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T3 ________	Problem Chosen	F3 ________
T4 ________	**D**	F4 ________

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APMCM
Summary Sheet

Design of Dater Recommendation Algorithm and Information Forms with Effect Analysis Study

Summary

Traditional Internet dating can be quite challening for those singles looking for love. Of all the single men or women met online, very few will be compatible specifically, and it can be difficult to determine the level of compatibility of a potential partner through methods of conventional dating services. This paper adopt K-Means, KNN algorithm and Personality Compatibility Matching Principles to recommend perfect dating partners for people online, devoting to giving a more suitable estimate of an ideally sized choice set and improving success rate of online dating.

Keywords: K-Means; K-Nearest Neighbor; Personality Compatibility Matching
Perfect Dating Partner Online Recommendation System

Contents

1 Background Introduction

In the age of Internet dating, there are more romantic options than fish in the well. Many daters believe that having more options means they're more likely to find the right person for they while many daters find that less romantic options may lead to better outcomes without much anxiety. In another view, when faced with a myriad of choices, the pleasure at the prospect of more options is canceled out by the anticipated loss of making a wrong choice. Actually, research has found that speed daters often choose their partners based on their looks. But when faced with fewer options, daters are likely to take the time to reflect on a person's deeper qualities. That suggests that in order to evaluate the qualities that matter – which, for most people, are things like a partners honesty, his dependability, her sense of humorgoing deeper in search but not wider is necessary.

Considering these phenomena, some feasible and scientific algorithms or methods can be applied to recommend appropriate partners for people want to find boy friend or girl friend.

2 The Description of Problem

2.1 Problem One: Online Dating Matches

The request of problem one is concise: Create an objective quantitative algorithm or set of algorithms to complete online dating matches by few options. There are two steps we can follow:

1. **Unsupervised Learning**: Since the data set of human beings can be very huge, we can filter all the human sample data to several classes, which is irrelevant to the attributes of data. This process can be regarded as unsupervised learning, so K-means algorithm can be considered.

2. **Supervised Learning**: According to data on few options, some objective functions and certain constraints could be set up. Aimming at the online dating matches, some algorithms in personalization recommendation such as K-Nearest Neighbor, Matrix Decomposition Recommender System, User-Based Collaborative Filtering, Model-Based Collaborative Filtering and Psychology-Based Recommendation can all be used in our dating matches models. This process can be regarded as supervised learning.

2.2 Problem Two: More Suitable Estimate of An Ideally Sized Choice Set

The goal of this problem is to give a more suitable estimate of an ideally sized choice set in the development of "Top 20 Recommended Daters" list established from problem one. Some Manual analysis can be done on the information of the top 20 daters from more angles and finally a best daters visualized report of eight persons can be generated and presented to the user to see his or her ideal daters with variety and depth consideration.

2.3 Problem Three: Information Forms Design and Effect Analysis Study

This problem consists of two parts:

- Design the information forms.
- Study the relationship between forms design and success rate of online dating.

For the design of forms, apart from some necessary information that every user must give, different kinds of questions can be designed to different users according to their unique personality traits. Besides, different size, style of forms can all be adopted to gather detailed information from users indirectly.

For the relationship study, a relational matrix between quantitative analysis of forms and the success rate of online dating can be established and then this problem is transferred to an regression problem which can be solved in quite a lot ways such as Linear Regression, Logistic Regression, Polynomial Regression, Stepwise Regression or even Support Vector Machine.

2.4 Problem Four: Non-Technical News Release

Problem four requires to write a one-page non-technical News Release describing the algorithms used, the results, and the website designed, which is based on the first three problems. With the limitation of one page, some refinement and streamlined form of expressions must be considered.

3 Terminology Explained in Model [1]

- Unsupervised Learning: A branch of machine learning that learns from test data that has not been labeled, classified or categorized. Instead of responding to feedback, unsupervised learning identifies commonalities in the data and reacts based on the presence or absence of such commonalities in each new piece of data.
- Supervised learning: The machine learning task of learning a function that maps an input to an output based on example input-output pairs. A supervised learning algorithm analyzes the training data and produces an inferred function, which can be used for mapping new examples.
- Loss Function and Objective Function: In mathematical optimization, statistics, econometrics, decision theory, machine learning and computational neuroscience, a loss function or cost function is a function that maps an event or values of one or more variables onto a real number intuitively representing some "cost" associated with the event. An optimization problem seeks to minimize a loss function. An objective function is either a loss function or its negative (in specific domains, variously called a reward function, a profit function, a utility function, a fitness function, etc.), in which case it is to be maximized.

4 Assumptions

1. Assume that all the data needed in models, algorithms or forms design are available in reality.

2. All data we want to collect are selected based on whether is useful for correct daters recommendation without privacy considerations.

3. Assume that data from users are all true and reliable and no need of noise elimination.

4. No small probability or random events in the recommendation system, such as world war and economic crisis.

5. Assume that personality traits of users do not change significantly over time.

5 Symbols and Definitions

symbol	**Meanings**
$\mathrm{Scores}_{\mathbf{i,j}}$	score of j_th person through i_th person's eyes
m	number of male users
w	number of female users
u	number of users, $u = m + w$
N	the top N recommended daters
onum	number of options selected in a specific situation
User_Item	a matrix with shape(u,), column number is optional. $User_i\_Item_j$ means the value of i_th user on j_th item
Top	a matrix storing information of recommended daters.

6 Problem Solutions with Model Foundation

6.1 Solution for Problem One

6.1.1 General Idea

Since the main task of this problem is to complete online dating matches, we can regard it as a recommendation system problem. We name the system **Perfect Dater Partner Online Recommendation System**. The core of this system is the dater match algorithm which can analyse the information of users inputting online and quickly recommend an ideally sized object choice set to users.

Nowadays, there are many mature recommendation algorithms in online shopping, online movies which can recommend perfectly appropriate goods. But when it comes to recommend daters, things become serious and more complex.

Object Matrix For evaluating which person is a ideal object for a user called $U1$, we can construct a two-dimensional square matrix named **Scores**. The shape of **Scores** is (u, u), we have to obtain the final Scores between every pair of users including each pair of two men and two women. This is a general solution which can calculate all the probability of two person regardless of their sex. In reality, we may divide the user data set to several parts according to their sexual orientation, in which the shape could be $(m, w), (w, m), (m, m), (w, w), (w, u), (m, u)$. But for universality and simplification, we only consider the **Scores** matrix with shape (u, u) as our evaluation matrix. The element $\mathbf{Scores_{i,j}}$ means the score of j_th person through i_th person's eyes. Through comparing and quickly sorting(Quick Sort Algorithm) the Scores in one row, the top **N** daters of $U1$ are easily founded.

Few Options According to the meaning of problem and for simplification, use few options as the inputs of algorithms. Due to different options needed by different algorithms, the detailed options will be shown in individual model.

Similarity Measurement A significant aspect is the way to measure the gap of two people which could be references of constructing objective function. The distance(or similarity) measurement methods we can use are very abundant[2]:

- **Euclidean Distance**
- Minkowski Distance
- Information Entropy
- Correlation Distance
- Manhattan Distance
- Mahalanobis Distance
- Hamming Distance
- Standardized Euclidean Distance
- Chebyshev Distance
- **Cosine Distance**
- Jaccard Distance

For example, Euclidean Distance can be presented as followed:

$$\mathrm{ED}(u_1, u_2) = \sqrt{(u_{11} - u_{21})^2 + (u_{12} - u_{22})^2 + ... + (u_{1onum} - u_{2onum})^2} \tag{1}$$

u_1, u_2 mean two users to be evaluated; u_{1i} means the score of u_1 on the i_th option; $onum$ means the number of options selected.
Another example, Cosine Distance:

$$\cos(u_1, u_2) = \frac{\sum\limits_{i=1}^{onum} u_{1i}u_{2i}}{\sqrt{\sum\limits_{i=1}^{onum} u_{1i}^2}\sqrt{\sum\limits_{i=1}^{onum} {u_{2i}}^2}} \tag{2}$$

All the distance measurement methods can be used to calculate the similarity of two persons. Training and testing work are needed as for which method is the best idea.

Our groups have tried to use some suitable algorithms based on daters recommendation, just see them in next several sections.

6.1.2 Model 1: K-means

This algorithm is only used for processing big data set. It can divide the whole data set into K clusters according to their global attributes distribution. The similar samples will be classified into the same cluster so that daters can be easier to find in the cluster they belong.

The core of this algorithm is the way to measure the gap and initialize the positions of K centroids. For gap measurement, any similarity measurement method discussed in 6.1.1 are accepted. For the initialization of centroids, the following formula can be adopted:

$$centroidSet[i, j] = min(j) + (max(j) - min(j)) * random(0, 1) \tag{3}$$

$centroidSet[i, j]$ means the value of j_th option in i_th centroid vector; $min(j)$ and $max(j)$ means the minimum and maximum value under the j_th option; $random(0, 1)$ means a random number between 0 and 1.

Inputs A numerical matrix: **User_Item**. The number of rows is u. The number of columns could be very large. Each value shows a user's evaluation or attribute about a item. A item could be any goods, things and any personal information.

Outputs A two-dimensional matrix named **User_Class** with shape (u,2). The first column represents the ID of user and the second presents the class number to which this user belongs. Each user has a unique class number.

Application Since we do not have any big data set, an example program of K-means applied in **UCI Iris** data set is shown in appendix A. It is based on python language version 3.6.6 and run on jupyter notebook(a kind of Integrated Development Environment). We use the Euclidean Distance as the measurement of the gap between two samples and assign the K parameter to 3. Finally, the data set is divided to 3 clusters.

Strength and Weakness

Strength

- It's a unsupervised learning process without consideration of options.
- Can easily and scientifically divide the data set into K sets, which is helpful for processing big data sets.
- No need of complex operations. The calculation is simple and clear.
- Time complexity(O(uKt), t is the iteration number) and space complexity(O(u*onum)) is nearly O(n), which is acceptable.

Weakness

- Can not know the meaning of each cluster, need further assessment.
- The result and effect is difficult to assess.
- Need to set a appropriate parameter K value and find a suitable similarity measurement method.

6.1.3 Model 2: KNN

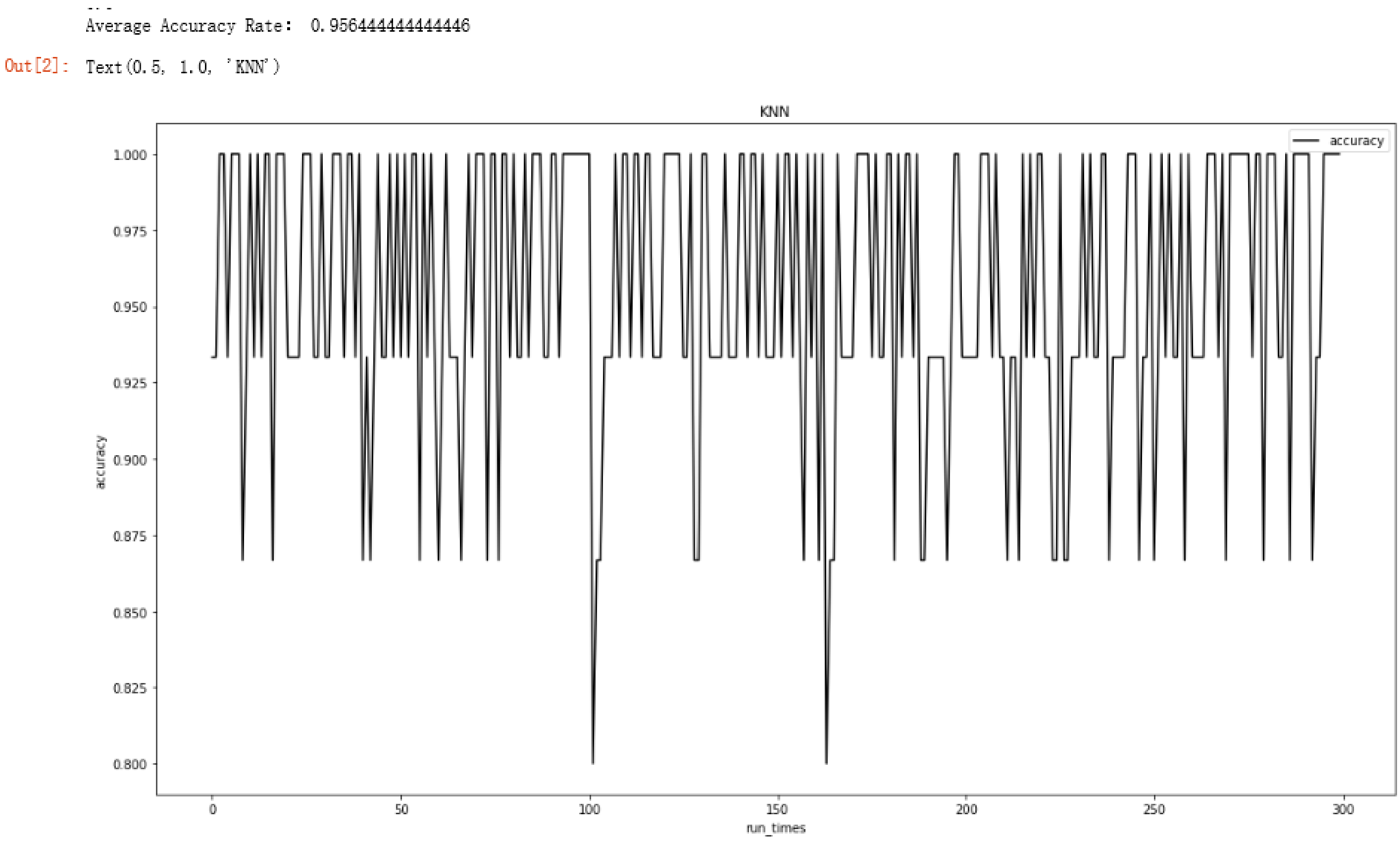
The full name of KNN is K-nearest neighbor. By using a similarity measurement method in 6.1.1, for each user, KNN algorithm can recommend the top K daters who are well-matched with him or her. The distance smaller, the similarity degree bigger. To be clear, the goal here is not to classify a user to which class, but just to get the K-nearest neighbor as the Top K daters.

Few Options The options here must have a characteristic that the difference value of a option between two users smaller, the matching degree of the two users higher. For example, the options could be goods and the values could represent how much users like the goods. Besides, personal information like educational background, age, height and weight can also be included.

Inputs A numerical matrix with shape(u, onum): **User_Item**. onum is the number of few options selected. Each value shows a user's evaluation or attribute about an option.

Output A two dimensional matrix with shape(u,2*K): **Top**. K columns store top K ID of matched daters and the other K columns store the scores. It could be a result of daters recommendation. By the way, it is a optimization compared to the **Scores** while **Top** needs fewer space.

Application Still based on data set **UCI Iris**, we run an example program using KNN algorithm. The full codes are shown in appendix B. We still use the Euclidean Distance as the measurement of the gap between two samples and assign the K parameter to 3. Since the KNN is a supervised learning process, we can calculate the accuracy and finally get an average accuracy rate 95.64%. The results can be seen in figure 1.



```
        Average Accuracy Rate:  0.9564444444444446
Out[2]: Text(0.5, 1.0, 'KNN')
```

Figure 1: Results of Accuracy Rate with 300 run times

Strength and Weakness

Strength

- Scientifically recommend the best k daters to each user, making it easy to choose friend from huge boundless sea of faces.
- It is a supervised learning process, which is very targeted and specific.

Weakness

- Do not separate the affection from user A to user B and affection from user B to user A, which should be different since different person have different request, so constraints need to be introduced.
- With time complexity O(n*n), this algorithm may be a little slow.
- Options related needs to be filtered carefully by staff.

6.1.4 Other Models

Due to the limitation on time and data, we decide to just give a brief description of other models or algorithms that can be used in our daters recommendation system.

- Collaborative Filtering Recommendation: Collaborative filtering is a method of making automatic predictions(filtering) about the interests of a user by collecting preferences or taste information from many users(collaborating). The underlying assumption of the collaborative filtering approach is that if a person A has the same opinion as a person B on an issue, A is more likely to have B's opinion on a different issue than that of a randomly chosen person. There are three mainly recommendation of collaborative filtering: Matrix factorization, Bayesian Belief Nets CF Models, Probabilistic Factor models.
- Content-based Recommendation
- Association Rule-based Recommendation
- Utility-based Recommendation
- Knowledge-based Recommendatio
- Hybrid Recommendation

6.1.5 Models Optimization

1. Let's go back to the original established goal matrix **Scores**. When calculating the top K daters we just use comparison and Quick Sort Algorithm in each row of the matrix. For different objects, they may score differently from each other which means $Scores_{i,j}! = Score_{j,i}$. So as for a user, we can add each $Score_{j,i}$ to each $Scores_{i,j}$ as a final matching degree, then do sorting algorithm on the sum matrix. In this way, the feelings of both sides are taken into account.

2. Since before the K-means require one user only belong to one cluster, now we can divide all the options into many aspects and do K-means on every aspect. In this way, data sets are divided into many different hierarchical clusters according to different classification criteria and we know which cluster is relevant to which aspect. A user can be classified to more than one class and KNN algorithm can be done in every aspect, which means our recommendation is more specific and targeted.

6.2 Solution for Problem Two

By using Hybrid Algorithm (Take each result of recommendation algorithms into consideration), we can easily get the list of Top 20 Recommended Daters based on sorting the **Scores** matrix. For acquiring a more suitable estimate of an ideally sized choice set, we can make such an attempt:

1. Divide the users into 20 parts, for i_th parts, we only recommend i daters, no more or less.

2. Gathering the results of dating and do evaluation about the recommendation effect which could be shown as date success rate and user satisfaction degree.

3. Do some analysis like regression and correlation on the number of daters and recommendation effect. Then it is clear to see the size of an ideal choice set for most people, which can be seen as large enough to include variety and depth and small enough that someone can fairly weigh each prospects potential without tripping his brains overload switch.

4. Analysis from the difference of character using the same way as step three, for diverse people we can recommend different size of choice set.

6.3 Solution for Problem Three

We design a form to collect the necessary information. We use this information to build user profiles and base on this information to recommend dating partner to users.

This information contains five parts:

- User's photo: The user must show his face in the photo.

- Basic information of the user: For instance, user's name or nickname and so on. See appendix C for details.

- User social attribute information: For instance, user′s family number and so on. See appendix C for details.
- Information about ideal dating partner: For instance, the gender of dating partner and so on. See appendix C for details.
- Information about user character: We design a lot of multiple choice questions to test the user′s personality. See appendix C for details.

In life, when someone ask our what date partner we want to date, we usually use a lot of words to describe the date partner′s character. For married people, personality compatibility between husband and wife has a great influence on the quality of marriage[3]. So, we set up a lot of questions to analyze the user′s personality in detail.Some domestic research shows that the similarities and differences between couples′ character have on significant effect on the quality of marriage. But dissatisfaction with the character of the spouse is an important reason for the decline in the quality of marriage and even thee breakdown of marriage[4]. So, we set up a lot of topics to analyze user preferences. We also set up some questions to get user′s basic information, but this information is not the point.

The answers to all questions on the questionnaire can be represented by numbers. So, we can build a matrix to describe the user. The user matrix will be our model′s input.

Forms are the basis for collecting information and the primary way to get user information. The quality of the form design has a great influence on the user′s portrayal. Inaccurate descriptions of users will greatly affect the accuracy of the model. We create a regression prediction model to solve this problem.

We have designed a total question bank. See appendix C for details. The questions in the form are form this question bank. We design different forms by changing the number and type of questions in the form. At the same time, calculate the appointment success rate for people using different forms.

We use a column vector to describe a form. Each value of the column vector corresponds to a test question. The total number of rows is the total number of questions in the test question bank. If question A appears in the form, the value which representative question A equal to 1. Else, the value equal to 0. Each form corresponds to a group of people who use the form. We calculate the success rate of dating in this group and think of it as a label for the form.

Finally, we group multiple column vectors which represent the forms into a matrix. This matrix is sample set and training data set. Every sample has a corresponding label. We use linear regression in supervised learning to fit the data. The prediction model is:

$$f(x; b, w) = w^T x + b.$$

Parameters in prediction is $w \in \mathbb{R}^m$ and $b \in \mathbb{R}$. The input value x is where $x_j \in \mathbb{R}$ for $j \in 1, ..., m$. m is the number of column vector′s row.

After training the model, first predict the label on the training set. After achieving higher accuracy on the training set, using the model, predict dating success rate on form which is not yet in use. At the same time put the form into use. Then, compare the difference between the predicted result and the true value and adjust the model to reduce the gap. When the accuracy of the model is stable at a relatively high level, the model is used to predict the newly designed un-used form, and the form design is adjusted based on the prediction result.

Combine the form and appointment success rate through the model, plus the huge test data of the website, and finally, improve the appointment success rate through high-quality form design.

6.4 Solution for Problem Four

Using Data Mining to Match Dating Partner Data-Mining Dating is a service within the online dating industry to use a scientific approach to matching highly compatible singles. Traditional Internet dating can be challening for those singles looking for love that lasts, but Data-Mining Dating is not a traditional dating site. Of all the single men or women you may meet online, very few will be compatible with you specifically, and it can be difficult to determine the level of compatibility of a potential partner through methods of conventional dating services. Our Predict System does the work for you by narrowing the field from thousands of single prospects to match you with a select group of compatible matches with whom you can build a quality relationship.

Our algorithm aims to recommend perfect daters to each user from large crowds. With consideration of all factors you can imagine including personal requests, character matching degree, common outlook on world, life and values and so on, abundant algorithms based on model, content, rules are adopted. In the future, we even will take more factors such as face similarity analysis and gene matching degree into consideration. No best but better and better algorithms will be applied for recommending daters with higher matching degree to you.

7 Future Work

The future work must be using a wider range of algorithms to do online recommendation tests, determining the best similarity measurement method, and optimizing form design according to the form size-success rate relationship analysis.

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Appendices

Appendix A Model 1: k-means – example on iris data set

```
from sklearn.datasets import load_iris
import matplotlib.pyplot as plt
from numpy import *

iris = load_iris()
data=iris['data']
target=iris['target']
X=data
Y=target
def calDistance(centroid, point):
return sqrt(sum(power(centroid-point,2)))

def constructCentroidSet(dataSet,K):
numOfCoordinate = dataSet.shape[1]

centroidSet=mat(zeros((K,numOfCoordinate)))

for ith_coordinate in range(numOfCoordinate):
min_ith_coordinate=min(dataSet[:,ith_coordinate])
max_ith_coordinate=max(dataSet[:,ith_coordinate])
range_coordinate=max_ith_coordinate-min_ith_coordinate
centroidSet[:,ith_coordinate] = min_ith_coordinate+range_coordinate* \
random.rand(K,1)
return centroidSet

def kMeans(dataSet, k):
numOfsamples= dataSet.shape[0]

class_distance = mat(zeros((numOfsamples,2)))
centroidSet = constructCentroidSet(dataSet, k)
NoChangeHappened = False

while not NoChangeHappened:
NoChangeHappened = True;
for ith_sample in range(numOfsamples):
minDistance = inf
classIndex = -1
for jth_cluster in range(k):
distance_ith_sample_jth_cluster = calDistance(centroidSet[jth_cluster,:], \
 dataSet[ith_sample,:])

if distance_ith_sample_jth_cluster < minDistance:
minDistance = distance_ith_sample_jth_cluster
classIndex = jth_cluster

if class_distance[ith_sample,0] != classIndex:
NoChangeHappened = False
class_distance[ith_sample,:] = classIndex , minDistance
```

```
for ith_centroid in range(k):
class_row_isCentroid= nonzero(class_distance[:,0].A==ith_centroid)[0]
sample_is_centroid = dataSet[class_row_isCentroid]

centroidSet[ith_centroid,:] = mean(sample_is_centroid, axis = 0)
#print(centroidSet)

return centroidSet, class_distance


def getClassValue(aclass):
for i in aclass:
return argmax(bincount(i))


accuracies=[]
run_times=300
for test_times in range(run_times):

centroids,class_distance=kMeans(data,3)
#print(class_distance)
#print(centroidSet)


class1=(array(class_distance[0:50,0]).T).astype(int)
class2=(array(class_distance[50:100,0]).T).astype(int)
class3=(array(class_distance[100:150,0]).T).astype(int)

class1_name=getClassValue(class1)
class2_name=getClassValue(class2)
class3_name=getClassValue(class3)
#print('class1: ',class1_name,'class2: ',class2_name,'class3: ',class3_name)

accuracy=0
accuracy= (sum(class1==class1_name)+sum(class2==class2_name)+ \
sum(class3==class3_name))/150
print(accuracy)
accuracies.append(accuracy)
print("average accuracy: ")
print(sum(accuracies)/run_times)


%matplotlib inline
import matplotlib.pyplot as plt

plt.figure(figsize=(18,10))
plt.plot(accuracies, "-", color="black", label="accuracy")
plt.xlabel("run_times")
plt.ylabel("accuracy")
plt.legend()
plt.title("kMeans")
```

Appendix B Model 2: KNN – example on iris data set

```
import pandas as pd
import numpy as np

class kNN:
def __init__(self,X,y,split=0.2,test=’YES’):

if isinstance(X,pd.core.frame.DataFrame) != True:
self.X = pd.DataFrame(X)
else:
self.X = X
if isinstance(y,pd.core.series.Series) != True:
self.y = pd.Series(y)
else:
self.y = y

self.max_data = np.max(self.X,axis=0)
self.min_data = np.min(self.X,axis=0)
max_set = np.zeros_like(self.X); max_set[:] = self.max_data
min_set = np.zeros_like(self.X); min_set[:] = self.min_data
self.X = (self.X - min_set)/(max_set - min_set)


if test == ’YES’:
self.test = ’YES’
n_samples = len(self.X)
trainDataSet = [i for i in range(n_samples)]  # 0-149
testSet = []
for i in range(int(n_samples*split)):
random_num = trainDataSet[int(np.random.uniform(0,len(trainDataSet)))]
testSet.append(random_num)
trainDataSet.remove(random_num)
self.X,self.testSet_X = self.X.iloc[trainDataSet],self.X.iloc[testSet]
self.y,self.testSet_y = self.y.iloc[trainDataSet],self.y.iloc[testSet]
else:
self.test = ’NO’

def getDistances(self,point):
points = np.zeros_like(self.X)
points[:] = point
minusSquare = (self.X - points)**2
EuclideanDistances = np.sqrt(minusSquare.sum(axis=1))
return EuclideanDistances


def getClass(self,point,k):
distances = self.getDistances(point)
argsort = distances.argsort(axis=0)
classList = list(self.y.iloc[argsort[0:k]])
classCount = {}

for i in classList:
if i not in classCount:
classCount[i] = 1
else:
```

```
classCount[i] += 1
maxCount = 0
maxkey = 'x'
for key in classCount.keys():
if classCount[key] > maxCount:
maxCount = classCount[key]
maxkey = key
return maxkey


def knn(self,testData,k):
if self.test == 'NO':
testData = pd.DataFrame(testData)
max_set = np.zeros_like(testData); max_set[:] = self.max_data
min_set = np.zeros_like(testData); min_set[:] = self.min_data
testData = (testData - min_set)/(max_set - min_set)
if testData.shape == (len(testData),1):
label = self.getClass(testData.iloc[0],k)
return label
else:
labels = []
for i in range(len(testData)):
point = testData.iloc[i,:]
label = self.getClass(point,k)
labels.append(label)
return labels


def errorRate(self,knn_class,real_class):
error = 0
allCount = len(real_class)
real_class = list(real_class)
for i in range(allCount):
if knn_class[i] != real_class[i]:
error += 1
return error/allCount
```

Appendix C Information Forms Design

- User basic information:
  1. name/nickname
  2. I am a man/woman.
  3. How many children do you have?
  4. When were you born?
  5. Where do you live?
  6. What is your nation?
     - white
     - Hispanic/Latino
     - black/African descent

  - Asian/pacific islander
  - Indian
  - Chinese
  - native American
  - Arabic/middle eastern
  - Korean
  - Japanese
  - other

7. What best describes your religious beliefs or spirituality?
   - christian
   - Jewish
   - Muslim
   - Hindu
   - Buddhist
   - Sikh
   - Shinto
   - other
   - spiritual
   - but not religious
   - neither religious nor spiritual
   - Baha'i
   - cao dai
   - Confucianism
   - Jainism
   - christian science
   - Rastafarianism
   - Taoism
   - Tokyoite
   - Unitarian-universalism
   - Scientology
   - metaphysical
   - pagan
   - Wiccan
   - new age
   - prefer not to specify
8. Which describes your highest level of education?
   - doctorate
   - masters
   - bachelors
   - associates
   - some college

   - high school

9. What is you job?
10. What's your personal income?(Your matches won't see this.)
11. How often do you smoke?
    - never
    - socially
    - once a week
    - few times a week
    - daily
12. How often do you drink?
    - never
    - on special occasions
    - once a week
    - few times a week
    - daily
13. How tall are you?
14. What are you passionate about?
15. What two or three things do you enjoy doing with you leisure time?

- User social attribute information.(Optional)
  1. Family members
  2. Graduated school
- Information about ideal dating partner.
  1. I am seeking a man/woman.
  2. I am looking for someone between the ages of xx-xx.
  3. How far should we search for your matches? x miles.
  4. How important is the distance of your match?
     - not at all important
     - somewhat important
     - very important
- Information about user character.
  1. How well dose this generally describe you?(Not at all / somewhat / very well)
     - warm
     - clever
     - dominant
     - outgoing
     - quarrelsome
     - stable

  - energetic
  - predictable
  - affectionate
  - intelligent
  - attractive
  - compassionate
  - loyal
  - witty
  - sensitive
  - generous
  - sensual
  - stylish
  - athletic
  - overweight
  - plain
  - healthy
  - sexy
  - content
  - patient
  - passionate
  - caring
  - genuine
  - vivacious
  - wise
  - bossy
  - leader
  - irritable
  - kind
  - aggressive
  - outspoken
  - opinionated
  - restless
  - romantic
  - selfish
  - stubborn
  - I do things according to a plan.
  - I take time out for others.
  - I feel unable to deal with things.
  - I love to help others.
  - I seek adventure.
  - I desire sexual activity.
  - I often leave a mess in my room.

- I often carry the conversation to a higher level.
- I get stressed out easily.
- I often make others feel good.
- I am good at analyzing problems.
- I usually stand up for myself.
- I am easily discouraged.
- I can handle a lot of information.
- I waste my time.
- I catch on quickly.
- I usually wait for others to lead the way.
- I love order and regularity.
- I often do nice things for people.
- I get angry easily.
- My personal religious beliefs are important.
- I ask questions in search of information.
- I think it is important to continually try to improve myself.
- I care about the physical shape I'm in.
- I feel better when I am around other people.
- I try to accommodate the other person's position.
- I try to understand the other person.
- I try to be respectful of all opinions different from my own.
- I try to resolve conflict well.

2. How strongly do you agree or disagree with...?(Absolutely disagree / Neither agree nor disagree / Absolutely agree)
    - I am looking for a long-term relationship that will ultimately lead to marriage.
    - When I get romantically involved, I tell my partner just about everything.
    - It is difficult for me to let people get emotionally close to me.
    - A "serious" relationship needs to be exclusive (i.e. monogamous).
    - I know I can always count on the people who are closest to me.
    - I don't need to have close relationships to be happy.
    - Being monogamous helps build intimacy and trust in a romantic relationship.
    - People often let you down if you depend on them.
    - It's important for me to have close friends in my life.
    - Being exclusive (i.e., monogamous) is one of benefits of being in a successful relationship.
    - I sometimes find it difficult to trust people I get romantically involved with.
    - I find it easy to get emotionally close to people.
3. How important in a relationship is...(Not at all important / Somewhat important / Very important)
    - My partner's dependability.
    - My partner's sex appeal.
    - My partner's physical appearance.

- Enjoying the way I feel around my partner.
- Our sexual compatibility.
- The friendship between me and my partner.
- Enjoying physical closeness with my partner.
- Being able to spend as much time as possible with my partner.
- Doing special things to let my partner know how important he/she is to me.

4. How happy are you with your physical appearance?
   - Not at all
   - Somewhat happy
   - Very happy
5. How often in the past month have you felt...?(Really / Occasionally / Almost Always)
   - Happy
   - Sad
   - Anxious
   - Confident
   - Hopeful
   - Fearful about future
   - Angry
   - Calm
   - Fortunate
   - Out of control
   - Fulfilled
   - Depressed
   - Unable to cope
   - Satisfied
   - Misunderstood
   - Plotted against
6. How skilled you are at the following things:(Not skilled / Somewhat Skilled / Very Skilled)
   - Creating romance in a relationship
   - Keeping physically fit
   - Finding and taking on challenging activities
7. What's your interest in....?(None / Some Interest / Very Strong Interest)
   - Watching movies
   - Listening to music
   - Watching TV
   - Reading
   - Parties
   - Dining out
   - Traveling
   - Shopping

- Family
- Talking with friends
- Religious Community
- Religious Faith
- Conversation
- Hosting/Entertaining
- Church Involvement

8. If your best friends had to pick four words to describe you, which four from this list would they pick?

   - good listener
   - modest
   - respectful
   - affectionate
   - caring
   - spontaneous
   - physically
   - fit
   - warm
   - outgoing
   - optimistic
   - dependable
   - romantic
   - creative
   - loyal
   - spiritual
   - kind
   - ambitious
   - articulate
   - rational
   - easy-going
   - generous
   - happy
   - quiet
   - genuine
   - intelligent
   - sweet
   - passionate
   - energetic
   - funny
   - perceptive