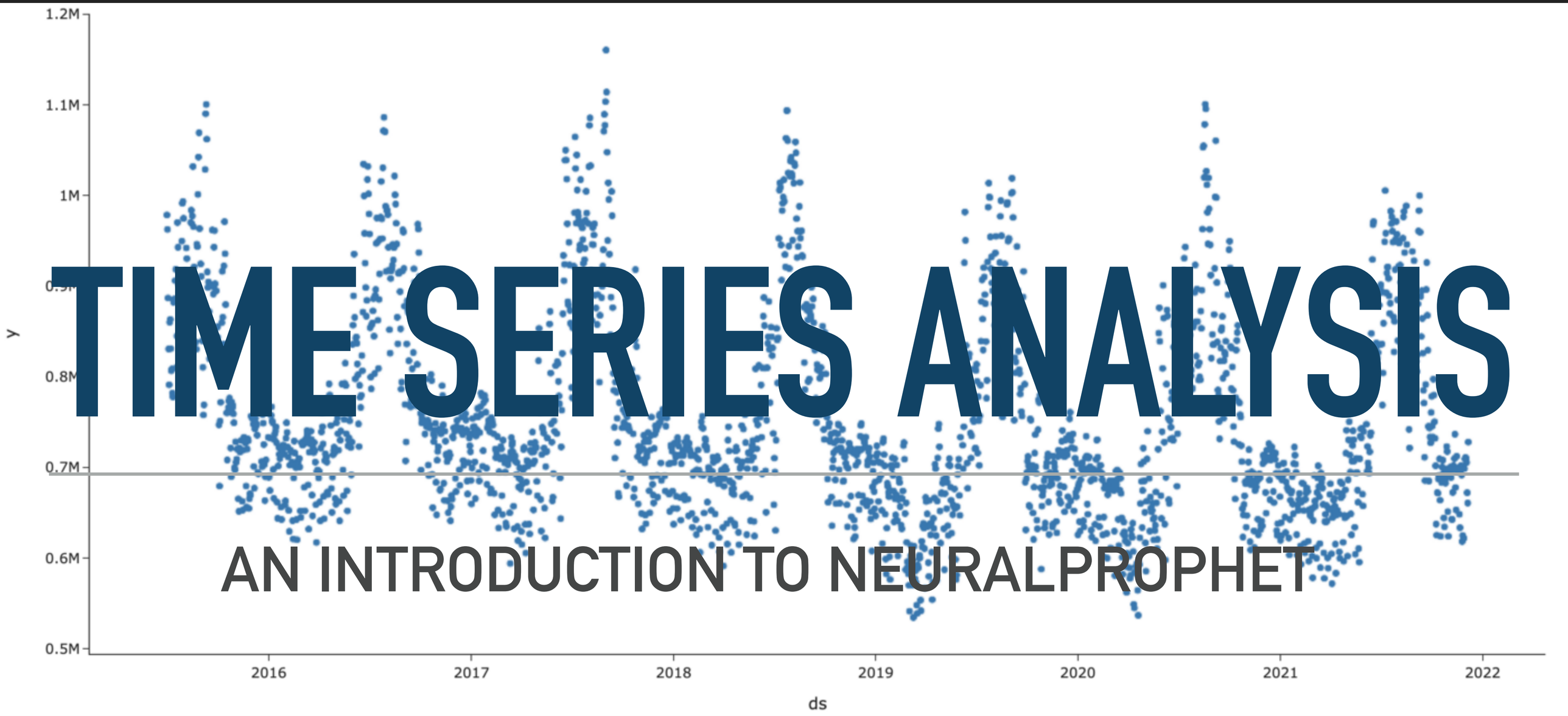


TIME SERIES ANALYSIS

AN INTRODUCTION TO NEURALPROPHET

AGENDA

Part I

AGENDA

AGENDA

Part I

- Machine Learning

AGENDA

Part I

- Machine Learning
- Pandas

AGENDA

Part I

- Machine Learning
- Pandas
- NeuralProphet

AGENDA

Part I

- Machine Learning
- Pandas
- NeuralProphet

Part II

AGENDA

Part I

- Machine Learning
- Pandas
- NeuralProphet

Part II

- kaggle

AGENDA

Part I

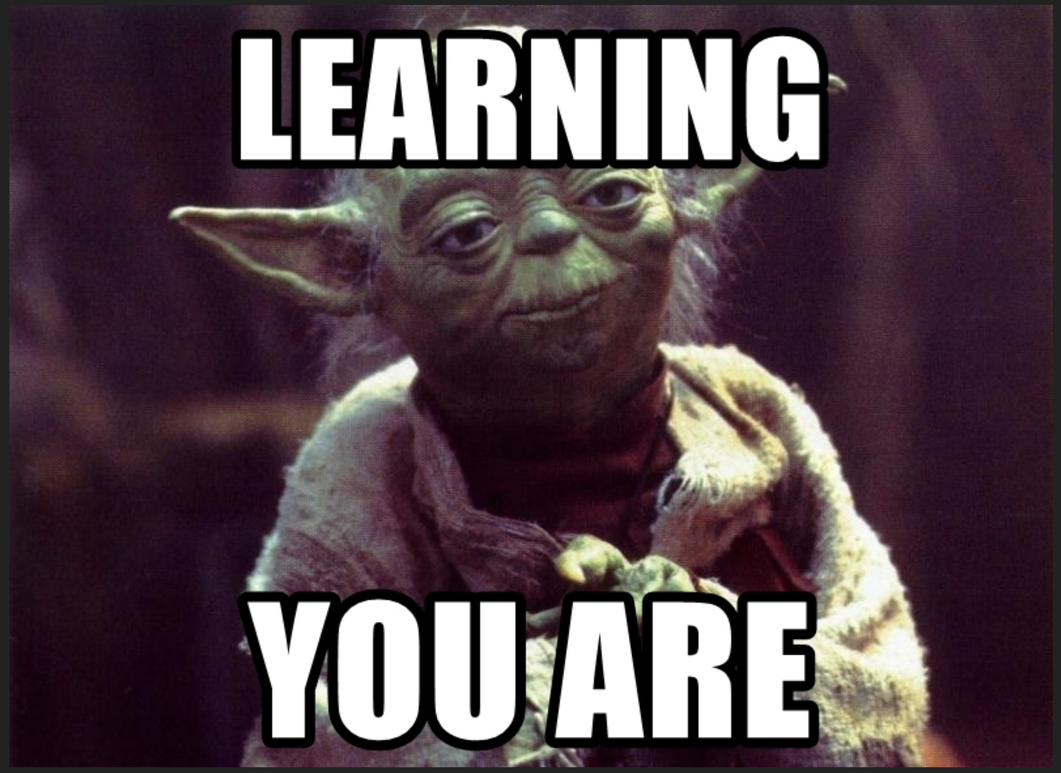
- Machine Learning
- Pandas
- NeuralProphet

Part II

- kaggle
- Coding

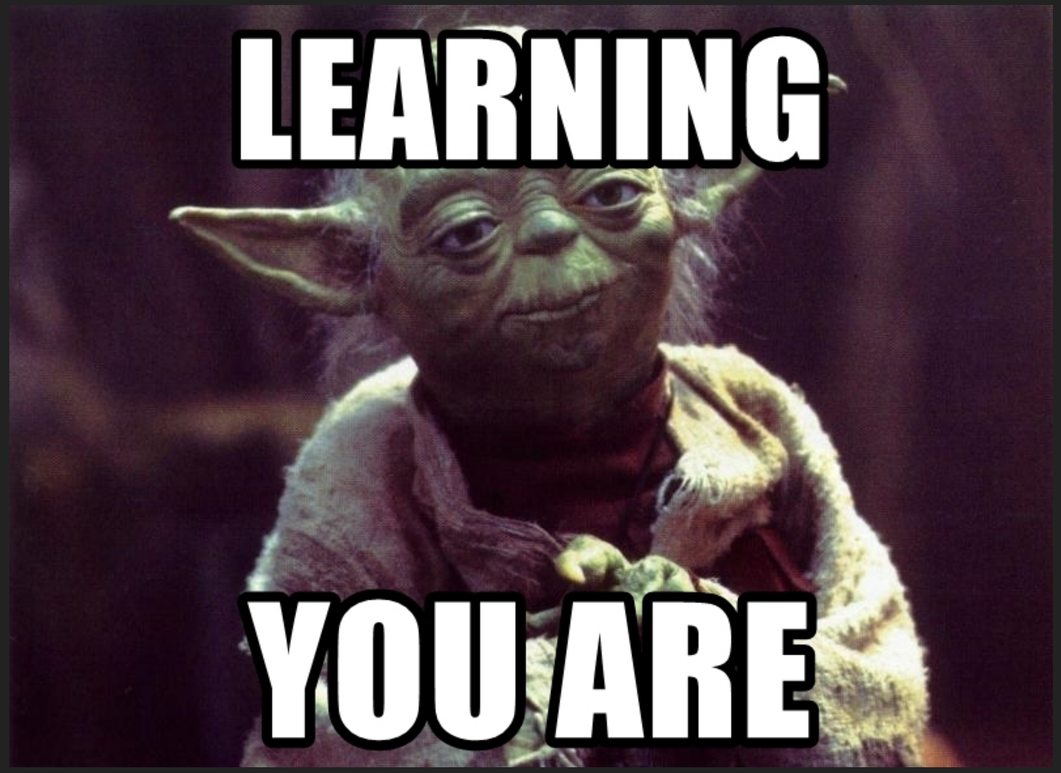
MACHINE LEARNING

MACHINE LEARNING



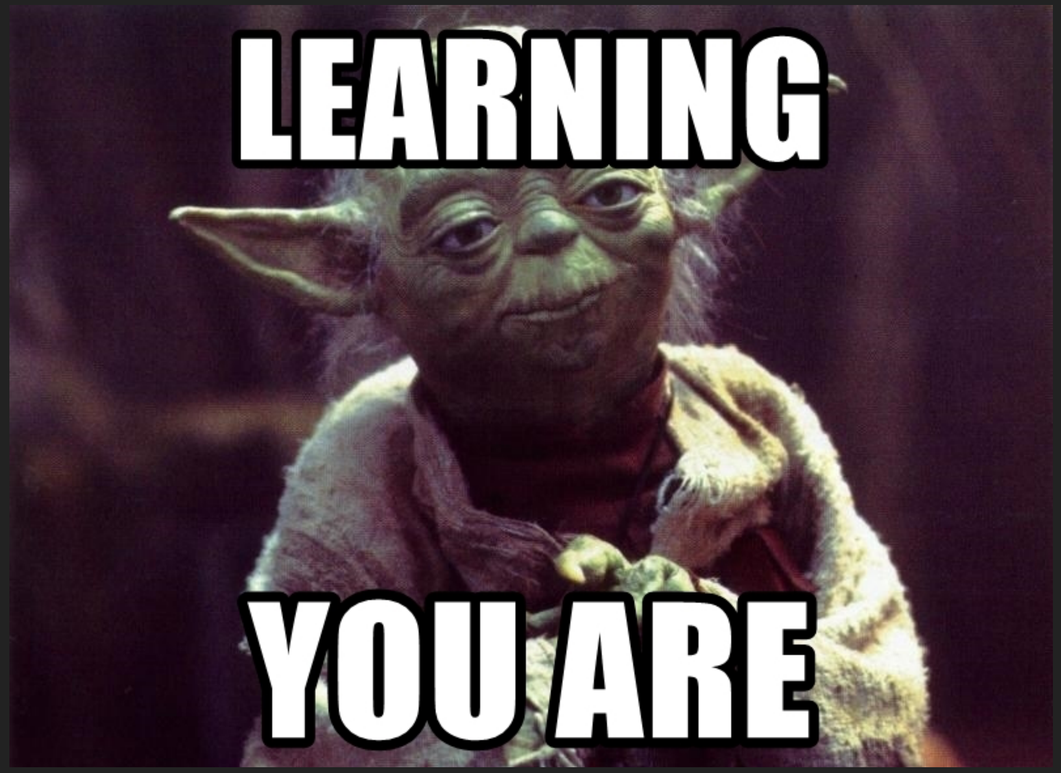
MACHINE LEARNING

- Learning: improving performance after making observations about the world



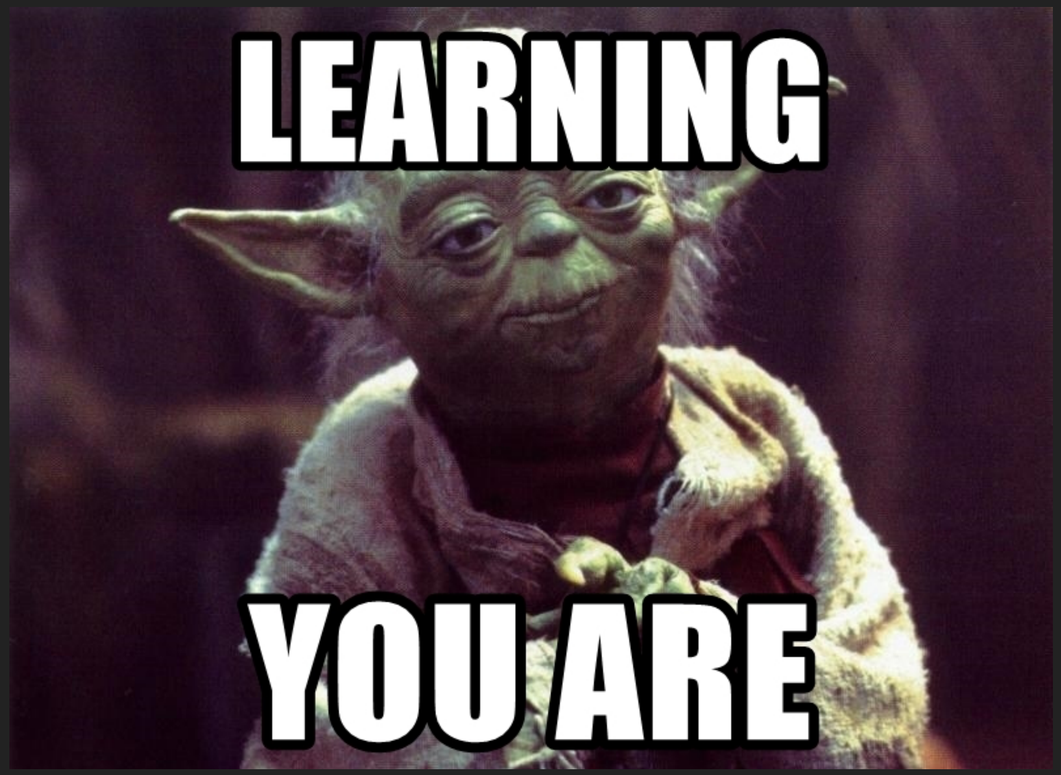
MACHINE LEARNING

- Learning: improving performance after making observations about the world
- Machine Learning:



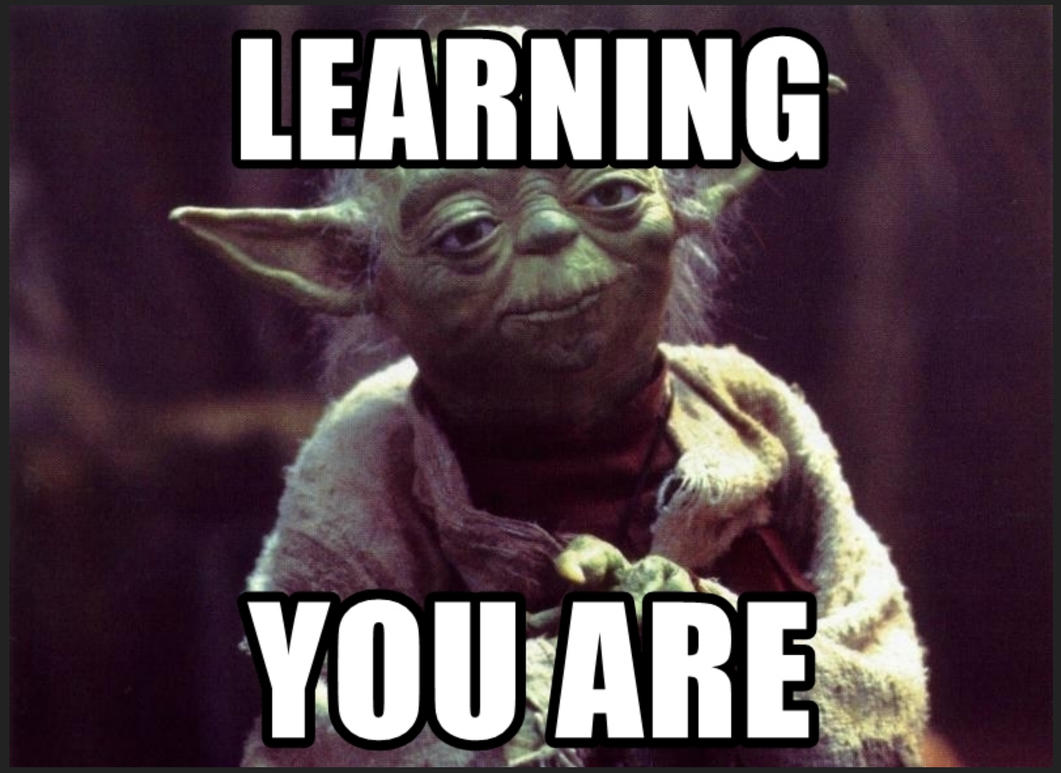
MACHINE LEARNING

- Learning: improving performance after making observations about the world
- Machine Learning:
  - Observing data



MACHINE LEARNING

- Learning: improving performance after making observations about the world
- Machine Learning:
  - Observing data
  - Building models



MACHINE LEARNING

- Learning: improving performance after making observations about the world
- Machine Learning:
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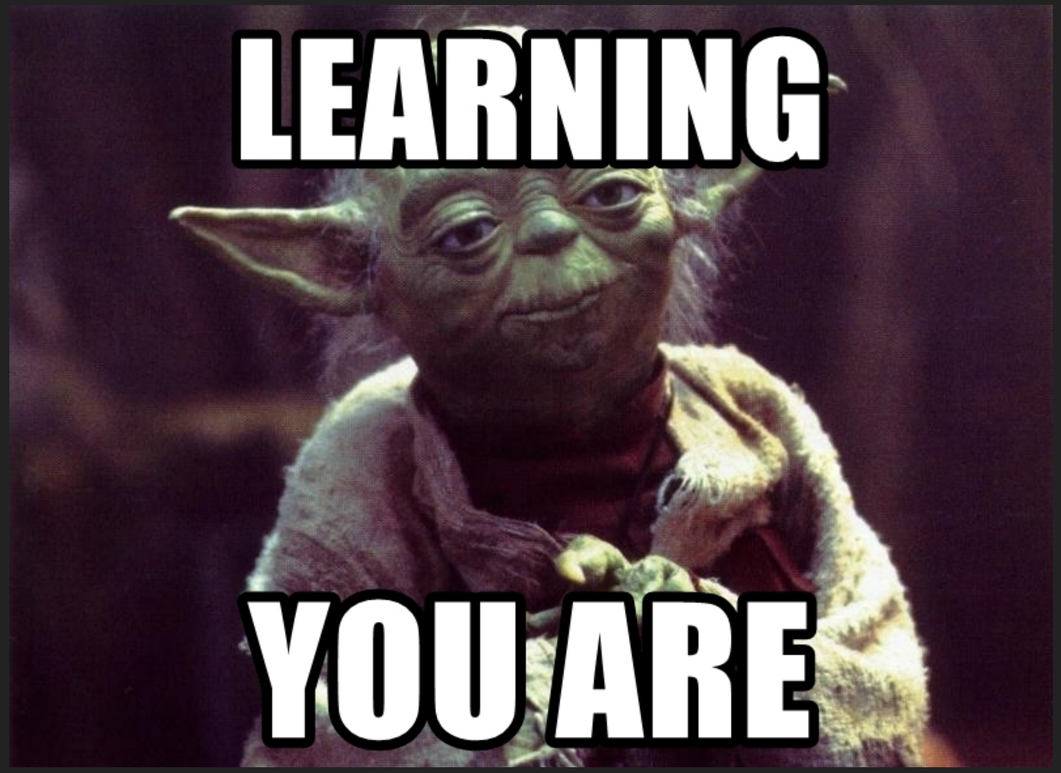
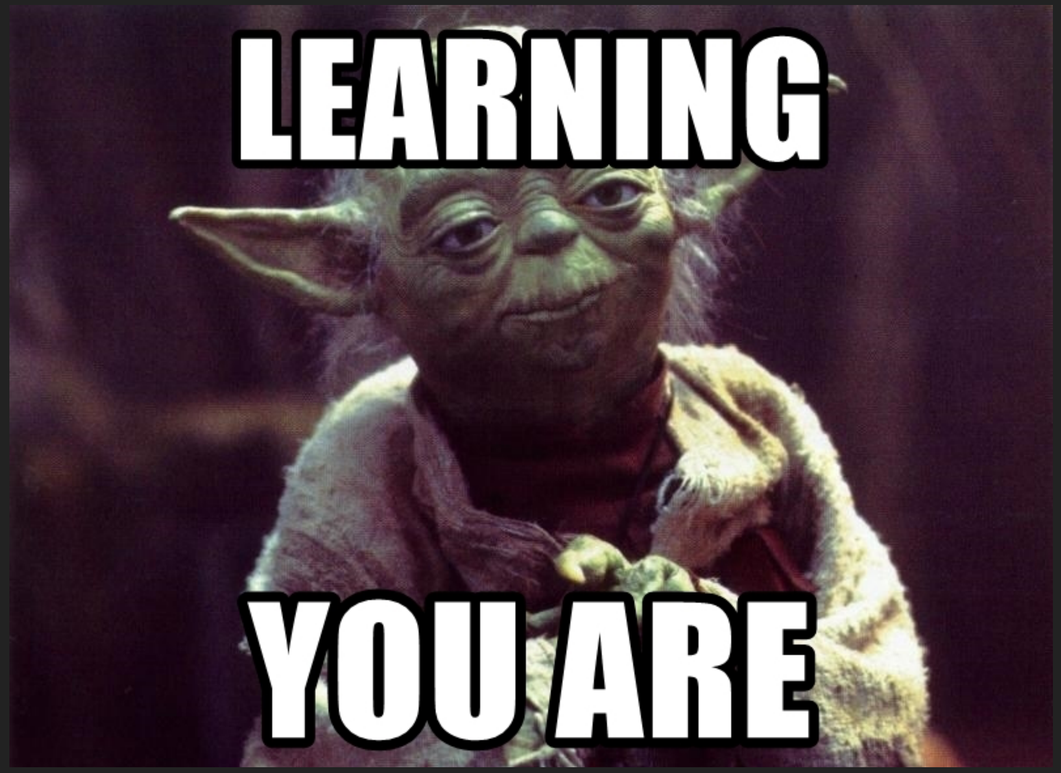
  - Building models
  - Using model as hypothesis



MACHINE LEARNING

- Learning: improving performance after making observations about the world
- Machine Learning:
  - Observing data
  - Building models
  - Using model as hypothesis
  - Software that can solve problems



TIME SERIES ANALYSIS

TIME SERIES ANALYSIS

- Analyzing a sequence of data points collected over an interval of time

TIME SERIES ANALYSIS

- Analyzing a sequence of data points collected over an interval of time
- Models:

TIME SERIES ANALYSIS

- Analyzing a sequence of data points collected over an interval of time
- Models:
  - Classification

TIME SERIES ANALYSIS

- Analyzing a sequence of data points collected over an interval of time
- Models:
  - Classification
  - Curve Fitting

TIME SERIES ANALYSIS

- Analyzing a sequence of data points collected over an interval of time
- Models:
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  - Descriptive analysis

TIME SERIES ANALYSIS

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TIME SERIES ANALYSIS

- Analyzing a sequence of data points collected over an interval of time
- Models:
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  - Explanative analysis
  - **Forecasting**

TIME SERIES ANALYSIS

- Analyzing a sequence of data points collected over an interval of time
- Models:
  - Classification
  - Curve Fitting
  - Descriptive analysis
  - Explanative analysis
  - **Forecasting**
  - Segmentation

FORECASTING

FORECASTING

- Decisions that involve a factor of uncertainty about the future

FORECASTING

- Decisions that involve a factor of uncertainty about the future
- Start: historical time series

FORECASTING

- Decisions that involve a factor of uncertainty about the future
- Start: historical time series
- Check for patterns of time decomposition

FORECASTING

- Decisions that involve a factor of uncertainty about the future
- Start: historical time series
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  - Trends

FORECASTING

- Decisions that involve a factor of uncertainty about the future
- Start: historical time series
- Check for patterns of time decomposition
  - Trends
  - Seasonal patterns

FORECASTING

- Decisions that involve a factor of uncertainty about the future
- Start: historical time series
- Check for patterns of time decomposition
  - Trends
  - Seasonal patterns
  - Cyclical patterns

FORECASTING

- Decisions that involve a factor of uncertainty about the future
- Start: historical time series
- Check for patterns of time decomposition
  - Trends
  - Seasonal patterns
  - Cyclical patterns
  - Regularity

STEPS OF FORECASTING

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1. Identify the problem

STEPS OF FORECASTING

1. Identify the problem
2. Collect information

STEPS OF FORECASTING

1. Identify the problem
2. Collect information
3. Perform a preliminary analysis

STEPS OF FORECASTING

1. Identify the problem
2. Collect information
3. Perform a preliminary analysis
4. Choose the forecasting model

STEPS OF FORECASTING

1. Identify the problem
2. Collect information
3. Perform a preliminary analysis
4. Choose the forecasting model
5. Data analysis (train & test → predict)

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1. Identify the problem
2. Collect information
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5. Data analysis (train & test → predict)
6. Verify model performance

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5. Data analysis (train & test → predict)
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THE FRAMEWORKS


pandas

- DataFrame objects

- DataFrame objects
- Data reading & writing tools

- DataFrame objects
- Data reading & writing tools
- Data alignment & missing data handling

- DataFrame objects
- Data reading & writing tools
- Data alignment & missing data handling
- Reshaping & pivoting of data

- DataFrame objects
- Data reading & writing tools
- Data alignment & missing data handling
- Reshaping & pivoting of data
- Label based slicing, indexing & subsetting

- DataFrame objects
- Data reading & writing tools
- Data alignment & missing data handling
- Reshaping & pivoting of data
- Label based slicing, indexing & subsetting
- High performance merging & joining

FUNCTIONS WE WILL USE...

- `DataFrame()`
- `read_csv()`
- `drop()`
- `columns`
- `concat()`
- `savefig()`
- `to_csv()`

My model on training data

My model on test dataset

Neural Prophet

EXPLAINABLE FORECASTING AT SCALE

Neural Prophet

EXPLAINABLE FORECASTING AT SCALE

- Explainable, scalable forecasting frameworks

Neural Prophet

EXPLAINABLE FORECASTING AT SCALE

- Explainable, scalable forecasting frameworks
- Interpretable classical methods & scalable deep learning models

Neural Prophet

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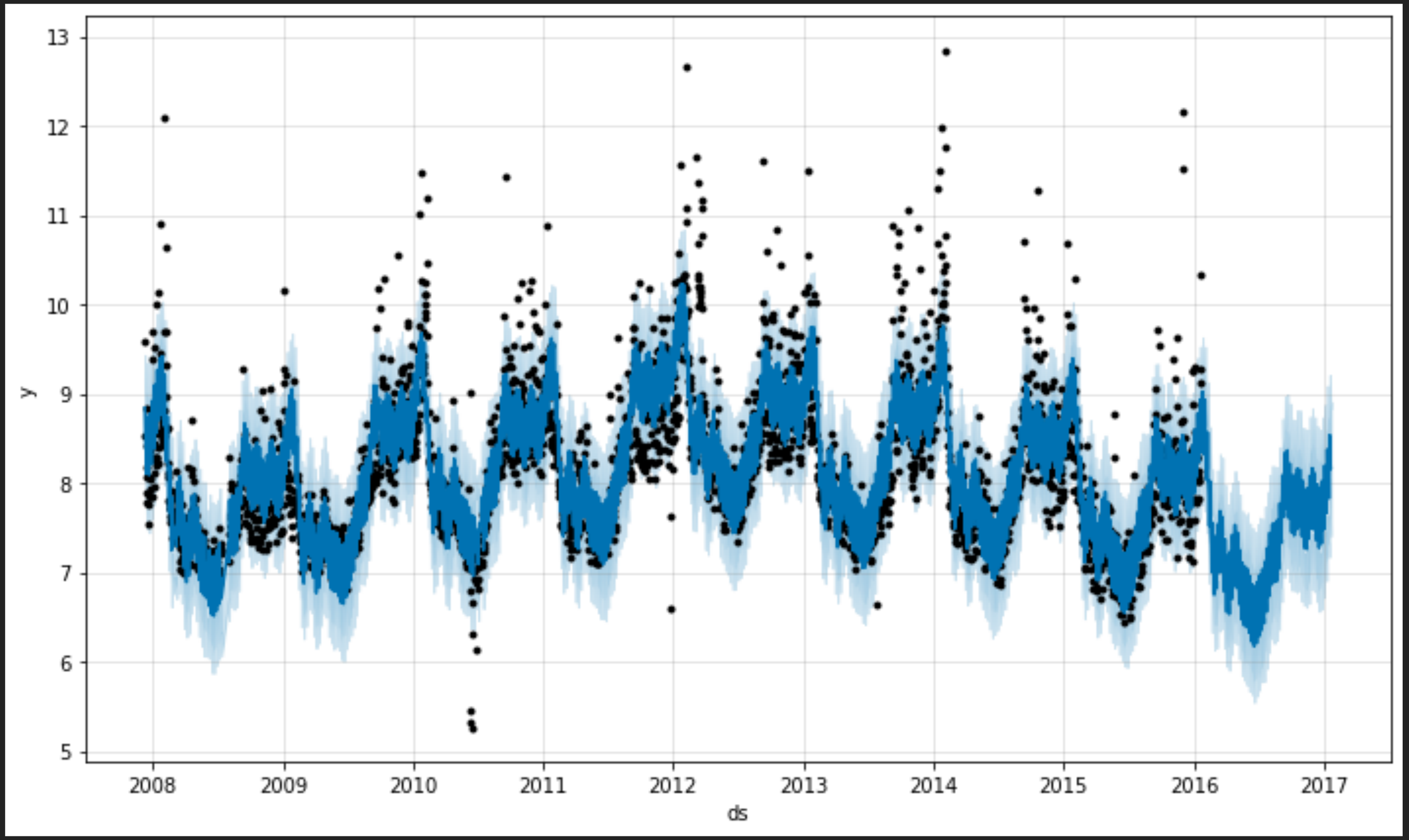
Neural Prophet

EXPLAINABLE FORECASTING AT SCALE

- Explainable, scalable forecasting frameworks
- Interpretable classical methods & scalable deep learning models
- Models trend, seasonality, auto regression
- Hybrid framework based on PyTorch
- Trained with standard deep learning methods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2008
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2010
2011
2012
2013
2014
2015
2016
2017
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FUNCTIONS WE WILL USE...

- `NeuralProphet()`
- `fit()`
- `predict()`
- `make_future_dataframe()`
- `check_dataframe()`
- `plot()`

Competitions
Find challenges for every interest level

Datasets
Explore, analyze, and share quality data

Notebooks
Explore and run machine learning code with Kaggle Notebooks, a cloud computational environment that enables reproducible and collaborative analysis

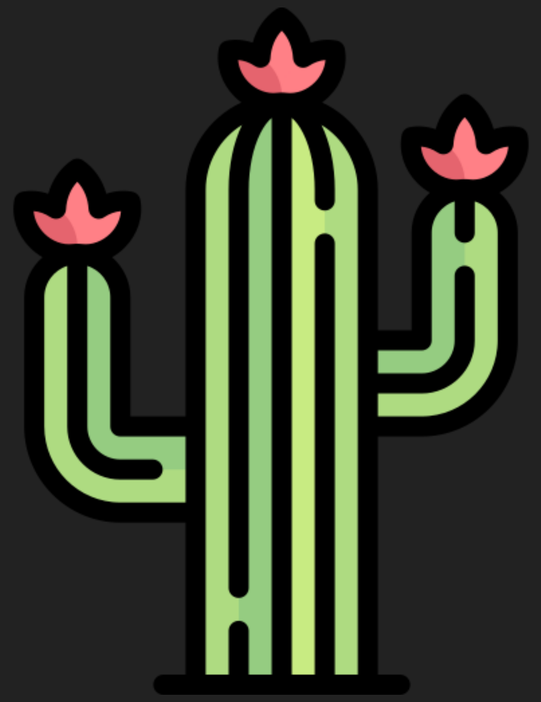
Public API
Create Datasets, Notebooks, and connect with Kaggle

Efficient GPU Usage Tips

Tensor Processing Units (TPUs)

CODING TIME...

THANK YOU FOR YOUR ATTENTION!



SOURCES

- Artificial Intelligence - A Modern Approach (Stuart Russel, Peter Norvig)
- https://pandas.pydata.org/about/
- https://neuralprophet.com/html/index.html
- https://www.kaggle.com