Basic Mobile Lab 2 (521200-1)

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Contents of this week

Basic Terminologies of Machine Learning

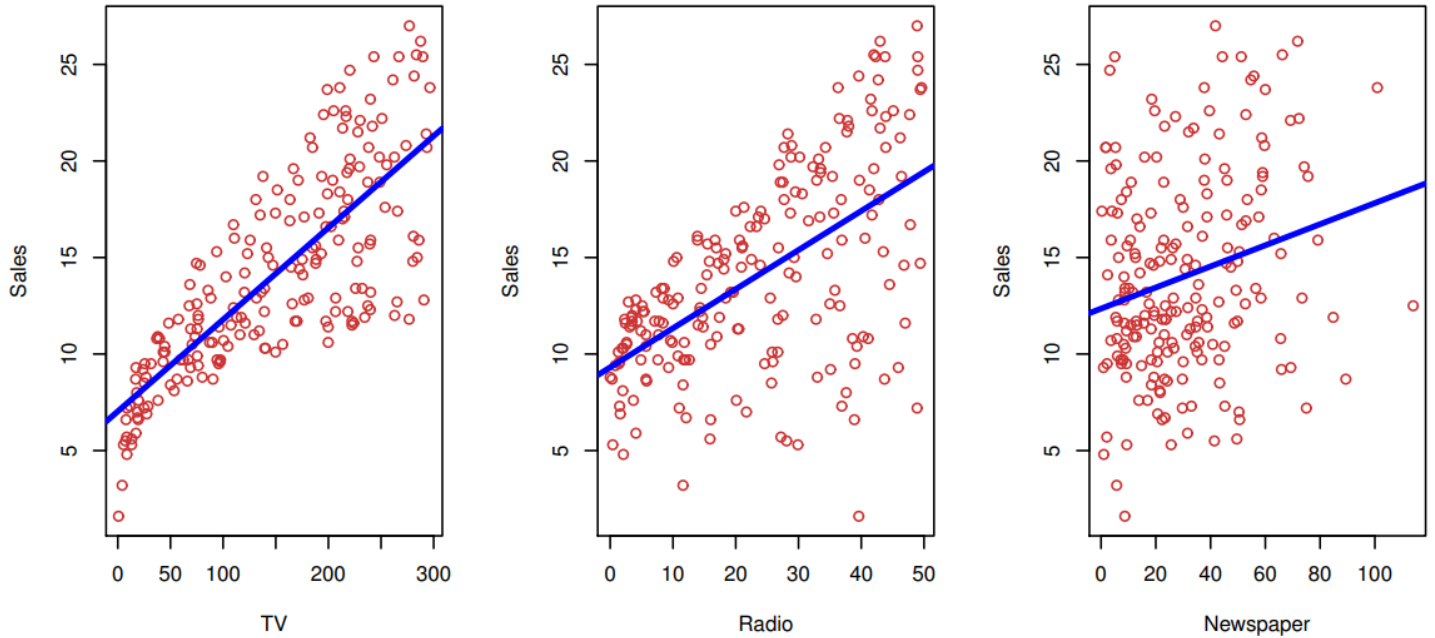
Scikit Learn

1. Why to use it
2. How to use it (lab)
3. Becoming a ML user (slide & lab)

Basic Terminologies of Machine Learning

Let’s use ‘Advertising’ data set as an example.

Dataset consists of the **sales** of the product, along with advertising budgets for three diffent media, : **TV**, **radio**, and **newspaper**.



reference : ISLR

Basic Terminologies of Machine Learning

Terminologies!

Let's assume that you want to predict or explain 'sales',
using budgets of 'TV', 'Radio', and 'Newspaper'

'TV', 'Radio', 'Newspaper' : **Input variable**, typically denoted using x_1, x_2, x_3
Inputs can have various different names :
predictors, independent variables, features, or just variables

'Sales' : **Output variable**, typically denoted using y
output can have various different names :
response variable, dependent variable, target

Terminologies : supervised learning

When we do supervised learning, we assume that there is some relationship between **y** and $\mathbf{X} = (x_1, x_2, x_3, .. , x_p)$

$$\mathbf{y} = f(\mathbf{X}) + \varepsilon$$

f : fixed, unknown function of **X**, relationship between **y** and **X**. systematic information that **X** provides about **y**.

ε : random error term, noise of the data itself, irreducible. cannot be predicted using **X**.

Terminologies : supervised learning

When we want to make a prediction or inference,
we are making $\hat{f}$ **as an estimate for** f

$$y = f(X) + \varepsilon$$

$$\hat{y} = \hat{f}(X)$$

$\hat{f}$: an estimated relationship (a ML model you choose)
$\hat{y}$: prediction for y

Basic Terminologies of Machine Learning

Terminologies : supervised learning

$$\begin{aligned} \mathrm{E}(Y - \hat{Y})^2 &= \mathrm{E}[f(X) + \epsilon - \hat{f}(X)]^2 \\ &= \underbrace{[f(X) - \hat{f}(X)]^2}_{\text{Reducible}} + \underbrace{\mathrm{Var}(\epsilon)}_{\text{Irreducible}} \end{aligned}$$

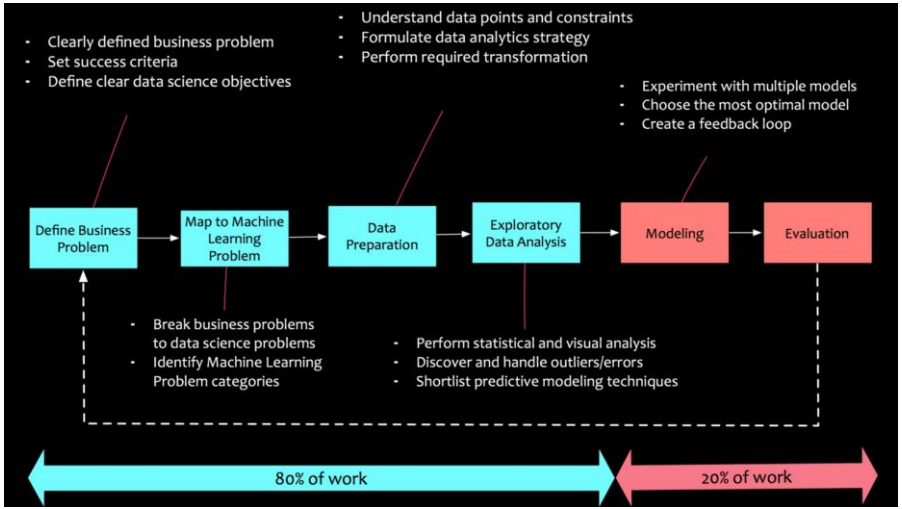
You will get your trained model, after minimizing **error**

Reducible Error :
- Error between true unknown relationship between estimated relationship.

Irreducible Error :
- Error in the data itself, **ε** cannot be predicted using **X**.

Scikit learn : why to use it?

Scikit learn : why to use it?

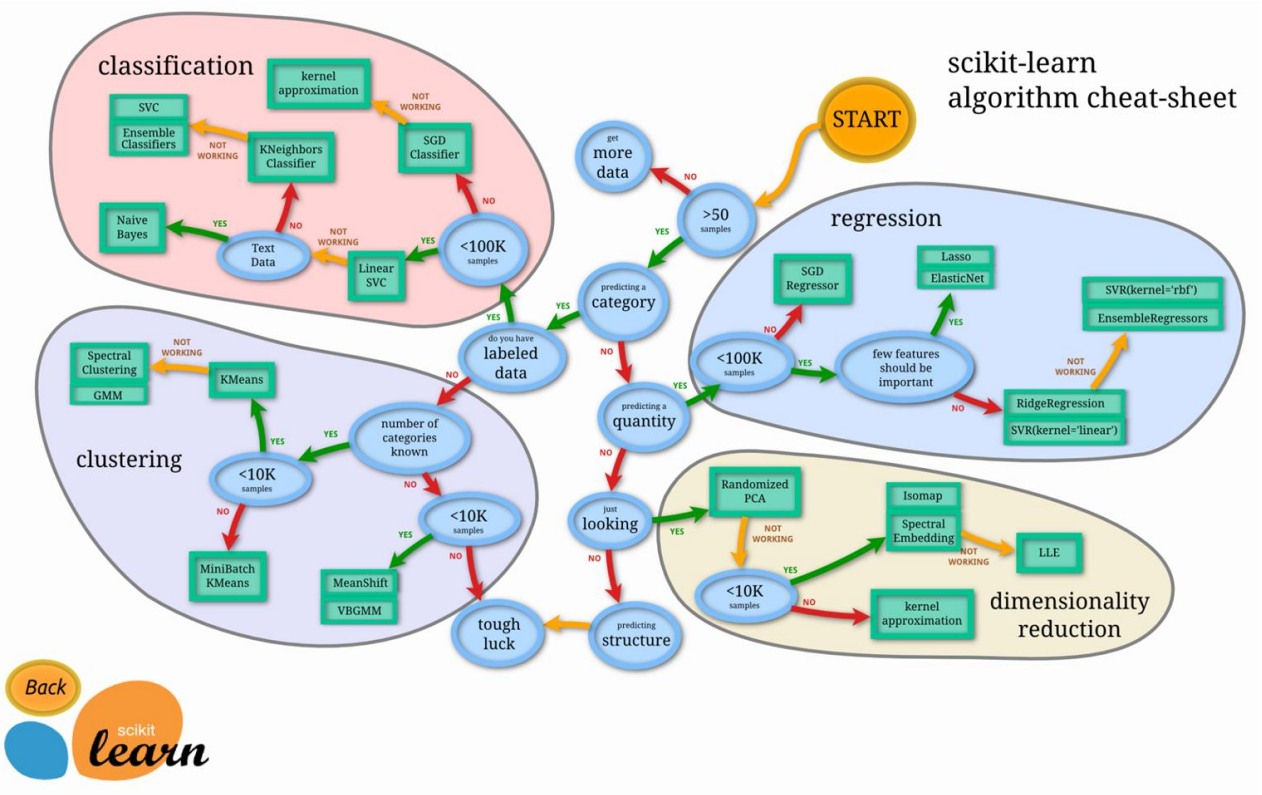


In the real machine learning Project

- There are lots of things to do, other than machine learning itself.
- Implementing a ML algorithm whenever we need is not efficient way.
- Fast prototyping is as Important as theoretical understanding of ML

Scikit learn : why to use it?

Sklearn already contains lots of ML algorithms



Scikit learn : why to use it?

Sklearn is really easy to use

```
[5]  1  # 1. Import what model you want.
     2  from sklearn.ensemble import RandomForestRegressor
     3
     4
     5  # 2. Declare your model.
     6  rf = RandomForestRegressor(  )
     7
     8
     9  # 3. Fit your model.
    10  rf.fit(x_in_sample, y_in_sample)
    11
    12
    13  # 4. predict using your fitted model.
    14  y_pred = rf.predict(x_new_observed)
```

These 4 lines of code is just enough to start

- You can use ML algorithms before learning ML.
- You can do more after learning ML, in addition to these 4 lines of code.

Scikit learn : why to use it?

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```

Someday...

- Depending on your task, you will be able to choose the right algorithm.
- Once you understand how the algorithm works, you will be able to set the appropriate hyperparameters.

Scikit learn : why to use it?

APIs of many ML libraries mirror sklearn's API

```
######cuML######

from cuml import
RandomForestClassifier as cuRF


# cuml Random Forest params
cu_rf_params = {
    'n_estimators': 25,
    'max_depth': 13,
     'n_bins': 15,
     'n_streams': 8 }

cu_rf = cuRF(**cu_rf_params)
cu_rf.fit(X_train, y_train)

print("cuml RF Accuracy Score: "
accuracy_score(
cu_rf.predict(X_test), y_test))
```

```
######Sklearn######

from sklearn.ensemble import
RandomForestClassifier as sklRF
import multiprocessing as mp


#sklearn Random Forest params
skl_rf_params = {
    'n_estimators': 25,
    'max_depth': 13,

    'n_jobs': mp.cpu_count() }

skl_rf = sklRF(**skl_rf_params)
skl_rf.fit(X_train, y_train)

print("sklearn RF Accuracy Score: "
accuracy_score(
skl_rf.predict(X_test), y_test))
```

These 4 lines of code is just enough again

1. Import what model you want.
2. Declare your model.
3. Fit your model.
4. Predict using your fitted model.

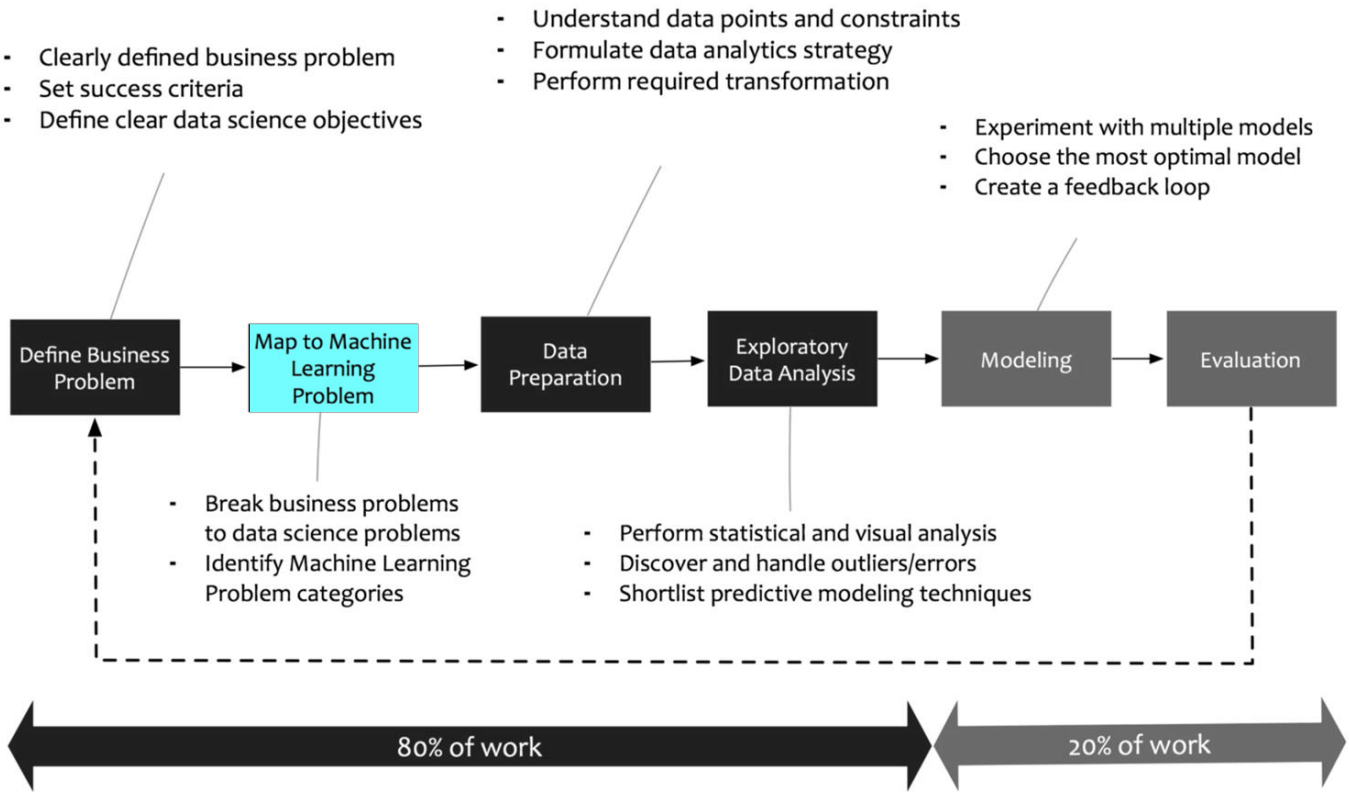
note : rapids.ai(that includes cuML) is an open source project, supported by NVIDIA

Summary

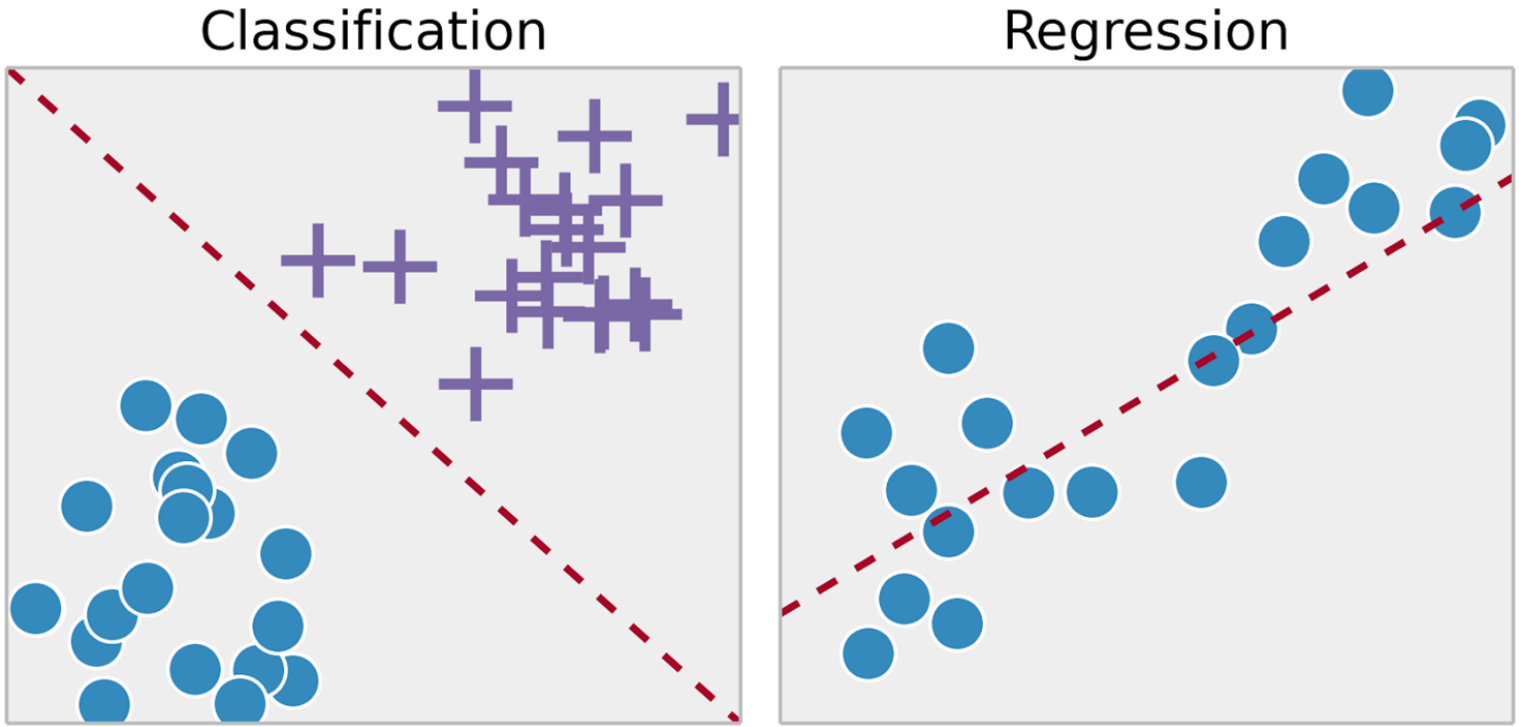
You can be a ML user first with sklearn.

- Many ML algorithms are prepared to you.
  → You can focus entire whole ML process.
- Really easy to use.
  → Familiarity with ML will lead you to become an ML engineer.
- The APIs of many other ML libraries is very simliar to sklearn’s API.
  → You can learn other ML libraries quickly.

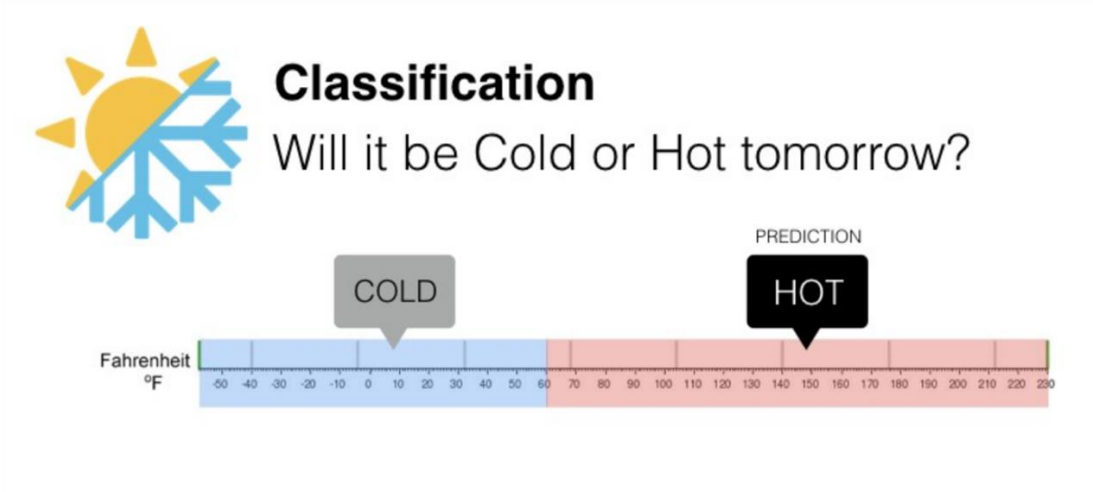
Becoming a ML user



Map to Machine Learning Problem in basic level



Classification or Regression



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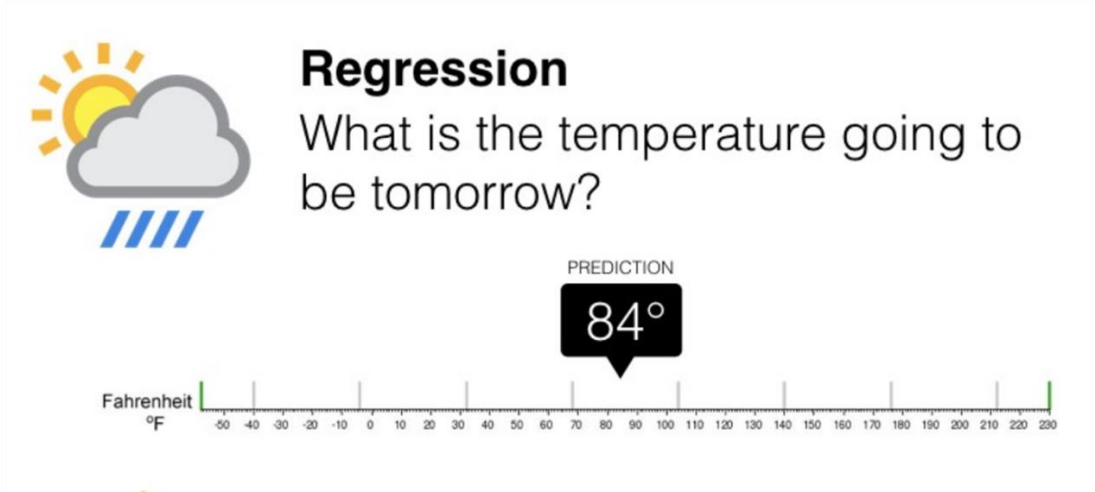

Quiz & Summary

You should be able to distinguish problems.

	Regression	Classification
SPAM or Not ?		
How much will be closing price ?		
The closing price will be higher than now or not?		
a Cat or a Dog or a Person ?		
Rain or Not tomorrow ?		
The probability of rain tomorrow ?		

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The probability of rain tomorrow ?	**Yes**	

Quiz & Summary

Yes, Confusing.

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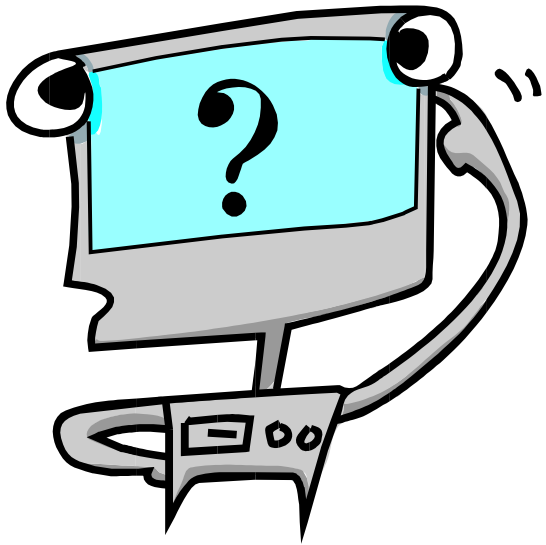
How much will be closing price ?	Yes	
The closing price will be higher than now or not?		**Yes**
a Cat or a Dog or a Person ?		Yes
Rain or Not tomorrow ?		Yes
The probability of rain tomorrow ?	**Yes**	

Quiz & Summary

	Regression	Classification
The closing price will be higher than now or not?		**Yes**
The probability of rain tomorrow ?	**Yes**	

At first, Just focus the final result.

Someday, you will solve ‘classification’ problem,
using ‘regression’ techniques.




THANK YOU