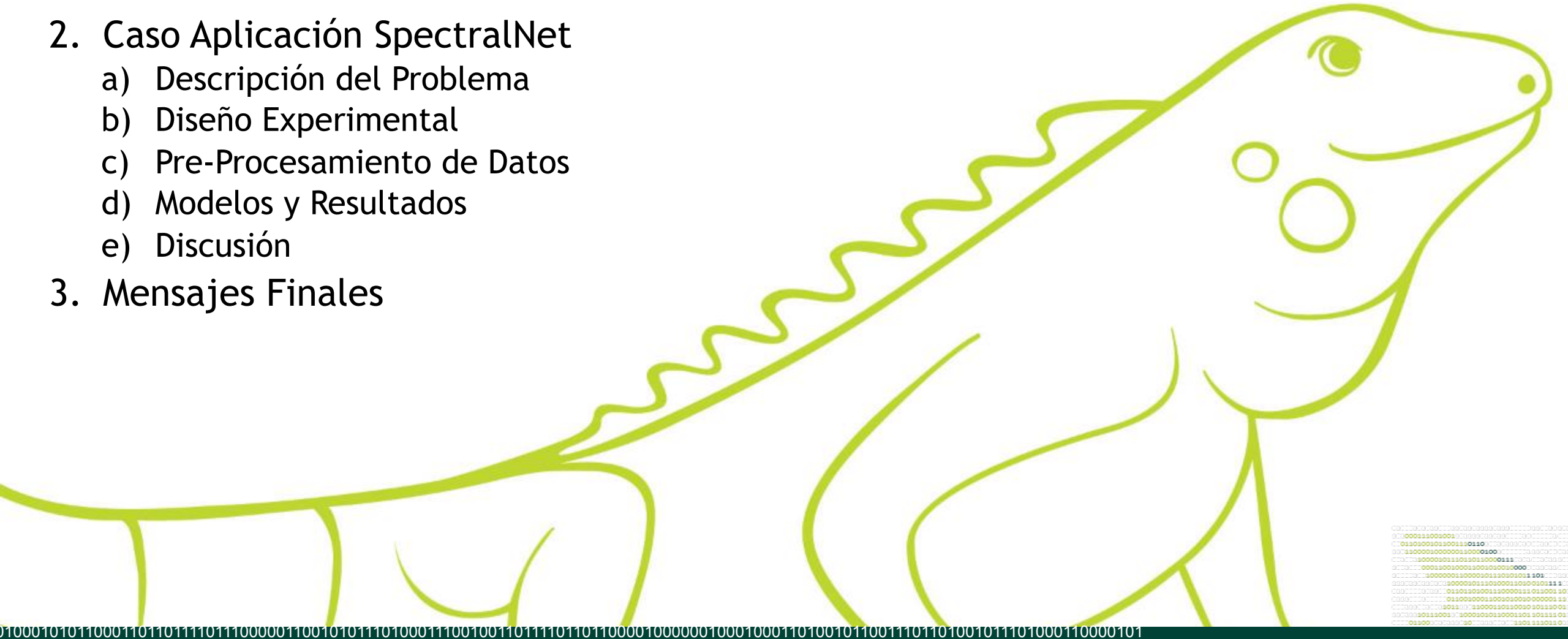
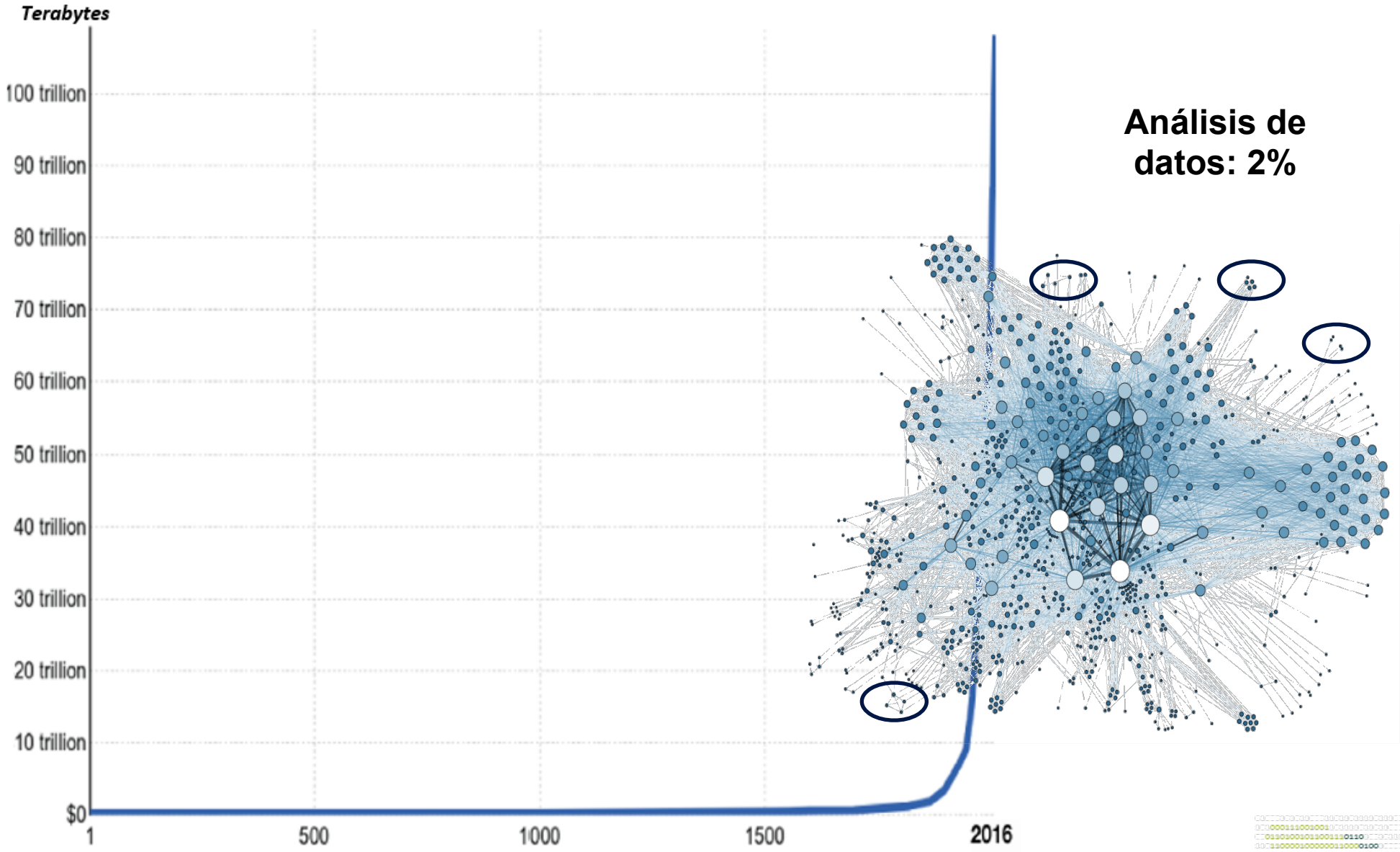
“La inteligencia artificial es el eje transformador por el cual estamos repensando cómo estamos haciendo todo”

Sundair Pichai
CEO Google

Agenda

1. Contexto AI
2. Caso Aplicación SpectralNet
   a) Descripción del Problema
   b) Diseño Experimental
   c) Pre-Procesamiento de Datos
   d) Modelos y Resultados
   e) Discusión
3. Mensajes Finales



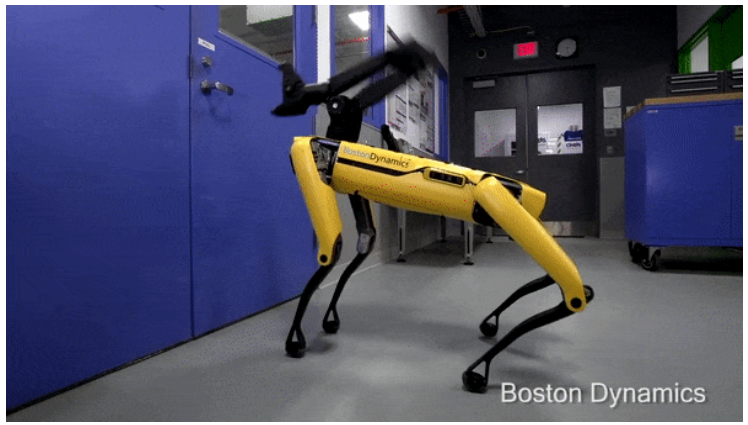

Terabytes
100 trillion
90 trillion
80 trillion
70 trillion
60 trillion
50 trillion
40 trillion
30 trillion
20 trillion
10 trillion
$0
1
500
1000
1500
2016
Análisis de datos: 2%

Contexto Machine Learning

“Rama del campo de la inteligencia artificial, que busca como dotar a las maquinas de capacidad de aprendizaje”

Programar una maquina para que realice una tarea

Generalización del Conocimiento

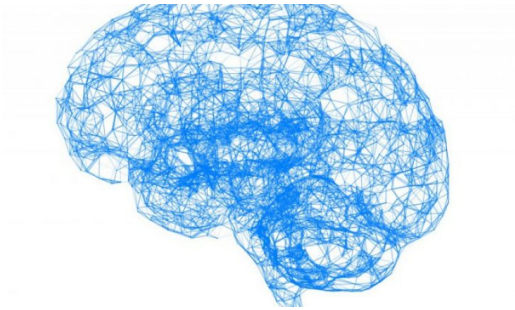


Programar una maquina para que aprenda a realizar una tarea

Escuela de pensamiento tradicional

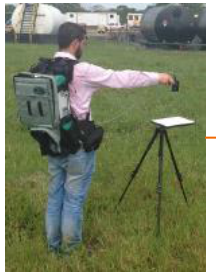
Machine Learning

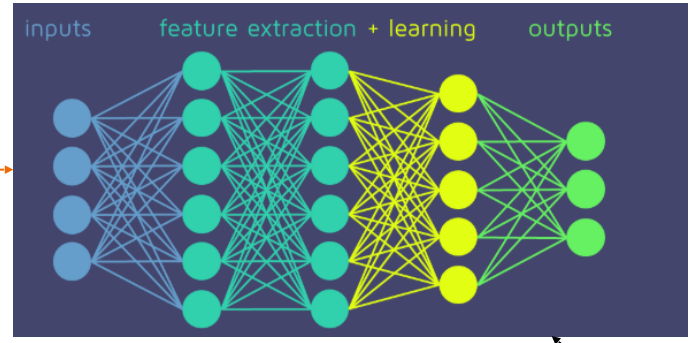
Caracterización de Rezumaderos para el monitoreo de yacimientos y control de impactos ambientales



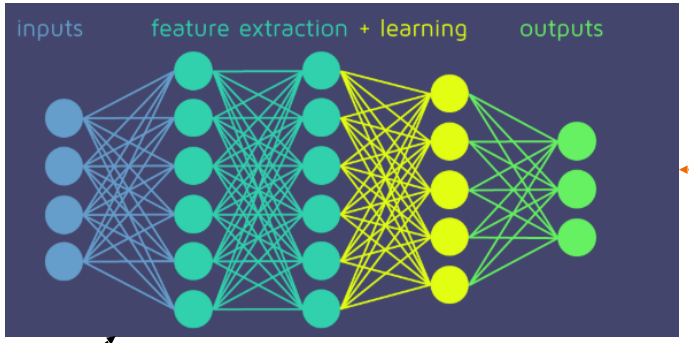
SpectralNet

ANN Firmas Campo

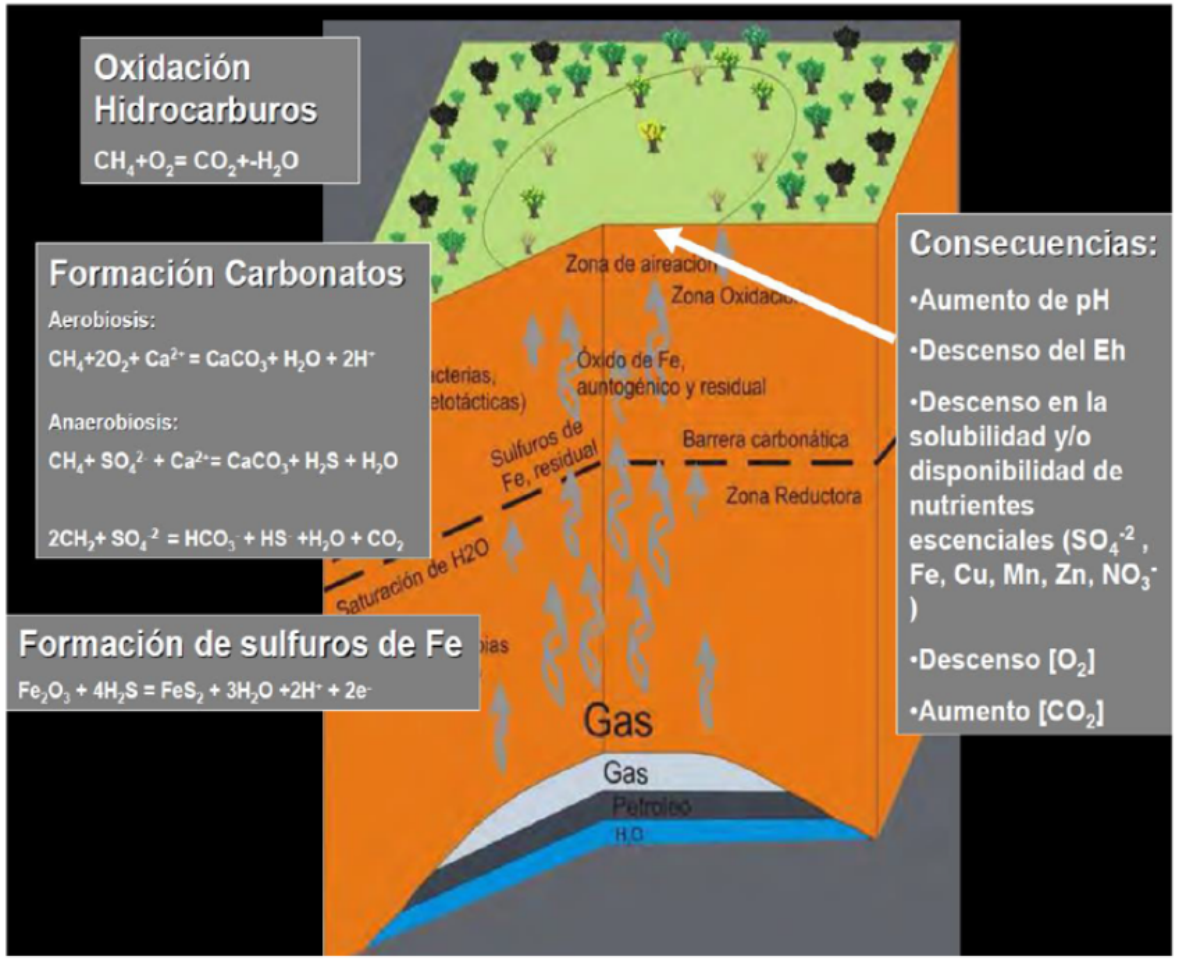


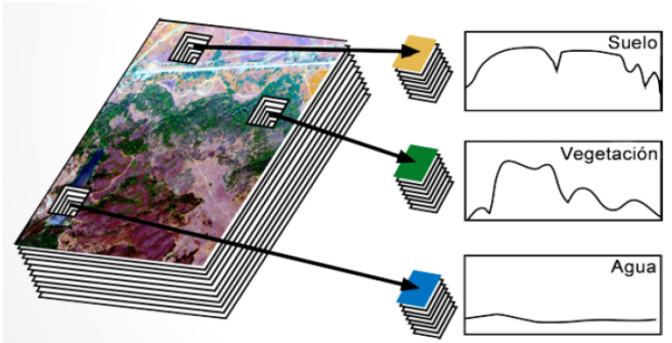


ANN Imágenes Satélite



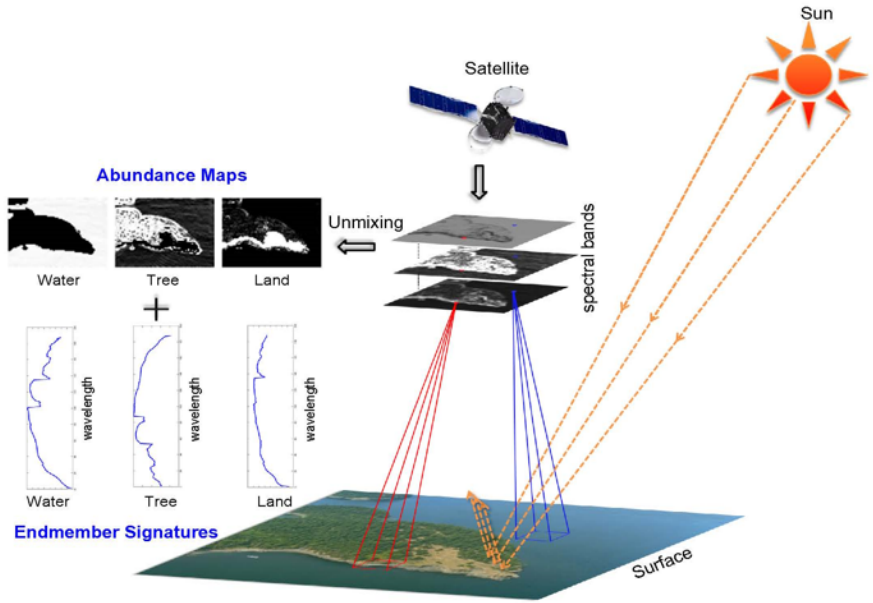
Diseño Experimental





* Cada elemento espacial tiene un espectro continuo que es utilizado para analizar las diversas superficies.

…….Modelo Teórico Rezumadero…..



Predecir la Gravedad API

- ✓ 4 Rezumaderos mediante firmas imágenes.
- ✓ 210 Rezumaderos a través de firmas de campo.

Pregunta de Negocio

Retos

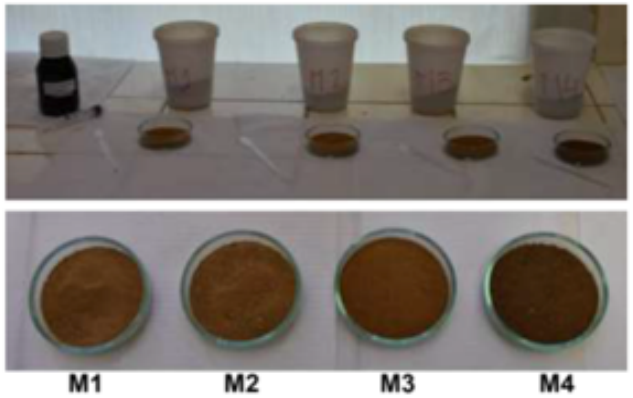
¿ Las Firmas espectrales tienen el potencial de predecir la propiedad física °API?

¿ El satélite WordView3 brinda información relevante para la predicción remota de la propiedad física °API?

¿ Es posible reducir la dimensionalidad y complejidad del problema ?

¿Como transformar las firmas espectrales e imputar los datos faltantes para minimizar la perdida de información ?

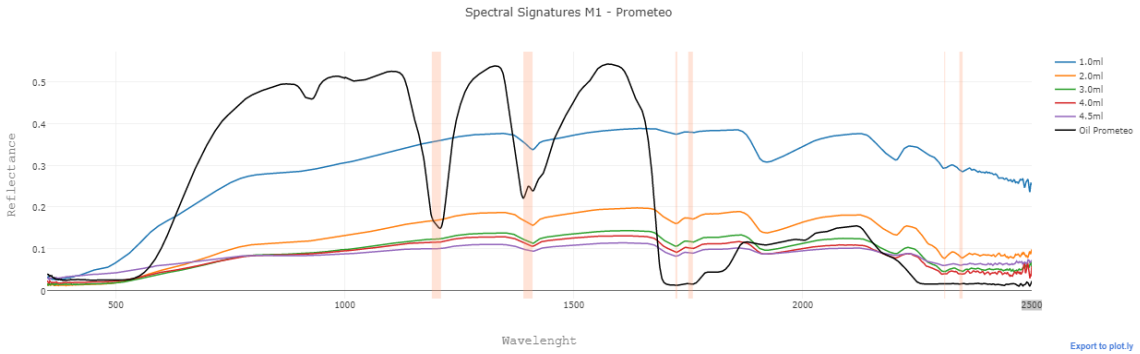
Espectroradiometria



tipos de suelos recolectados en campo

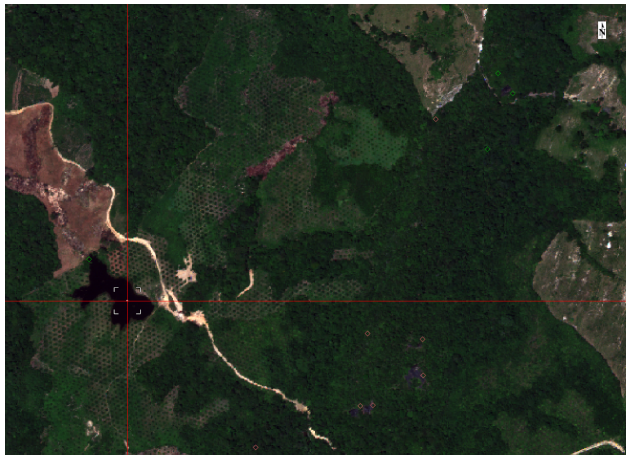
tipos de calidad de crudo

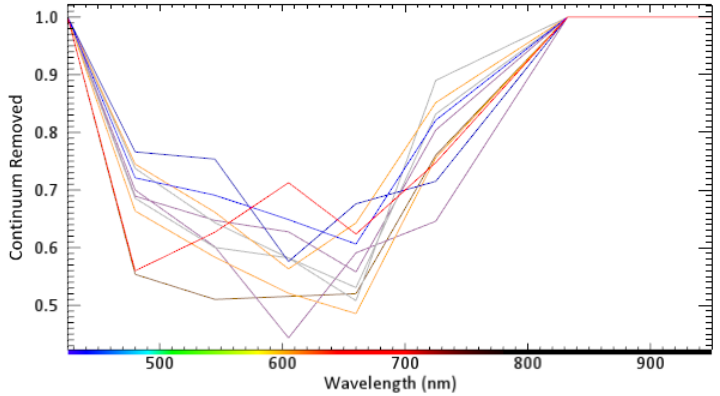
UNICAMP

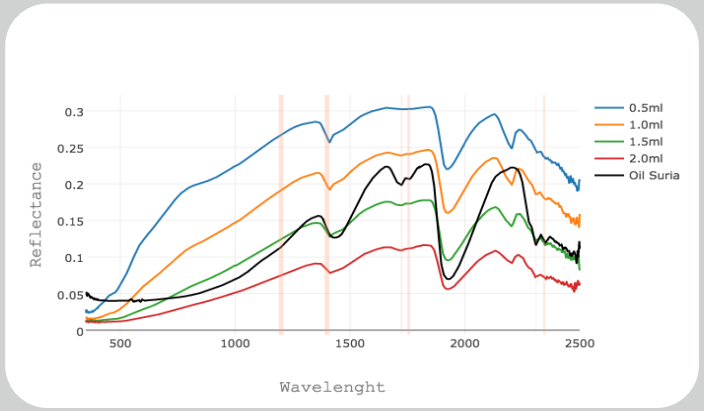


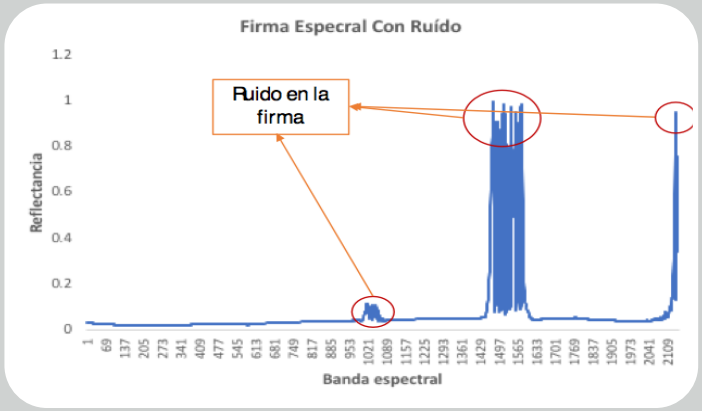
Firmas espectrales de tipos de suelos

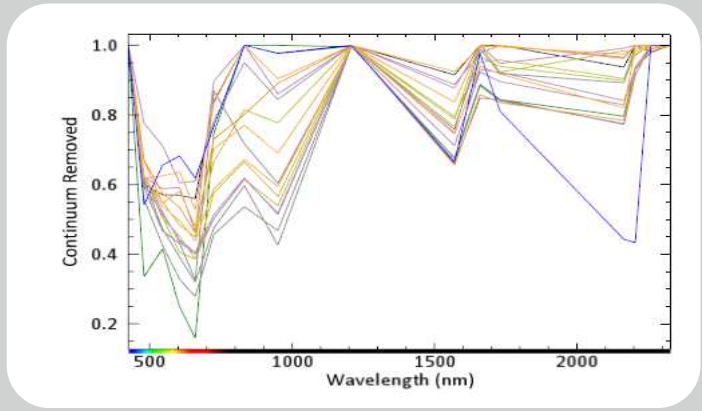
Sensores Remotos - WorldView3











Base de datos de Entrenamiento.

(216 Firmas espectrales)

(456840 Datos)

Base de datos Predicción firmas de campo.

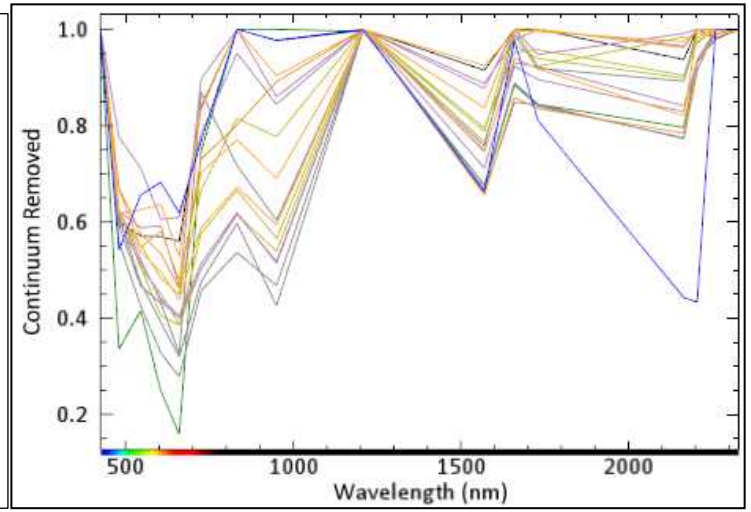
(210 Firmas espectrales)

Base de datos predicción firmas de imágenes.

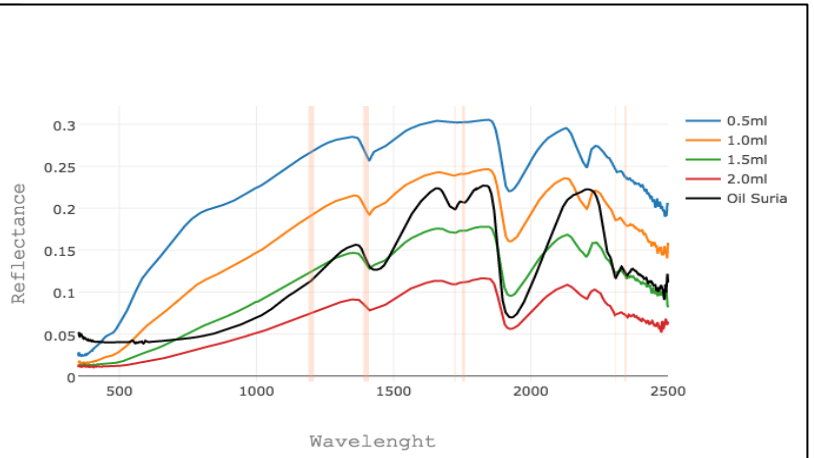
(Imágenes 1154 km2- 700GB)

DigitalGlobe

Firma Espesctral de Imágen

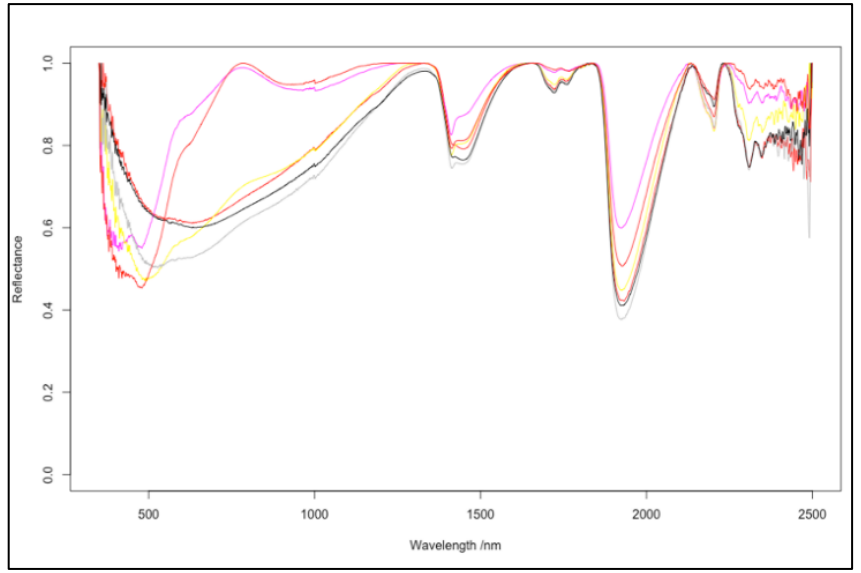


Firma Espesctral de

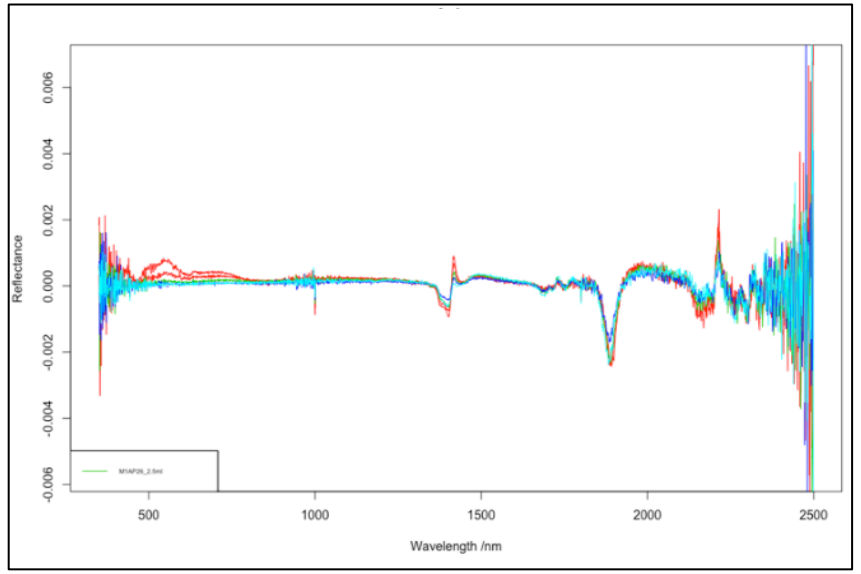


Transformación

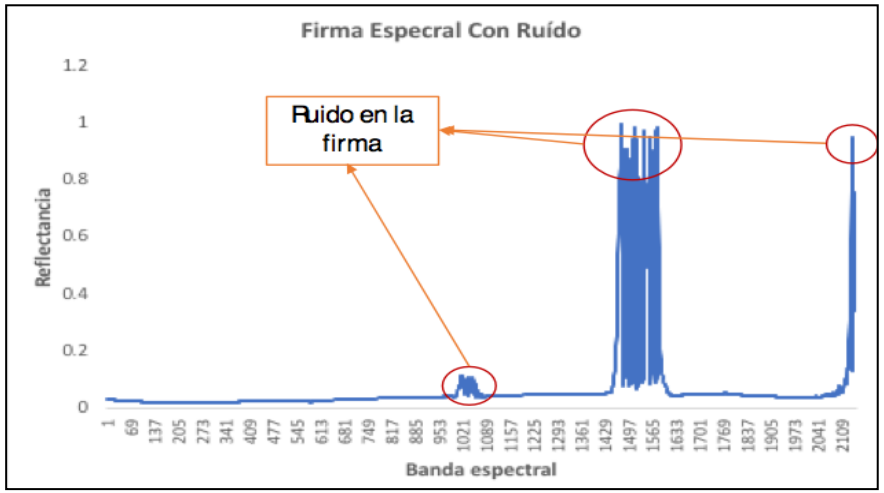
Continual Removal

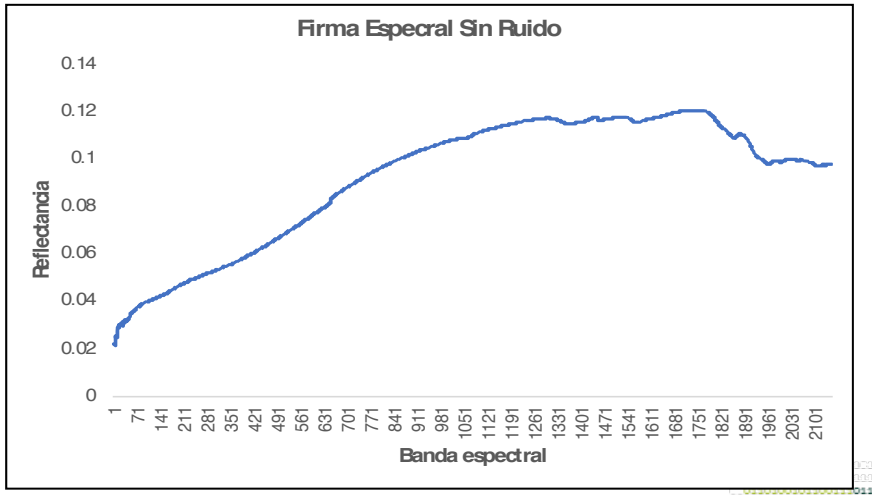


Derivadas



Simulación de Firma Espectral

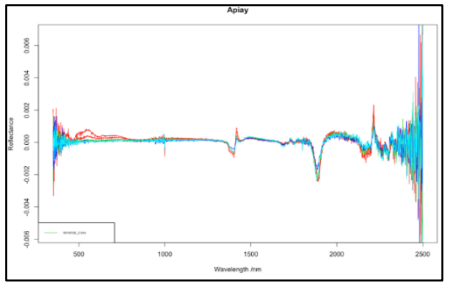




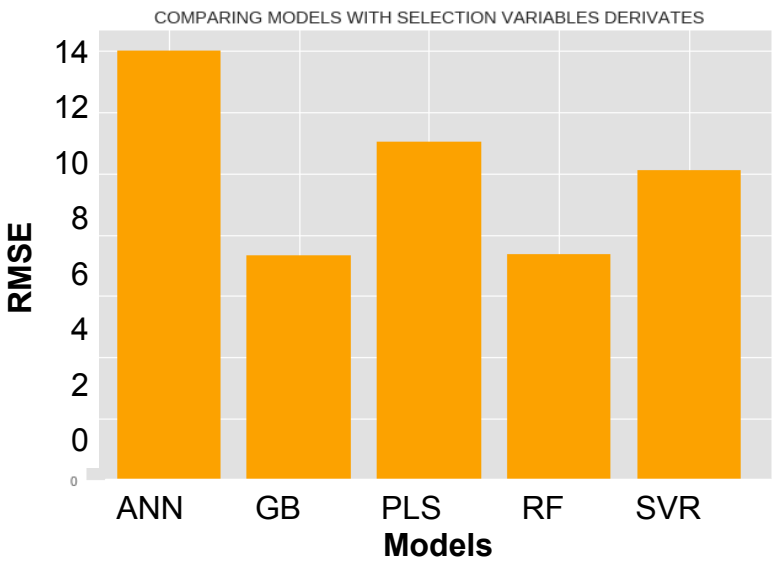
Modelación Firmas Campo

Resultados Firmas Campo

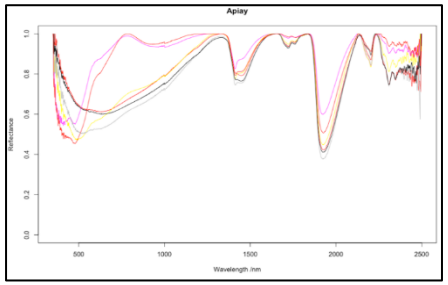
Derivadas



Bands set 1	1190-1210
Bands set 2	1390-1410
Bands set 3	1722-1726
Bands set 4	1750- 1760
Bands set 5	2309-2311
Bands set 6	2342-2349



Continual Removal



Bands set 1	1190-1210
Bands set 2	1390-1410
Bands set 3	1722-1726
Bands set 4	1750- 1760
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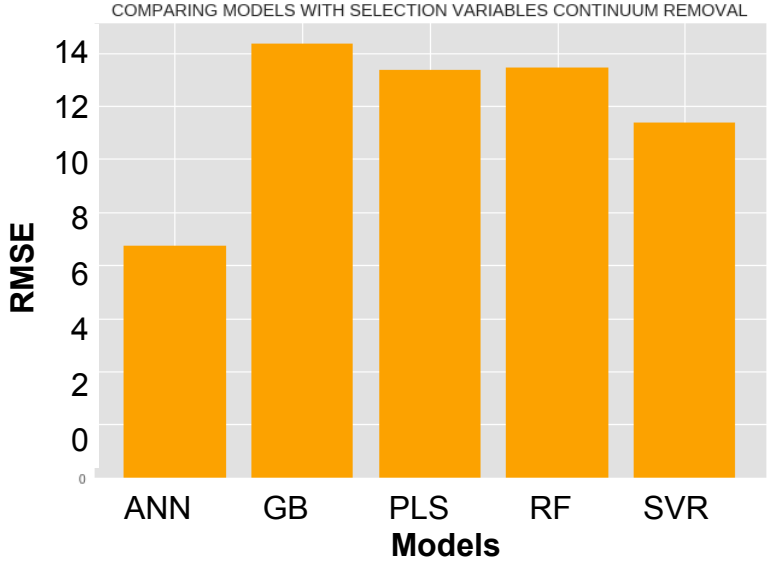
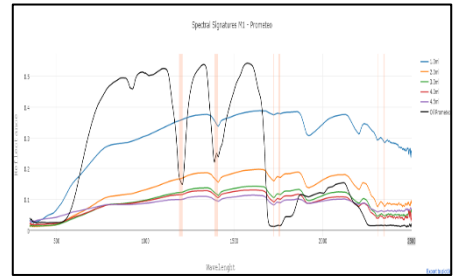
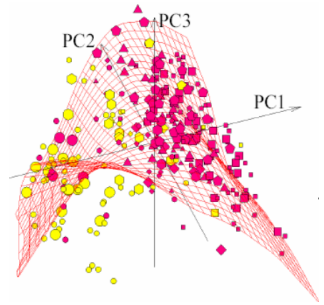
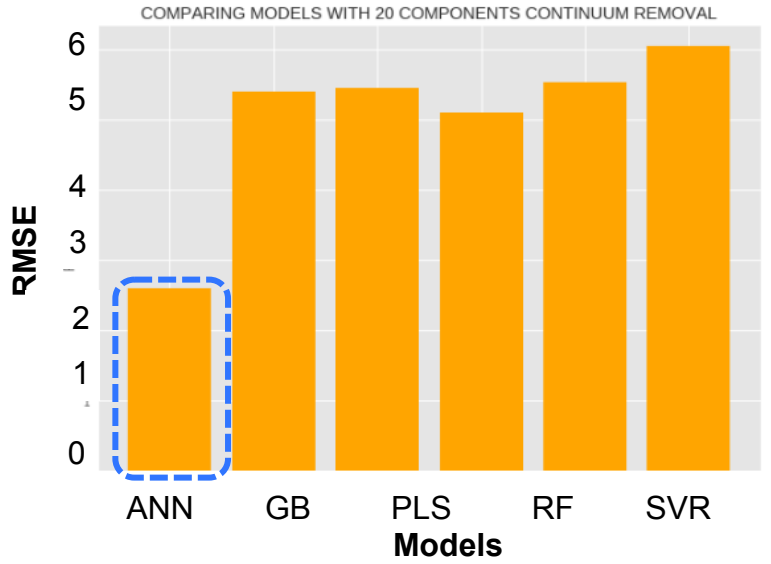


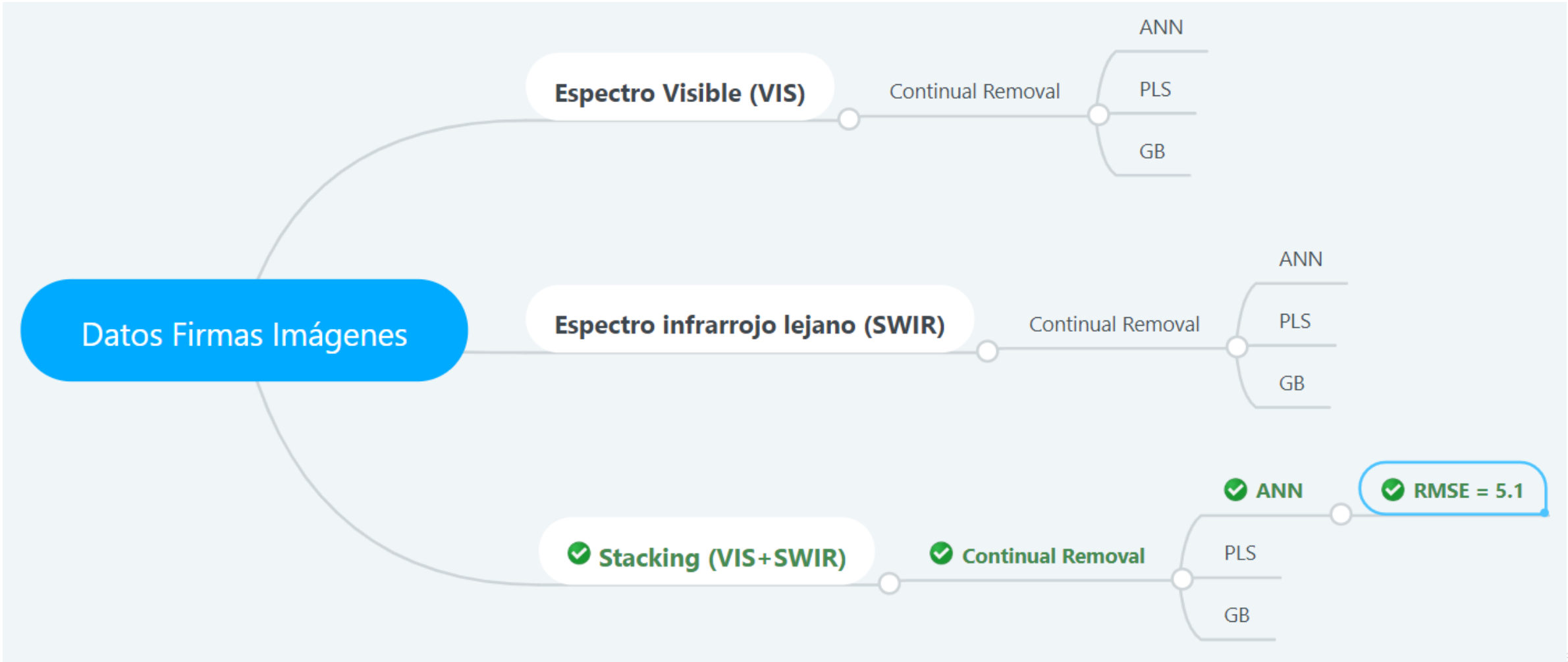
Firma completa + Continual Removal + PCA





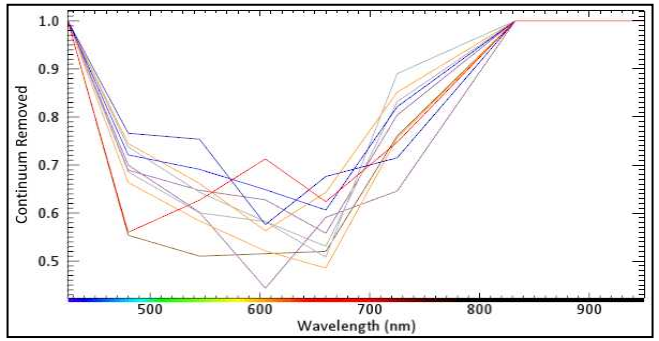


Modelación Firmas Imágenes

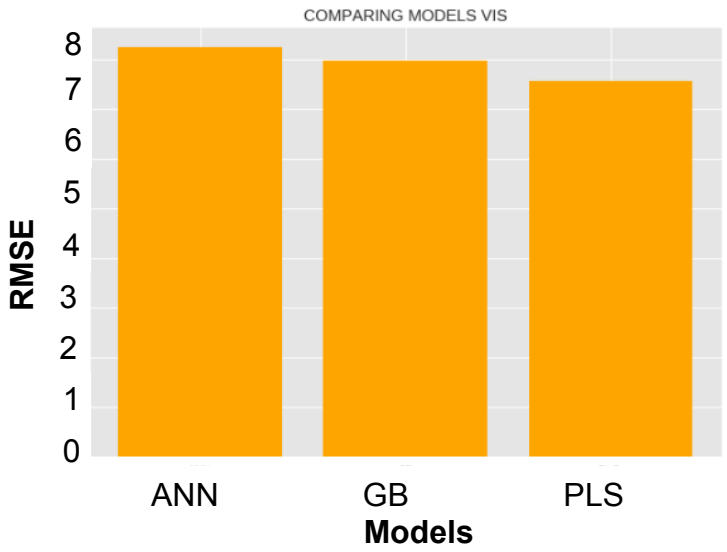


Resultados Firmas Imágenes

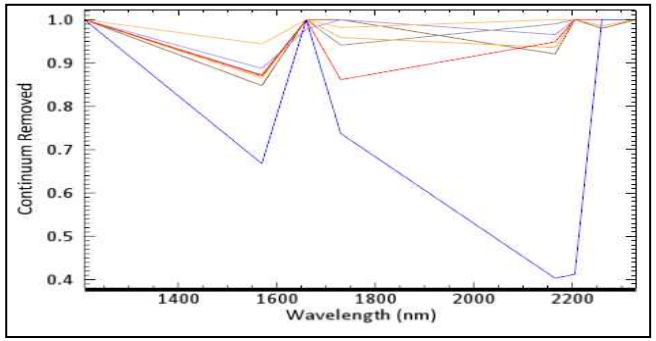
Espectro Visible



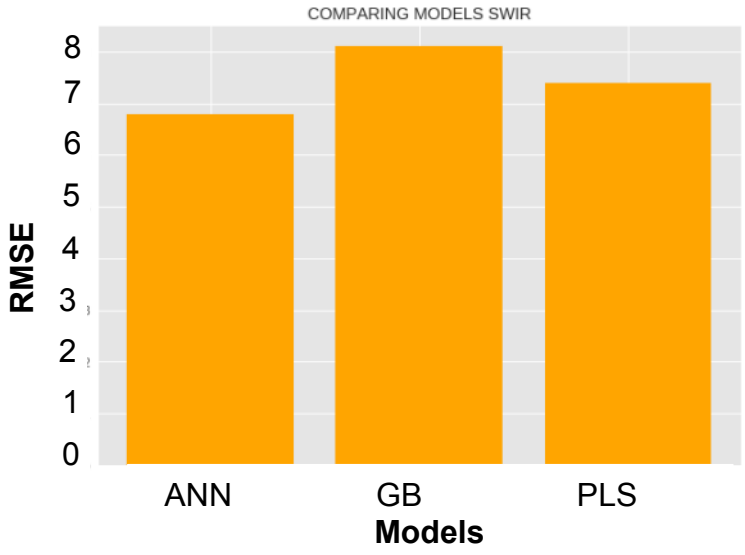
Centro de Banda	425	480	545	605	660	725	832	950
Espectro	VIS	VIS	VIS	VIS	VIS	VIS	VIS	VIS



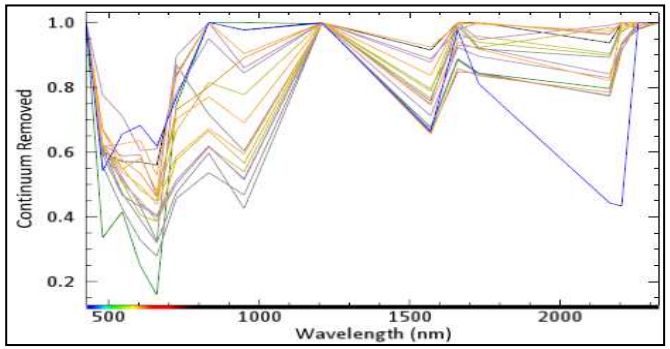
Espectro Infrarrojo Lejano

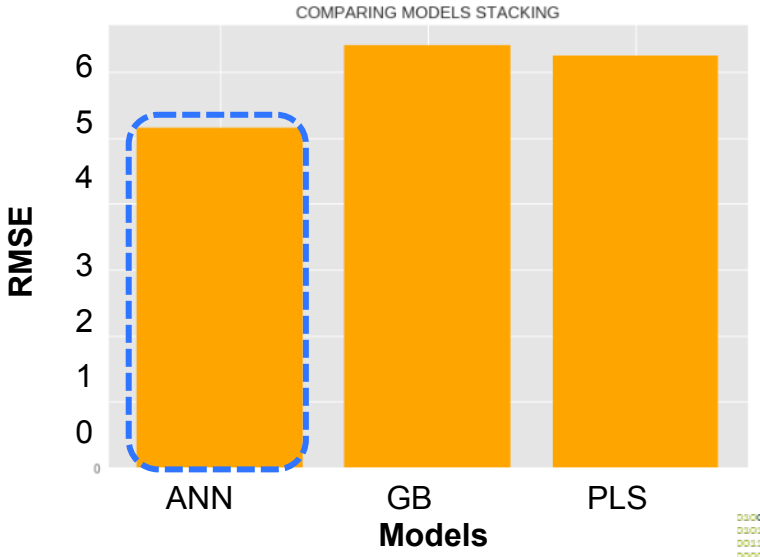


Centro de Banda	1210	1570	1660	1730	2165	2205	2260	2330
Espectro	SWIR	SWIR	SWIR	SWIR	SWIR	SWIR	SWIR	SWIR

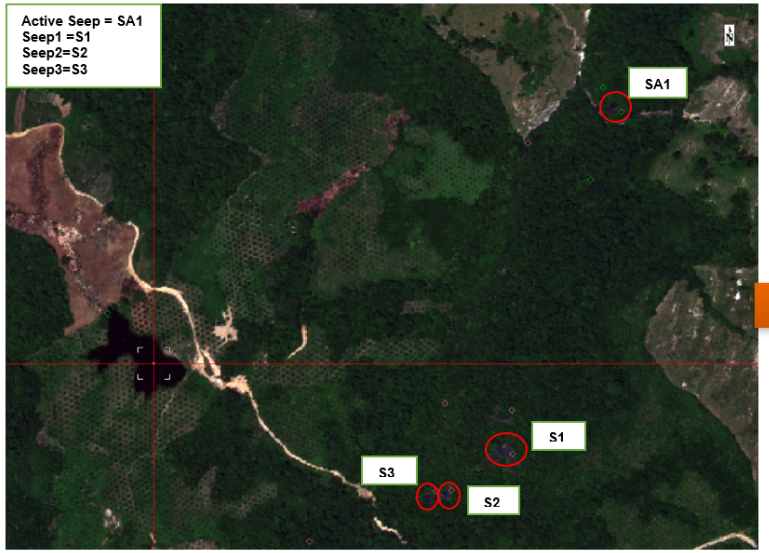


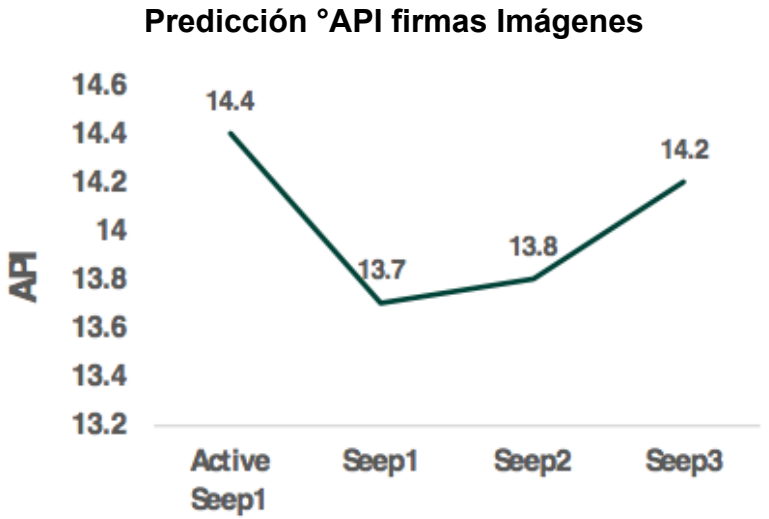
Stacking (VIS+ SWIR)

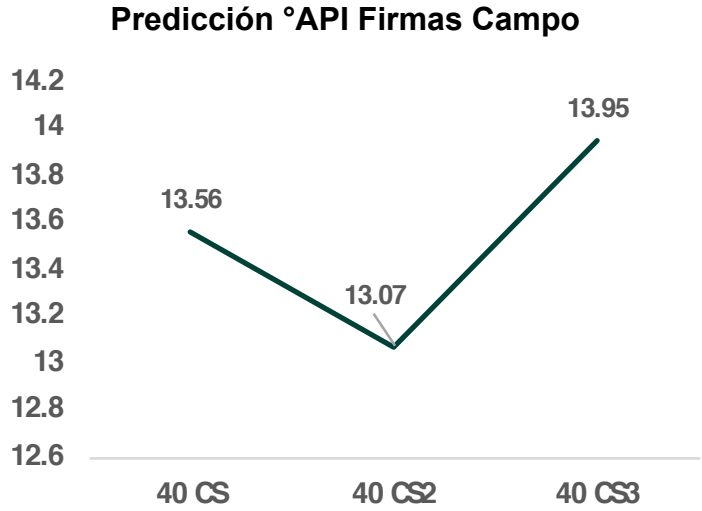


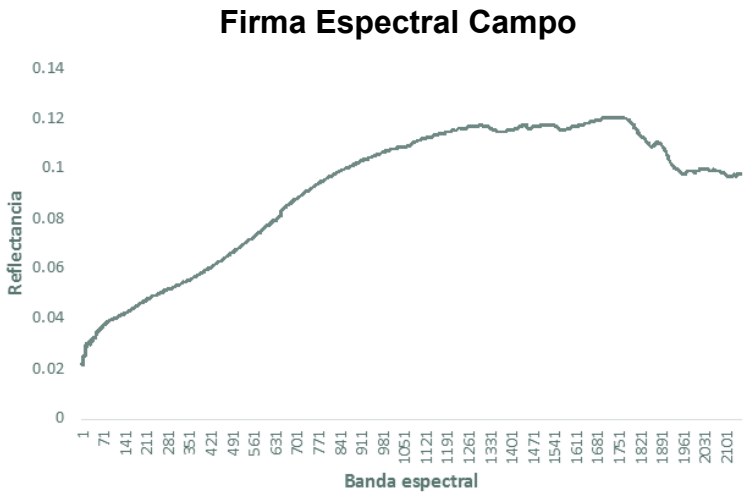


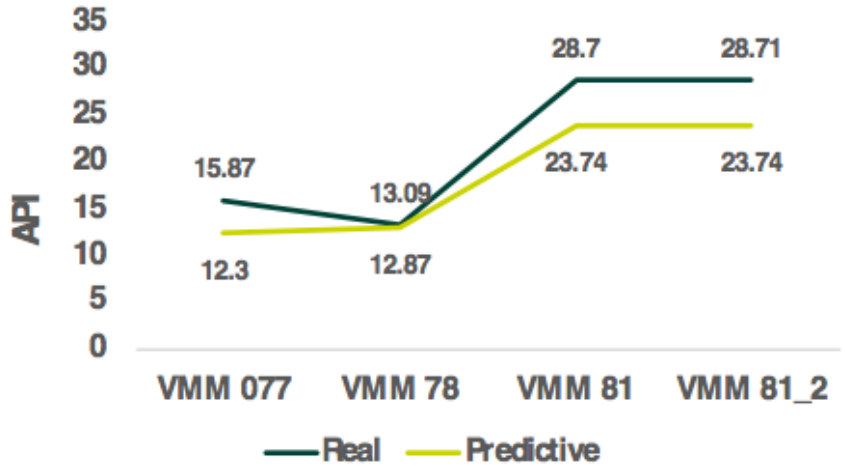
Predicciones Firmas











Reflexiones de Modelamiento

Agile*

TensorFlow

K

Awesome Open Geoscience

> Geoscience is awesome.

awesome | link check passing | contributions 79 | last contribution last friday | slack join | license CC0-1.0

Open geoscience is even more awesome, so we made a list. This list is curated from repositories that make our lives as geoscientists, hackers and data wranglers easier or just more awesome. In accordance with the awesome manifesto, we add awesome repositories. We are open to contributions of course, this is a community effort after all.

scikit learn

plotly

jupyter

CO

TensorBoard

ANNvisualizer

hypernetworks.

AutoKeras

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import matplotlib.cm as cm
import seaborn as sns
import fancyimpute
from fancyimpute import KNN, NuclearNormMinimization, SoftImpute, BiScaler
import os
from pylab import imshow, show, get_cmap
from scipy.signal import savgol_filter
from sklearn.decomposition import PCA
from sklearn.preprocessing import StandardScaler
from sklearn.cross_decomposition import PLSRegression
from sklearn import model_selection
from sklearn.metrics import mean_squared_error, r2_score
from sklearn.model_selection import train_test_split

from keras.models import Sequential
from keras.layers import Conv2D, MaxPooling2D
from keras.layers import Activation, Dropout, Flatten, Dense,BatchNormalization
from keras.callbacks import TensorBoard
from time import time
from keras import backend as K
from keras.optimizers import adam
from keras.optimizers import SGD
from keras.optimizers import adamax
from keras.optimizers import adadelta, nadam
from keras.optimizers import RMSprop
from livelossplot import PlotLossesKeras
from keras import regularizers
from keras import initializers
from sklearn.metrics import roc_curve, auc, roc_auc_score, mean_squared_error

%matplotlib inline
```

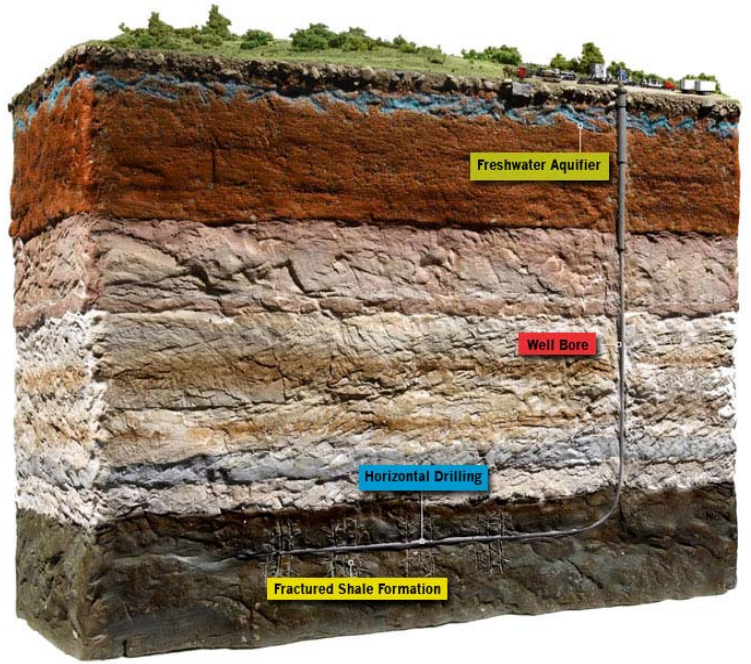
Impacto en el Negocio

1) Caracterización Remota de Crudos (Rezumaderos), permitiendo ahorros en los ensayos de laboratorio y desplazamientos a campo alrededor de $90,000 dólares.

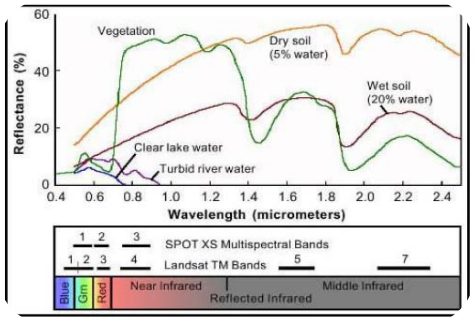
2) Identificación de nuevas estructuras en los procesos exploratorios y Near Field Exploration, que permitan el aumento de las reservas del país.

3) Prevención de desastres ambientales dada la migración vertical de crudo a superficie, permitiendo caracterizar y monitorear anticipadamente las microfugas, con ahorros que pueden llegar hasta $ 2 MUSD.

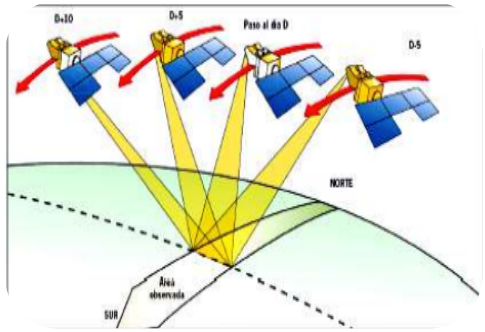
4) Aporte al estado del arte en el análisis y uso de firmas espectrales.



Discusión

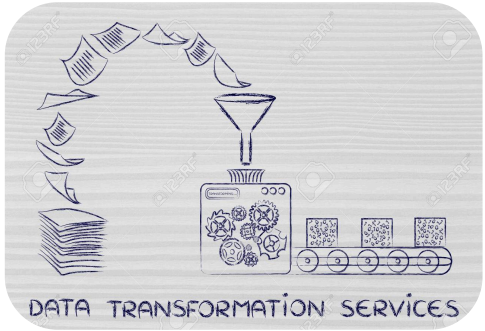


Resolución Espectral



Resolución Temporal

Simulación y Reconstrucción de Firmas



Índices de Vegetación


SciPy
LATAM • 2019