AI 工具包 Documentation

—— Jiazhen Zhang, Tianyi Wu

八大章节

- 第一章：人工智能简介
- 第三章：识图认物
- 第五章：视频行为分类
- 第七章：文本识别

第二章:　二元分类
第四章：音乐分类
第六章：分门别类
第八章-GAN

Chp2 —— 鸢尾花分类

- Folder Path: /Chp2-Binary_Classification/Perceptron
  - File: Perceptron.ipynb
  - Dataset path: /data/Chp2/iris_dataset-Copy1.csv
  - Hyperparameters: None
- Folder Path: /Chp2-Binary_Classification/Logistic-Regression
  - File: Logistic Regression 1vsAll.ipynb
  - Dataset path: /data/Chp2/iris_full_set-Copy1.csv
  - Hyperparameters: Learner rate, decay, epoch
- Folder Path: /Chp2-Binary_Classification
  - File: Exercise_1:Iris_Classification_Based_on_SVM_Method.ipynb
  - Dataset path: None

Chp3 — Image Recognition

- Folder Path : /Chp3-Image_Recognition /3.1 HOG + SVM
- File: 3.1 Classifier SVM.ipynb
  - File: 3.1 HOG Feature Extraction.ipynb
  - Dataset path: /data/Chp3/3.1/cifar-10-batches-py
  - Hyperparameters: None
- Folder Path : /Chp3-Image_Recognition /3.2 Resnet18
  - File: 8.3 Resnet.ipynb
  - Dataset path: /data/Chp3/3.2/cifar-10-batches-py
  - Hyperparameters: Epoch

Chp4 —— 音乐流派分类

- Folder Path : /Chp4-Music_Genre_Classification/Music_Genre_Classificati
  - File: Exercise1:Music_Signal_Analysis.ipynb
  - Dataset path: /data/Chp4/Ex1

- Folder Path :/Chp4-Music_Genre_Classification/Music_Genre_Classificatio
  - File: Exercise2:Multi-class_Classification_for_different_music_Genres.ipynb
  - Dataset path: /data/Chp4/Ex2

Chp5 — 视频动作识别

- Folder Path: /Chp5-Video_Action_Recognition/Exercise1:Optical_Flow_Extraction
- File:main.ipynb
- Dataset path: /data/Chp5/Ex1
- Folder Path: /Chp5-Video_Action_Recognition/Exercise2:Human_Action_Recognition_Based_on_Sensor_Dataset
- File: Project_Pro.ipynb
- Dataset path: /data/Chp5/Ex2
- Folder Path: /Chp5-Video_Action_Recognition/Exercise3:Zero-Shot-Action_Recognition_with_Two_Stream_GCN
- File: train_two_stream_gcn
- Dataset path: /data/Chp5/Ex3

Chp6 — Unsupervised Learning

- Folder Path : /Chp6-Unsupervised_Learning/6.1 KNN
  - File: 3.1 kmeans clustering.ipynb
  - Dataset path: None, Data is imported
  - Hyperparameters: None
- Folder Path : /Chp6-Unsupervised_Learning/6.2-6.3 Face Clustering
  - File: 6.2 Extract Features.ipynb
  - File: 6.3 Group Faces.ipynb
  - Dataset path: /data/Chp6/Ex2
  - Hyperparameters: Choose the highest number of clusters to test until when observing mean distance to clusters

Chp7 — LSA

- Folder Path : /Chp7-Document_Analyze_and_Topic_Digging_Based_On_LSA/Exercise1:Chinese_Word_Segmentation/wordseg
- File: wordseg.ipynb
  - Dataset path: /data/Chp7
- Folder Path : /Chp7-Document_Analyze_and_Topic_Digging_Based_On_LSA/Exercise2:LSA_Classification
  - File: inspect_LSA.ipynb
  - File: runClassification_LSA.ipynb
  - Dataset path: none

Chp8 — GAN

- Folder Path : /Chp8-GAN/
- File: 8.1 Generate Random Point.ipynb
- Dataset path: None
- Hyperparameters: Pick how many points you want to generate

- Folder Path : /Chp8-GAN/
- File: 8.2 Uniform to Normal.ipynb
- Dataset path: None
- Hyperparameters: Pick how many points you want to generate

Chp8 — GAN

- Folder Path: /Chp8-GAN/
- File: 8.3 Adversarial Logistic Regression.ipynb
- Dataset path: None
- Hyperparameters: Number of generated data points, epoch, learner rate, decay

- Folder Path: /Chp8-GAN/8.4 GAN Face Generation
- File: 8.4 GAN Face Generation.ipynb
- Dataset path: /data/Chp8/Ex4/img_align_celeba
- Hyperparameters: Batch Size, number of epochs

Chp4 — 音乐流派分类

- 理解声音数字化
- 利用频谱图分析乐音的特点
- 针对不同流派的音乐片段进行类比和对比
- 使用神经网络完成音乐风格分类，并与传统算法进行对比

数据集：GTZAN

路径：/home/tianyi/Chp4 — Music Genre Classification/Music Genre Classification

Chp5 —— 视频行为识别

- 预处理视频资料
- 利用多种传统算法完成视频行为识别
- 基于深度学习完成视频行为识别

数据集：UCF-101 从youtube收集而得，共包含101类动作。此数据集可分为5类：人与物体互动，人体动作，人与人互动，乐器演奏，体育运动。

路径：/home/tianyi/Chp5 — Video Action Recognition

Chp7 —— 文本内容识别

- 针对文档内容进行中文分词
- 利用LSA（潜在语义分析）技术对文本内容进行分析

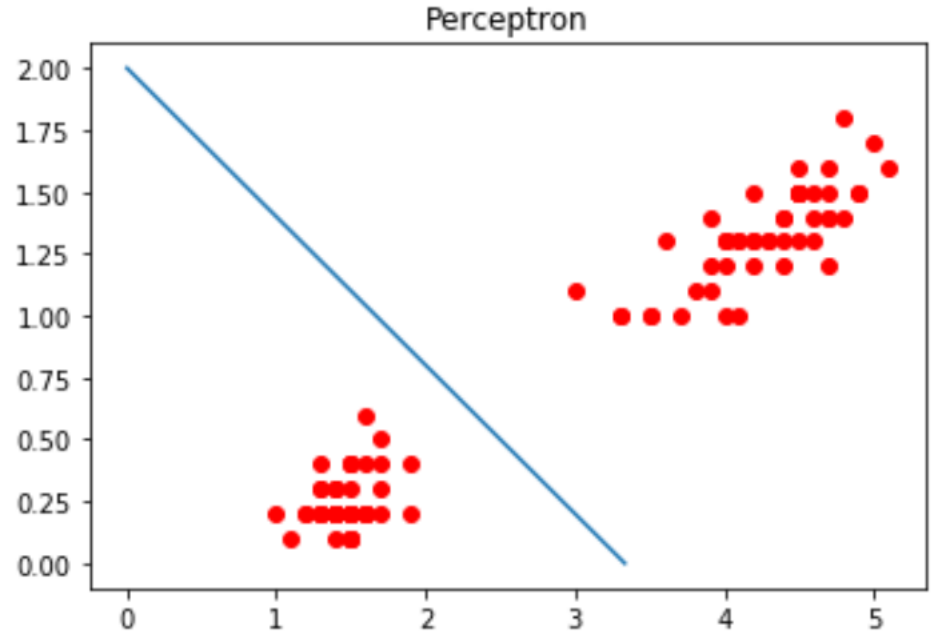
数据集：大规模中文自然语言处理语料（新闻语料json版2016）。此文档包含250万篇新闻，来源涵盖6.3万个媒体。

路径：home/tianyi/Chp7 — Document Analyze and Topic Digging Based On LSA

第二章: 二元分类

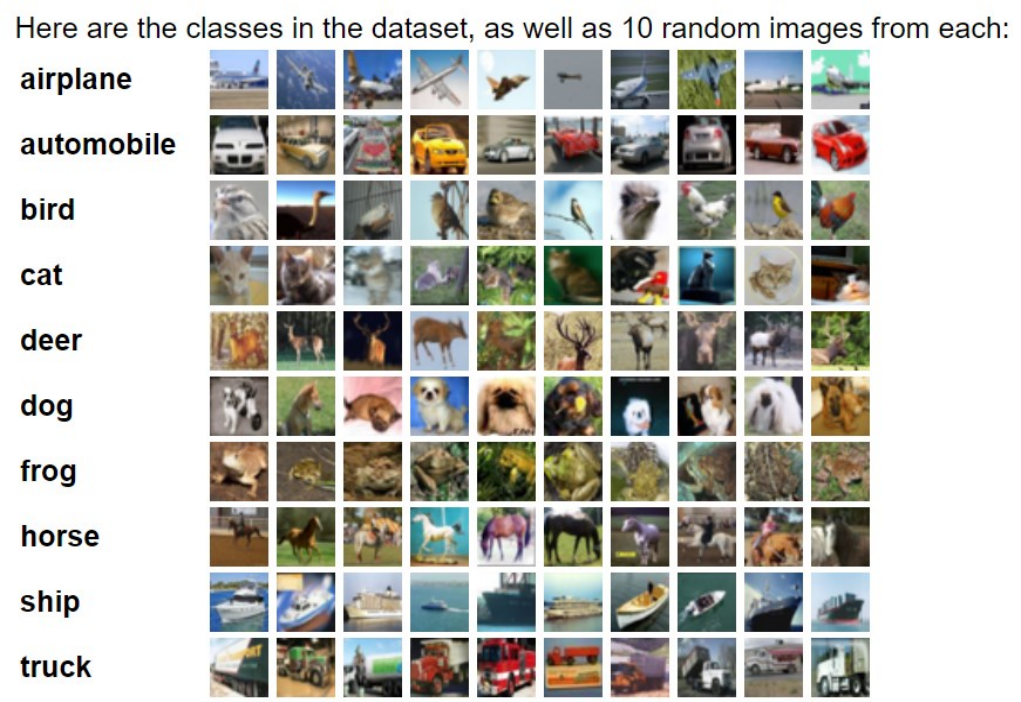
- 数据库：鸢尾花 (Iris Dataset)
  - 3 种花，各50个数据点
  - sepal length（花萼长度）
  - sepal width（花萼宽度）
  - petal length（花瓣长度）
  - petal width（花瓣宽度
- 二元逻辑回归 (Binary Logistic Regression)
- 感知机（perceptron)

```
training error: 0.0
test error:  0.0
line equation: y = -0.60x + 2.00
```



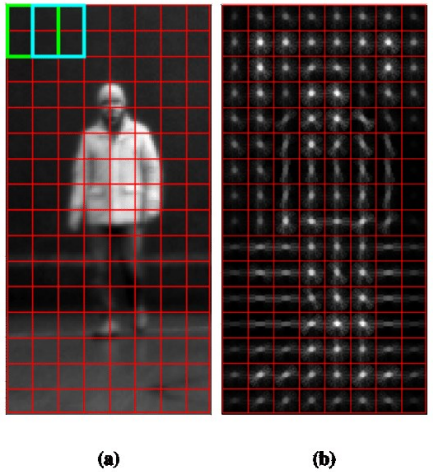
第三章-识图认物

- 数据库：ciphar10
  - 60,000张 32X32图片， 10 classes，分为50000张训练集，10000张测试集
- 用定向梯度直方图(HOG) 对图片提取特征， 然后用向量器（SVM)来做分类
- 用resnet18来做分类



第六章-分门别类

- 用定向梯度直方图(HOG) 对图片提取特征， 然后用向量器（SVM) 来做分类
  - Test accuracy：51.37%
- 用resnet18来做分类
  - Test accuracy： 93.02%
  - Test accuracy (41st epoch)： 90.03%

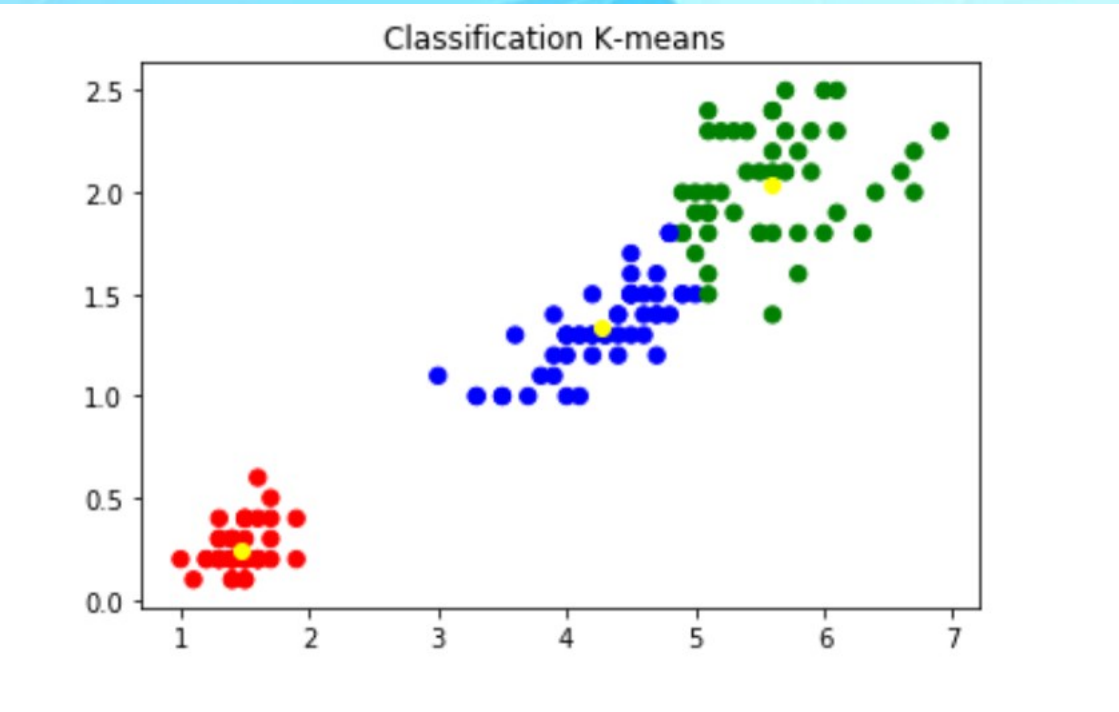



```
70
71 for epoch in range(start_epoch, start_epoch+200): #call to train
72     train(epoch)
73     test(epoch)
```

```
Epoch: 0
 [==============================================================>..]  Step: 178ms | Tot: 1m6s | Loss: 1.474 | Acc: 45.567% (218
14/4787 374/391 91
```

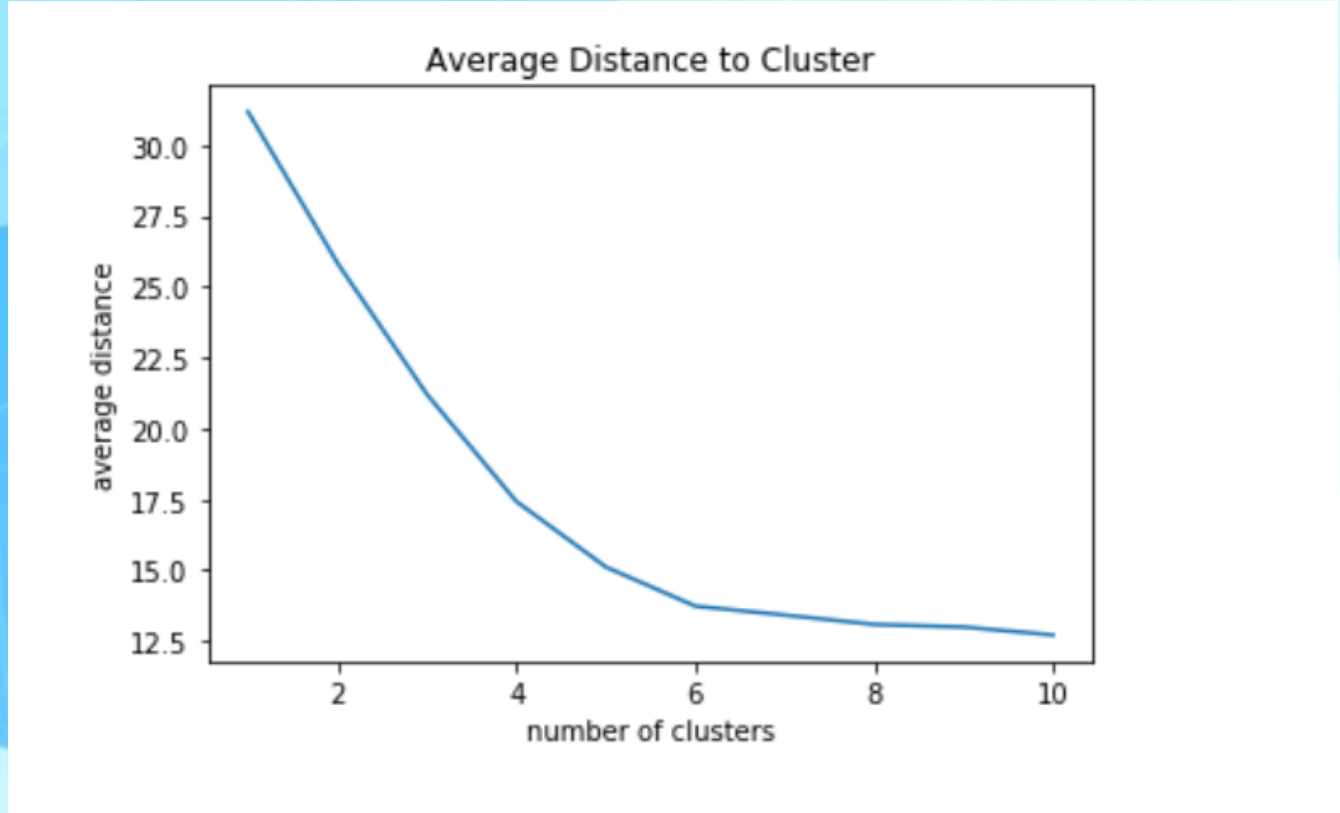
第六章-分门别类

- K近邻 （KNN）
- 数据库：数据库：鸢尾花 (Iris Dataset)， 同学们自己的家庭照
- 用KNN 在鸢尾花 (Iris Dataset)分组



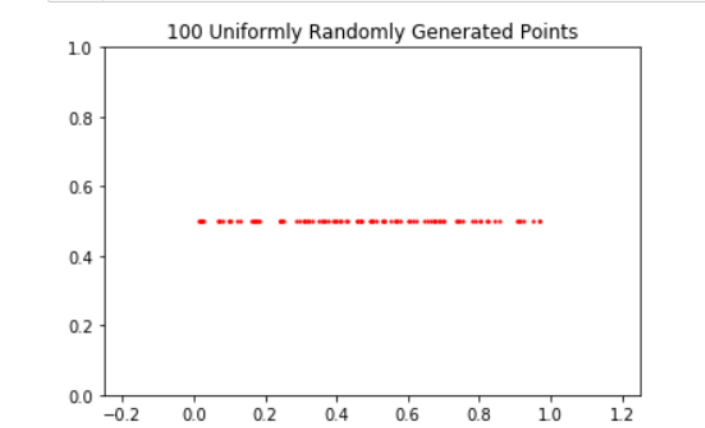
第六章-分门别类

- 先用卷积神经网（CNN）找到并数字化人脸
- 然后用KNN来分组

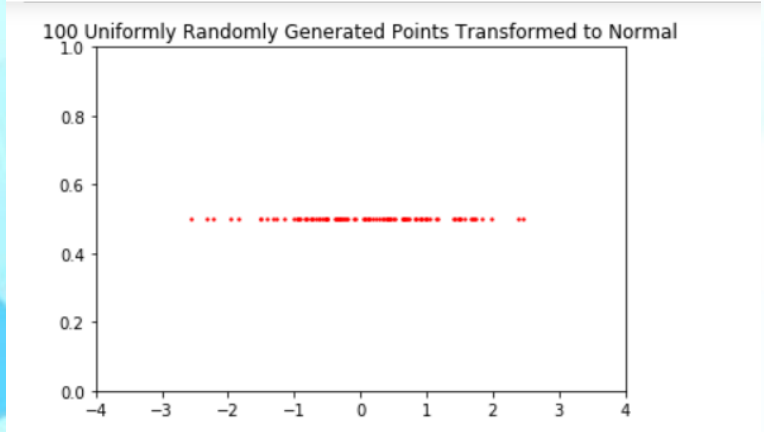


第八章-生成对抗网络（GAN）

- 简单的统计学介绍: 均匀和正态分布



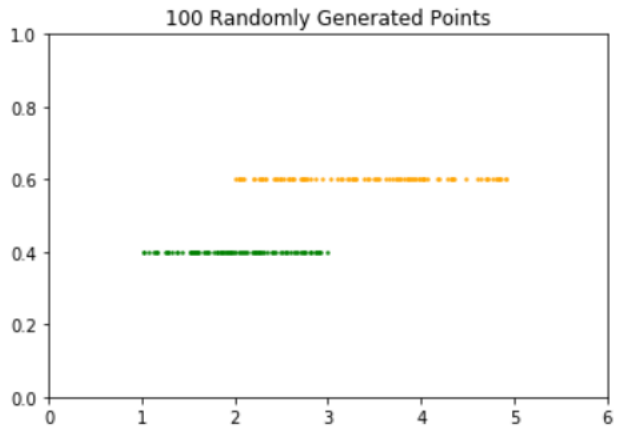
反变换采样法



第八章-生成对抗网络（GAN）

- 用判别器来模拟对抗网

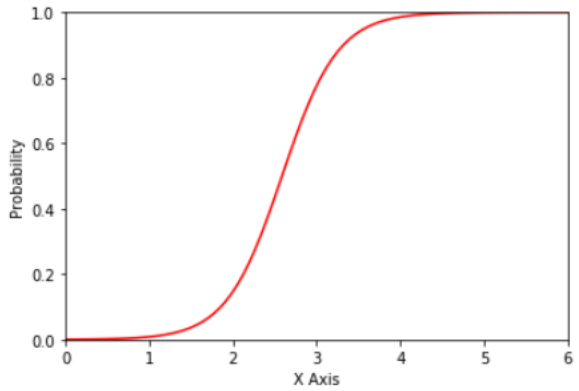
```
real, fake = generate_points(True, 100)
data = []
for i in range(len(real)): #append truth values
    data.append((np.array([1, real[i]]),1)) #first term is folded bias term
    data.append((np.array([1, fake[i]]),0))

data = np.array(data)
np.random.shuffle(data)
```



Plot of Discriminator

Plot sigmoid function that we learned.

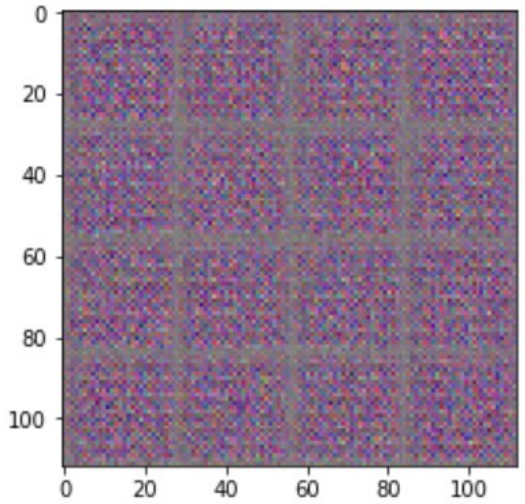
```
def plot_sigmoid(weight):
    x = np.linspace(0, 7, 100)
    z = weight[0] + (x*weight[1]) #weight[0] is the bias term
    plt.plot(x, sigmoid(z), 'r')
    plt.axis([0, 6, 0, 1])
    plt.xlabel('X Axis')
    plt.ylabel('Probability')
    # create the graph
    plt.show()

def sigmoid(y):
    return (1 / (1 + np.exp(-y)))

weights = train_model(epoch, data, learner_rate, decay)
plot_sigmoid(weights)
```



第八章-生成对抗网络（GAN）

- 数据库： celeba
  - 200,000 张明星的照片
- 用生成对抗器生成人脸

initial output:



Epoch 1/2... Generator Loss: 1.0634 Discriminator Loss: 1.0572...
Epoch 1/2... Generator Loss: 1.2571 Discriminator Loss: 0.7688...

谢谢

Albert Einstein: Insanity Is Doing the Same Thing Over and Over Again and Expecting Different Results

Machine learning:

> Interviewer: What's your biggest strength?
>
> Me: I'm a fast learner.
>
> Interviewer: What's 11 * 11?
>
> Me: 65.
>
> Interviewer: Not even close. It's 121.
>
> Me: It's 121.

Difference between machine learning and AI:

If it is written in Python, it's probably machine learning

If it is written in PowerPoint, it's probably AI