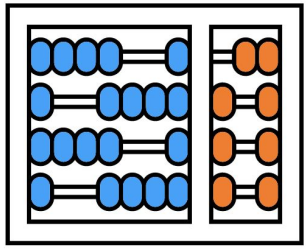

Instituto de Computação

UNIVERSIDADE ESTADUAL DE CAMPINAS

Capacitação profissional em tecnologias de Inteligência Artificial

Machine Learning Overview

Prof. Edson Borin

https://www.ic.unicamp.br/~edson

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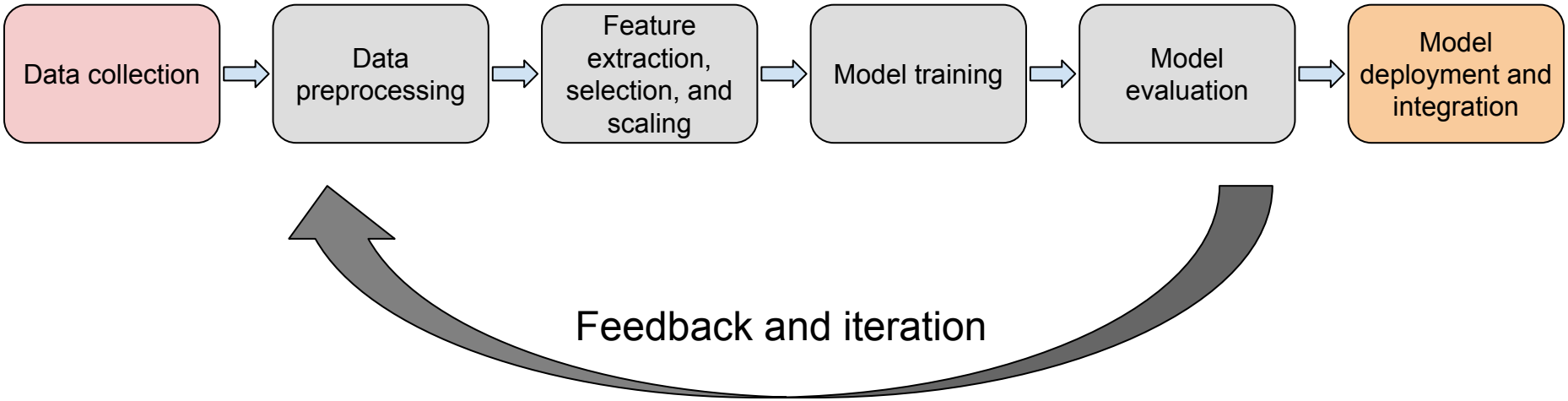
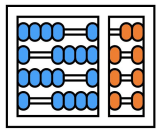
ML Process Overview

ML Process


Data collection
Data preprocessing
Feature extraction, selection, and scaling
Model training
Model evaluation
Model deployment and integration
Feedback and iteration

Dataset Terminology



ML Process

Dataset: collection of data used in machine learning tasks.

- Each record is called a sample.
- Each sample i is represented by a set of n features $(x_1^i, \ldots, x_n^i)$
- Each sample i may contain a label (y^i)

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House price training dataset

	x_1 (Size)	x_2 (# bedrooms)	x_3 (Age in Years)	y (**Price**)
House 1	2104 ft.^{2}	4	1	460,000 USD
House 2	1416 ft.^{2}	2	2	232,000 USD
House 3	1534 ft.^{2}	3	0	315,000 USD
House 4	852 ft.^{2}	2	12	178,000 USD
...	...	...	...	...

ML Process

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- Each record is called a sample.
- Each sample i is represented by a set of n features (
- Each sample i may contain a label (y^i)

First sample (i=1)

House price training dataset

	x_1 (Size)	x_2 (# bedrooms)	x_3 (Age in Years)	y (**Price**)
House 1	2104 ft.^{2}	4	1	460,000 USD
House 2	1416 ft.^{2}	2	2	232,000 USD
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House 4	852 ft.^{2}	2	12	178,000 USD
...	...	...	...	...

ML Process

Dataset: collection of data used in machine learning tasks.

- Each record is called a sample.
- Each sample i is represented by a set c… x_n^i)
- Each sample i may contain a label (y^i)

House 1 **features**:
$x_1^1 = 2104$ (House size)
$x_2^1 = 4$ (# bedrooms)
$x_3^1 = 1$ (Age in Years)

House price training …aset

	x_1 (Size)	x_2 (# bedrooms)	x_3 (Age in Years)	y (**Price**)
House 1	2104 ft.^{2}	4	1	460,000 USD
House 2	1416 ft.^{2}	2	2	232,000 USD
House 3	1534 ft.^{2}	3	0	315,000 USD
House 4	852 ft.^{2}	2	12	178,000 USD
…	…	…	…	…

ML Process

Dataset: collection of data used in machine learning tasks.

- Each record is called a sample.
- Each sample i is represented by a set o
- Each sample i may contain a label (y^i)

House 1 **label**:
y^1 = 460,000 (House price)

House price training dataset

	x_1 (Size)	x_2 (# bedrooms)	x_3 (Age in Years)	y (**Price**)
House 1	2104 ft.^{2}	4	1	460,000 USD
House 2	1416 ft.^{2}	2	2	232,000 USD
House 3	1534 ft.^{2}	3	0	315,000 USD
House 4	852 ft.^{2}	2	12	178,000 USD
...	...	...	...	...

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House price training dataset

	x_1 (Size)	x_2 (# bedrooms)	x_3 (Age in Years)	y (**Price**)
House 1	2104 ft.^{2}	4	1	460,000 USD
House 2	1416 ft.^{2}	2	2	232,000 USD
H				315,000 USD
H				178,000 USD
				...

Features and **labels** are usually represented as numerical (real or integer) values.

ML Process

Dataset: collection of data used in machine learning tasks.

- Each record is called
- Each sample i is repr… es $(x_1^i, \ldots, x_n^i)$
- Each sample i may contain … el (y^i)

Dataset may be split into subsets. Ex: **training** and **test** sets

House price training dataset

	x_1 (Size)	x_2 (# bedrooms)	x_3 (Age in Years)	y (**Price**)	
House 1	2104 ft.^{2}	4	1	460,000 USD	Training Set
House 2	1416 ft.^{2}	2	2	232,000 USD	
House 3	1534 ft.^{2}	3	0	315,000 USD	
House 4	852 ft.^{2}	2	12	178,000 USD	Test Set
…	…	…	…	…	

ML Process

Dataset organization:

- CSV file, database tables, python objects (Numpy array, pandas dataframe, Python lists, …)

	x_1 (Size)	x_2 (# bedrooms)	x_3 (Age in Years)	y (**Price**)
House 1	2104 ft.^{2}	4	1	460,000 USD
House 2	1416 ft.^{2}	2	2	232,000 USD
…	…	…	…	…

train.csv

```
House ID,Size,# Bedrooms,Age,Price
1,2104,4,1,460000
2,1416,2,2,232000
...
```

Explicit object construction in python

```
dataset = [ [1,2104,4,1,460000],
            [2,1416,2,2,232000],
            ...
          ]
```

ML Process

Dataset organization:

- CSV file, database tables, python objects (Numpy array, pandas dataframe, Python lists, …)

train.csv

```
House ID,Size,# Bedrooms,Age,Price
1,2104,4,1,460000
2,1416,2,2,232000
...
```

List of lists in python

```
dataset = [ [1,2104,4,1,460000],
            [2,1416,2,2,232000],
            ...
          ]
```

	x_1 (Size)	x_2 (# bedrooms)	x_3 (Age in Years)	y (**Price**)
House 1	2104 ft.^{2}	4	1	460,000 USD
House 2	1416 ft.^{2}	2	2	232,000 USD
…	…	…	…	…

ML Process

Dataset organization:

- CSV file, database tables, python objects (Numpy array, pandas dataframe, Python lists, …)
- X (dataset attributes) are usually viewed as a table in which each line represents a dataset item and each column an attribute.
- Y (dataset labels) can be represented as a separated array of data or as a column on the same object (file) as the dataset attributes.

	X			Y
	x_1 (Size)	x_2 (# bedrooms)	x_3 (Age in Years)	y (**Price**)
House 1	2104 ft.^{2}	4	1	460,000 USD
House 2	1416 ft.^{2}	2	2	232,000 USD
…	…	…	…	…

ML Process

Dataset organization:

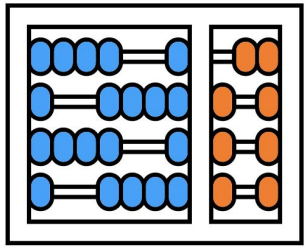
- CSV file, database tables, python objects (Numpy array, pandas dataframe, Python lists, …)
- X (dataset attributes) are usually viev ach line represents a dataset item and ea
- Y (dataset labels) can be represented data or as a column on the same object (f tes.

List of lists in python

```
X = [ [2104,4,1],
      [1416,2,2,],
      ...]

Y = [460000,
     232000,
     ... ]
```

	X			Y
	x_1 (Size)	x_2 (# bedrooms)	x_3 (Age in Years)	y (**Price**)
House 1	2104 ft.^{2}	4	1	460,000 USD
House 2	1416 ft.^{2}	2	2	232,000 USD
…	…	…	…	…



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