Categorical and ordinal features

Categorical

Titanic dataset

	PassengerId	Survived	Pclass	Name
0	1	0	3	Braund, Mr. Owen Harris
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...
2	3	1	3	Heikkinen, Miss. Laina
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)
4	5	0	3	Allen, Mr. William Henry
5	6	0	3	Moran, Mr. James
6	7	0	1	McCarthy, Mr. Timothy J
7	8	0	3	Palsson, Master. Gosta Leonard

	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	male	22.000000	1	0	A/5 21171	7.2500	NaN	S
1	female	38.000000	1	0	PC 17599	71.2833	C85	C
2	female	26.000000	0	0	STON/O2. 3101282	7.9250	NaN	S
3	female	35.000000	1	0	113803	53.1000	C123	S
4	male	35.000000	0	0	373450	8.0500	NaN	S
5	male	29.699118	0	0	330877	8.4583	NaN	Q
6	male	54.000000	0	0	17463	51.8625	E46	S
7	male	2.000000	3	1	349909	21.0750	NaN	S

Ordinal features

Ticket class: 1,2,3

Driver's license: A, B, C, D

Education: kindergarden, school, undergraduate, bachelor, master, doctoral

Label encoding

Label encoding

pclass	1	2	3
target	1	0	1

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pclass	1	2	3
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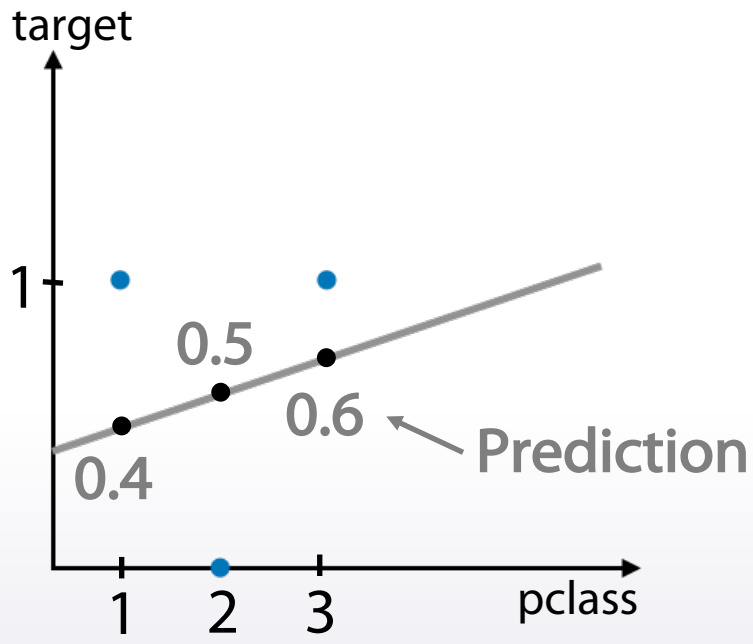
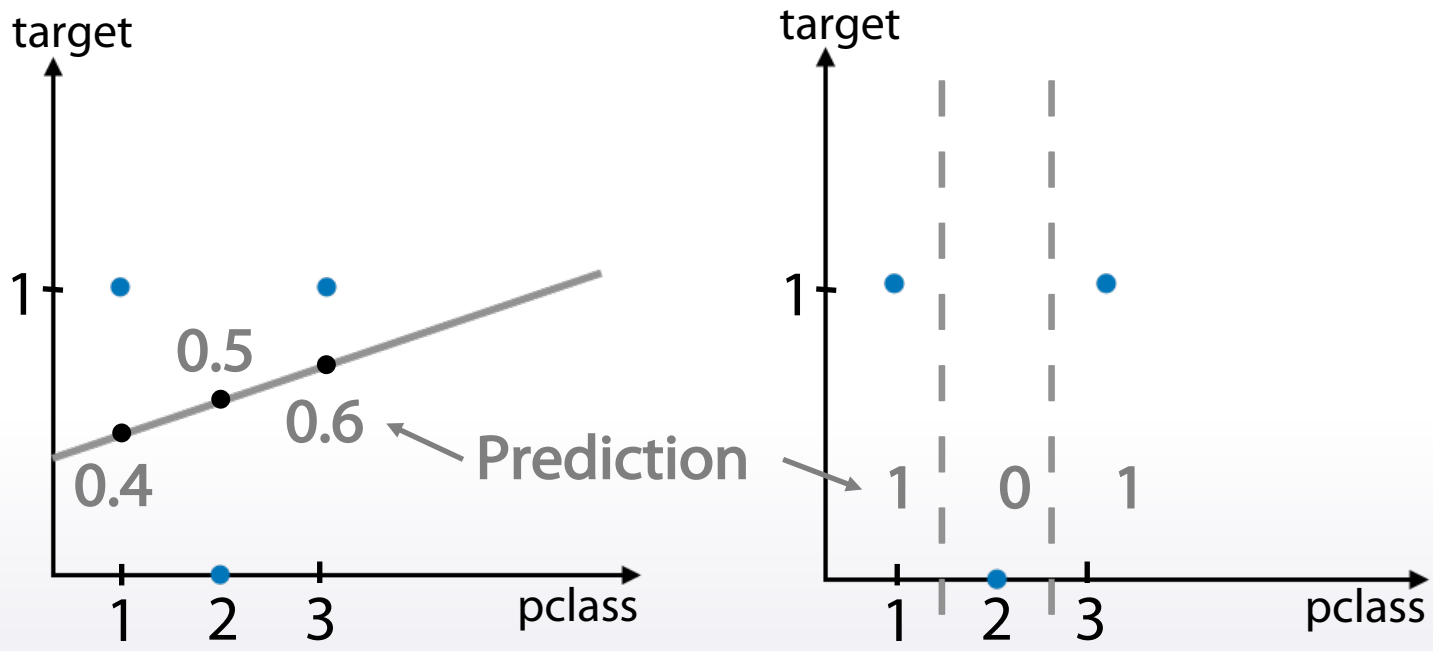


Label encoding

pclass	1	2	3
target	1	0	1



Label encoding

	K
	embarked
	S
	C
	S
	S
	S
	Q
	S
	S
	S
	C
	S
	S

1. Alphabetical (sorted)
   [S,C,Q] -> [2, 1, 3]

   `sklearn.preprocessing.LabelEncoder`

2. Order of appearance
   [S,C,Q] -> [1, 2, 3]

   `Pandas.factorize`

Frequency encoding

	K
	embarked
	S
	C
	S
	S
	S
	Q
	S
	S
	S
	C
	S
	S

[S,C,Q] -> [0.5, 0.3, 0.2]

```
encoding = titanic.groupby('Embarked').size()
encoding = encoding/len(titanic)
titanic['enc'] = titanic.Embarked.map(encoding)
```

Frequency encoding

	K
	embarked
	S
	C
	S
	S
	S
	Q
	S
	S
	S
	C
	S
	S

[S,C,Q] -> [0.5, 0.3, 0.2]

```
encoding = titanic.groupby('Embarked').size()
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```

```
from scipy.stats import rankdata
```

Categorical features

One-hot encoding

pclass
1
2
1
3

pclass==1	pclass==2	pclass==3
1		
	1	
1		
		1

`pandas.get_dummies`, `sklearn.preprocessing.OneHotEncoder`

Categorical features

pclass	sex	pclass_sex
3	male	3male
1	female	1female
3	female	3female
1	female	1female

Pclass_sex==					
1male	1female	2male	2female	3male	3female
				1	
	1				
					1
	1				

Categorical features

1. Values in ordinal features are sorted in some meaningful order
2. Label encoding maps categories to numbers
3. Frequency encoding maps categories to their frequencies
4. Label and Frequency encodings are often used for tree-based models
5. One-hot encoding is often used for non-tree-based models
6. Interactions of categorical features can help linear models and KNN