# Cloud Machine Learning for Cybersecurity

BSIDES CDMX 2019

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# hugo@bsidescdmx2019$ whoami

Professor at Polytechnics University of San Luis Potosi (-)

```
- IoT malware
- Machine Learning
- Teaching Cybersecurity: gamification, CTF
```

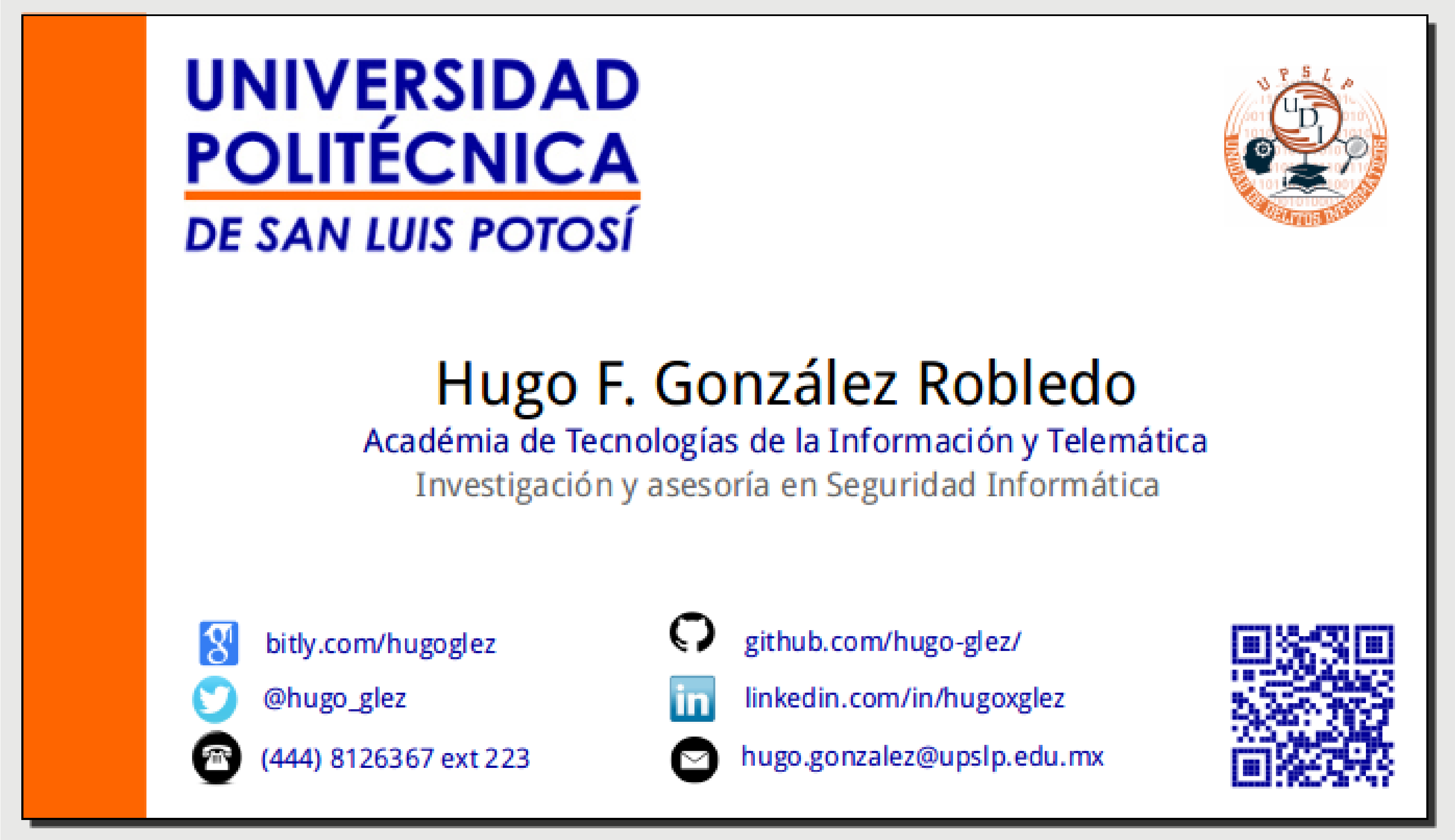
Graduated from Canadian Institute for Cybersecurity (2017)

```
- Android malware authorship attribution
```

Honeynet member (2007)

```
- GSoC mentor, Android stuff.
```

# hugo@bsidescdmx2019$ ristretto card.png



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# hugo@bsidescdmx2019$ w

```
16:00:00 up 4 days, 3:35, 27 users, load average: 1.41, 1.10, 1.08
USER ______ FROM ______ LOGIN@ _________ WHAT

_

.

.

.

.
```

# hugo@bsidescdmx2019$ cat Agenda.txt

1. Data Science Introduction (Videos)
2. Short introduction to Machine Learning
3. Process
4. AzureML studio
5. Cybersecurity/InfoSec use cases
    i. Url classification (CIC dataset)
    ii. VPN vs NO-VPN (CIC dataset)
    iii. IDS dataset (CIC dataset)
6. Crafting features
    i. WAF dataset
7. Advance usages

## Data, slides, code

http://github.com/hugo-glez/bsidescdmx2019/

### More info and data related

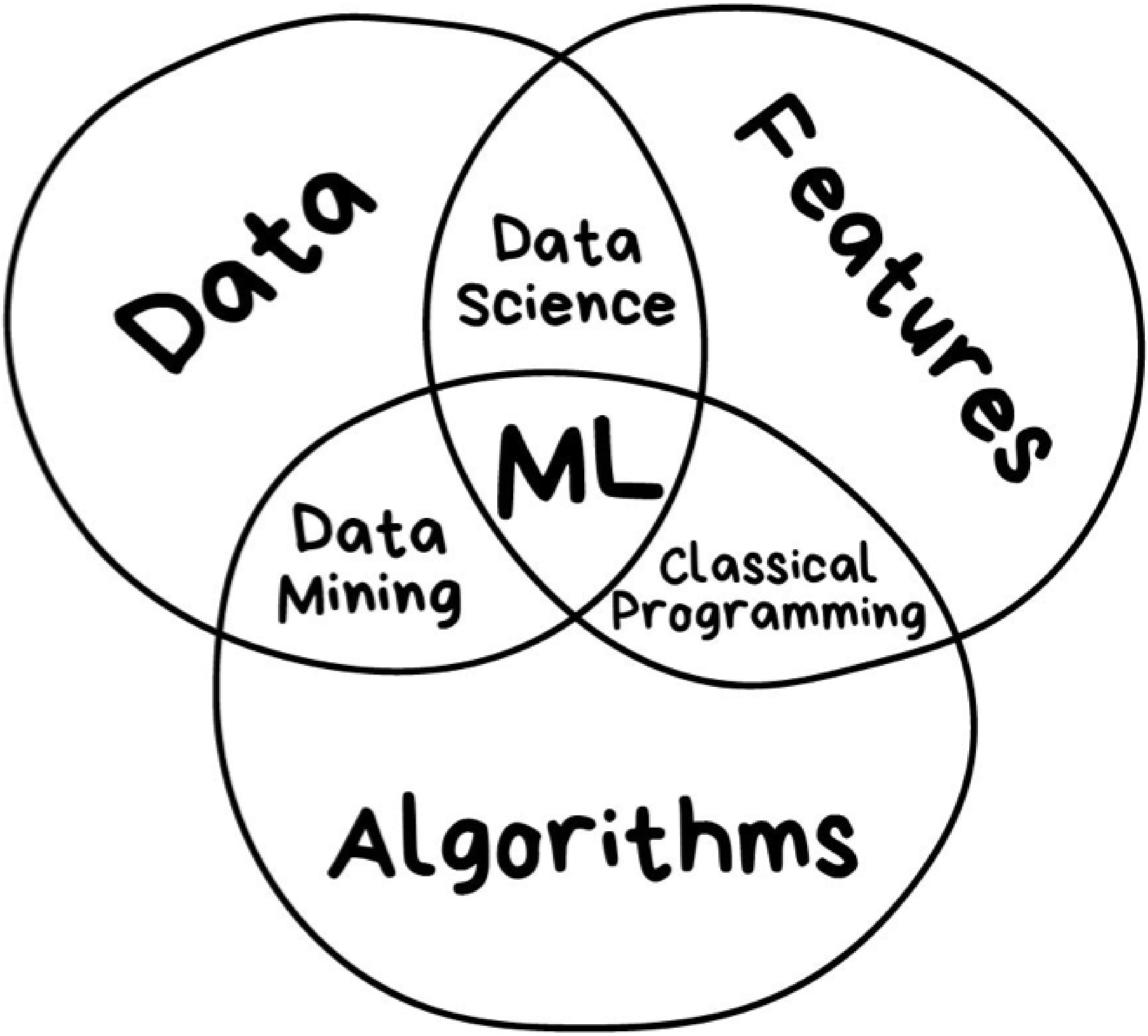
http://github.com/hugo-glez/awesome-ml-for-cybersecurity

# Data Science Introduction (Videos)

Videos from Microsoft ...

# Short introduction to Machine Learning

MACHINE LEARNING
MACHINE LEARNING EVERYWHERE
Quebolu.com


Data
Features
Data Science
ML
Data Mining
Classical Programming
Algorithms

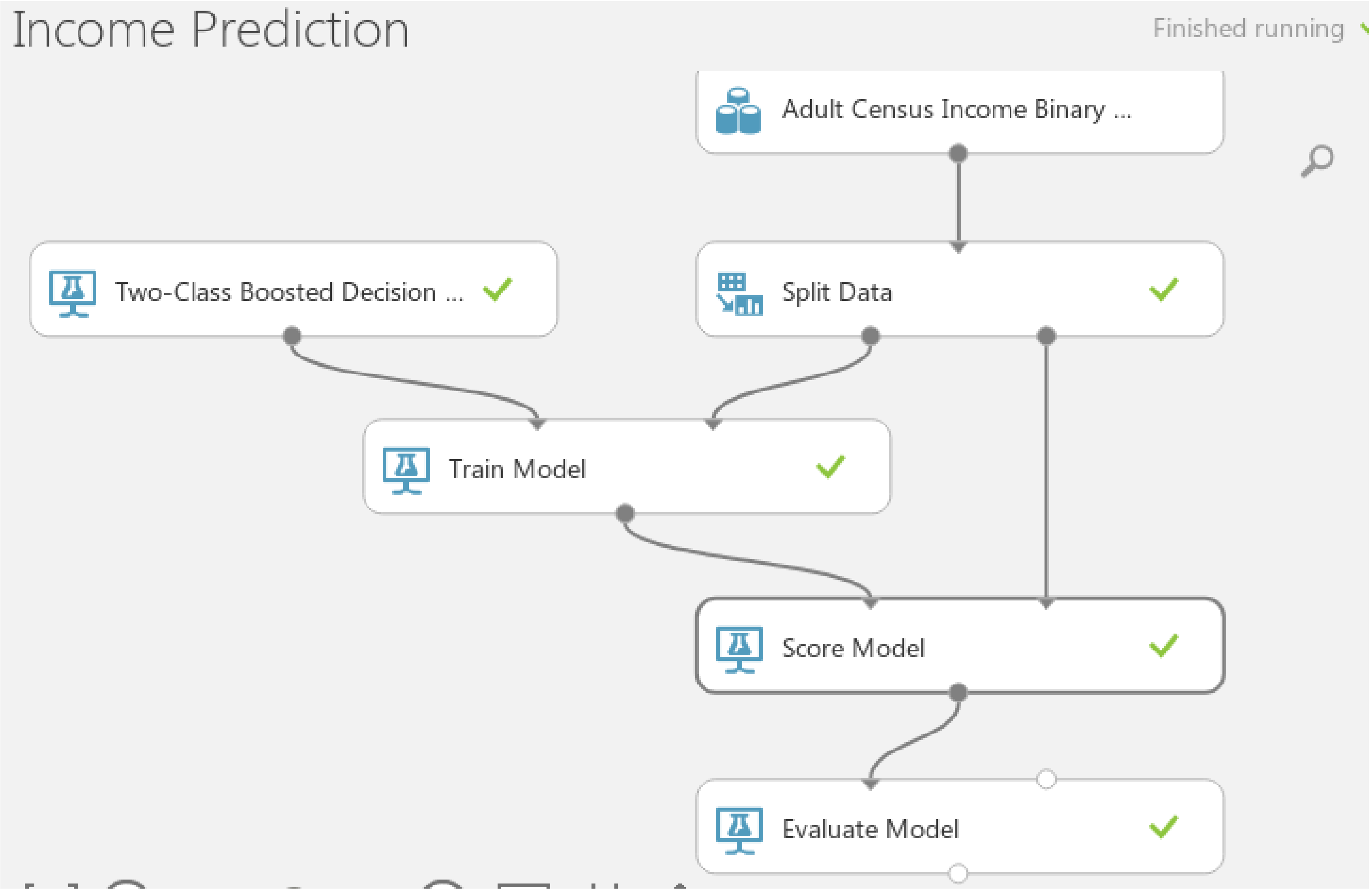
1. We need DATA! a lot of it
2. Different techniques / algorithms
    i. Classification
    ii. Prediction
    iii. Clustering
    iv. Anomaly detection

## Algorithms supported by AzureML

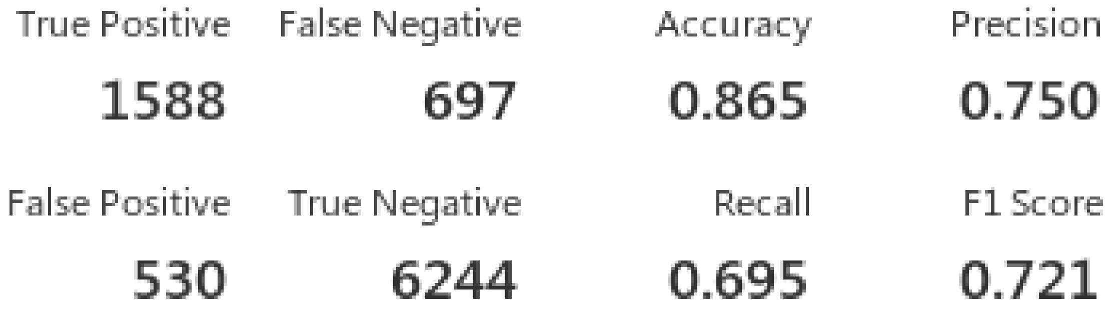
https://azuremlsimpleds.azurewebsites.net/simpleds/

# Process

1. Get data (dataset)
2. Data cleansing
3. Data partition
4. Algorithm selection
5. Train the model
6. Test the model
7. Evaluate the model


Income Prediction
Finished running
Adult Census Income Binary ...
Two-Class Boosted Decision ... ✓
Split Data ✓
Train Model ✓
Score Model ✓
Evaluate Model ✓

# hugo@bsidescdmx2019$ ristretto evalua.png



| | | | |
|---|---|---|---|
| True Positive | False Negative | Accuracy | Precision |
| 1588 | 697 | 0.865 | 0.750 |
| False Positive | True Negative | Recall | F1 Score |
| 530 | 6244 | 0.695 | 0.721 |

## Accuracy

Acc = TP + TN / TP + TN + FP + FN

## Precision

Precision = TP / TP+FP

## Recall

Recall = TP / TP+FN

## F1-score

F1 Score = 2*(Recall * Precision) / (Recall + Precision)

https://blog.exsilio.com/all/accuracy-precision-recall-f1-score-interpretation-of-performance-measures/

# AzureML studio

## Cloud base Machine Learning studio

1. Cloud base
    - You only need a browser !!!
    - Free to try
    - Paid to use webservices
    - Do not need to write code (almost)
2. MS service

http://studio.azureml.net

# Cybersecurity/InfoSec use cases

```
1. Url classification (CIC dataset)
2. VPN vs NO-VPN (CIC dataset)
3. Botnets (CIC dataset)
```

# Url Classification (CIC dataset)

- Dataset is clean and ready to use it.
- Five classes of URLS
- Load into AzureML studio
- Create the flow (follow me)

IT'S
DEMO TIME!

# VPN vs NO-VPN (CIC dataset)

- Data based on network flows of VPN and no-VPN
- Binary classification

IT'S
DEMO TIME!

# Crafting features

```
1. WAF dataset
```

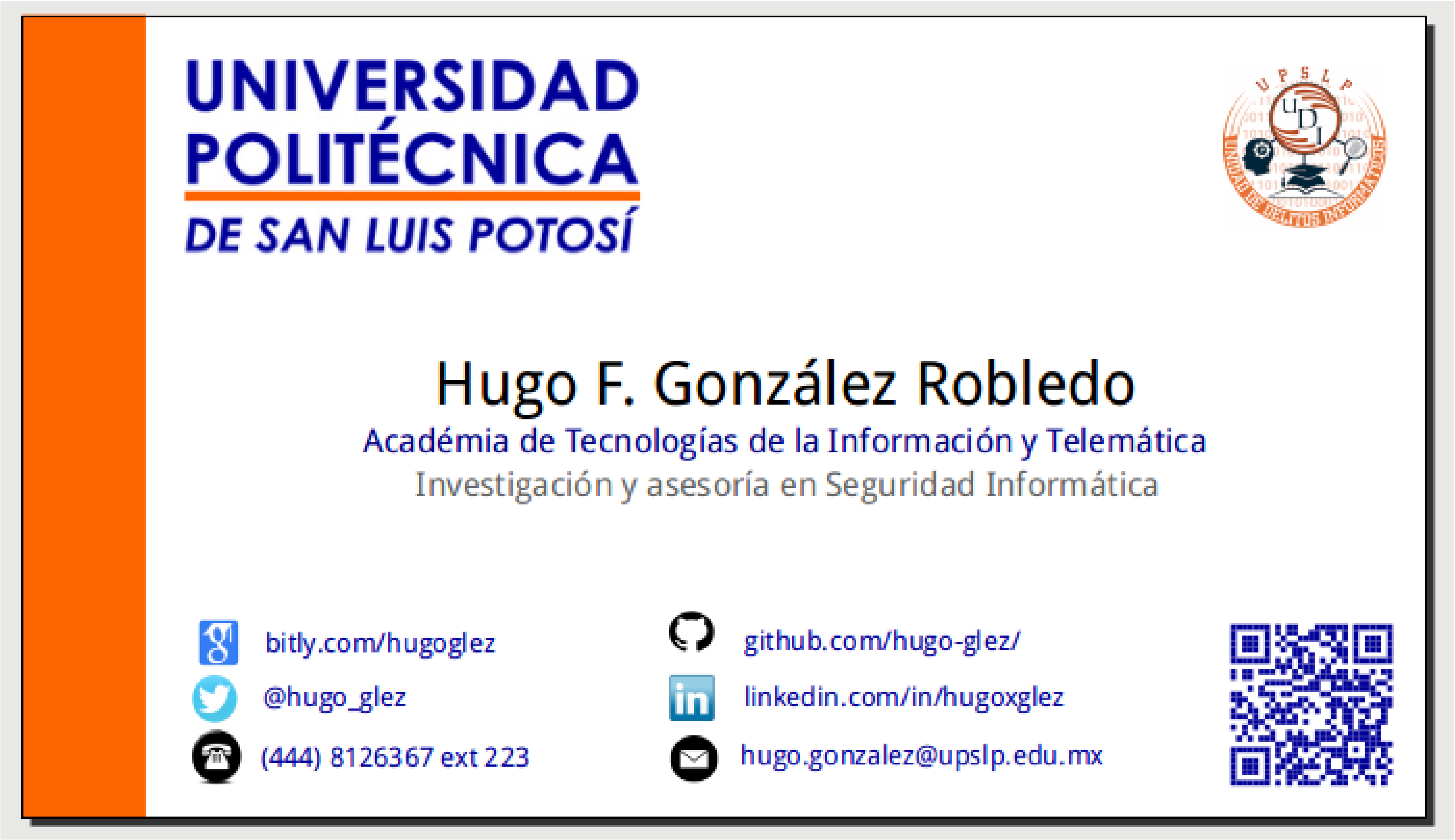
IT'S
DEMO TIME!

# Advance usages

1. Clean data
2. Transform data

# hugo@bsidescdmx2019$ poweroff

Thanks!



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