데이터 과학

L10.1: Clustering Practice

Kookmin University

목차

- k-means 구현
- 이미지 처리 응용

모듈 불러오기

- 사용할 모듈 import 하기

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

K-Means

```
def kmeans(k, points):
    prev_assignment = []

    # 1. 임의로 k개의 점을 중심점으로 선택 (forgy)
    centroids = points[np.random.choice(points.shape[0], replace=False, size=k)]

    for epoch in range(10):
        # 2. 각 점이 할당될 중심점을 계산
        assignments = [assign(p, centroids, k) for p in points]

        # 3. 새로운 centroid 계산
        centroids = compute_centroids(assignments, points, k)

        # 4. 클러스터에 변화가 없을 경우 종료
        if prev_assignment == assignment:
            break
        prev_assignment = assignment

    return assignments, centroids
```

assign()

```
def assign(point, centroids, k):
    return min(range(k), key=lambda i: np.dot(centroids[i]-point, centroids[i]-point))
```

compute_centroids()

```
def compute_centroids(assignments, points, k):
    vec_sum = [np.zeros(len(points[0])) for _ in range(k)]
    counts = [0] * k

    for i, p in zip(assignments, points):
        vec_sum[i] += p
        counts[i] += 1

    return [vec_sum[i]/counts[i] if counts[i] > 0 else random.choice(points) for i in range(k)]
```

테스트

```
# 데이터 생성
k = 3

points = [np.random.randn(k) for _ in range(80)]
points.extend([np.random.randn(k) + np.array([5, 5, 5]) for _ in range(20)])
points.extend([np.random.randn(k) + np.array([10, 5, 0]) for _ in range(20)])
points = np.array(points)

# kmeans 실행
assignments, centroids = kmeans(k, points)
```

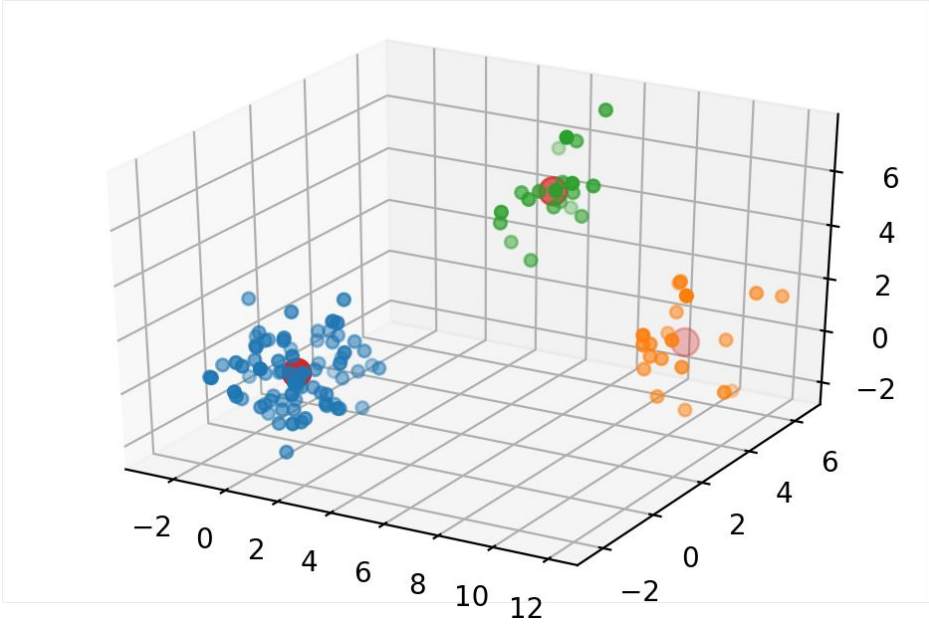
테스트

```
# 결과 확인
fig = plt.figure()
ax = fig.gca(projection='3d')

clusters = [[] for _ in range(k)]
for a, p in zip(assignments, points):
    clusters[a].append(p)

for cluster in clusters:
    ax.scatter(*zip(*cluster))

ax.scatter(*zip(*centroids), s=100)
plt.show()
```



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- k-means 구현
- **이미지 처리 응용**

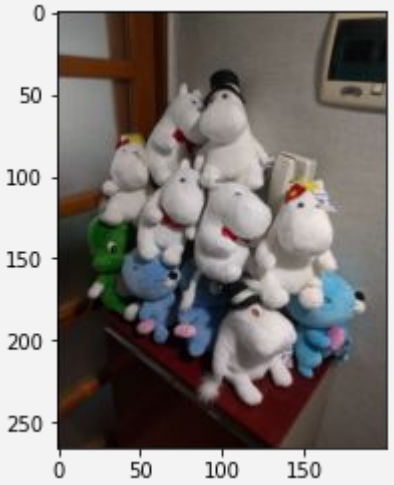
사진 불러오기

```
from PIL import Image

# 사진 불러오기 & 크기 조절 & 화면에 출력
im = Image.open("IMG_20171130_110254.jpg")

width = 200
height = im.height * width // im.width
im = im.resize((width, height))

plt.imshow(im)
plt.show()
```

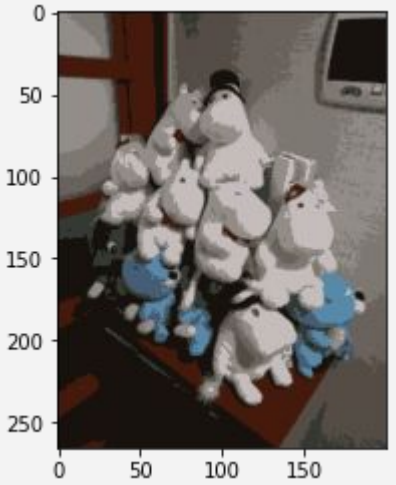


k-means 적용, 결과 확인

```
# 데이터 준비 & k-means 알고리즘 적용
pixels = np.array(im).reshape(-1,3)
assignments, centroids= kmeans(10, pixels)

# 모든 픽셀의 색을 centroid중 하나로 선택
for a, i in zip(assignments, range(pixels.shape[0])):
    pixels[i] = centroids[a]

# 바뀐 그림 출력
im_remastered = Image.fromarray(pixels.reshape(im.height, im.width, 3), 'RGB')
plt.imshow(im_remastered)
plt.show()
```



Questions?