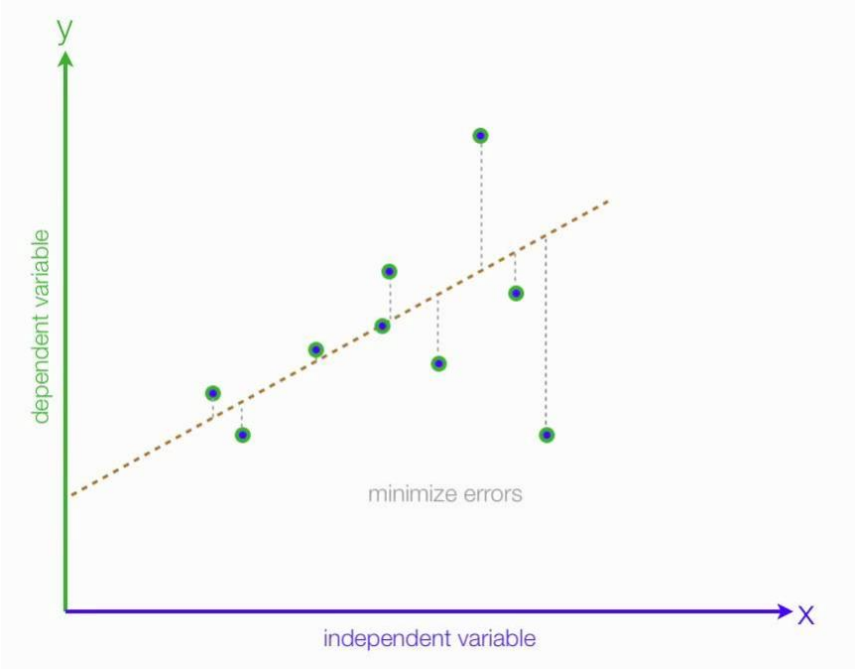
Enthuse Workshop

Intro to Data Science

Supervised Learning: Linear Regression

Linear regression



$$y = ax + b$$

Linear regression: preparing data

	R&D Spend	Administration	Marketing Spend	State	Profit
0	165349.20	136897.80	471784.10	New York	192261.83
1	162597.70	151377.59	443898.53	California	191792.06
2	153441.51	101145.55	407934.54	Florida	191050.39
3	144372.41	118671.85	383199.62	New York	182901.99
4	142107.34	91391.77	366168.42	Florida	166187.94

Predicting the profit using linear regression

We need to split the dataset into the training set and test set:

```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2,
random_state = 0)
```

	R&D Spend	Administration	Marketing Spend	State	Profit
0	165349.20	136897.80	471784.10	New York	192261.83
1	162597.70	151377.59	443898.53	California	191792.06
2	153441.51	101145.55	407934.54	Florida	191050.39
3	144372.41	118671.85	383199.62	New York	182901.99
4	142107.34	91391.77	366168.42	Florida	166187.94

Predicting the profit using linear regression

And then fit a regression model:

```
from sklearn.linear_model import LinearRegression

regressor = LinearRegression()

regressor.fit(X_train, y_train)
```

Predicting the profit using linear regression

Test the model:

```
y_pred = regressor.predict(X_test)
```

Transform discrete variables

Linear regression: preparing data

	R&D Spend	Administration	Marketing Spend	State	Profit
0	165349.20	136897.80	471784.10	New York	192261.83
1	162597.70	151377.59	443898.53	California	191792.06
2	153441.51	101145.55	407934.54	Florida	191050.39
3	144372.41	118671.85	383199.62	New York	182901.99
4	142107.34	91391.77	366168.42	Florida	166187.94

- the 4th column is text.
- we can’t have text in our data if we’re going to run any kind of model on it.
- we need to make this data ready for the model: convert it to numbers

preparing data: label encoder

Each distinct name should be replaced by a number

	R&D Spend	Administration	Marketing Spend	State	Profit
0	165349.20	136897.80	471784.10	New York	192261.83
1	162597.70	151377.59	443898.53	California	191792.06
2	153441.51	101145.55	407934.54	Florida	191050.39
3	144372.41	118671.85	383199.62	New York	182901.99
4	142107.34	91391.77	366168.42	Florida	166187.94

0	165349.20	136897.80	471784.10	2.0
1	162597.70	151377.59	443898.53	0.0
2	153441.51	101145.55	407934.54	1.0
3	144372.41	118671.85	383199.62	2.0
4	142107.34	91391.77	366168.42	1.0

preparing data: label encoder

Code:

```
from sklearn.preprocessing import LabelEncoder, OneHotEncoder

labelencoder = LabelEncoder()

X[:, 3] = labelencoder.fit_transform(X[:, 3])
```

Problem with our encoding

- The data is categorical and does not have any relation between different categories
- However, our encoding implies a relation: 0 < 1 < 2.
- To overcome this problem, we use One Hot Encoder:

0	165349.20	136897.80	471784.10	2.0
1	162597.70	151377.59	443898.53	0.0
2	153441.51	101145.55	407934.54	1.0
3	144372.41	118671.85	383199.62	2.0
4	142107.34	91391.77	366168.42	1.0

	0	1	2	3	4	5
0	0.0	0.0	1.0	165349.20	136897.80	471784.10
1	1.0	0.0	0.0	162597.70	151377.59	443898.53
2	0.0	1.0	0.0	153441.51	101145.55	407934.54
3	0.0	0.0	1.0	144372.41	118671.85	383199.62
4	0.0	1.0	0.0	142107.34	91391.77	366168.42

One-hot encoding

Code:

```
onehotencoder = OneHotEncoder(categorical_features = [3])

X = onehotencoder.fit_transform(X).toarray()
```

Thank you!