Resolviendo tu primera competencia de Kaggle

Francisco Alfaro

16 de Junio del 2023

Tabla de Contenidos

¿ Qué es Kaggle?

kaggle

Kaggle es una plataforma acceder a conjuntos de datos, participar en desafíos y colaborar con otros en proyectos de aprendizaje automático.

Datasets 📖

Datasets

Explore, analyze, and share quality data. Learn more about data types, creating, and collaborating.

+ New Dataset | Your Work

Search datasets | Filters

All datasets | Computer Science | Education | Classification | Computer Vision | NLP | Data Visualization | Pre-Trained Model

Trending Datasets

See All

Ranking of United States cities by area

D Rahulsingh · Updated a day ago
Usability **10.0** · 5 kB
1 File (CSV)

Used Car Listings: Features and Price Prediction

Tugberk Karan · Updated 11 hours ago
Usability **9.4** · 1 MB
2 Files (CSV)

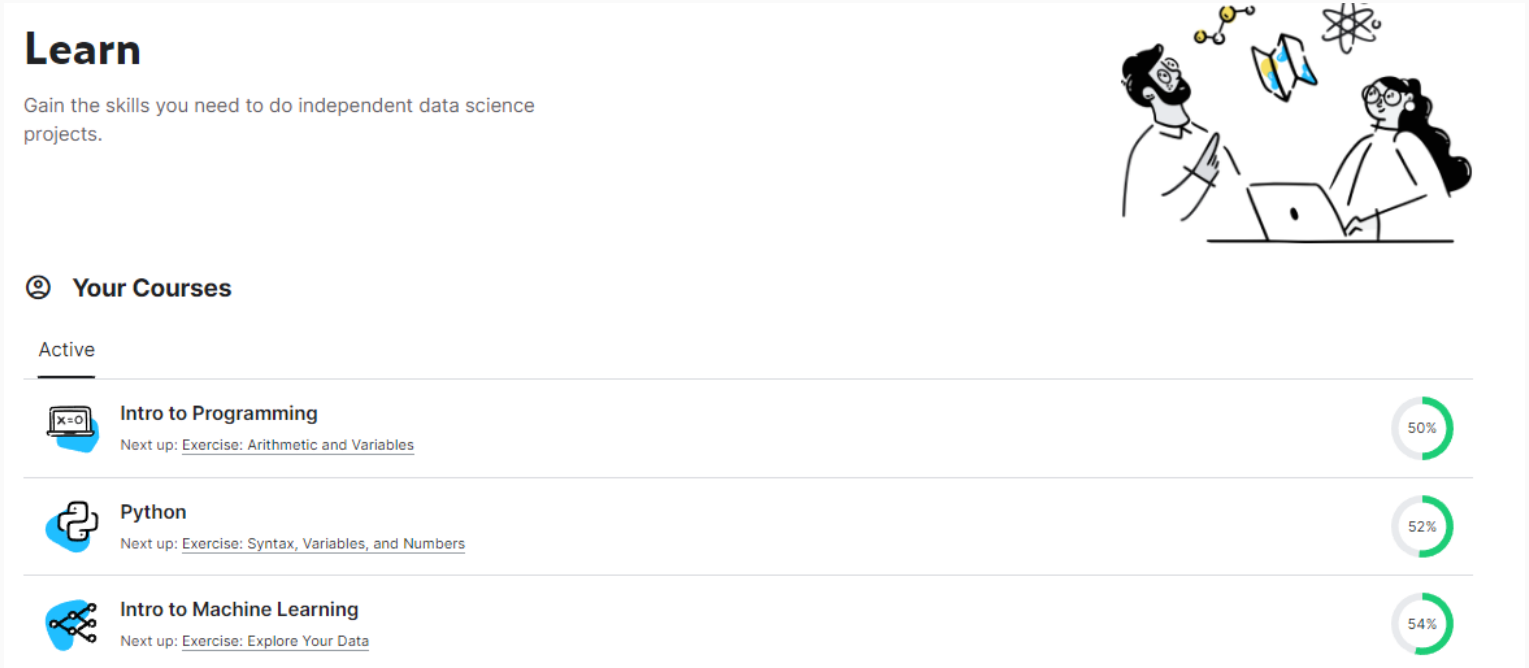
⚡🚙Tesla Supercharge Locations Globally🌎⚡

Omar Sobhy · Updated 7 days ago
Usability **10.0** · 305 kB
1 File (CSV)

💎 r/Fitness Posts & Comments 💎

PeachOrange · Updated 3 hours ago
Usability **10.0** · 2 MB

Learn



Puede encontrar más detalles en el siguiente link:

⇒ fralfaro/kaggle-courses

Kaggle Courses

Kaggle Courses

Search

Kaggle Courses

Kaggle Courses

Intro to Programming

Python

Pandas

Data Visualization

Data Cleaning

Intro to Machine Learning

Intermediate to Machine Learning

Feature Engineering

Time Series

Intro to Deep Learning

SQL

Advanced SQL

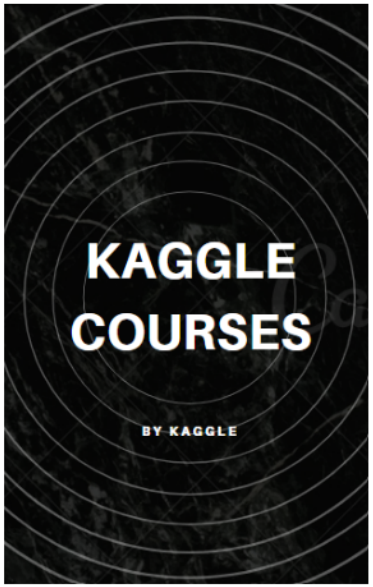
Kaggle Courses

Gain the skills you need to do independent data science projects.

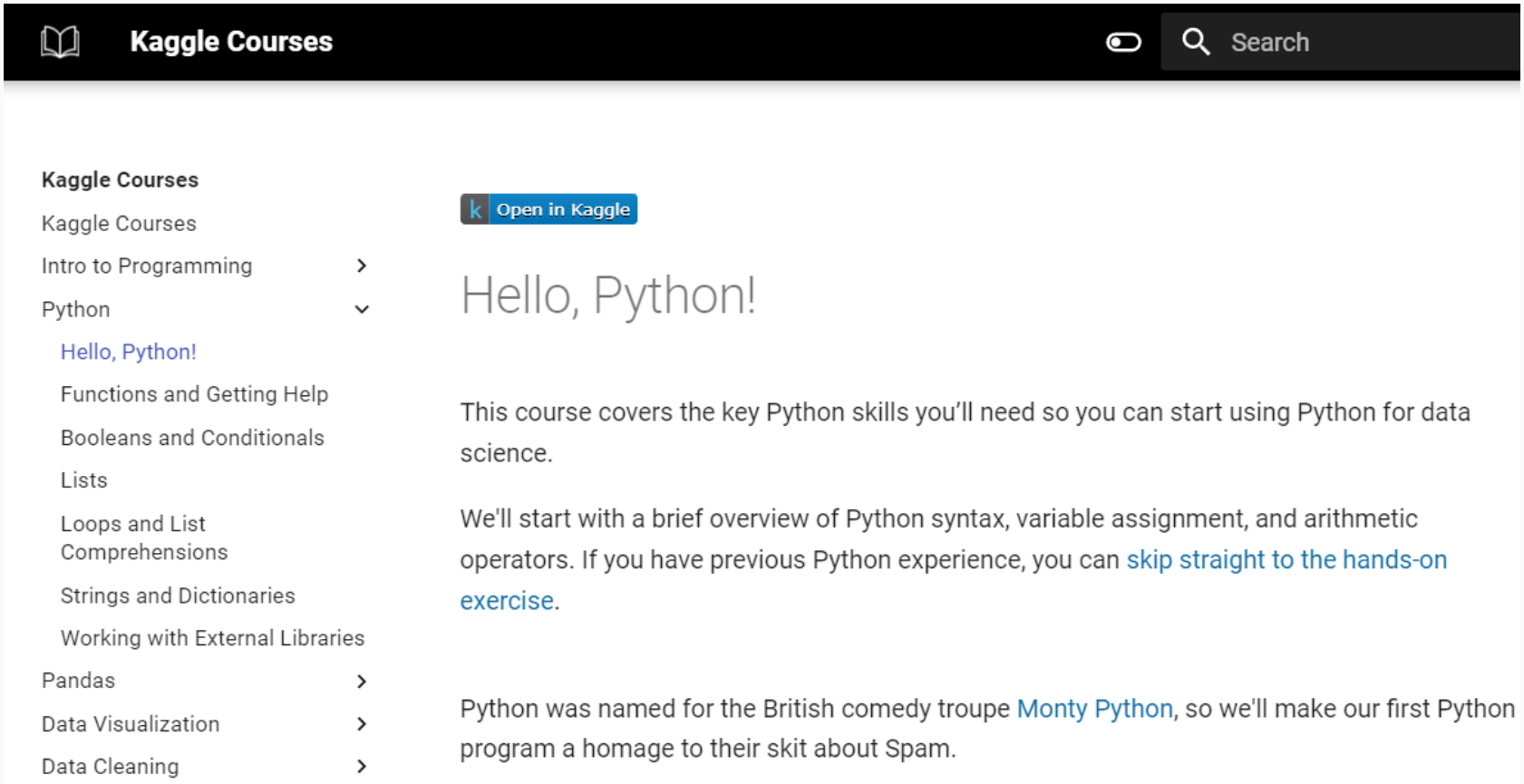
We pare down complex topics to their key practical components, so you gain usable skills in a few hours (instead of weeks or months).

The courses are provided at **no cost to you**, and you can now earn certificates.

> **Note**: This new documentation was developed by fralfaro. You can find the repository at the following link: fralfaro/kaggle-courses.



Kaggle Courses



Competitions

Competitions

Grow your data science skills by competing in our exciting competitions. Find help in the documentation or learn about Community Competitions.

Host a Competition | Your Work

Search competitions | Filters

All Competitions	Featured	Getting Started	Research	Community	Playground
Everything, past & present	Premier challenges with prizes	Approachable ML fundamentals	Scientific and scholarly challenges	Created by fellow Kagglers	Fun practice problems

Active Competitions

Hotness

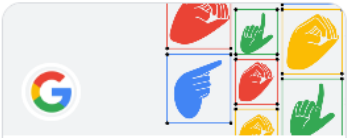
Vesuvius Challenge - Ink Detection

Resurrect an ancient library from the ashe...

Featured

Code Competition · 1243 Teams

$1,000,000 — 3 days to go



Google - American Sign Language Fingerspelling...

Train fast and accurate American Sign La...

Research

Code Competition · 255 Teams

$200,000 — 2 months to go

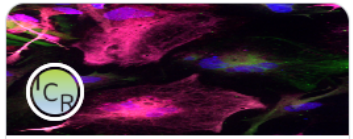
2023 Kaggle AI Report

Essays on the state of machine learning i...

Analytics

82 Teams

$70,000 — 24 days to go



ICR - Identifying Age-Related Conditions

Use Machine Learning to detect condition...

Featured

Code Competition · 2679 Teams

$60,000 — 2 months to go

Por qué debería participar ?

- Aprendizaje y mejora de habilidades
- Acceso a conjuntos de datos y problemas interesantes
- Colaboración y aprendizaje compartido
- Reconocimiento y oportunidades profesionales

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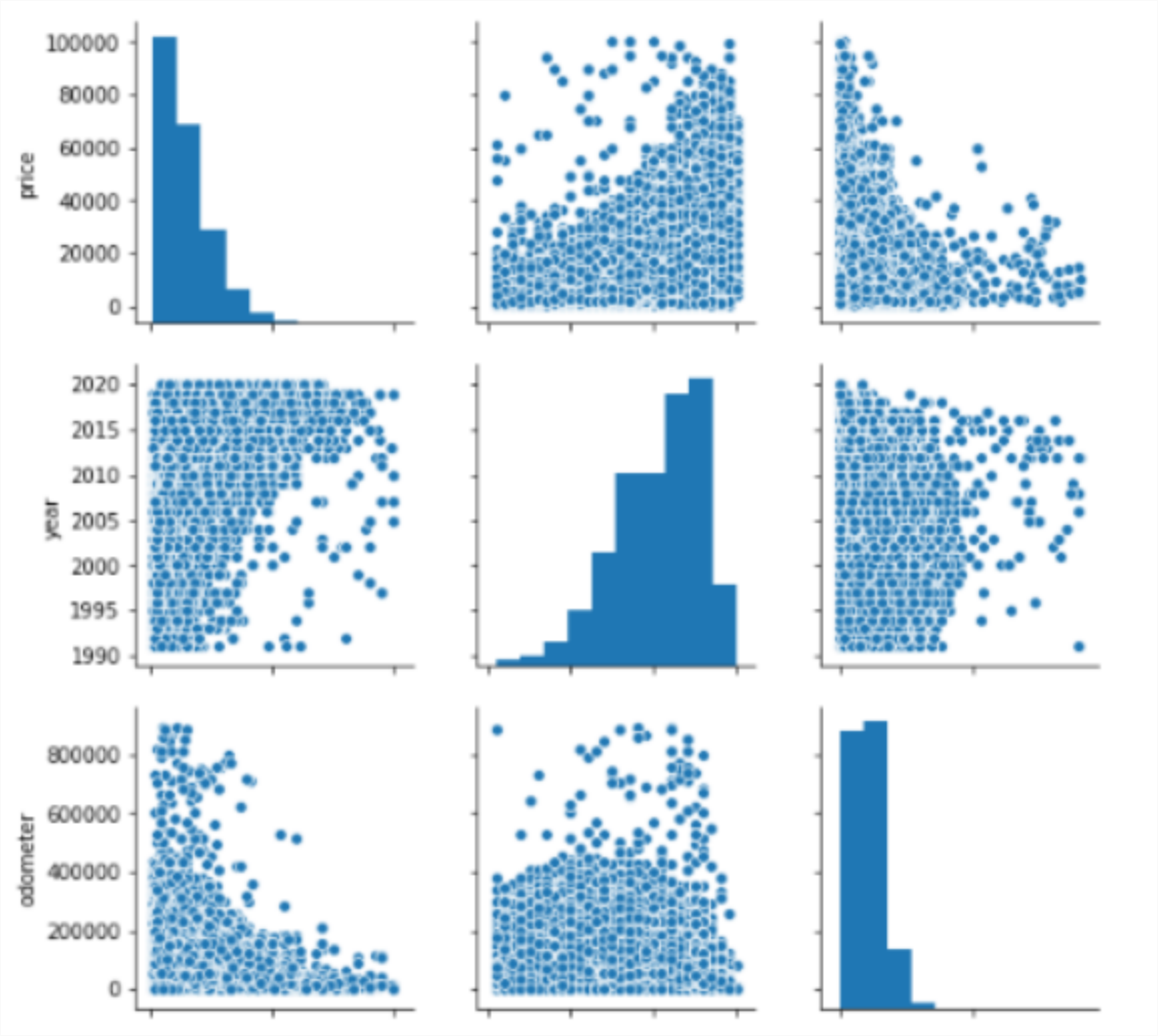
Tabla de Contenidos

CRISP-DM


Business Understanding
Data Understanding
Data Preparation
Modeling
Evaluation
Deployment
Data

EDA


price
year
odometer
100000
80000
60000
40000
20000
0
2020
2015
2010
2005
2000
1995
1990
800000
600000
400000
200000
0

- Resumen estadístico
- Visualización de datos
- Tratamiento de datos faltantes o duplicados
- Análisis de valores atípicos

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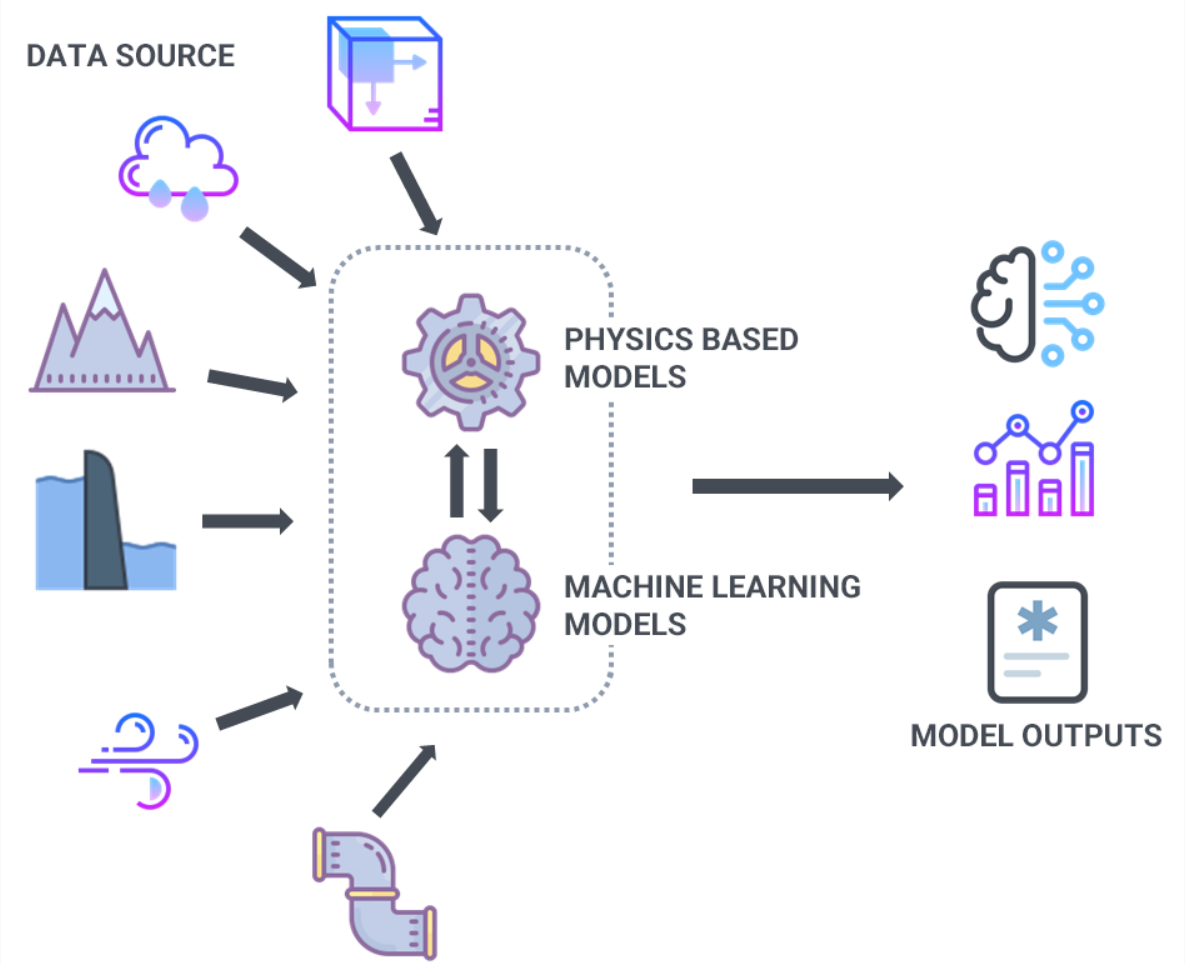
Machine Learning



Machine Learning

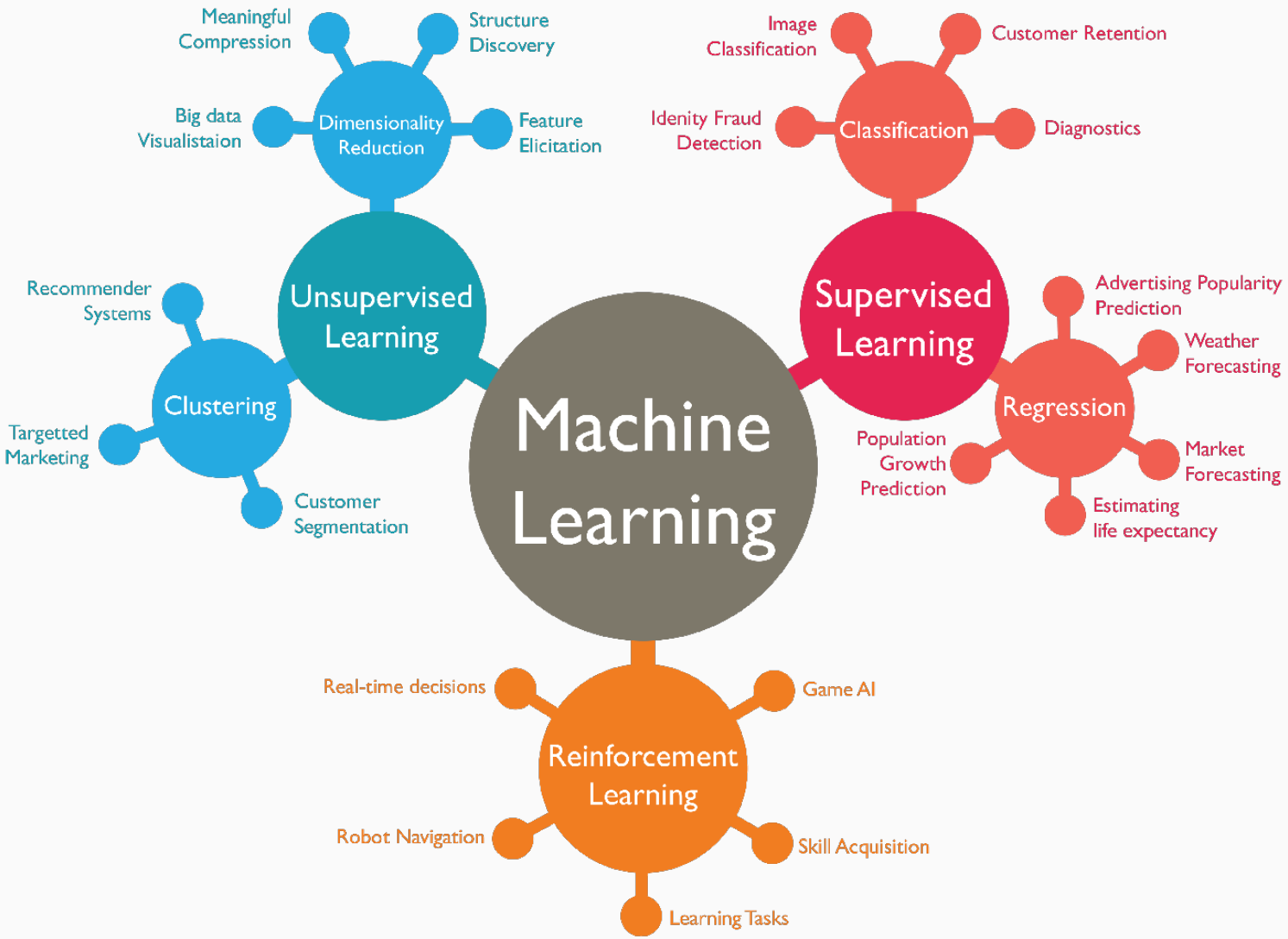


Tabla de Contenidos

Caso de Estudio 

Resolver competencia de **Titanic** mediante notebooks.

- Código este en Github
- Ejemplo del Notebook
- Subir resultados

Ocuparemos el repositorio: fralfaro/kaggle-competitions

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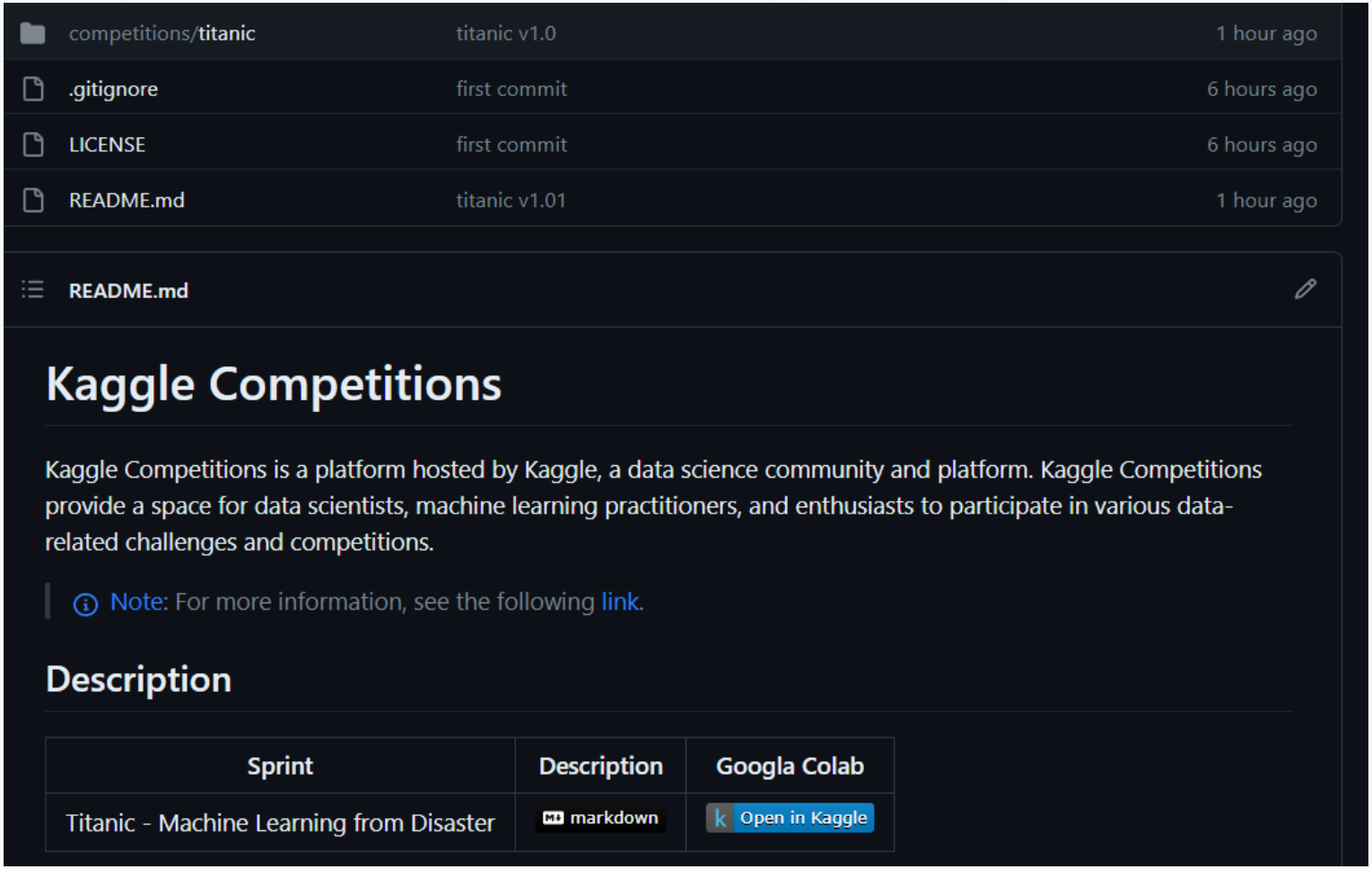
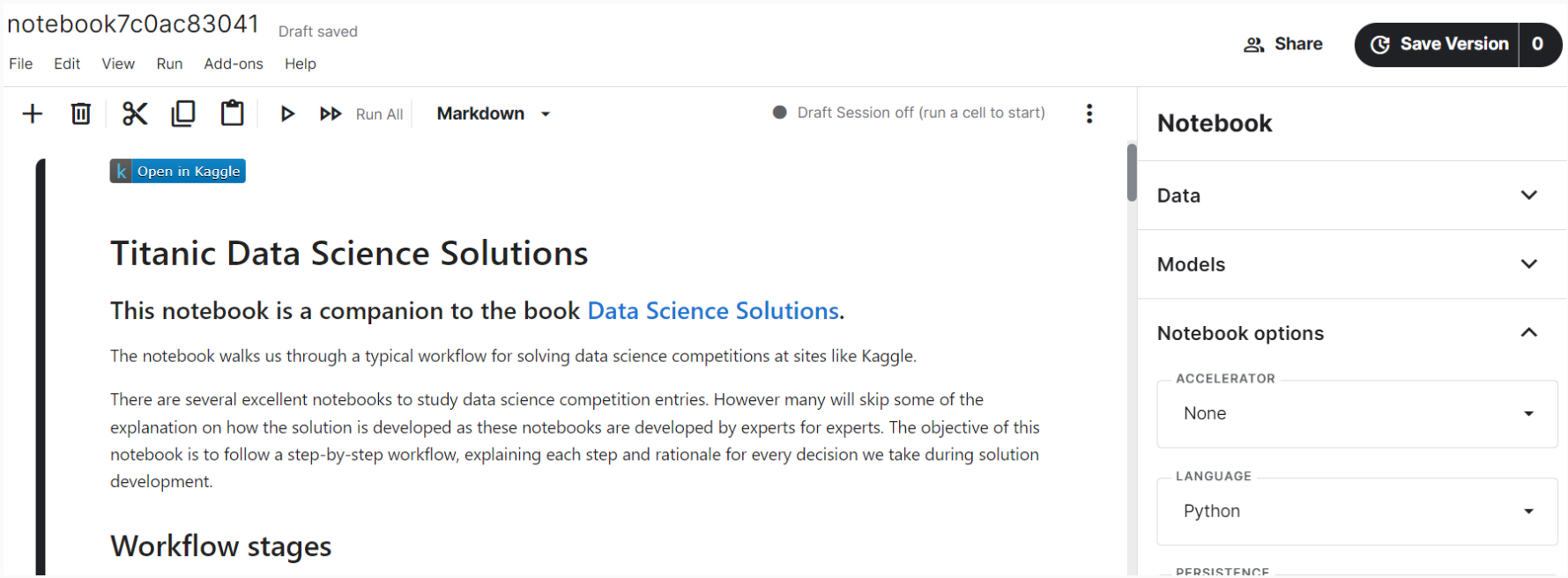
`github.com/fralfaro/kaggle-competitions`



Caso de Estudio

`kaggle-competitions/tree/main/competitions/titanic`

Jupyter Notebook

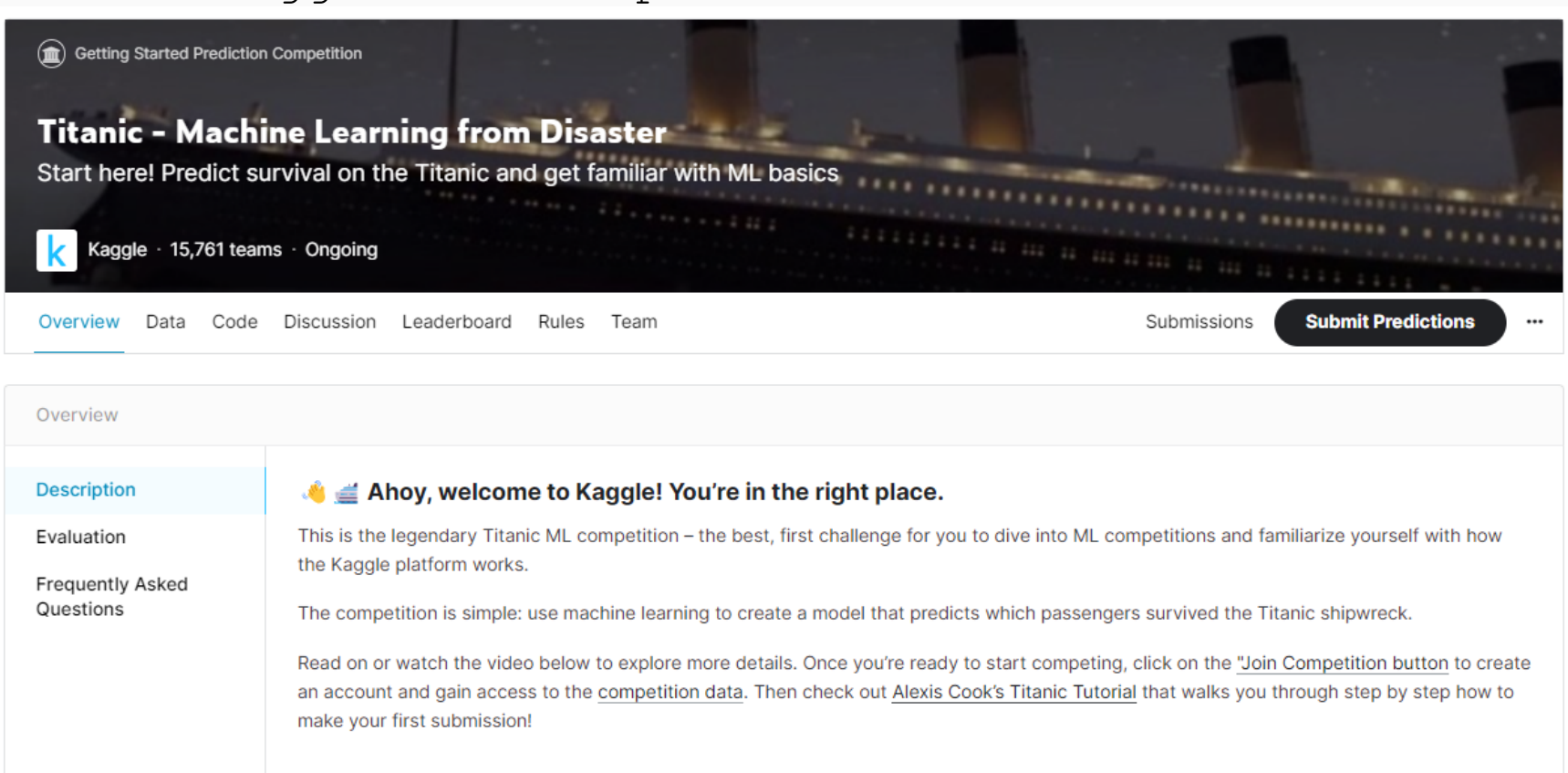


Paso a Paso 

- Definir Problema
- Datos entrenamiento y pruebas
- Discutir, preparar, limpiar los datos
- Analizar y explorar los datos
- Modelar, predecir y resolver el problema
- Visualizar resultados y dar solución final
- Enviar los resultados

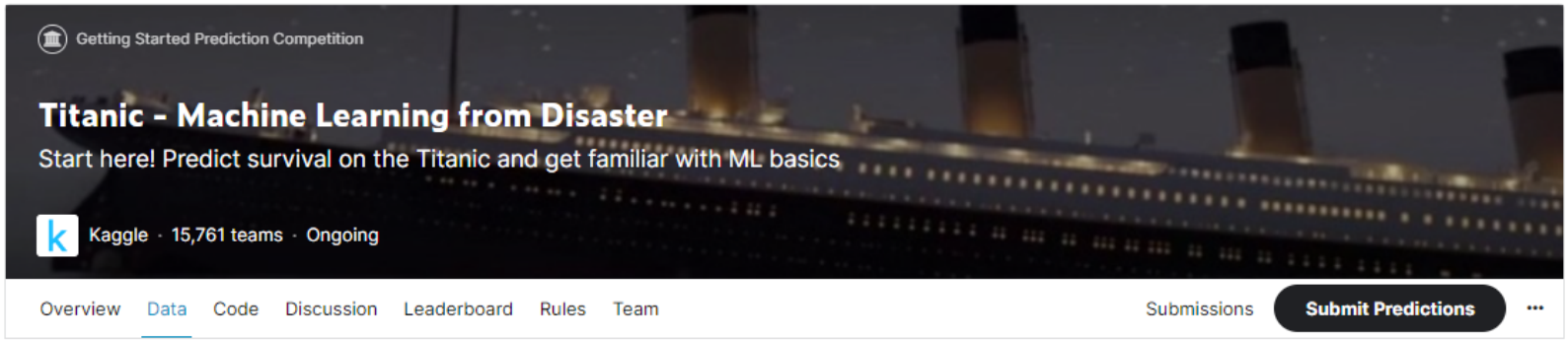
Definir Problema

www.kaggle.com/competitions/titanic/overview



Datos entrenamiento y pruebas

www.kaggle.com/competitions/titanic/data



Dataset Description

Overview

The data has been split into two groups:

- training set (train.csv)
- test set (test.csv)

The training set should be used to build your machine learning models. For the training set, we provide the outcome (also known as the "ground truth") for each passenger. Your model will be based on "features" like passengers' gender and class. You can also use feature engineering to create new features.

The test set should be used to see how well your model performs on unseen data. For the test set, we do not provide the ground truth for each passenger. It is your job to predict these outcomes. For each passenger in the test set, use the model you trained to predict whether or not they survived the sinking of the Titanic.

We also include **gender_submission.csv**, a set of predictions that assume all and only female passengers survive, as an example of what a submission file should look like.

Files
3 files

Size
93.08 kB

Type
csv

Discutir, preparar, limpiar los datos

```
train_df.describe()
```

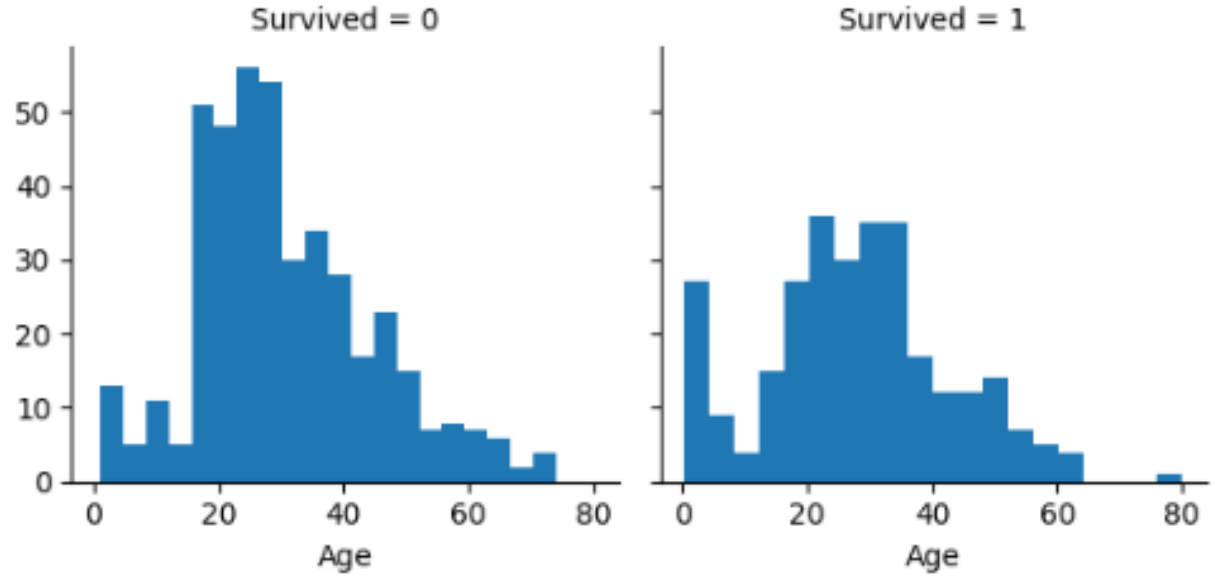
	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

Se utiliza la librería de **Pandas** para leer, agrupar y manipular los datos.

Analizar y explorar los datos

```
g = sns.FacetGrid(train_df, col='Survived')
g.map(plt.hist, 'Age', bins=20)
```

```
<seaborn.axisgrid.FacetGrid at 0x198bf4cc430>
```



Se utiliza **Matplotlib** o **Seaborn** para el análisis univariado y multivariado.

Modelar, predecir y resolver el problema.

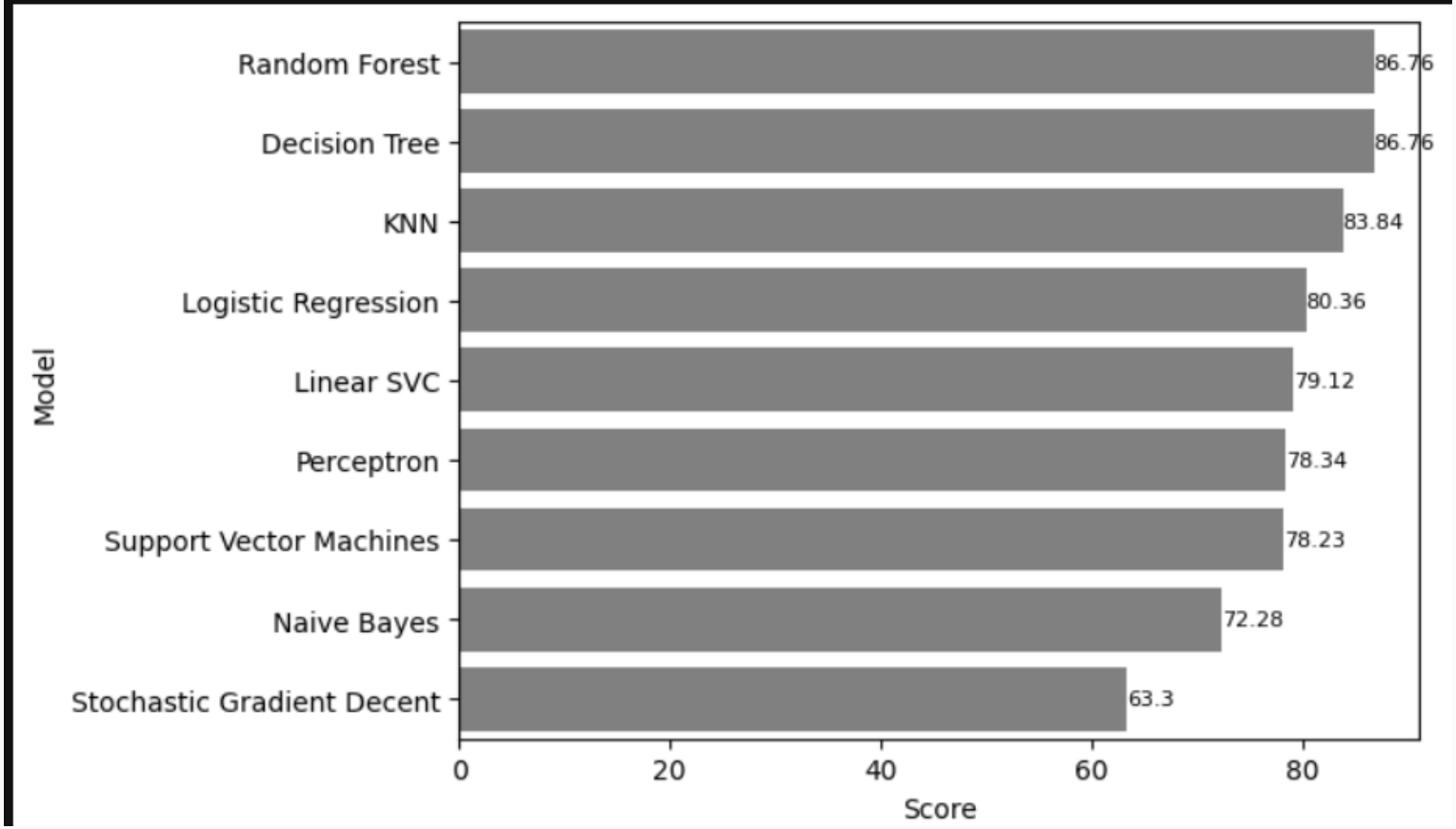
```
# Decision Tree

decision_tree = DecisionTreeClassifier()
decision_tree.fit(X_train, Y_train)
Y_pred = decision_tree.predict(X_test)
acc_decision_tree = round(decision_tree.score(X_train, Y_train) * 100, 2)
acc_decision_tree
```

```
86.76
```

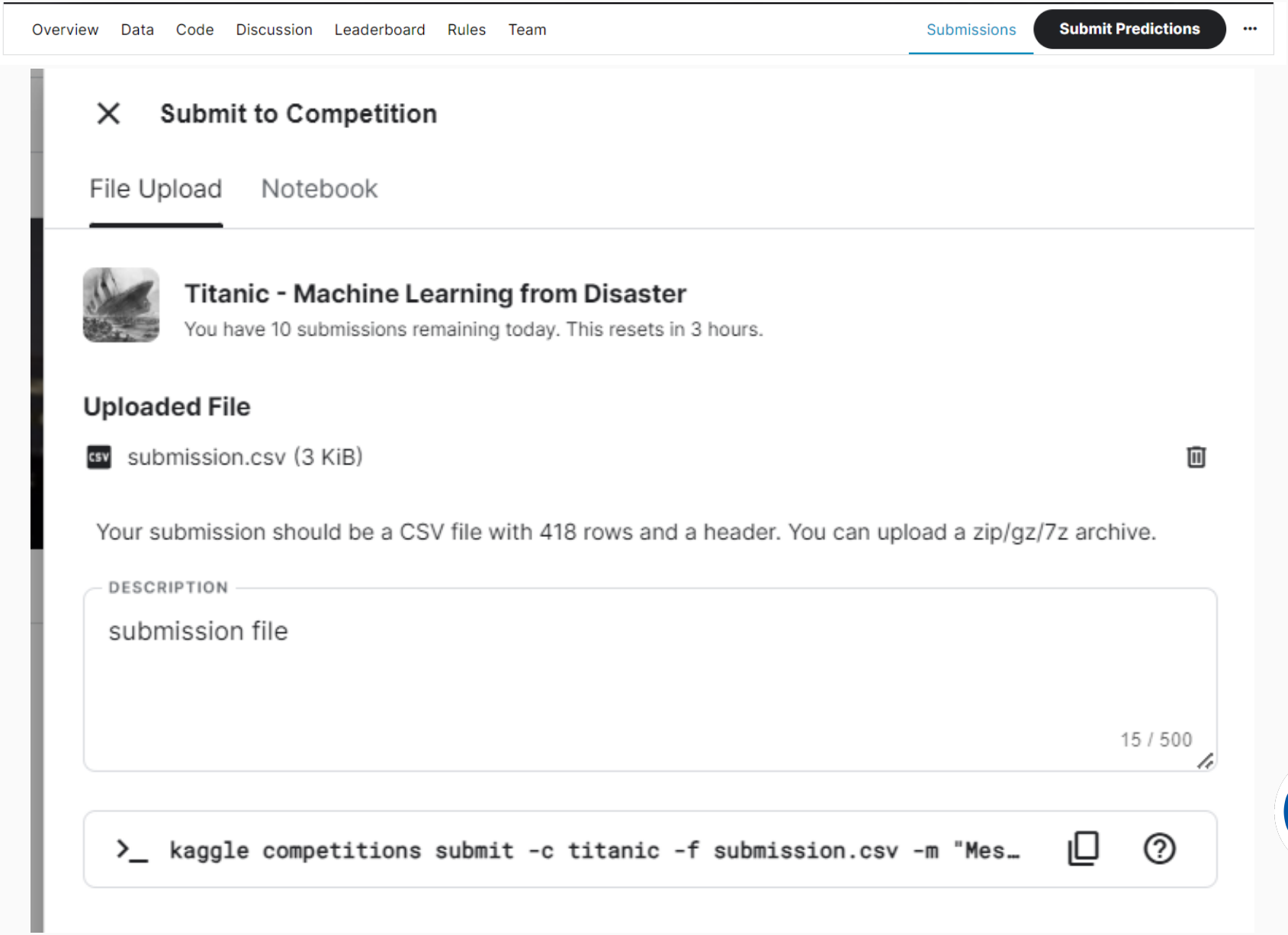
Se utiliza la librería de **scikit-learn** para los modelos de machine learning.

Visualizar resultados y dar solución final

```
plotting = sns.barplot(data=models, y="Model", x="Score",color = 'gray')
for container in plotting.containers:
    plotting.bar_label(container,fontsize=8)
```



Enviar los resultados



Enviar los resultados

www.kaggle.com/competitions/titanic/submissions

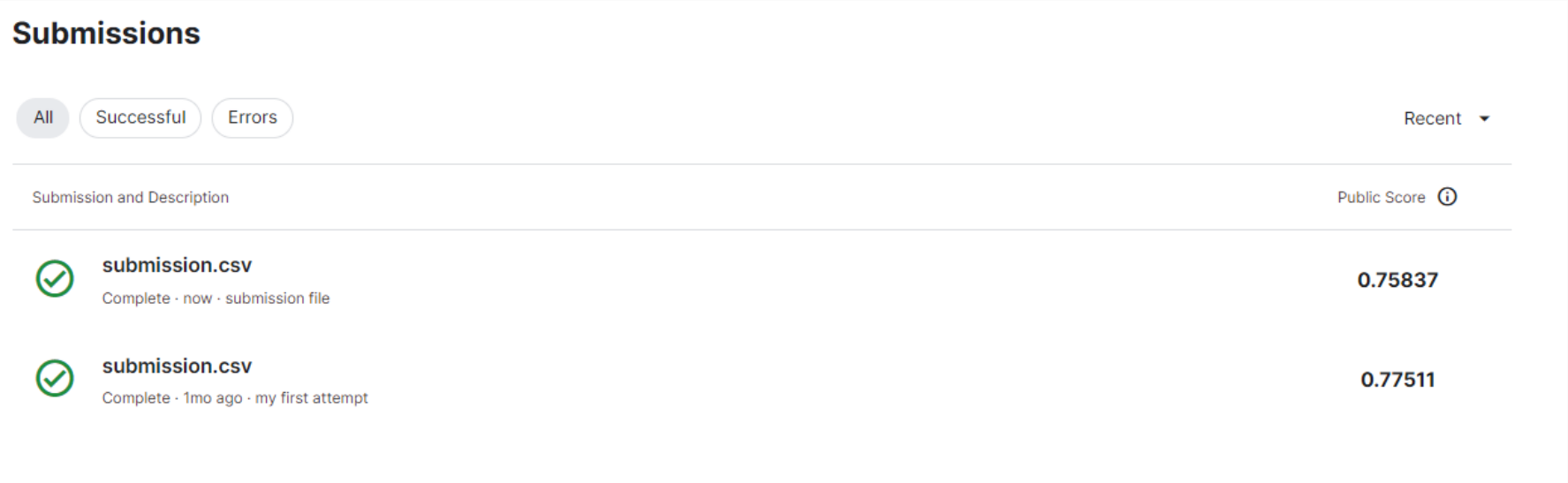


Tabla de Contenidos

Modelos dominantes - Gradient Boosting

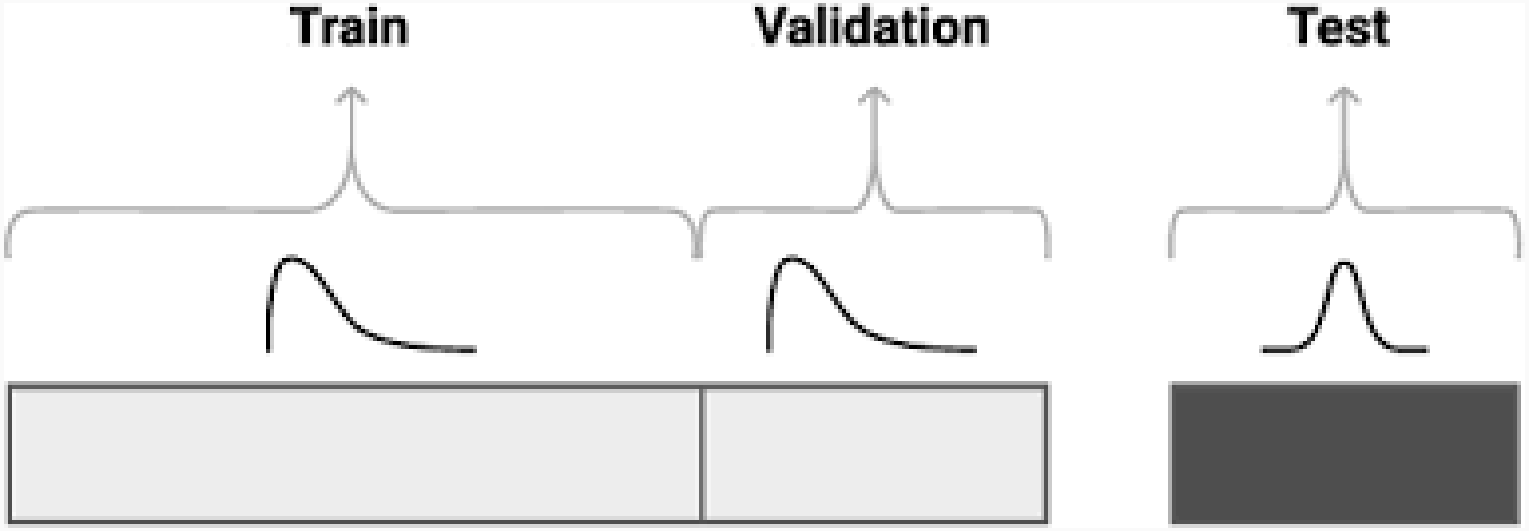
- **LightGBM**:
  - Funciona por defecto con variables categóricas.
  - Muy rápido, incluso en CPU.
- **XGBoost**:
  - Debemos hacer encoding de variables categóricas.
  - Rápido en GPU.
- **CatBoost**:
  - Funciona por defecto con variables categóricas.
  - Más rápido que XGBoost, más lento que LightGBM.

Modelos dominantes - DeepLearning

TabNet (2020): Mecanismo de atención secuencial. Selecciona features en cada iteración (ganando interpretabilidad). Ver Paper

Name	Rossman	CoverType	Higgs	Gas	Eye	Gesture	YearPrediction	MSLR	Epsilon	Shrutime	Blastchar
XGBoost	490.18	3.13	21.62	2.18	**56.07**	80.64	77.98	55.43	11.12	13.82	20.39
NODE	488.59	4.15	21.19	2.17	68.35	92.12	76.39	55.72	**10.39**	14.61	21.40
DNF-Net	503.83	3.96	23.68	**1.44**	68.38	86.98	81.21	56.83	12.23	16.80	27.91
TabNet	**485.12**	3.01	**21.14**	1.92	67.13	96.42	83.19	56.04	11.92	14.94	23.72
1D-CNN	493.81	3.51	22.33	1.79	67.90	97.89	78.94	55.97	11.08	15.31	24.68
Simple Ensemble	488.57	3.19	22.46	2.36	58.72	89.45	78.01	55.46	11.07	13.61	21.18
Deep Ensemble w/o XGBoost	489.94	3.52	22.41	1.98	69.28	93.50	78.99	55.59	10.95	14.69	24.25
Deep Ensemble w XGBoost	485.33	**2.99**	22.34	1.69	59.43	**78.93**	**76.19**	**55.38**	11.18	**13.10**	**20.18**
	TabNet			DNF-Net			NODE			New datasets	

Validación adversarial

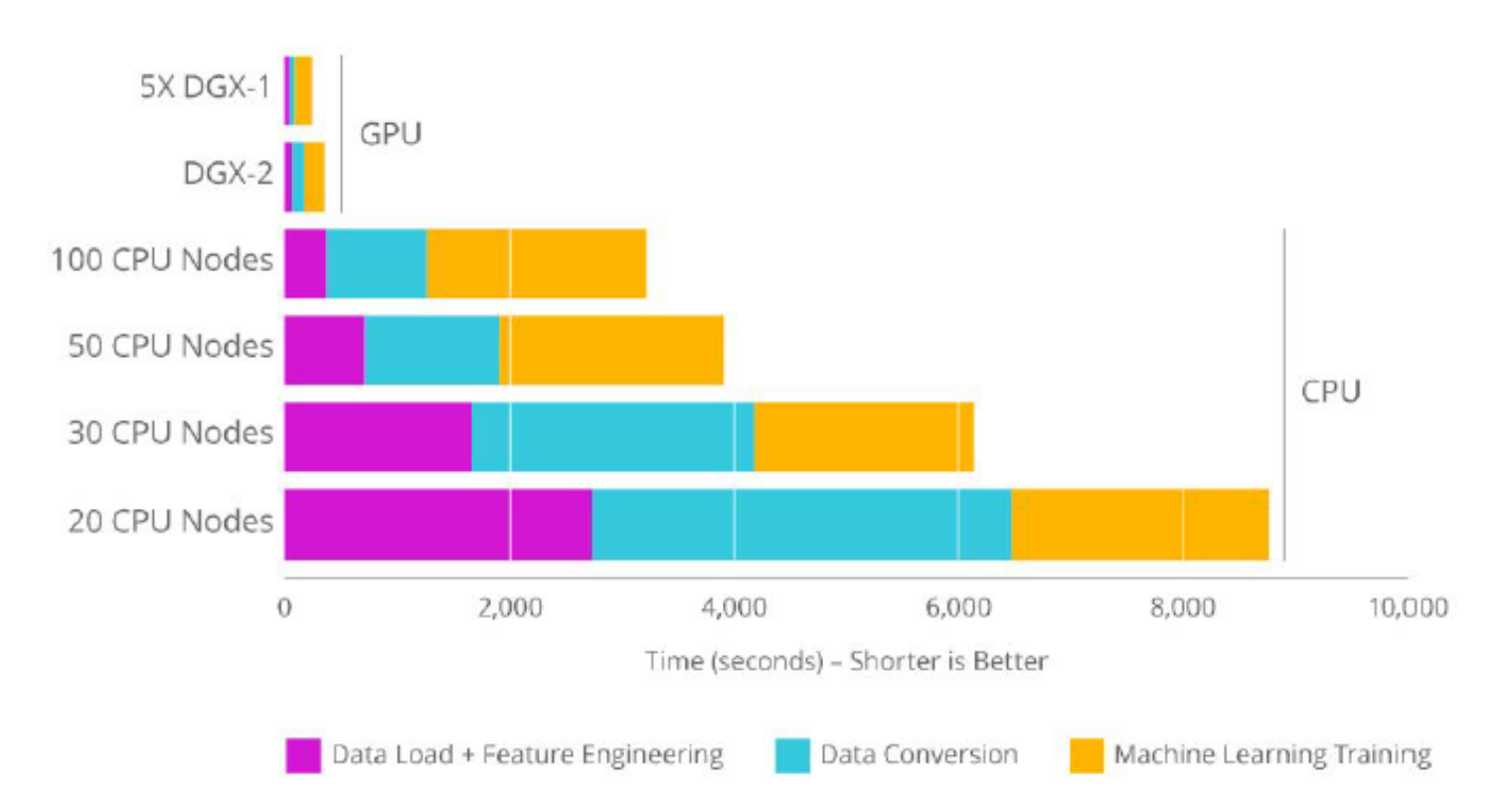


La idea es comparar el nivel de similitud entre **Train** y **Test** en términos de la distribución de las features.

Validación adversarial

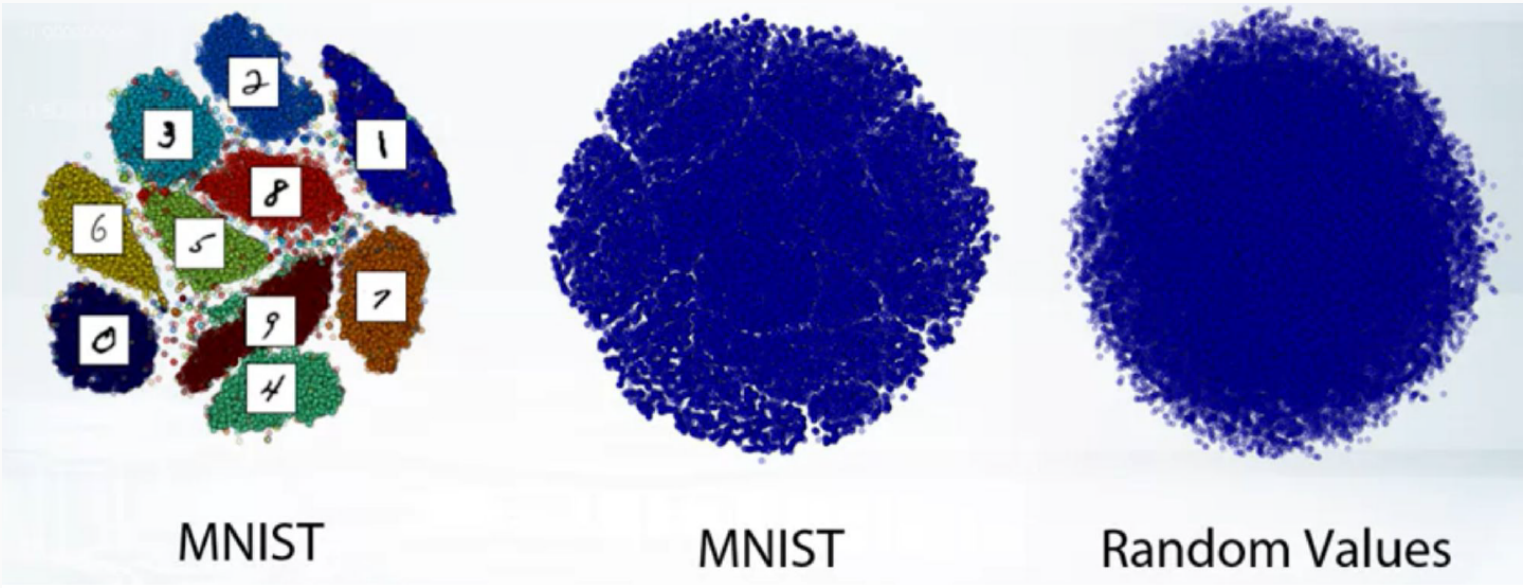
- Si son difíciles de distinguir, entonces probablemente las distribuciones son similares y técnicas de validación usuales pueden ser aplicadas.
- Si no, debemos buscar la(s) features que nos están dando problema(s) y arreglarlas (esto normalmente es complejo) o eliminarlas.

NVIDIA RAPIDS



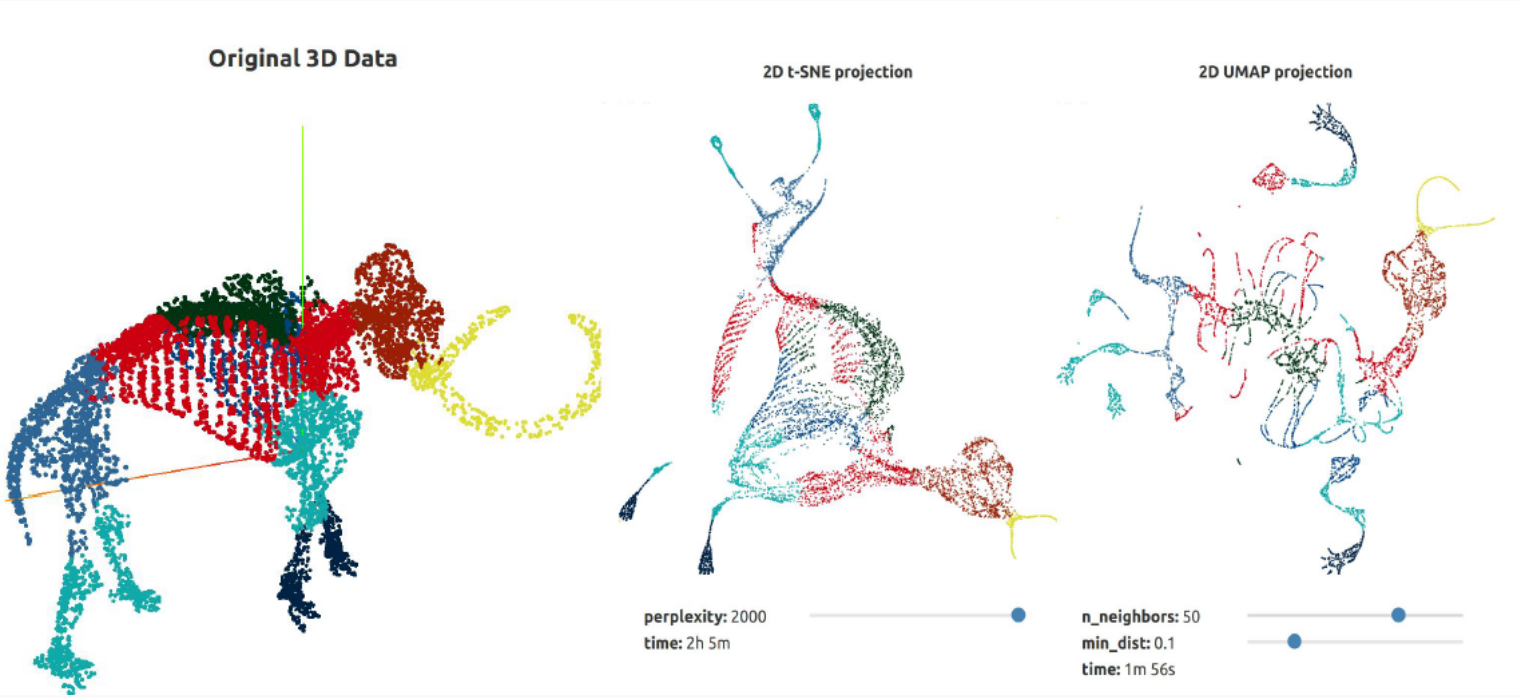
- **cuML:** ¿Sklearn en GPU?. Ver algoritmos en github
- **cuDF:** Dask en GPU. Competencia en Kaggle Accelerating Trading on GPU.

Reducción Dimensionalidad - TSNE



Visualizing Data using t-SNE (2008)

Reducción Dimensionalidad - UMAP



UMAP: Uniform Manifold Approximation and Projection for Dimension Reduction (2018)

Leave One Feature Out (LOFO)

```
kf = KFold(n_splits=10, shuffle=True, random_state=42)

features = ['cat0', 'cat1', 'cat2', 'cat3', 'cat4', 'cat5', 'cat6', 'cat7',
       'cat8', 'cat9', 'cont0', 'cont1', 'cont2', 'cont3', 'cont4', 'cont5',
       'cont6', 'cont7', 'cont8', 'cont9', 'cont10', 'cont11', 'cont12',
       'cont13']

model = XGBRegressor(tree_method ="gpu_hist", gpu_id = 0, predictor = "gpu_predictor")
dataset = Dataset(df=train, target="target", features=features)
lofo_imp = LOFOImportance(dataset, cv=kf, scoring="neg_root_mean_squared_error", model = model)
importance_df_xgb = lofo_imp.get_importance()
plot_importance(importance_df_xgb, figsize=(12, 20))
```

```
100% 24/24 [05:00<00:00, 12.49s/it]
```

- Evalúa la performance del modelo utilizando todas las features, luego, de manera iterativa remueve features una a una.
- Generaliza bien a test set no vistos.
- Es agnóstica al modelo.

Optuna

```
%%time
study = optuna.create_study(direction='minimize')
optuna.logging.set_verbosity(optuna.logging.WARNING)
study.optimize(objective, n_trials=1024)

best_trial=study.best_trial.params
print('Number of finished trials:', len(study.trials))
best_trial
```

```
Number of finished trials: 1024
CPU times: user 52min 20s, sys: 1min 55s, total: 54min 15s
Wall time: 9min 4s
```

- Optimización de hiperparámetros mediante técnicas de optimización bayesiana y algoritmos genéticos.
- Pruning Callbacks y más!

Recomendación

Machine Learning Competitivo: top 1% en Kaggle - Youtube

Tabla de Contenidos

Resultados

- Conocer plataforma de Kaggle.
- Primer Desafio en el mundo DS.
- Mejoras continuas en competiciones.

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- Conocer plataforma de Kaggle.
- Primer Desafio en el mundo DS.
- Mejoras continuas en competiciones.

Referencias

- Machine Learning Competitivo: top 1% en Kaggle - YouTube
- KC: A Beginner's Guide to Winning (Rob Mulla) - YouTube
- Introducción a Kaggle - YouTube

Resolviendo tu primera competencia de Kaggle

Francisco Alfaro

16 de Junio del 2023