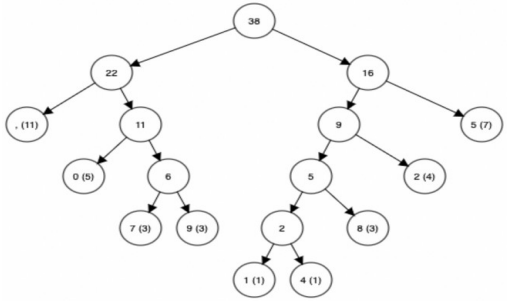


LZW



	Compressed Output	Dictionary	Buffer	Uncompressed Input
a)			0	100110101
b)	0	2(0,1)	0	100110101
c)	01	3(1,0)	1	00110101
d)	010	4(0,0)	0	0110101
e)	010		0	110101
f)	0102	5(0,1,1)	2	10101
g)	0102		1	0101
h)	01023	6(1,0,1)	3	101
i)	01023		1	01
j)	01023		3	1
k)	010236		6	

Huffman Coding



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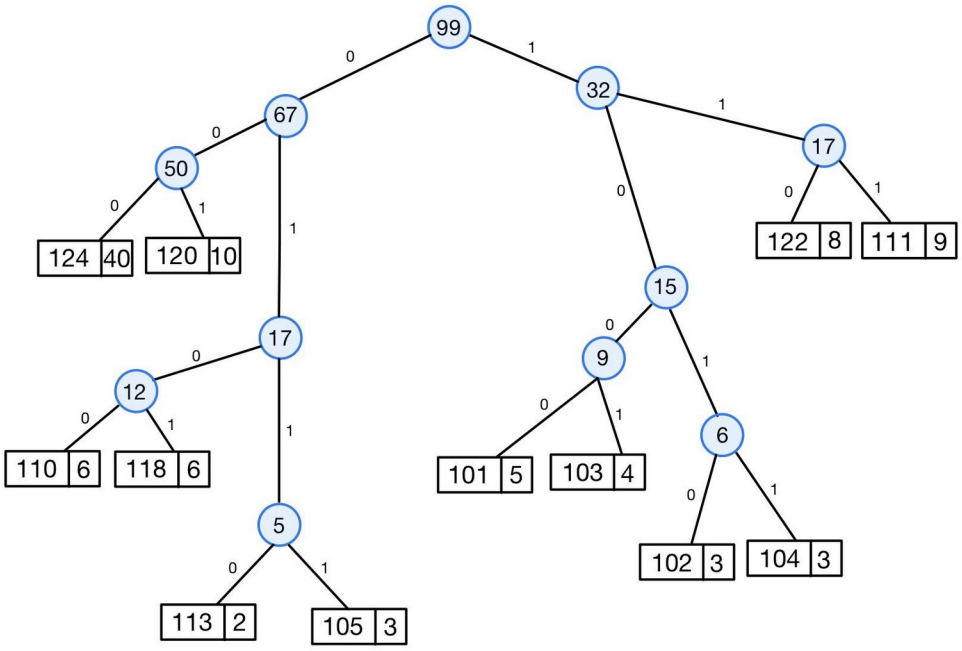
Lossless-Compression Algorithm Design



HUFFMAN CODING

Encode the next set of pixels using Huffman the Coding

Simulador :https://people.ok.ubc.ca/ylucet/DS/Huffman.html

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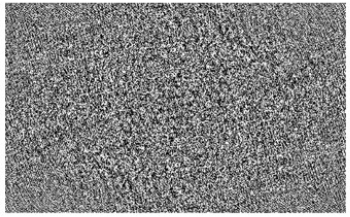
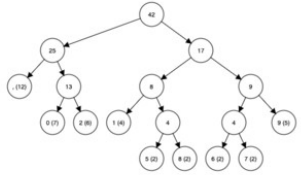
Image compression and decompression with FFT and Huffman Coding

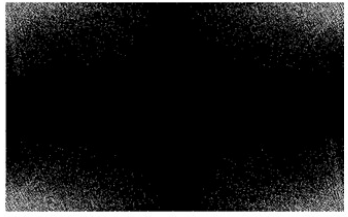
FFT Transform



Thresholds the Fourier coefficients and make the Huffman tree



Decode Huffman Tree



Inverse FFT Transform

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Compression Algorithm Complexity

	Time Complexity	Memory Complexity
Image compression	O(N*M*log(N*M))	O(N*M)
Image decompression	O(N*M*log(N*M))	O(N*M)

- Where **N** is the total number of rows and **M** is the total number of columns of a picture

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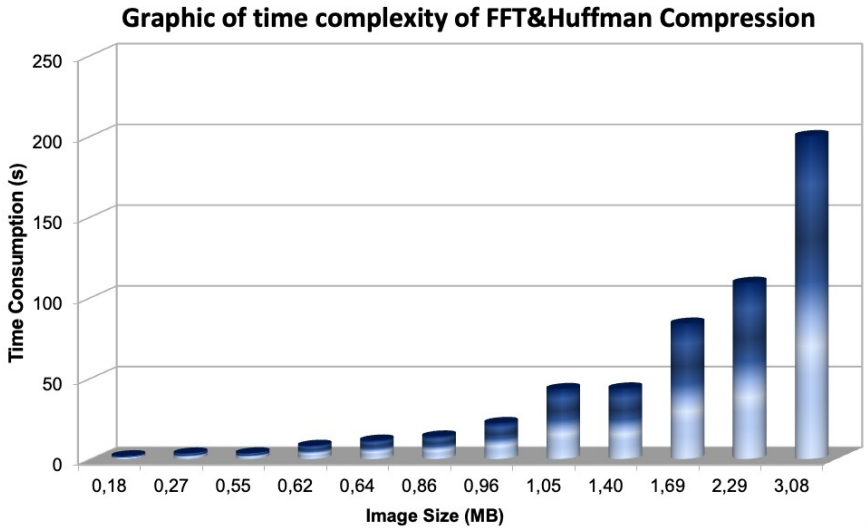
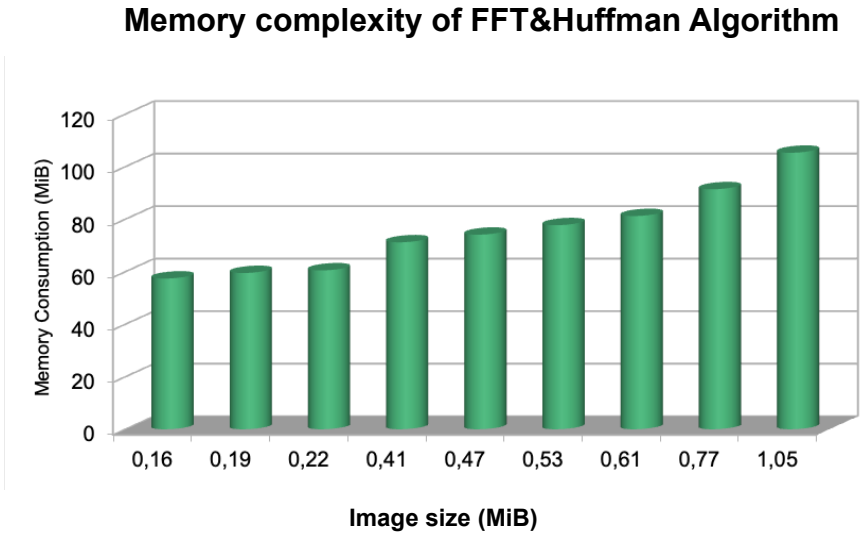
Time and Memory Consumption





Time Consumption

Memory Consumption

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Average Compression Ratio

Compression Ratio	
Healthy Cattle	4 : 1
Sick Cattle	4 : 1

Average compression ratio for Healthy Cattle and Sick Cattle.

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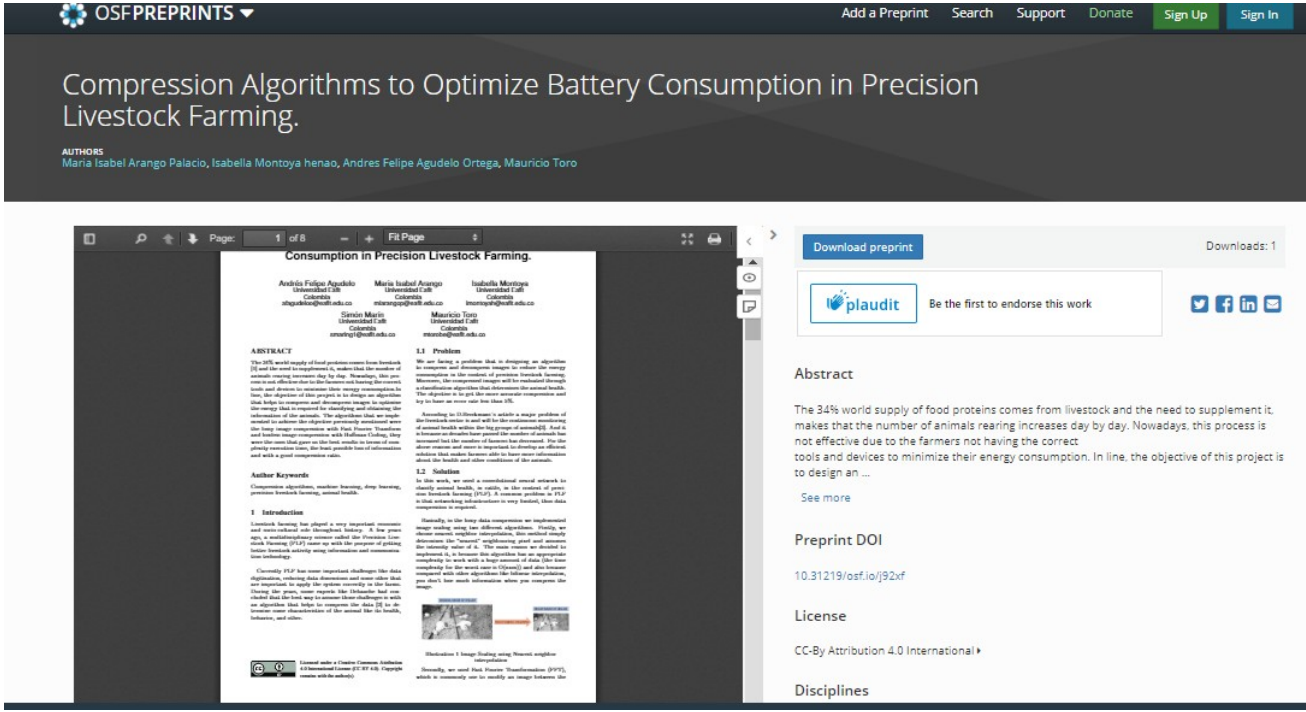
Report Accepted on OSF

A.Agudelo Ortega, M. Arango Palacio, I. Montoya Henao and M Toro.
Compression Algorithms to optimize battery consumption in precision livestock farming. OSF, May. 2021. Available at: https://osf.io/2vw8t/



GitHub´s link: https://github.com/imontoyah/ST0245-002/tree/master/proyecto

THANK YOU!