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Northern Jaguar Project Research
Project Viviendo
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Project Viviendo Evaluation, Summary, and Report

Objective: *The purpose of this report is to determine the effectiveness of the Northern Jaguar Project's (NJP) Project Viviendo in changing the perception of ranch owners who reside near the jaguar reserve on the importance of the role of the jaguars and other felines in the ecosystem. Recently, the ranchers near the reserve have been complaining about jaguar predation of their livestock, costing the ranches a lot of money in damages. To resolve this issue, NJP currently pays the ranchers to take photos of the jaguars they see on their ranches instead of killing them in order to preserve the life of the jaguars as well as provide them with the opportunity to integrate nearby territories as a part of their natural habitat. Thus, the ultimate goal of Project Viviendo is to encourage the livelihood of the jaguars who live on the reserve by ensuring their safety when they wander near the ranchers' property as well as allow them the opportunity to integrate back into a habitat that was once theirs. In this evaluation, we will see if the ranch owners understand the purpose of Project Viviendo and have changed their perception on the role of jaguars in the ecosystem to a more "friendly and accepting" one since the project first began. Does this change in perspective encourage more jaguars to visit each ranch?*

Data:

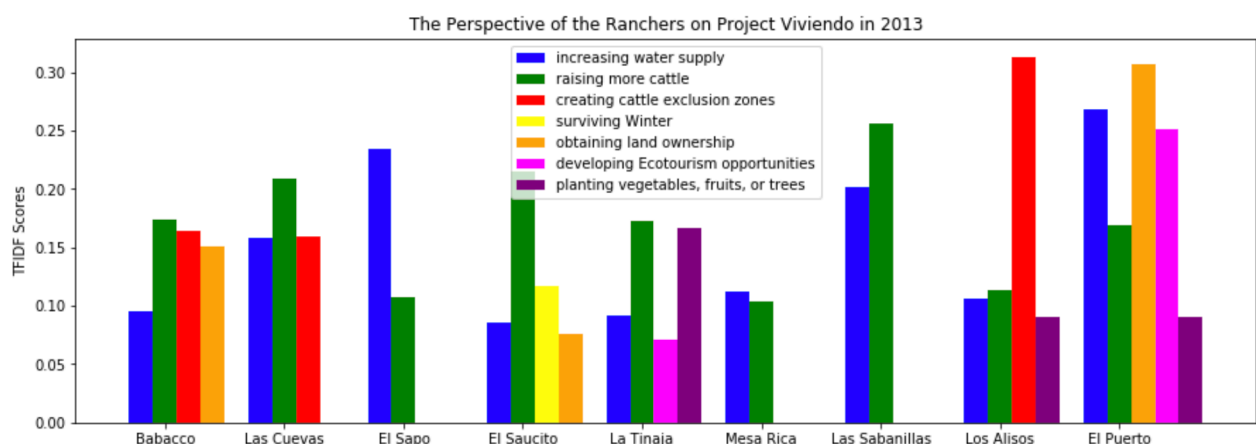


Figure 1. Bar Graph of the Perspective of the Rancher's on Project Viviendo in 2013

The ranchers were interviewed in 2013 regarding their perception about the purpose and effectiveness of Project Viviendo. I will be using Natural Language Processing Techniques (NLP) and Machine Learning (ML) to analyze the

ranchers' perceptions. In Figure 1 above, I ranked the most common key words used by each ranch owner in the survey by their TD-IDF scores. The average TD-IDF score for the ranchers' perceptions is 0.17 ± 0.05 . All of the ranch owners seem to be confused about the purpose of the project as they are more concerned about the survival and needs of their ranches' than that of the jaguars. All of them are concerned about increasing the water supply on the ranches as they seem to be experiencing water shortages as well as raising more cattle by addressing fodder shortage needs, lack of laborers, harsh weather conditions due to dry seasons and very cold seasons, ect. Some ways in which some of the ranchers are addressing the shortage of fodder for their cattle is with pasture division or creating cattle exclusion zones in which they rotate areas in the pasture in which the cattle can graze at one time.

Other ranchers are more concerned with using their ranches as a place of recreation and ecotourism and developing activities to that end. Still others want to increase planting activities on their ranches such as through the planting of vegetables, fruits, and trees. Some ranchers are going through land ownership despites and suffer from a lack of laborers, usually their own family members, to work the land. Overall, the ranchers perceive Project Viviendo to be a means of obtaining extra income to save their ranches from financial devastation and to increase the livelihood of their own ranches rather than care for the jaguars and their role in the ecosystem.

Data Analysis:

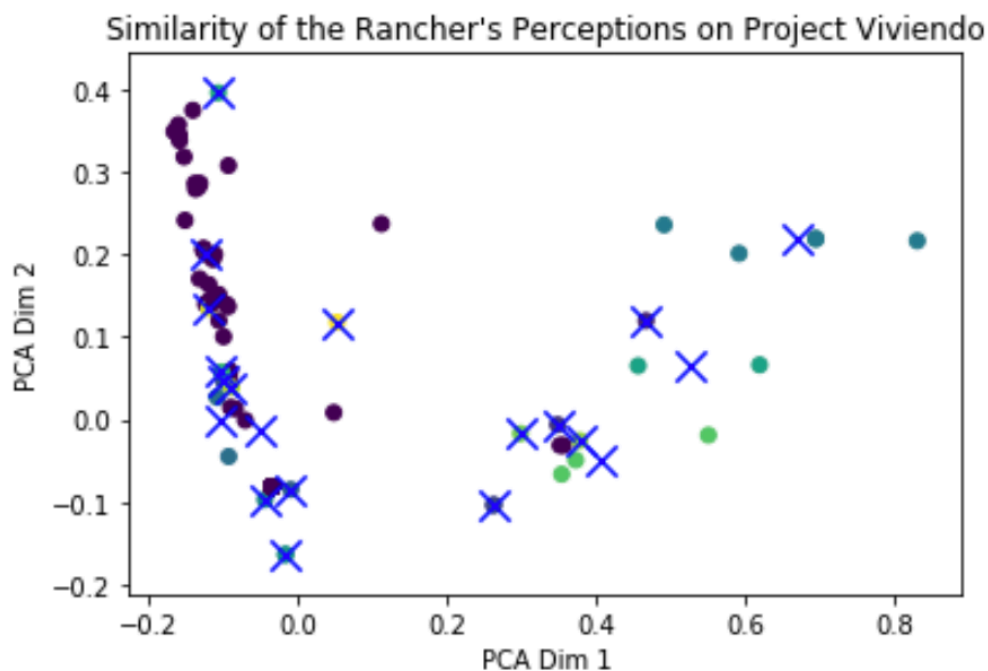


Figure 2. PCA Analysis of the Perspective of the Rancher's on Project Viviendo in 2013

Table of Key Words for PCA Clusters of the Ranchers' Perceptions

	Color	PCA 1	PCA 2	Cluster	Key Words
0	forrestal green	0.694312	0.219365	8	exclusion zone, cattle, NJP, confirmed, ranche...
1	forrestal green	0.467050	0.119891	2	result, describes, program, reserva, specific,...
2	forrestal green	0.348721	-0.006340	3	submitted, Application, UMA, does, confirmed, ...
3	light green	0.456467	0.065145	11	pond, rehabilitation, Cattle, rancher, NJP, in...
4	light green	0.354154	-0.066478	14	Pasture division, NJP, rancher, cercos, instal...
5	light green	0.299143	-0.017102	15	protect, Electric, calving, installed, fence, ...
6	light green	0.378136	-0.025601	16	monitoring, Deer, project, confirmed, rancher,...
7	yellow	0.053607	0.117977	19	asked, When, enter, zones, created, said, excl...
8	blue	0.263178	-0.103881	4	Tree planting, NJP, describes, diagram, develo...
9	blue	-0.098245	0.046440	5	owns, land, owner, Ricardo, sole, purchase, pu...
10	blue	-0.008471	-0.084993	6	consider, program, Viviendo, zquez, desire, di...
11	blue	-0.091570	-0.045016	7	seeing jaguar, experience, ranch, property, zq...
12	blue	-0.015593	-0.164013	10	specific, zquez, describes, diagram, developin...
13	blue	-0.105528	0.396526	12	ranch, cattle, house, workers, potreros, He, r...
14	blue	-0.101276	0.057840	13	The land, Somos, mayori, compro, Mi, generatio...
15	purple	-0.110236	0.200281	0	He, ranch, water, property, cattle, potreros, ...
16	purple	-0.121672	0.200475	1	represa, tengo, potreros, water, divide, deten...
17	purple	-0.043089	-0.097223	9	August rains, 2013, designed, diagram, develop...
18	purple	-0.087871	0.038786	17	inspector, position, area, He, asserting, auth...
19	purple	-0.118015	0.134872	18	ranch, region, travels, explaining, properties...

Table 1. Table of the Key Words for each PCA Cluster of the Ranchers' Perceptions

Note: The table of the clusters goes in the order of decreasing similarity; for instance, green is closest to yellow as is blue is most similar to purple.

According to the PCA analysis done above, there are about twenty clusters that the survey of the ranchers' perception on the purpose of Project Viviendo falls within. In the table above as well as is evident in scatterplot in Figure 2, some clusters are more similar to others with the green clusters most similar to the yellow cluster and the blue clusters most similar to the purple clusters. The most obvious distinction is that between the purple clusters and the green clusters, which is linearly separable as shown in Figure 3 below.

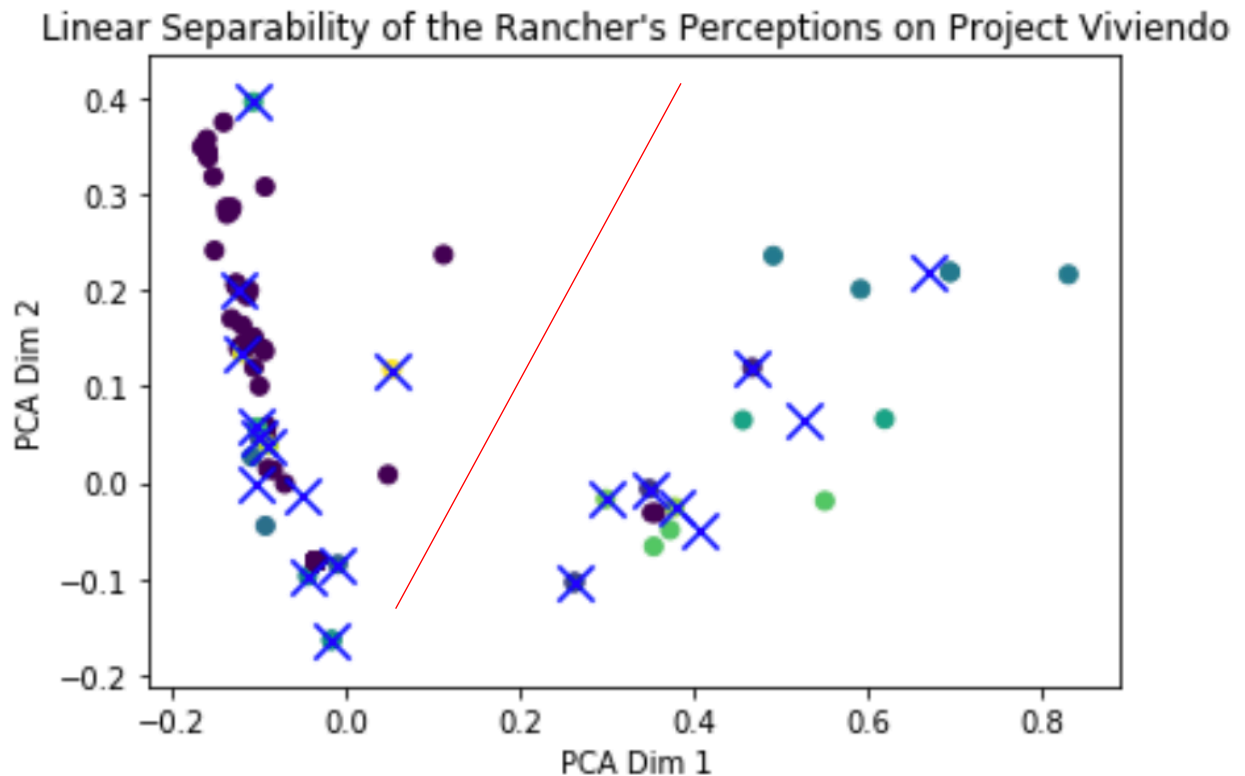


Figure 3. Linear Separability of the Two Planes of Clusters of the Ranchers' Perceptions

The information obtain from the above graphs and charts is essentially the same as that obtained from ranking the TD-IDF scores of key words used by the ranch owners in Figure 1. There are two planes of clusters that are distinctly linearly separable from each other which are the purple/blue clusters and the green/yellow clusters. The purple and blue clusters are most similar to each other with the ranchers more concerned about increasing their profit through increasing their water supply, raising more cattle, growing more plants, increasing the number of workers on their ranch, ect. On the contrary, the green and yellow clusters represent the ranchers who are more focused on resource conservation on their ranches such as through implementing pasture division techniques and creating cattle exclusion zones-where they rotate grazing land to prevent overgrazing by the cattle in any single area of land at a time- as well as building fences to protect their cattle and keep them predators outside the ranch. Still, the clusters are fairly similar in that the ranchers are more interested in their own problems and preserving/forwarding the interests of their ranches so the plane of the graph in Figure 3 is not the one we desire to see if the ranchers truly understood that the objective of Project Viviendo is to protect the jaguars and enhance their quality of life in their natural habitat.

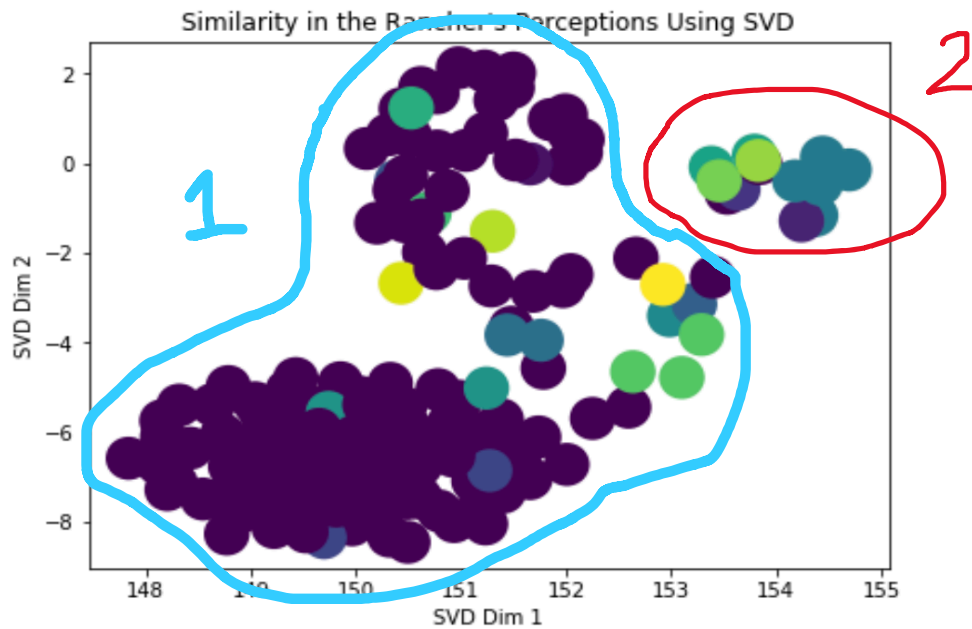


Figure 4. Separability of the Two Planes of Clusters of the Ranchers' Perceptions Using SVD

When I graph the analysis using SVD, another NLP technique, I obtain a similar graph to the graph generated by using PCA. We again obtain two linearly separable clusters with the purple/ blue clusters representing the ranchers who believe that Project Viviendo is about expanding their profits and the green/yellow clusters representing the ranchers who want to conserve their resources on their ranches. Still, the clusters are fairly similar in space because they are all about forwarding the interests of the ranches instead of protecting the jaguars in their natural habitat which is the true objective of Viviendo.

Summary/Results:

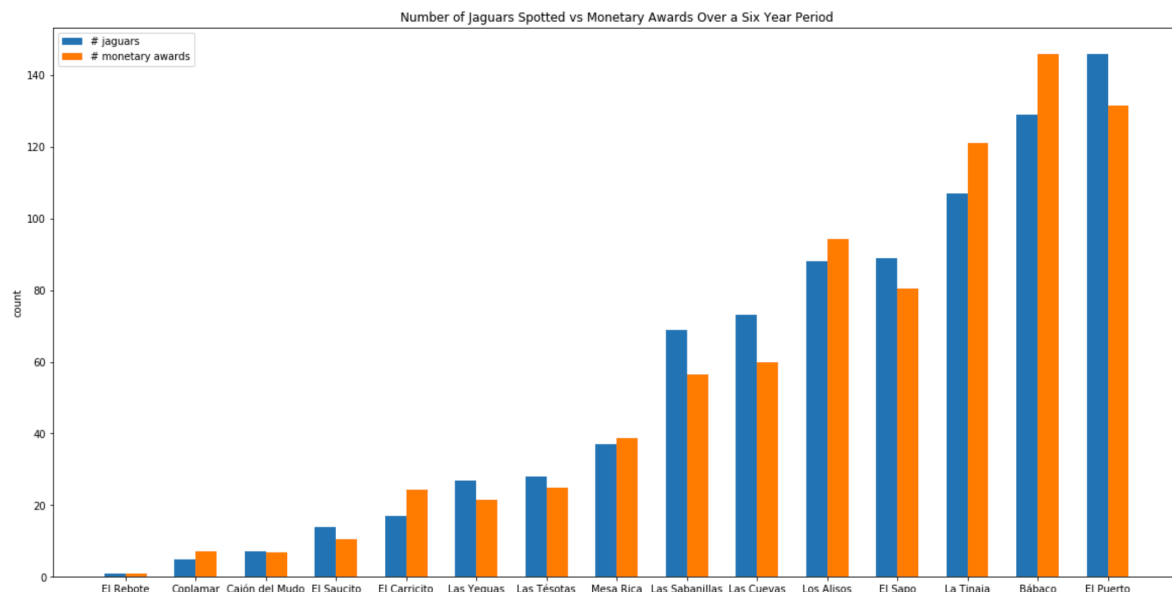


Figure 5. Bar Graph of the Number of Jaguars Spotted vs Monetary Awards Provided Over a Six Year Period

How effective is Project Viviendo in increasing the number of jaguar visits to each ranch by changing the perception of the ranch owners into a more “positive, welcoming, and embracing” attitude towards the jaguars? Unfortunately, the number of jaguars that visit each ranch is not very high. Based on Figure 5 above, the average number of jaguars that visit each ranch is about ten jaguars per year. The El Rebote Ranch and Coplamar Ranch have the lowest number of visits over a six year period of time in which the jaguar visit frequency is monitored. The La Tinaja Ranch, Babacco Ranch, and El Puerto Ranch have the highest number of visits.

Additionally, since the ranchers share very similar perceptions that seem to miss the purpose of Project Viviendo, the perceptions of the ranchers seem to have no significant influence on how many jaguars visit each ranch per year. Further analysis needs to be conducted to determine what factors influence the frequency at which the jaguars visit the ranches. Doing so will help determine if continuing Project Viviendo is worth it, and if it is, are there more effective, cost-saving ways of operating the project? For instance, would it be a good idea to allot money to certain ranches that have more frequent jaguar visits and create a co-jaguar and livestock habitat while generating revenue such as through ecotourism activities and government funding?

[Credits: Data provided by the Northern Jaguar Project for analysis]

Appendix A:

Natural Language Processing and Machine Learning Concepts:

- 1) TF-IDF : term frequency–inverse document frequency
- 2) PCA : Principal component analysis
- 3) SVD : Singular value decomposition