

# Supervised Learning, Python Tutorial

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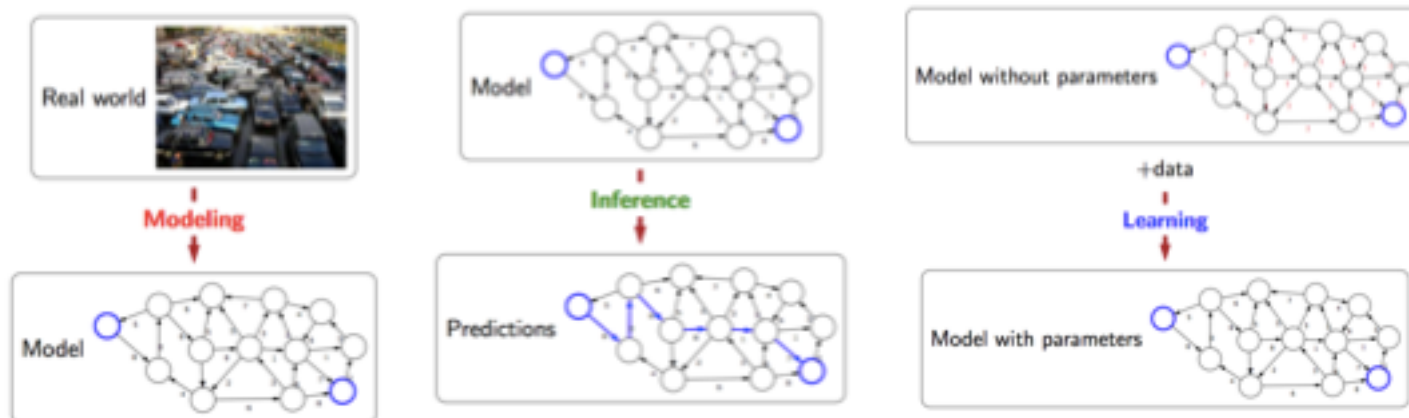
Pratch Piyawongwisal

# Today

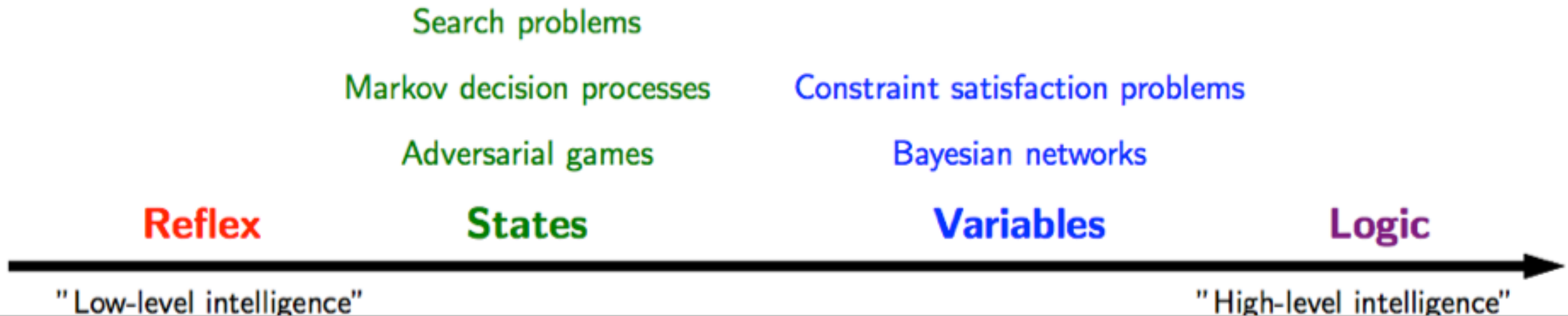
- Recap
- Supervised Learning
- Python Tutorial

# Recap: Artificial Intelligence (AI)

- Study of how to make “Intelligent Agents”
- Strong AI vs Weak AI
- Two sources of complexity that makes AI hard:
  - Computational complexity
  - Information complexity
- Model-Inference-Learning



# AI Solution Space



# Topics to be covered (revised)

- Models, Inference, Learning
- **Python Tutorial**
- Machine Learning
  - **Supervised Learning**
    - Regression Linear Regression
    - Classification SVM, Logistic Regression, Decision Trees
  - Unsupervised Learning K-Means
  - Neural Network, Deep Learning

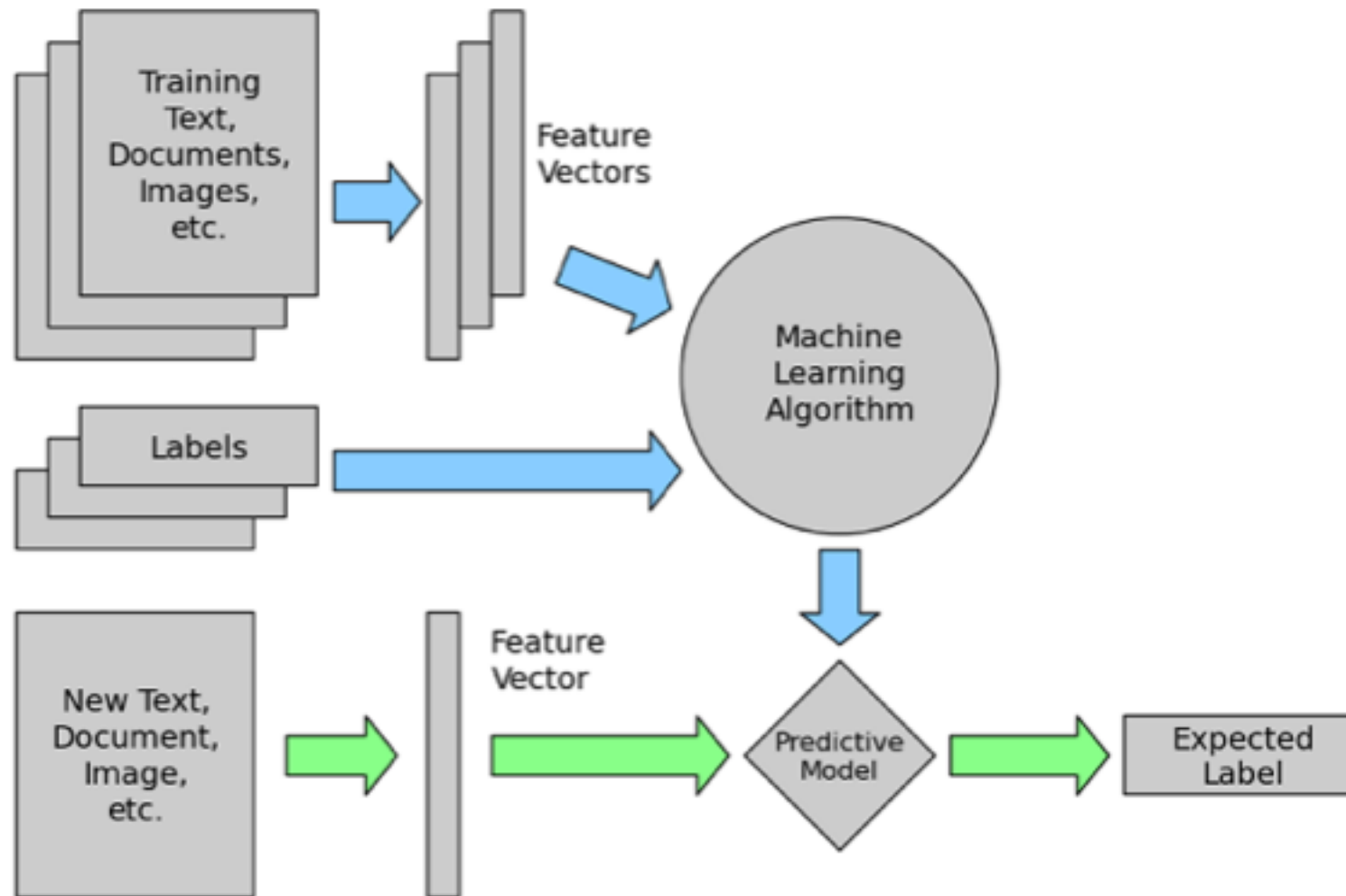
## ===== MIDTERM =====

- Symbolic AI (aka. Good Old-Fashioned AI or GOFAI)
  - Searching
  - Dynamic Programming
  - Knowledge Representation
  - Logic and Inference
  - Game Playing

# Machine Learning (ML)

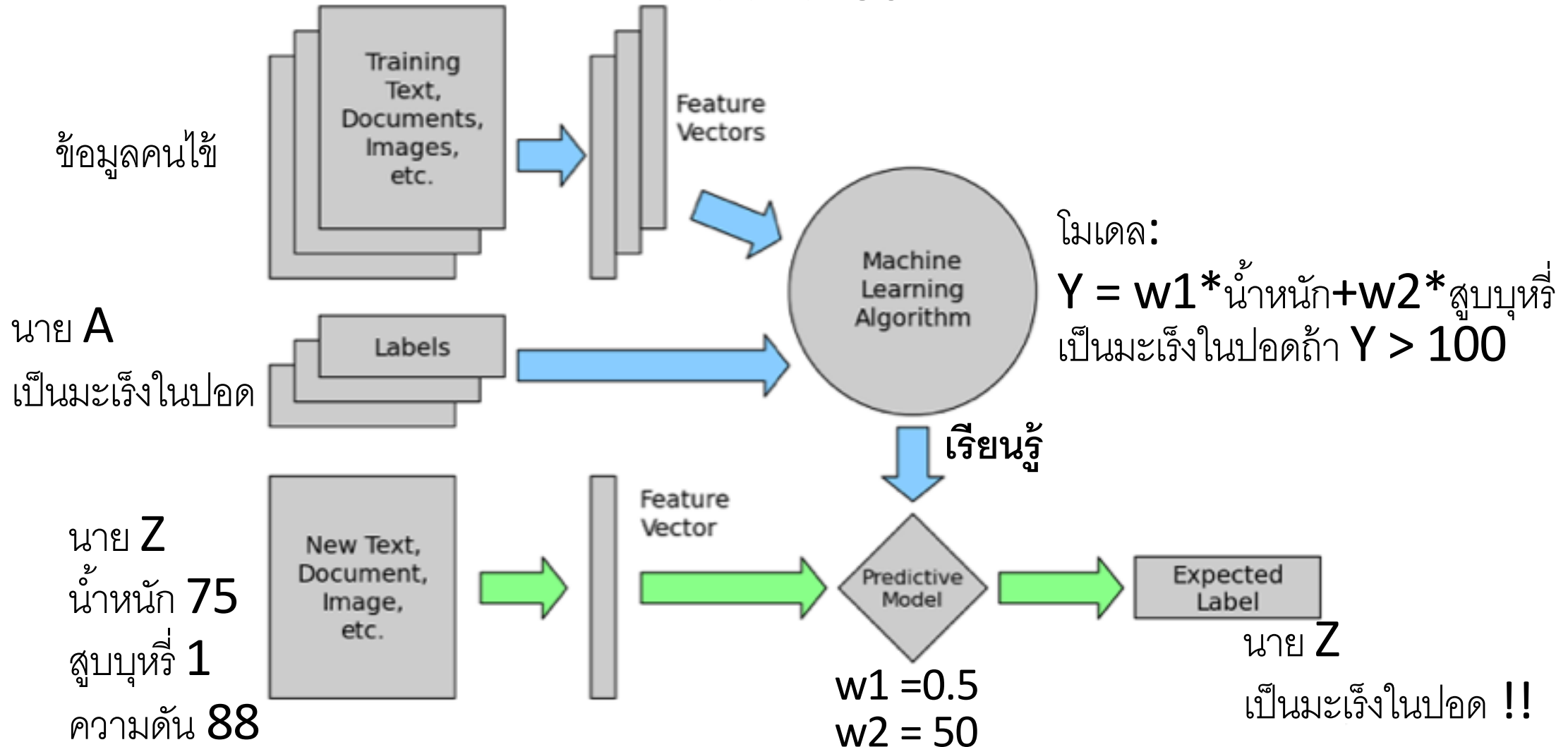
- The science of getting machines to “**learn**” from data and make **predictions** without being explicitly programmed
  - Solves specific AI tasks
  - Uses statistical techniques

# How ML works?



# Example

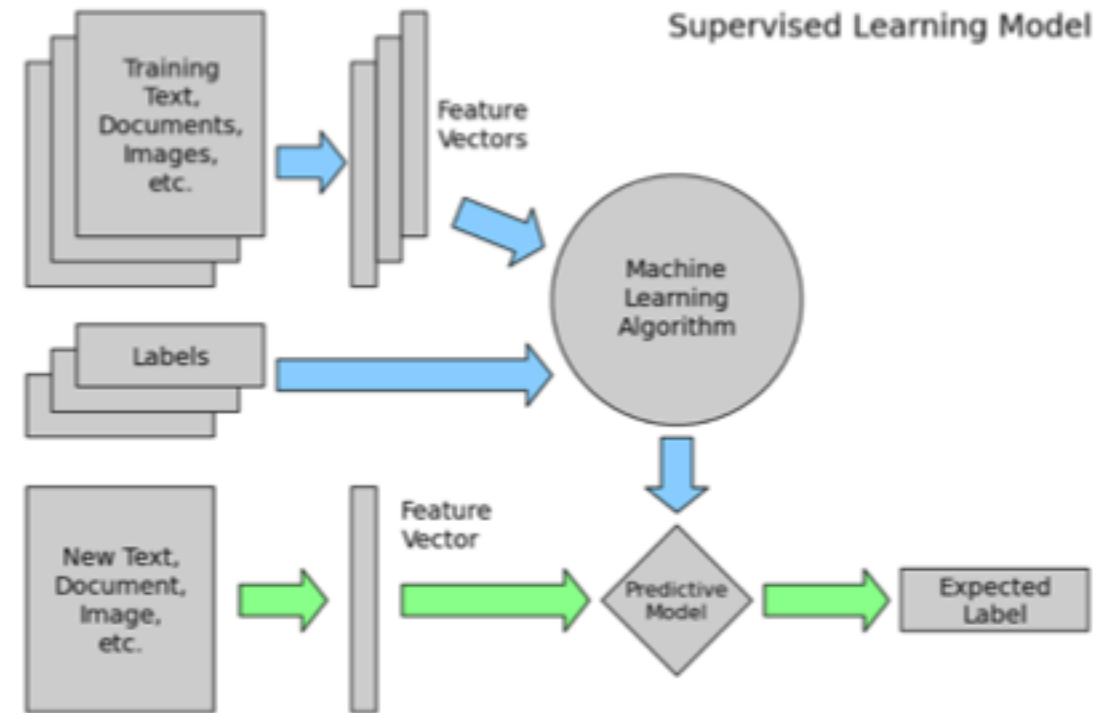
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สูบบุหรี่ 1  
ความดัน 150





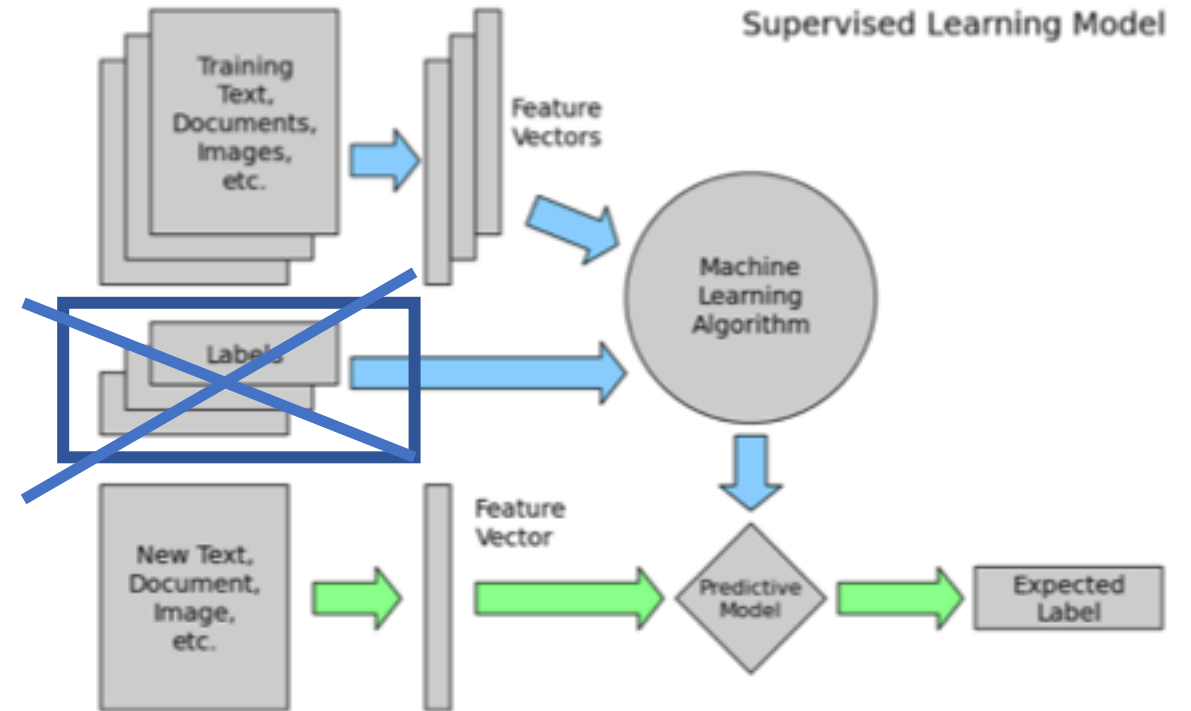
# Must-know Terminology

- Training set ข้อมูลชุดสอน
- Test set ข้อมูลชุดทดสอบ
- Feature คุณลักษณะเด่น
- Class Label ชนิดที่จำแนก
- Model แบบจำลองคณิตศาสตร์
- Predictor ตัวทำนาย
- Classifier ตัวจำแนกชนิด
- Training Error ค่าคาดเคลื่อนการฝึก
- Testing Error ค่าคาดเคลื่อนการทดสอบ



# 2 Types of ML Systems

- Supervised Learning
  - Trained **with** human supervision
  - Training set has **labels**
- Unsupervised Learning
  - Trained **without** human supervision
  - No class labels



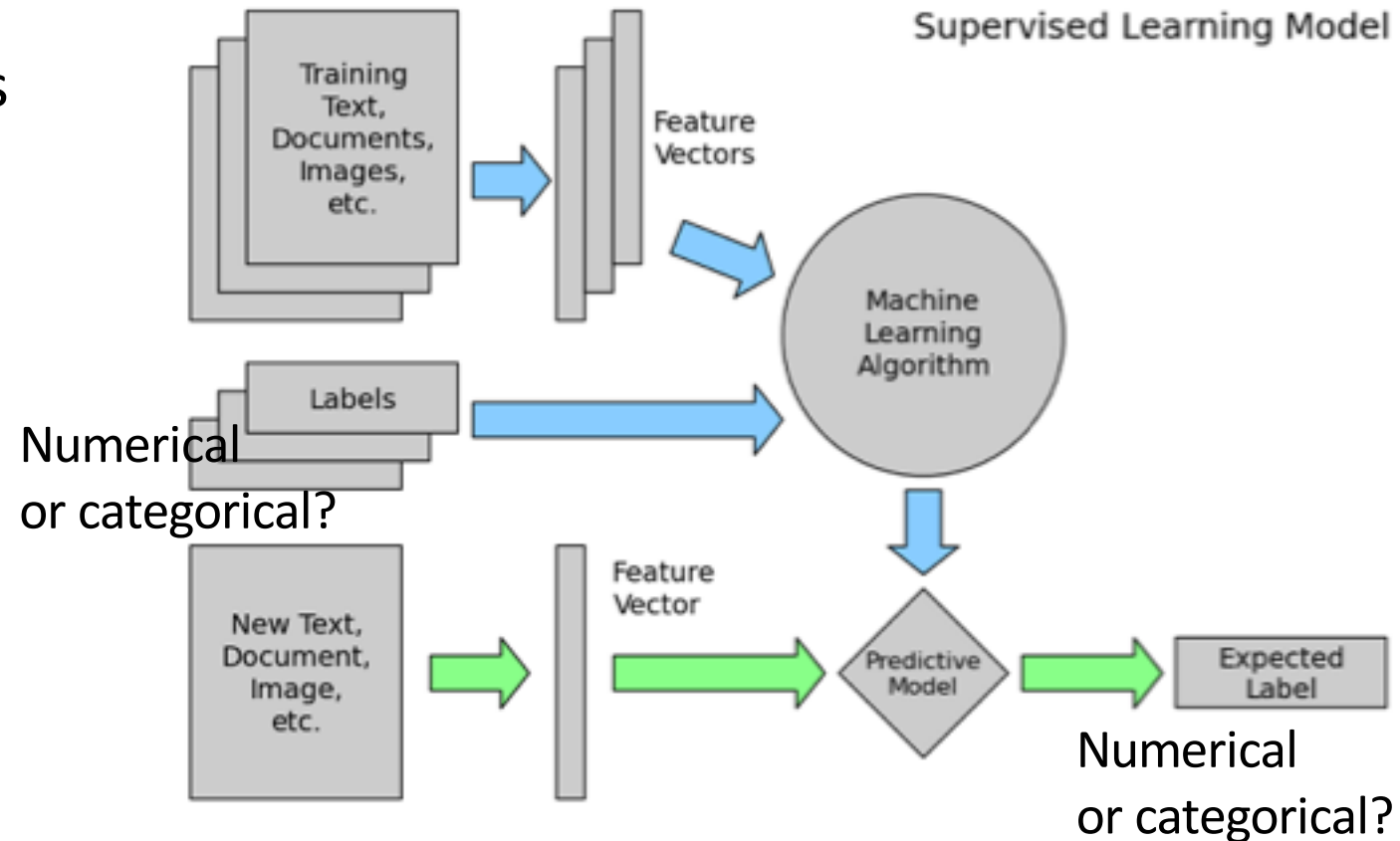
# Common Supervised Learning Tasks

- Classification

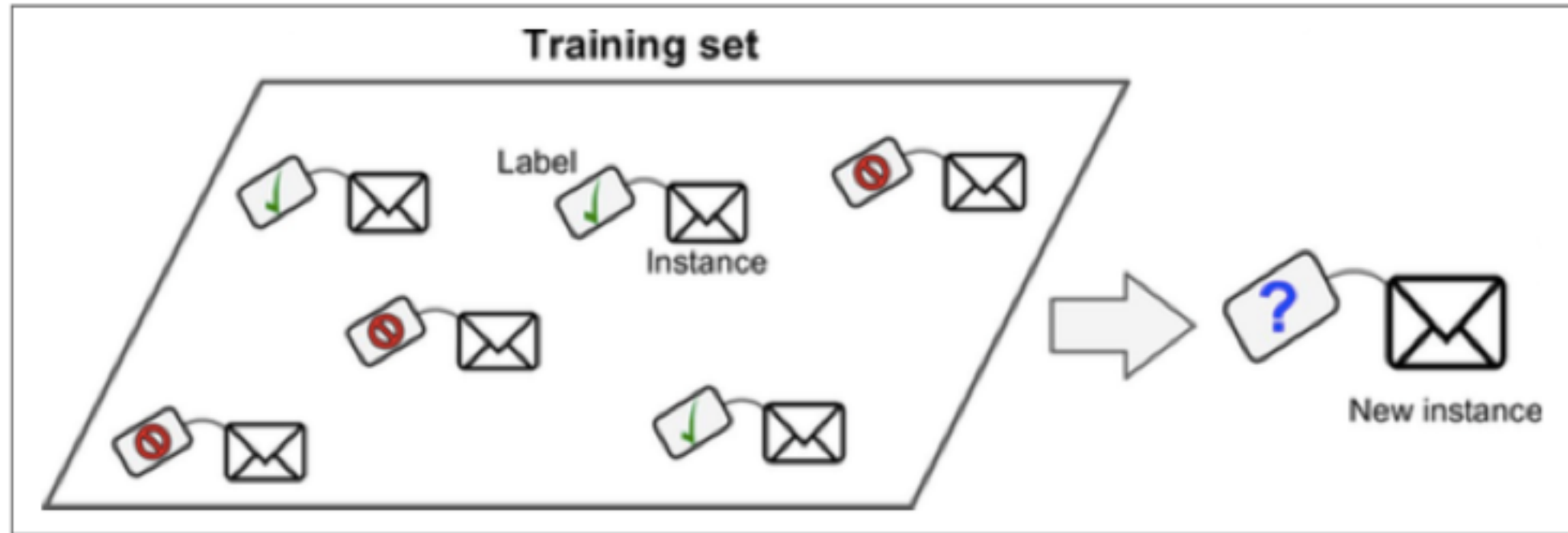
- Predicts class labels/categories
- Example:
  - cancer/no cancer
  - husky/malamute/chiba/akita
  - 1/2/3/4/5/6/7/8/9/0

- Regression

- Predicts continuous values
- Example:
  - House pricing
  - Temperature



# Example – Spam Filtering



Is this Classification or Regression?

# Supervised Learning Algorithms

- k-Nearest Neighbors (kNN)
- Linear Regression
- Logistic Regression
- Support Vector Machines (SVM)
- Decision Trees
- Neural Network

# Python Tutorial

- Download Python (3.6.x)
  - <https://www.python.org/getit/>
- Anaconda Package
  - <https://www.anaconda.com/download/>
  - Spyder, Jupyter notebook, Numpy, Pandas

# Python

- Python is an interpreted language
- Focuses on simplicity => make programmers' lives easier
- Lots of useful libraries



# Anaconda Package for Python

- Bundle of packages for scientific computing
- Numpy, Scikit-learn, Jupyter Notebook, Spyder
- Spyder is an IDE





# Basic Python

- Type in Spyder console:
  - `3+4`
  - `1+2*3+5/2`
  - `3/4`
  - `3./4`
  - `2**3`
  - `type(3)`
  - `type(3.)`
  - `clear`

# Variables

- Type in Spyder console:
  - `a = 3`
  - `a`
  - `print(a)`
  - `print("a=", a)`
  - `float(a)/7`
  - `nums = [1, 2, 3]`
  - `print(nums[0])`

# Math Functions

- Type in Spyder console:
  - `exp(2.0)`
  - `sin(2.0)`
- Error... why ?

# Importing Math Library

- Type in Spyder console:
  - `import math`
  - `math.exp(2.0)`
  - `math.pi`
  - `math.sin(math.pi)`

# Different ways of importing

- `import math`
- `import math as m`
- `from math import pi, exp`
- `from math import *`
- Useful:
  - `dir(math)`

# Data Structure

- List
- Set
- Tuple
- Dictionary

# Writing a script

```
from math import *
```

```
a = [0, pi/2, pi]
```

```
x = a[2]
```

```
if sin(x) == 0:
```

```
    print("zero")
```

```
elif sin(x) == 1:
```

```
    print("one")
```

```
else:
```

```
    print("huh")
```

# Writing a script

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    print("huh")
```



# Numpy Basics – Matrix/array

```
import numpy as np
```

```
a = np.array([[0,-1],[1,0]])
```

```
b = np.array([3,4])
```

```
print(a)
```

```
print(b)
```

```
print(a.dot(b))
```

# Numpy Basics – random sampling

```
import numpy as np
```

```
a = np.array([[0,-1],[1,0]])
```

```
b = np.array([3,4])
```

```
print(a)
```

```
print(b)
```

```
print(a.dot(b))
```

# Plotting with matplotlib

```
import numpy as np  
import matplotlib.pyplot as plt
```

```
n = 1000  
x = np.arange(n)  
y = np.random.rand(n)  
plt.scatter(x,y)
```

# Next week

- Supervised Learning - Classification
- Homework 1
- Form group of 3