MJCN_ISIK_BANGLA_NUM

March 13, 2020

```
[1]: !pip install sklearn_extensions

import scipy.io as io
from keras.models import Sequential
from keras.layers import Lambda, Conv2D, Flatten, Layer, Activation, MaxPool2D
import tensorflow as tf
from keras import backend as K
import numpy as np
import matplotlib.pyplot as plt
import os
from mlxtend.data import loadlocal_mnist
from sklearn.neighbors import KNeighborsClassifier as knn
from sklearn.metrics import confusion_matrix, classification_report
from sklearn_extensions.extreme_learning_machines.elm import GenELMClassifier␣
 ↪as ELM_clf
from sklearn_extensions.extreme_learning_machines.random_layer import␣
 ↪MLPRandomLayer as rand_l
from sklearn.svm import SVC
from sklearn.neural_network import MLPClassifier as MLP
import warnings
warnings.filterwarnings("ignore")
import cv2
from keras.optimizers import SGD
from keras import models
```

```
Collecting sklearn_extensions
  Downloading https://files.pythonhosted.org/packages/c5/f0/af4a0885bbb04e88bb1f
57ae82a4e811ac25c73616f844e0214b1be74a8e/sklearn-extensions-0.0.2.tar.gz
Requirement already satisfied: numpy>=1.9.0 in /usr/local/lib/python3.6/dist-
packages (from sklearn_extensions) (1.17.5)
Requirement already satisfied: scikit-learn>=0.15 in
/usr/local/lib/python3.6/dist-packages (from sklearn_extensions) (0.22.1)
Requirement already satisfied: scipy>=0.16.0 in /usr/local/lib/python3.6/dist-
packages (from sklearn_extensions) (1.4.1)
Requirement already satisfied: joblib>=0.11 in /usr/local/lib/python3.6/dist-
packages (from scikit-learn>=0.15->sklearn_extensions) (0.14.1)
Building wheels for collected packages: sklearn-extensions
  Building wheel for sklearn-extensions (setup.py) … done
```

```
   Created wheel for sklearn-extensions:
filename=sklearn_extensions-0.0.2-py2.py3-none-any.whl size=24578
sha256=074148422972dafeef97674cc8dae6249c5d7d65910dd1d5af0ee0b8116d9001
   Stored in directory: /root/.cache/pip/wheels/b5/26/b2/09100728168b45e4de834b94
3a588028744fdfaa9ac979ffb2
Successfully built sklearn-extensions
Installing collected packages: sklearn-extensions
Successfully installed sklearn-extensions-0.0.2

Using TensorFlow backend.

<IPython.core.display.HTML object>
```

```python
def img_resize(img):
    for i in range(img.shape[0]):
        d = img[i,:,:]
        if i==0:
            xxx=cv2.resize(d, (40, 40))
            xxx=np.expand_dims(xxx,axis=0)
        else:
            nnn=cv2.resize(d, (40, 40))
            nnn=np.expand_dims(nnn,axis=0)
            xxx=np.append(xxx,nnn,axis=0)
    return(xxx)


class MyLayer(Layer):
    def __init__(self,dim, **kwargs):
        self.dim=dim
        super(MyLayer, self).__init__(**kwargs)
    def build(self, input_shape):
        self.kernel = self.add_weight(name='kernel', shape=(self.dim),␣
 ↪initializer='uniform',trainable='false')
        super(MyLayer, self).build(input_shape)
    def call(self, x):
        dd=self.kernel
        for i in range(dd.shape[2]):
            if i==0:
                cd=tf.transpose(K.dot(tf.transpose(x,[0,3,1,2]), dd[:,:
 ↪,i]),[0,2,3,1])
            else:
                cd = cd + tf.transpose(K.dot(tf.transpose(x,[0,3,1,2]), dd[:,:
 ↪,i]),[0,2,3,1])
        return K.sum(cd,axis=3)
    def compute_output_shape(self, input_shape):
        return (input_shape[0], input_shape[1], self.dim[1])
```

```python
def new_model(m,n,p):
    model=Sequential()
    model.add(Conv2D(8, kernel_size = (5,5), input_shape = (m,n,p),␣
 ↪padding='same'))
    model.add(Activation('sigmoid'))
    model.add(MyLayer((n,10,2)))
    model.add(Flatten())
    model.add(Activation('sigmoid'))
    return(model)
def obj_eval(data, model):
    m = []
    v = []
    for i in range(len(data)):
        out = model.predict(data[i], steps=1)
        m.append(np.mean(out, axis=0))
        v.append(np.var(out, axis=0))
    mt=np.mean(np.array(m),axis=0)
    m_obj = 0;
    v_obj = 0
    for i in range(len(m)):
        for j in range(i+1,len(m),1):
            m_obj=m_obj+ np.sqrt(np.sum(np.square(m[i]-m[j])))
        m_obj=m_obj + np.sqrt(np.sum(np.square(mt-m[j])))
        v_obj=v_obj+np.sum(v[i])
    return m_obj, v_obj




def initialize_pop(w):
    pop=[]
    for i in range(len(w)):
        pop.append((-1+np.random.random(w[i].shape)*2)*0.1)
    return pop
def initialize_vel(w):
    vel=[]
    for i in range(len(w)):
        vel.append(np.random.random(w[i].shape))
    return vel




def get_feature(data,model):
    for i in range(len(data)):
        out = model.predict(data[i], steps=1)
```

```python
        if i==0:
            feature = np.array(out)
            label = np.ones((out.shape[0],1))*i
        else:
            feature = np.append(feature,out,axis=0)
            label = np.append(label, np.ones((out.shape[0],1))*i,axis=0)
    return feature, label



def precision(label, confusion_matrix):
    tp = confusion_matrix[label, label];
    fn = np.sum(confusion_matrix[label, :]) - tp;
    fp = np.sum(confusion_matrix[:, label]) - tp;
    tn = np.sum(confusion_matrix) - (tp+fp+fn)
    return (tp)/(tp+fp)

def recall(label, confusion_matrix):
    tp = confusion_matrix[label, label];
    fn = np.sum(confusion_matrix[label, :]) - tp;
    fp = np.sum(confusion_matrix[:, label]) - tp;
    tn = np.sum(confusion_matrix) - (tp+fp+fn)
    return (tp)/(tp+fn)

def accuracy_f(label, confusion_matrix):
    tp = confusion_matrix[label, label];
    fn = np.sum(confusion_matrix[label, :]) - tp;
    fp = np.sum(confusion_matrix[:, label]) - tp;
    tn = np.sum(confusion_matrix) - (tp+fp+fn)
    return (tp+tn)/(tp+tn+fp+fn)
def tp_f(label, confusion_matrix):
    tp = confusion_matrix[label, label];
    fn = np.sum(confusion_matrix[label, :]) - tp;
    fp = np.sum(confusion_matrix[:, label]) - tp;
    tn = np.sum(confusion_matrix) - (tp+fp+fn)
    return tp,fn,fp,tn



def k_nn(train_feature,train_label,test_feature,test_label):
    cls=knn(n_neighbors=1)
    cls.fit(train_feature, train_label.ravel())
    p = cls.predict(test_feature)
    no_cl = np.unique(train_label).shape[0]
    conf = confusion_matrix(test_label.ravel(),p)
    acc=np.sum(np.diagonal(conf))/np.sum(conf)
    return(acc)
```

```python
def ELM(train_feature,train_label,test_feature,test_label):
    cls=ELM_clf(hidden_layer=rand_l(n_hidden=200, activation_func='sigmoid'))
    cls.fit(train_feature, train_label.ravel())
    p = cls.predict(test_feature)
    no_cl = np.unique(train_label).shape[0]
    conf = confusion_matrix(test_label.ravel(),p)
    acc=np.sum(np.diagonal(conf))/np.sum(conf)
    return(acc)
def svc_new(train_feature,train_label,test_feature,test_label):
    cls=SVC(C=10000,gamma=10,kernel='rbf',random_state=None,tol=0.
 ↪000001,coef0=0,degree=2,decision_function_shape='ovr')
    cls.fit(train_feature, train_label.ravel())
    p = cls.predict(test_feature)
    no_cl = np.unique(train_label).shape[0]
    conf = confusion_matrix(test_label.ravel(),p)
    acc=np.sum(np.diagonal(conf))/np.sum(conf)
    return(acc)
def mlp_new(train_feature,train_label,test_feature,test_label):
    cls=MLP(solver='adam', alpha=0.00003, hidden_layer_sizes=(100,20), tol=0.
 ↪00001, activation='identity', max_iter=5000)
    cls.fit(train_feature, train_label.ravel())
    p = cls.predict(test_feature)
    no_cl = np.unique(train_label).shape[0]
    conf = confusion_matrix(test_label.ravel(),p)
    acc=np.sum(np.diagonal(conf))/np.sum(conf)
    return(acc)
```

```python
if not os.path.exists('ISIK_BANGLA_NUM_Train.mat'):
    train_full=[]
    data_path='/home/drago/store/Dataset_Raw/OCR Dataset/ISI OCR Datasets/Oriya␣
 ↪Handwritten Numeral/Train'
    list_folder=sorted(os.listdir(data_path))
    train_data_set=[]
    for fo in list_folder:
        k=0;
        list_files=os.listdir(data_path+'/'+fo)
        d=[]
        for f in list_files:
            if f.endswith('.tif'):
                d.append(f)
            if f.endswith('.png'):
                d.append(f)
            if f.endswith('.jpg'):
                d.append(f)
        for f in d:
            if k==0:
                img_set=plt.imread(data_path+'/'+fo+'/'+f)
```

```python
                img_set=cv2.resize(img_set, (40, 40))
                th,img_set=cv2.threshold(img_set,130,255,cv2.THRESH_BINARY)
                img_set=(1- img_set/255)
                img_set=(img_set-np.mean(img_set))
                img_set=img_set/(np.std(img_set))
                img_set=np.expand_dims(img_set,axis=0)
                img_set=np.expand_dims(img_set,axis=3)
                k=1
            else:
                img=plt.imread(data_path+'/'+fo+'/'+f)
                img=cv2.resize(img, (40, 40))
                th,img=cv2.threshold(img,130,255,cv2.THRESH_BINARY)
                img=(1- img/255)
                img=(img-np.mean(img))
                img=img/(np.std(img))
                img=np.expand_dims(img,axis=0)
                img=np.expand_dims(img,axis=3)
                img_set=np.append(img_set,img,axis=0)
        print(img_set.shape)
        train_data_set.append(img_set)
    print(len(train_data_set))
    io.savemat('ISIK_BANGLA_NUM_Train.mat',{'train_data_set':train_data_set})
    mat_train = io.loadmat('ISIK_BANGLA_NUM_Train.mat')
else:
    mat_train = io.loadmat('ISIK_BANGLA_NUM_Train.mat')

train_data_set=mat_train['train_data_set'][0]
```

```python
if not os.path.exists('ISIK_BANGLA_NUM_Test.mat'):
    data_path='/home/drago/store/Dataset_Raw/OCR Dataset/ISI OCR Datasets/Oriya
 →Handwritten Numeral/Test'
    list_folder=sorted(os.listdir(data_path))
    test_data_set=[]
    for fo in list_folder:
        k=0;
        list_files=os.listdir(data_path+'/'+fo)
        d=[]
        for f in list_files:
            if f.endswith('.tif'):
                d.append(f)
            if f.endswith('.png'):
                d.append(f)
            if f.endswith('.jpg'):
                d.append(f)
        for f in d:
            if k==0:
                img_set=plt.imread(data_path+'/'+fo+'/'+f)
```

```
                img_set=cv2.resize(img_set, (40, 40))
                th,img_set=cv2.threshold(img_set,130,255,cv2.THRESH_BINARY)
                img_set=(1- img_set/255)
                img_set=(img_set-np.mean(img_set))
                img_set=img_set/(np.std(img_set))
                img_set=np.expand_dims(img_set,axis=0)
                img_set=np.expand_dims(img_set,axis=3)
                k=1
            else:
                img=plt.imread(data_path+'/'+fo+'/'+f)
                img=cv2.resize(img, (40, 40))
                th,img=cv2.threshold(img,130,255,cv2.THRESH_BINARY)
                img=(1- img/255)
                img=(img-np.mean(img))
                img=img/(np.std(img))
                img=np.expand_dims(img,axis=0)
                img=np.expand_dims(img,axis=3)
                img_set=np.append(img_set,img,axis=0)
        print(img_set.shape)
        test_data_set.append(img_set)
    print(len(test_data_set))
    io.savemat('ISIK_BANGLA_NUM_Test.mat',{'test_data_set':train_data_set})
    mat_train = io.loadmat('ISIK_BANGLA_NUM_Test.mat')
else:
    mat_train = io.loadmat('ISIK_BANGLA_NUM_Test.mat')

test_data_set=mat_train['test_data_set'][0]
```

```
[5]: sz_f_data=[10,20,50,100,150,200,450]
     sz_t_data=[10,20,50,100,150,200,450]
     for k in range(len(sz_f_data)):
         pop_sz = 50
         MaxIter= 200
         train_full=np.array(train_data_set)
         train_set=[]
         for i in range(train_full.shape[0]):
             n_data=train_full[i]
             sz = n_data.shape
             pos = np.random.permutation(sz[0])
             train_set.append(n_data[pos[0:sz_f_data[k]],:,:,:])
         sz = train_set[0].shape
         model = new_model(sz[1],sz[2],sz[3])
         w = model.get_weights()
         pop = []
         vel = []
         for i in range(pop_sz):
             pop.append(initialize_pop(w))
```

```python
    pop=np.array(pop)
    for i in range(pop_sz):
        vel.append(initialize_vel(w))
    vel=np.array(vel)
    m_obj=[]
    v_obj=[]
    for i in range(pop_sz):
        model.set_weights(pop[i])
        [m, v] = obj_eval(train_set,model)
        m_obj.append(np.copy(m))
        v_obj.append(np.copy(v))
    m_obj = np.array(m_obj)
    v_obj = np.array(v_obj)
    it=1
    plot_g_m=[]
    plot_g_v=[]
    while it<= MaxIter:
        obj =0.2*(m_obj/np.sum(m_obj)) -  0.8*(v_obj/np.sum(v_obj))
        g_best=np.argmax(obj)
        global_best=np.copy(pop[g_best])
        global_best_m_obj=np.copy(m_obj[g_best])
        global_best_v_obj=np.copy(v_obj[g_best])
        g_worst=np.argmin(obj)
        global_worst=np.copy(pop[g_worst])
        global_worst_m_obj=np.copy(m_obj[g_worst])
        global_worst_v_obj=np.copy(v_obj[g_worst])
        print("iteration:{}\t global m:{}\t global v:{}\t mean_m:{}\t mean_v:
↪{}".format(it,global_best_m_obj,global_best_v_obj,np.mean(m_obj),np.
↪mean(v_obj)))
        for i in range(pop_sz):
            npop = pop[i] + np.multiply(np.random.random(pop[i].shape),␣
↪global_best-np.abs(pop[i])) - np.multiply(np.random.random(pop[i].shape),␣
↪global_worst-np.abs(pop[i]))
            model.set_weights(npop)
            [m, v] = obj_eval(train_set,model)
            if (m>m_obj[i] and v<v_obj[i]) or (m>m_obj[i] and v==v_obj[i])␣
↪or(m==m_obj[i] and v<v_obj[i]):#(m-v>m_obj[i]-v_obj[i]):
                pop[i] = np.copy(npop)
                m_obj[i] = np.copy(m)
                v_obj[i] = np.copy(v)
            else:
                npop=pop[i]+(np.multiply(np.random.random(pop[i].
↪shape),global_best)-np.multiply(np.random.random(pop[i].
↪shape),global_worst))/2
                model.set_weights(npop)
                [m, v] = obj_eval(train_set,model)
```

```python
                 if (m>m_obj[i] and v<v_obj[i]) or (m>m_obj[i] and v==v_obj[i])
↪or(m==m_obj[i] and v<v_obj[i]):#(m-v>m_obj[i]-v_obj[i]):
                     pop[i] = np.copy(npop)
                     m_obj[i] = np.copy(m)
                     v_obj[i] = np.copy(v)
        plot_g_m.append(global_best_m_obj)
        plot_g_v.append(global_best_v_obj)
        it = it+1
    obj = m_obj-v_obj#0.2*(m_obj/np.sum(m_obj)) -  0.8*(v_obj/np.sum(v_obj))
    g_best=np.argmax(obj)
    global_best=np.copy(pop[g_best])
    model.set_weights(global_best)
    [m,v]=obj_eval(train_set,model)
    print('per class sample Feature\t|per class sample
↪train_sz\t|k_nn\t|ELM\t|SVM\t|BPNN\t|')
   
↪print('--------------------------------------------------------------------------------
   
↪print('--------------------------------------------------------------------------------
    for kk in range(len(sz_t_data)):
        train_full=np.array(train_data_set)
        train_set=[]
        for i in range(train_full.shape[0]):
            n_data=train_full[i]
            sz = n_data.shape
            pos = np.random.permutation(sz[0])
            train_set.append(n_data[pos[0:sz_t_data[kk]],:,:,:])
        train_feature, train_label = get_feature(train_set,model)
        test_feature, test_label = get_feature(test_data_set,model)
        acc1=k_nn(train_feature,train_label,test_feature,test_label)
        acc2=ELM(train_feature,train_label,test_feature,test_label)
        acc3=svc_new(train_feature,train_label,test_feature,test_label)
        acc4=mlp_new(train_feature,train_label,test_feature,test_label)
        print('{}\t\t\t|{}\t\t\t|{}\t|{}\t|{}\t|{}\t|'.
↪format(sz_f_data[k],sz_t_data[kk],acc1,acc2,acc3,acc4))
```

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-
packages/keras/backend/tensorflow_backend.py:66: The name tf.get_default_graph
is deprecated. Please use tf.compat.v1.get_default_graph instead.

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-
packages/keras/backend/tensorflow_backend.py:541: The name tf.placeholder is
deprecated. Please use tf.compat.v1.placeholder instead.

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-
packages/keras/backend/tensorflow_backend.py:4432: The name tf.random_uniform is
deprecated. Please use tf.random.uniform instead.

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:190: The name tf.get_default_session is deprecated. Please use tf.compat.v1.get_default_session instead.

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:197: The name tf.ConfigProto is deprecated. Please use tf.compat.v1.ConfigProto instead.

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:203: The name tf.Session is deprecated. Please use tf.compat.v1.Session instead.

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:207: The name tf.global_variables is deprecated. Please use tf.compat.v1.global_variables instead.

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:216: The name tf.is_variable_initialized is deprecated. Please use tf.compat.v1.is_variable_initialized instead.

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend.py:223: The name tf.variables_initializer is deprecated. Please use tf.compat.v1.variables_initializer instead.

iteration:1   global m:3.484053786844015   global v:0.16396969184279442
mean_m:9.232855295538902   mean_v:0.7184923821687699
iteration:2   global m:3.484053786844015   global v:0.16396969184279442
mean_m:9.402315825819969   mean_v:0.7127872384339571
iteration:3   global m:7.376388099044561   global v:0.12575756292790174
mean_m:9.718101768121123   mean_v:0.6949260285682977
iteration:4   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:9.817206177785993   mean_v:0.6862083111982793
iteration:5   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:9.856667693033815   mean_v:0.6817088087741285
iteration:6   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:9.96819555900991   mean_v:0.6730779915396125
iteration:7   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:10.108903336450458   mean_v:0.6632569423783571
iteration:8   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:10.161512166783213   mean_v:0.6585568973142654
iteration:9   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:10.161512166783213   mean_v:0.6585568973142654
iteration:10   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:10.161512166783213   mean_v:0.6585568973142654

```
iteration:11     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.200667947158218       mean_v:0.6556591635663063
iteration:12     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.237568356916308       mean_v:0.6492677676770836
iteration:13     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.237568356916308       mean_v:0.6492677676770836
iteration:14     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.293250875398517       mean_v:0.6470529166143387
iteration:15     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.40700199611485        mean_v:0.6462291778158397
iteration:16     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.41923236168921        mean_v:0.6454904734622687
iteration:17     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.436699708774686       mean_v:0.6445524179097265
iteration:18     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.456901379898191       mean_v:0.6418492691125721
iteration:19     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.456901379898191       mean_v:0.6418492691125721
iteration:20     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.498885303065181       mean_v:0.6392310467083007
iteration:21     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.503163460716605       mean_v:0.6353283311147243
iteration:22     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.503163460716605       mean_v:0.6353283311147243
iteration:23     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.543532360866665       mean_v:0.634197404878214
iteration:24     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.543532360866665       mean_v:0.634197404878214
iteration:25     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.543532360866665       mean_v:0.634197404878214
iteration:26     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.560053254291415       mean_v:0.6333095343131572
iteration:27     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.560053254291415       mean_v:0.6333095343131572
iteration:28     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.57438733883202        mean_v:0.6321388707030564
iteration:29     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.57438733883202        mean_v:0.6321388707030564
iteration:30     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.57438733883202        mean_v:0.6321388707030564
iteration:31     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.575626315250993       mean_v:0.6315110828448087
iteration:32     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.604934037700296       mean_v:0.63091792200692
iteration:33     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.604934037700296       mean_v:0.63091792200692
iteration:34     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.604934037700296       mean_v:0.63091792200692
```

```
iteration:35    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.648936811462045    mean_v:0.6286986462492495
iteration:36    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.648936811462045    mean_v:0.6286986462492495
iteration:37    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.648936811462045    mean_v:0.6286986462492495
iteration:38    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.71323154874146    mean_v:0.6217413583863527
iteration:39    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.71323154874146    mean_v:0.6217413583863527
iteration:40    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.71525526471436    mean_v:0.6214454175252467
iteration:41    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.71525526471436    mean_v:0.6214454175252467
iteration:42    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.730585276708007    mean_v:0.6195226976741105
iteration:43    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.800147035047411    mean_v:0.6175577941257506
iteration:44    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.81572592459619    mean_v:0.6163770142663271
iteration:45    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.81572592459619    mean_v:0.6163770142663271
iteration:46    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.81572592459619    mean_v:0.6163770142663271
iteration:47    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.81572592459619    mean_v:0.6163770142663271
iteration:48    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.81572592459619    mean_v:0.6163770142663271
iteration:49    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.81572592459619    mean_v:0.6163770142663271
iteration:50    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.832742994055153    mean_v:0.6163704291451723
iteration:51    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.851008258387447    mean_v:0.6157103303540498
iteration:52    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.855684507861733    mean_v:0.6126482296455652
iteration:53    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.855684507861733    mean_v:0.6126482296455652
iteration:54    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.859217128828169    mean_v:0.6115049466956407
iteration:55    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.859217128828169    mean_v:0.6115049466956407
iteration:56    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.859217128828169    mean_v:0.6115049466956407
iteration:57    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.859217128828169    mean_v:0.6115049466956407
iteration:58    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.907703092321754    mean_v:0.6071473446208984
```

```
iteration:59    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.91008938021958      mean_v:0.6071152544859797
iteration:60    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.91008938021958      mean_v:0.6071152544859797
iteration:61    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.91008938021958      mean_v:0.6071152544859797
iteration:62    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.91008938021958      mean_v:0.6071152544859797
iteration:63    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.91008938021958      mean_v:0.6071152544859797
iteration:64    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.91008938021958      mean_v:0.6071152544859797
iteration:65    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.91008938021958      mean_v:0.6071152544859797
iteration:66    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.91008938021958      mean_v:0.6071152544859797
iteration:67    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.91008938021958      mean_v:0.6071152544859797
iteration:68    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.910502957627177     mean_v:0.6070380776468665
iteration:69    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.910502957627177     mean_v:0.6070380776468665
iteration:70    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.910502957627177     mean_v:0.6070380776468665
iteration:71    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.910502957627177     mean_v:0.6070380776468665
iteration:72    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.910502957627177     mean_v:0.6070380776468665
iteration:73    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.913376366570592     mean_v:0.6061876546684652
iteration:74    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.913376366570592     mean_v:0.6061876546684652
iteration:75    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.913376366570592     mean_v:0.6061876546684652
iteration:76    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.913376366570592     mean_v:0.6061876546684652
iteration:77    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.984707613959909     mean_v:0.6031456835661083
iteration:78    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.984707613959909     mean_v:0.6031456835661083
iteration:79    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.984707613959909     mean_v:0.6031456835661083
iteration:80    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.995352852120995     mean_v:0.6009509179089219
iteration:81    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.995352852120995     mean_v:0.6009509179089219
iteration:82    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:10.995352852120995     mean_v:0.6009509179089219
```

```
iteration:83     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.995352852120995     mean_v:0.6009509179089219
iteration:84     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.995352852120995     mean_v:0.6009509179089219
iteration:85     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.995352852120995     mean_v:0.6009509179089219
iteration:86     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.995352852120995     mean_v:0.6009509179089219
iteration:87     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.995352852120995     mean_v:0.6009509179089219
iteration:88     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.995352852120995     mean_v:0.6009509179089219
iteration:89     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.995352852120995     mean_v:0.6009509179089219
iteration:90     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:10.995352852120995     mean_v:0.6009509179089219
iteration:91     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.010219582989812     mean_v:0.6007579769287258
iteration:92     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.010219582989812     mean_v:0.6007579769287258
iteration:93     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.010219582989812     mean_v:0.6007579769287258
iteration:94     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.028227417245507     mean_v:0.5974753508809953
iteration:95     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.028227417245507     mean_v:0.5974753508809953
iteration:96     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.028227417245507     mean_v:0.5974753508809953
iteration:97     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.038805398717523     mean_v:0.5971136009413749
iteration:98     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.038805398717523     mean_v:0.5971136009413749
iteration:99     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.038805398717523     mean_v:0.5971136009413749
iteration:100     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.045386026427149     mean_v:0.595088905254379
iteration:101     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.045386026427149     mean_v:0.595088905254379
iteration:102     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.045386026427149     mean_v:0.595088905254379
iteration:103     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.056976702138781     mean_v:0.5948536000866443
iteration:104     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.056976702138781     mean_v:0.5948536000866443
iteration:105     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.056976702138781     mean_v:0.5948536000866443
iteration:106     global m:3.9372956417500973     global v:0.04294851468876004
mean_m:11.056976702138781     mean_v:0.5948536000866443
```

iteration:107   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.06085929326713   mean_v:0.5921097490098327
iteration:108   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.06085929326713   mean_v:0.5921097490098327
iteration:109   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.06085929326713   mean_v:0.5921097490098327
iteration:110   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.06085929326713   mean_v:0.5921097490098327
iteration:111   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.06085929326713   mean_v:0.5921097490098327
iteration:112   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.06085929326713   mean_v:0.5921097490098327
iteration:113   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.06085929326713   mean_v:0.5921097490098327
iteration:114   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.06085929326713   mean_v:0.5921097490098327
iteration:115   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.06085929326713   mean_v:0.5921097490098327
iteration:116   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.08556190289557   mean_v:0.5920702477823943
iteration:117   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.091091364100576   mean_v:0.5913471518177539
iteration:118   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.091091364100576   mean_v:0.5913471518177539
iteration:119   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.104445445388556   mean_v:0.5912490530777723
iteration:120   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.104445445388556   mean_v:0.5912490530777723
iteration:121   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.104445445388556   mean_v:0.5912490530777723
iteration:122   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.115636239796878   mean_v:0.5891102651227266
iteration:123   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.11741248100996   mean_v:0.5883437897544355
iteration:124   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.11741248100996   mean_v:0.5883437897544355
iteration:125   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.11741248100996   mean_v:0.5883437897544355
iteration:126   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.11741248100996   mean_v:0.5883437897544355
iteration:127   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.11741248100996   mean_v:0.5883437897544355
iteration:128   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.11741248100996   mean_v:0.5883437897544355
iteration:129   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.11741248100996   mean_v:0.5883437897544355
iteration:130   global m:3.9372956417500973   global v:0.04294851468876004
mean_m:11.11741248100996   mean_v:0.5883437897544355

```
iteration:131    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.11741248100996      mean_v:0.5883437897544355
iteration:132    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.11741248100996      mean_v:0.5883437897544355
iteration:133    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.11741248100996      mean_v:0.5883437897544355
iteration:134    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.11741248100996      mean_v:0.5883437897544355
iteration:135    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.124360484778881     mean_v:0.5864125870447606
iteration:136    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.124360484778881     mean_v:0.5864125870447606
iteration:137    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.124360484778881     mean_v:0.5864125870447606
iteration:138    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.124360484778881     mean_v:0.5864125870447606
iteration:139    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.124360484778881     mean_v:0.5864125870447606
iteration:140    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.124360484778881     mean_v:0.5864125870447606
iteration:141    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.124360484778881     mean_v:0.5864125870447606
iteration:142    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.127037594467401     mean_v:0.5860536114219577
iteration:143    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.127037594467401     mean_v:0.5860536114219577
iteration:144    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.127227107137442     mean_v:0.5852120738569647
iteration:145    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.127227107137442     mean_v:0.5852120738569647
iteration:146    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.127227107137442     mean_v:0.5852120738569647
iteration:147    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.127227107137442     mean_v:0.5852120738569647
iteration:148    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.127227107137442     mean_v:0.5852120738569647
iteration:149    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.127227107137442     mean_v:0.5852120738569647
iteration:150    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.127227107137442     mean_v:0.5852120738569647
iteration:151    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.127227107137442     mean_v:0.5852120738569647
iteration:152    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015     mean_v:0.5846740287635476
iteration:153    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015     mean_v:0.5846740287635476
iteration:154    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015     mean_v:0.5846740287635476
```

```
iteration:155    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:156    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:157    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:158    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:159    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:160    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:161    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:162    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:163    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:164    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:165    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:166    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:167    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:168    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:169    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:170    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:171    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.148032079190015    mean_v:0.5846740287635476
iteration:172    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.170505138635635    mean_v:0.5840241874475032
iteration:173    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.170505138635635    mean_v:0.5840241874475032
iteration:174    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.170505138635635    mean_v:0.5840241874475032
iteration:175    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.170505138635635    mean_v:0.5840241874475032
iteration:176    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.178755792677402    mean_v:0.576934463204816
iteration:177    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.178755792677402    mean_v:0.576934463204816
iteration:178    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.181840095371008    mean_v:0.5766374307405203
```

17

```
iteration:179    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.182951910495758        mean_v:0.5765325432550162
iteration:180    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.19075832694769        mean_v:0.5739634411688894
iteration:181    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.19075832694769        mean_v:0.5739634411688894
iteration:182    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.19075832694769        mean_v:0.5739634411688894
iteration:183    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.199843448549508        mean_v:0.5724568147864193
iteration:184    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.199843448549508        mean_v:0.5724568147864193
iteration:185    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.208137303739786        mean_v:0.5626816113200038
iteration:186    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.208137303739786        mean_v:0.5626816113200038
iteration:187    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.208524175882339        mean_v:0.5626369981188327
iteration:188    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.208524175882339        mean_v:0.5626369981188327
iteration:189    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.208524175882339        mean_v:0.5626369981188327
iteration:190    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.211863698512316        mean_v:0.5604441750515252
iteration:191    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.211863698512316        mean_v:0.5604441750515252
iteration:192    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.211863698512316        mean_v:0.5604441750515252
iteration:193    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.211863698512316        mean_v:0.5604441750515252
iteration:194    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.211863698512316        mean_v:0.5604441750515252
iteration:195    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.211863698512316        mean_v:0.5604441750515252
iteration:196    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.22697119116783        mean_v:0.5602364954445511
iteration:197    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.22697119116783        mean_v:0.5602364954445511
iteration:198    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.22697119116783        mean_v:0.5602364954445511
iteration:199    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.22697119116783        mean_v:0.5602364954445511
iteration:200    global m:3.9372956417500973    global v:0.04294851468876004
mean_m:11.22697119116783        mean_v:0.5602364954445511
per class sample Feature        |per class sample train_sz      |k_nn   |ELM
|SVM    |BPNN   |
--------------------------------------------------------------------------------
--------------------------
```


10	10	0.7291750503018108	0.2625754527162978	0.787122736418511	0.2074446800804828
10	20	0.796579476861167	0.5193158953722334	0.8488933601609658	0.4187122736418511
10	50	0.8728370221327968	0.8251509054325956	0.9158953722334005	0.2881287726358149
10	100	0.9116700201207244	0.8820925553319919	0.9505030181086519	0.5824949698189135
10	150	0.9380281690140845	0.890543259557344	0.9617706237424547	0.6203219315895372
10	200	0.958148893360161	0.8987927565392354	0.9736418511066398	0.6688128772635815
10	450	0.9967806841046277	0.90261569416499	0.9979879275653923	0.7927565392354124

```
iteration:1     global m:3.5705163404345512     global v:0.24659104458987713
mean_m:7.8598503153026105     mean_v:0.7172182087600231
iteration:2     global m:5.686260238289833     global v:0.24573232047259808
mean_m:7.992382138371467     mean_v:0.6927145984023809
iteration:3     global m:3.695781048387289     global v:0.1888192556798458
mean_m:8.096755984723568     mean_v:0.6844020841270685
iteration:4     global m:3.695781048387289     global v:0.1888192556798458
mean_m:8.096755984723568     mean_v:0.6844020841270685
iteration:5     global m:5.33304437994957     global v:0.11747928522527218
mean_m:8.231247153058648     mean_v:0.672808205075562
iteration:6     global m:5.33304437994957     global v:0.11747928522527218
mean_m:8.322994726821781     mean_v:0.6614690335653722
iteration:7     global m:4.130367338657379     global v:0.062346491031348705
mean_m:8.393319422528148     mean_v:0.6518921290710569
iteration:8     global m:4.130367338657379     global v:0.062346491031348705
mean_m:8.53211022861302     mean_v:0.6322537356987595
iteration:9     global m:4.130367338657379     global v:0.062346491031348705
mean_m:8.782617229670286     mean_v:0.5981117831915617
iteration:10     global m:4.130367338657379     global v:0.062346491031348705
mean_m:8.814594102054834     mean_v:0.596699101421982
iteration:11     global m:4.130367338657379     global v:0.062346491031348705
mean_m:8.819270949289203     mean_v:0.5814000324718654
iteration:12     global m:4.130367338657379     global v:0.062346491031348705
mean_m:8.926738267317415     mean_v:0.5722691843099892
iteration:13     global m:4.130367338657379     global v:0.062346491031348705
mean_m:8.977986637875437     mean_v:0.5681799436546862
iteration:14     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.000895603969694     mean_v:0.5653079662658275
iteration:15     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.044850985407829     mean_v:0.5593499927222729
iteration:16     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.137037549912929     mean_v:0.5578454734757543
```

```
iteration:17    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.137037549912929    mean_v:0.5578454734757543
iteration:18    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.151643194705247    mean_v:0.5568794119358063
iteration:19    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.153524868786334    mean_v:0.5563158078119159
iteration:20    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.179623312950135    mean_v:0.5551654247939587
iteration:21    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.19448366895318    mean_v:0.5504943710193038
iteration:22    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.246060738116503    mean_v:0.5446730099990964
iteration:23    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.246060738116503    mean_v:0.5446730099990964
iteration:24    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.263125940859318    mean_v:0.5429987045750022
iteration:25    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.263125940859318    mean_v:0.5429987045750022
iteration:26    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.279045751541853    mean_v:0.5423242788389325
iteration:27    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.284890886023641    mean_v:0.5413551506213844
iteration:28    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.284890886023641    mean_v:0.5413551506213844
iteration:29    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.284890886023641    mean_v:0.5413551506213844
iteration:30    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.29581083483994    mean_v:0.540866293553263
iteration:31    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.301222407370807    mean_v:0.5372104771621525
iteration:32    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.301222407370807    mean_v:0.5372104771621525
iteration:33    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.301222407370807    mean_v:0.5372104771621525
iteration:34    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.301222407370807    mean_v:0.5372104771621525
iteration:35    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.301222407370807    mean_v:0.5372104771621525
iteration:36    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.301981998682022    mean_v:0.534524569157511
iteration:37    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.301981998682022    mean_v:0.534524569157511
iteration:38    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.310339664816857    mean_v:0.5338758430816233
iteration:39    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.310339664816857    mean_v:0.5338758430816233
iteration:40    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.35233402326703    mean_v:0.5308976922743023
```

```
iteration:41     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.378844697549939     mean_v:0.5295363575778902
iteration:42     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.378844697549939     mean_v:0.5295363575778902
iteration:43     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.378844697549939     mean_v:0.5295363575778902
iteration:44     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.386436192169786     mean_v:0.5282943243347108
iteration:45     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.41257846929133     mean_v:0.5229649265669286
iteration:46     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.436210177317262     mean_v:0.5183943428657949
iteration:47     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.436210177317262     mean_v:0.5183943428657949
iteration:48     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.436210177317262     mean_v:0.5183943428657949
iteration:49     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.436210177317262     mean_v:0.5183943428657949
iteration:50     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.436210177317262     mean_v:0.5183943428657949
iteration:51     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.436210177317262     mean_v:0.5183943428657949
iteration:52     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.436210177317262     mean_v:0.5183943428657949
iteration:53     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
iteration:54     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
iteration:55     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
iteration:56     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
iteration:57     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
iteration:58     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
iteration:59     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
iteration:60     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
iteration:61     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
iteration:62     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
iteration:63     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
iteration:64     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122     mean_v:0.5173719701729715
```

```
iteration:65    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122      mean_v:0.5173719701729715
iteration:66    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122      mean_v:0.5173719701729715
iteration:67    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122      mean_v:0.5173719701729715
iteration:68    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.438838424757122      mean_v:0.5173719701729715
iteration:69    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.43987865075469      mean_v:0.5166993429325522
iteration:70    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.43987865075469      mean_v:0.5166993429325522
iteration:71    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.43987865075469      mean_v:0.5166993429325522
iteration:72    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.43987865075469      mean_v:0.5166993429325522
iteration:73    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.43987865075469      mean_v:0.5166993429325522
iteration:74    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.445112734586    mean_v:0.5155377432890237
iteration:75    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.445112734586    mean_v:0.5155377432890237
iteration:76    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.445112734586    mean_v:0.5155377432890237
iteration:77    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.447885324656964      mean_v:0.514514831174165
iteration:78    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.447885324656964      mean_v:0.514514831174165
iteration:79    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.462020575851202      mean_v:0.513069333229214
iteration:80    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633      mean_v:0.512724488787353
iteration:81    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633      mean_v:0.512724488787353
iteration:82    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633      mean_v:0.512724488787353
iteration:83    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633      mean_v:0.512724488787353
iteration:84    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633      mean_v:0.512724488787353
iteration:85    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633      mean_v:0.512724488787353
iteration:86    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633      mean_v:0.512724488787353
iteration:87    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633      mean_v:0.512724488787353
iteration:88    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633      mean_v:0.512724488787353
```

```
iteration:89     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633     mean_v:0.512724488787353
iteration:90     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633     mean_v:0.512724488787353
iteration:91     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633     mean_v:0.512724488787353
iteration:92     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.481397416442633     mean_v:0.512724488787353
iteration:93     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.499413823783398     mean_v:0.5127139218896627
iteration:94     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.499413823783398     mean_v:0.5127139218896627
iteration:95     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.499413823783398     mean_v:0.5127139218896627
iteration:96     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.499413823783398     mean_v:0.5127139218896627
iteration:97     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.499413823783398     mean_v:0.5127139218896627
iteration:98     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523351712673902     mean_v:0.5124847000837326
iteration:99     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523351712673902     mean_v:0.5124847000837326
iteration:100     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523608473837376     mean_v:0.511683624945581
iteration:101     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523608473837376     mean_v:0.511683624945581
iteration:102     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523608473837376     mean_v:0.511683624945581
iteration:103     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523608473837376     mean_v:0.511683624945581
iteration:104     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523608473837376     mean_v:0.511683624945581
iteration:105     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523608473837376     mean_v:0.511683624945581
iteration:106     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523608473837376     mean_v:0.511683624945581
iteration:107     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523608473837376     mean_v:0.511683624945581
iteration:108     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523608473837376     mean_v:0.511683624945581
iteration:109     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523608473837376     mean_v:0.511683624945581
iteration:110     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.523608473837376     mean_v:0.511683624945581
iteration:111     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.547967287153005     mean_v:0.5115889602527023
iteration:112     global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.547967287153005     mean_v:0.5115889602527023
```

```
iteration:113    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.547967287153005    mean_v:0.5115889602527023
iteration:114    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.547967287153005    mean_v:0.5115889602527023
iteration:115    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.547967287153005    mean_v:0.5115889602527023
iteration:116    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.551445137411356    mean_v:0.510992427393794
iteration:117    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.551445137411356    mean_v:0.510992427393794
iteration:118    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.551445137411356    mean_v:0.510992427393794
iteration:119    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.551445137411356    mean_v:0.510992427393794
iteration:120    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.551445137411356    mean_v:0.510992427393794
iteration:121    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.556468232125043    mean_v:0.5108139300718904
iteration:122    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.556468232125043    mean_v:0.5108139300718904
iteration:123    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.556468232125043    mean_v:0.5108139300718904
iteration:124    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.556468232125043    mean_v:0.5108139300718904
iteration:125    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.556468232125043    mean_v:0.5108139300718904
iteration:126    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.556468232125043    mean_v:0.5108139300718904
iteration:127    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.573328607082367    mean_v:0.5092990786954761
iteration:128    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.573640293702484    mean_v:0.5089001119975001
iteration:129    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.573640293702484    mean_v:0.5089001119975001
iteration:130    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.573640293702484    mean_v:0.5089001119975001
iteration:131    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.573640293702484    mean_v:0.5089001119975001
iteration:132    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.573640293702484    mean_v:0.5089001119975001
iteration:133    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.573640293702484    mean_v:0.5089001119975001
iteration:134    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.573640293702484    mean_v:0.5089001119975001
iteration:135    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.573640293702484    mean_v:0.5089001119975001
iteration:136    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.573640293702484    mean_v:0.5089001119975001
```

```
iteration:137    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.573640293702484      mean_v:0.5089001119975001
iteration:138    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.573640293702484      mean_v:0.5089001119975001
iteration:139    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.573640293702484      mean_v:0.5089001119975001
iteration:140    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.573640293702484      mean_v:0.5089001119975001
iteration:141    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.573640293702484      mean_v:0.5089001119975001
iteration:142    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.573640293702484      mean_v:0.5089001119975001
iteration:143    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:144    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:145    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:146    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:147    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:148    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:149    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:150    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:151    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:152    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:153    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:154    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:155    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:156    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:157    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.61604962170124      mean_v:0.5086849586199969
iteration:158    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.620707642883062      mean_v:0.5080644087027758
iteration:159    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.620707642883062      mean_v:0.5080644087027758
iteration:160    global m:4.130367338657379      global v:0.062346491031348705
mean_m:9.620707642883062      mean_v:0.5080644087027758
```

```
iteration:161    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.620707642883062     mean_v:0.5080644087027758
iteration:162    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.620707642883062     mean_v:0.5080644087027758
iteration:163    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.620707642883062     mean_v:0.5080644087027758
iteration:164    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.620707642883062     mean_v:0.5080644087027758
iteration:165    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.620707642883062     mean_v:0.5080644087027758
iteration:166    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.620707642883062     mean_v:0.5080644087027758
iteration:167    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:168    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:169    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:170    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:171    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:172    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:173    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:174    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:175    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:176    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:177    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:178    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:179    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:180    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:181    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:182    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:183    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
iteration:184    global m:4.130367338657379     global v:0.062346491031348705
mean_m:9.672254797667264     mean_v:0.506386304339394
```

```
iteration:185    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.672254797667264    mean_v:0.506386304339394
iteration:186    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.672254797667264    mean_v:0.506386304339394
iteration:187    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.672254797667264    mean_v:0.506386304339394
iteration:188    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.672254797667264    mean_v:0.506386304339394
iteration:189    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.672254797667264    mean_v:0.506386304339394
iteration:190    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.672254797667264    mean_v:0.506386304339394
iteration:191    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.672254797667264    mean_v:0.506386304339394
iteration:192    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.672254797667264    mean_v:0.506386304339394
iteration:193    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.672254797667264    mean_v:0.506386304339394
iteration:194    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.674844133406877    mean_v:0.506307725450024
iteration:195    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.674844133406877    mean_v:0.506307725450024
iteration:196    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.68656939357519    mean_v:0.506165162390098
iteration:197    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.68656939357519    mean_v:0.506165162390098
iteration:198    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.68656939357519    mean_v:0.506165162390098
iteration:199    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.68656939357519    mean_v:0.506165162390098
iteration:200    global m:4.130367338657379    global v:0.062346491031348705
mean_m:9.687448765337468    mean_v:0.5055129271838814
per class sample Feature        |per class sample train_sz      |k_nn    |ELM
|SVM    |BPNN    |
--------------------------------------------------------------------------------
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--------------------------------------------------------------------------------
---------------------------
20                      |10                     |0.64466800804829
|0.3243460764587525     |0.6633802816901408     |0.45814889336016096    |
20                      |20                     |0.7024144869215292
|0.4529175050301811     |0.7585513078470825     |0.20945674044265594    |
20                      |50                     |0.8034205231388329
|0.7907444668008048     |0.8501006036217303     |0.33782696177062377    |
20                      |100                    |0.8647887323943662
|0.8444668008048289     |0.8971830985915493     |0.547887323943662      |
20                      |150                    |0.9022132796780684
|0.8627766599597585     |0.9352112676056338     |0.6148893360160966     |
```

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20	|200	|0.9219315895372233
|0.8700201207243461	|0.9478873239436619	|0.5070422535211268	
20	|450	|0.9925553319919517
|0.8796780684104628	|0.9947686116700202	|0.704225352112676	

iteration:1   global m:2.375043746083975   global v:0.15941300801932812
mean_m:7.756527415961028   mean_v:0.8932415613159538
iteration:2   global m:2.375043746083975   global v:0.15941300801932812
mean_m:7.850425827279687   mean_v:0.8764643043279647
iteration:3   global m:2.375043746083975   global v:0.15941300801932812
mean_m:7.859329180121422   mean_v:0.8744506052136422
iteration:4   global m:7.568158715963364   global v:0.22735262382775545
mean_m:7.976159382164479   mean_v:0.8611600031889975
iteration:5   global m:7.568158715963364   global v:0.22735262382775545
mean_m:7.997947186529636   mean_v:0.8506168723292649
iteration:6   global m:4.663048129528761   global v:0.13005091436207294
mean_m:8.136260507032276   mean_v:0.8450615833885968
iteration:7   global m:4.663048129528761   global v:0.13005091436207294
mean_m:8.1848036146909 mean_v:0.8363831769116223
iteration:8   global m:4.663048129528761   global v:0.13005091436207294
mean_m:8.263835734203457   mean_v:0.8348606481403112
iteration:9   global m:4.663048129528761   global v:0.13005091436207294
mean_m:8.329900708794593   mean_v:0.8016494419053197
iteration:10   global m:4.663048129528761   global v:0.13005091436207294
mean_m:8.373651429191233   mean_v:0.7970368145033717
iteration:11   global m:4.663048129528761   global v:0.13005091436207294
mean_m:8.387471099719406   mean_v:0.7943454910628498
iteration:12   global m:4.663048129528761   global v:0.13005091436207294
mean_m:8.393734796270728   mean_v:0.7902282431535422
iteration:13   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:8.424048100709916   mean_v:0.7881986675038933
iteration:14   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:8.46546348825097   mean_v:0.7861589872837067
iteration:15   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:8.535500266626478   mean_v:0.7778564796596765
iteration:16   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:8.553303792104124   mean_v:0.7766734416037798
iteration:17   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:8.606345939300954   mean_v:0.7747007298935205
iteration:18   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:8.67400070618838   mean_v:0.7692328580189496
iteration:19   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:8.67400070618838   mean_v:0.7692328580189496
iteration:20   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:8.691787095330655   mean_v:0.7652776374761016
iteration:21   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:8.691787095330655   mean_v:0.7652776374761016
iteration:22   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:8.811185661293566   mean_v:0.7646501761768013

```
iteration:23    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:8.83199763033539         mean_v:0.7581759354192763
iteration:24    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:8.908867909796536        mean_v:0.7495951650012285
iteration:25    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:8.908867909796536        mean_v:0.7495951650012285
iteration:26    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:8.951404270268977        mean_v:0.7493521495629102
iteration:27    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.021464533247054        mean_v:0.7476127285230905
iteration:28    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.021464533247054        mean_v:0.7476127285230905
iteration:29    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.025360580421983        mean_v:0.7454260003287345
iteration:30    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.025360580421983        mean_v:0.7454260003287345
iteration:31    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.025360580421983        mean_v:0.7454260003287345
iteration:32    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.025360580421983        mean_v:0.7454260003287345
iteration:33    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.04469695519656         mean_v:0.7445935521740467
iteration:34    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.050893319360911        mean_v:0.74390833244659
iteration:35    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.132956393174828        mean_v:0.7411355082783848
iteration:36    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.145524014793336        mean_v:0.7409757390711457
iteration:37    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.19011018332094         mean_v:0.7243560369405896
iteration:38    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.19011018332094         mean_v:0.7243560369405896
iteration:39    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.236216723434627        mean_v:0.7187205676082522
iteration:40    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.300806291662157        mean_v:0.7177294213417917
iteration:41    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.306350960098207        mean_v:0.7156108895037323
iteration:42    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.319037487469613        mean_v:0.7111408503446728
iteration:43    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.394433238916099        mean_v:0.710286583872512
iteration:44    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.394433238916099        mean_v:0.710286583872512
iteration:45    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.394433238916099        mean_v:0.710286583872512
iteration:46    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.394433238916099        mean_v:0.710286583872512
```

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iteration:47     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.394433238916099     mean_v:0.710286583872512
iteration:48     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.394433238916099     mean_v:0.710286583872512
iteration:49     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.479714668653905     mean_v:0.7064210173953325
iteration:50     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.573339794389904     mean_v:0.7035811517108231
iteration:51     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.573339794389904     mean_v:0.7035811517108231
iteration:52     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.60727164890617     mean_v:0.6982547608483582
iteration:53     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.60727164890617     mean_v:0.6982547608483582
iteration:54     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.60727164890617     mean_v:0.6982547608483582
iteration:55     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.60727164890617     mean_v:0.6982547608483582
iteration:56     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.60727164890617     mean_v:0.6982547608483582
iteration:57     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.60727164890617     mean_v:0.6982547608483582
iteration:58     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.60727164890617     mean_v:0.6982547608483582
iteration:59     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.632004336677491     mean_v:0.6942218964267522
iteration:60     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.636312006823719     mean_v:0.6915569219458848
iteration:61     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.647386081479489     mean_v:0.6909108931291849
iteration:62     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.673678679428996     mean_v:0.6905562977213413
iteration:63     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.673678679428996     mean_v:0.6905562977213413
iteration:64     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.673678679428996     mean_v:0.6905562977213413
iteration:65     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.673678679428996     mean_v:0.6905562977213413
iteration:66     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.673678679428996     mean_v:0.6905562977213413
iteration:67     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.70642161037773     mean_v:0.6902096715290099
iteration:68     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.70642161037773     mean_v:0.6902096715290099
iteration:69     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.711771961413325     mean_v:0.6897614766377955
iteration:70     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.711771961413325     mean_v:0.6897614766377955
```

```
iteration:71    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.711771961413325      mean_v:0.6897614766377955
iteration:72    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.780405149422586      mean_v:0.6877186421770602
iteration:73    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.789172736369073      mean_v:0.6826590227056295
iteration:74    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:75    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:76    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:77    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:78    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:79    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:80    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:81    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:82    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:83    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:84    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:85    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:86    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:87    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:88    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:89    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:90    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:91    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:92    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:93    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
iteration:94    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.797170370854438      mean_v:0.6825045770127326
```

```
iteration:95     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.801642407551407     mean_v:0.6824878392089159
iteration:96     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.801642407551407     mean_v:0.6824878392089159
iteration:97     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.801642407551407     mean_v:0.6824878392089159
iteration:98     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.836768854483962     mean_v:0.6749559472780675
iteration:99     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.836768854483962     mean_v:0.6749559472780675
iteration:100     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.836768854483962     mean_v:0.6749559472780675
iteration:101     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.836768854483962     mean_v:0.6749559472780675
iteration:102     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.836768854483962     mean_v:0.6749559472780675
iteration:103     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.836768854483962     mean_v:0.6749559472780675
iteration:104     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.836768854483962     mean_v:0.6749559472780675
iteration:105     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.836768854483962     mean_v:0.6749559472780675
iteration:106     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.836768854483962     mean_v:0.6749559472780675
iteration:107     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.836768854483962     mean_v:0.6749559472780675
iteration:108     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.836768854483962     mean_v:0.6749559472780675
iteration:109     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.853667907714843     mean_v:0.6724980586674064
iteration:110     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.853667907714843     mean_v:0.6724980586674064
iteration:111     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.853667907714843     mean_v:0.6724980586674064
iteration:112     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.853667907714843     mean_v:0.6724980586674064
iteration:113     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.853667907714843     mean_v:0.6724980586674064
iteration:114     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.853667907714843     mean_v:0.6724980586674064
iteration:115     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.853667907714843     mean_v:0.6724980586674064
iteration:116     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.853667907714843     mean_v:0.6724980586674064
iteration:117     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.853667907714843     mean_v:0.6724980586674064
iteration:118     global m:3.2475494258105755     global v:0.07128899823874235
mean_m:9.853667907714843     mean_v:0.6724980586674064
```

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iteration:119    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.853667907714843        mean_v:0.6724980586674064
iteration:120    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:121    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:122    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:123    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:124    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:125    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:126    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:127    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:128    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:129    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:130    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:131    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:132    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:133    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:134    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:135    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.86294348552823        mean_v:0.6708312079962343
iteration:136    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.87044553399086        mean_v:0.6697222696896642
iteration:137    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.87044553399086        mean_v:0.6697222696896642
iteration:138    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.87044553399086        mean_v:0.6697222696896642
iteration:139    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.87044553399086        mean_v:0.6697222696896642
iteration:140    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.87044553399086        mean_v:0.6697222696896642
iteration:141    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664        mean_v:0.669233008241281
iteration:142    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664        mean_v:0.669233008241281
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iteration:143    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664     mean_v:0.669233008241281
iteration:144    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664     mean_v:0.669233008241281
iteration:145    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664     mean_v:0.669233008241281
iteration:146    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664     mean_v:0.669233008241281
iteration:147    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664     mean_v:0.669233008241281
iteration:148    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664     mean_v:0.669233008241281
iteration:149    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664     mean_v:0.669233008241281
iteration:150    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664     mean_v:0.669233008241281
iteration:151    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664     mean_v:0.669233008241281
iteration:152    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664     mean_v:0.669233008241281
iteration:153    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.900596994906664     mean_v:0.669233008241281
iteration:154    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.903423603475094     mean_v:0.6636919724103063
iteration:155    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.90871804445982     mean_v:0.6596961023565382
iteration:156    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.90871804445982     mean_v:0.6596961023565382
iteration:157    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.911085187569261     mean_v:0.6579519421141594
iteration:158    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.911085187569261     mean_v:0.6579519421141594
iteration:159    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.911085187569261     mean_v:0.6579519421141594
iteration:160    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.911085187569261     mean_v:0.6579519421141594
iteration:161    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.911085187569261     mean_v:0.6579519421141594
iteration:162    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.911085187569261     mean_v:0.6579519421141594
iteration:163    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.911085187569261     mean_v:0.6579519421141594
iteration:164    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.911085187569261     mean_v:0.6579519421141594
iteration:165    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.911085187569261     mean_v:0.6579519421141594
iteration:166    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.91430705241859     mean_v:0.6577660309057682
```

```
iteration:167    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:168    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:169    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:170    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:171    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:172    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:173    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:174    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:175    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:176    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:177    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:178    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:179    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:180    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.920904719606042      mean_v:0.6576725085359066
iteration:181    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.936203707233071      mean_v:0.6536946096736937
iteration:182    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.936203707233071      mean_v:0.6536946096736937
iteration:183    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.940320312455297      mean_v:0.6534585851896554
iteration:184    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.942902359887958      mean_v:0.653221781225875
iteration:185    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.942902359887958      mean_v:0.653221781225875
iteration:186    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.942902359887958      mean_v:0.653221781225875
iteration:187    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.942902359887958      mean_v:0.653221781225875
iteration:188    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.942902359887958      mean_v:0.653221781225875
iteration:189    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.942902359887958      mean_v:0.653221781225875
iteration:190    global m:3.2475494258105755    global v:0.07128899823874235
mean_m:9.942902359887958      mean_v:0.653221781225875
```

iteration:191   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:9.942902359887958   mean_v:0.653221781225875
iteration:192   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:9.942902359887958   mean_v:0.653221781225875
iteration:193   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:9.942902359887958   mean_v:0.653221781225875
iteration:194   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:9.942902359887958   mean_v:0.653221781225875
iteration:195   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:9.942902359887958   mean_v:0.653221781225875
iteration:196   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:9.942902359887958   mean_v:0.653221781225875
iteration:197   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:9.942902359887958   mean_v:0.653221781225875
iteration:198   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:9.942902359887958   mean_v:0.653221781225875
iteration:199   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:9.95605816461146   mean_v:0.6504864818323404
iteration:200   global m:3.2475494258105755   global v:0.07128899823874235
mean_m:9.95605816461146   mean_v:0.6504864818323404

per class sample Feature	per class sample train_sz	k_nn	ELM	SVM	BPNN
50	10	0.7070422535211267	0.22032193158953722	0.737625754527163	0.5953722334004025
50	20	0.7561368209255533	0.41770623742454727	0.8006036217303822	0.6959758551307847
50	50	0.827364185110664	0.7995975855130785	0.86841046277666	0.596579476861167
50	100	0.886317907444668	0.8380281690140845	0.9167002012072435	0.706841046277666
50	150	0.9138832997987928	0.8637826961770624	0.9370221327967807	0.7319919517102615
50	200	0.9356136820925554	0.8665995975855131	0.9533199195171026	0.654728370221328
50	450	0.9925553319919517	0.8814889336016096	0.9961770623742455	0.7507042253521127

iteration:1   global m:3.8602282218635082   global v:0.1972540095448494
mean_m:6.750510713383555   mean_v:0.7337598807550967
iteration:2   global m:3.8602282218635082   global v:0.1972540095448494
mean_m:6.843226542584598   mean_v:0.7282851026766002
iteration:3   global m:3.8602282218635082   global v:0.1972540095448494
mean_m:7.017790062092245   mean_v:0.6976119173876941
iteration:4   global m:4.333719447255135   global v:0.0820649997331202
mean_m:7.055454281792045   mean_v:0.6893055202951655

```
iteration:5      global m:4.333719447255135      global v:0.0820649997331202
mean_m:7.180519170835614      mean_v:0.6747439379757271
iteration:6      global m:4.333719447255135      global v:0.0820649997331202
mean_m:7.2424715752154585      mean_v:0.6660996700963006
iteration:7      global m:4.333719447255135      global v:0.0820649997331202
mean_m:7.355976737290621      mean_v:0.6591033717012033
iteration:8      global m:3.163245813921094      global v:0.056309419916942716
mean_m:7.560371659211814      mean_v:0.645164154577069
iteration:9      global m:3.163245813921094      global v:0.056309419916942716
mean_m:7.630502577163279      mean_v:0.6355932835163549
iteration:10      global m:3.163245813921094      global v:0.056309419916942716
mean_m:7.660495688654482      mean_v:0.634565346208401
iteration:11      global m:5.1329626347869635      global v:0.07799674244597554
mean_m:7.727071895673871      mean_v:0.6205863531981595
iteration:12      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:7.866355826668442      mean_v:0.586556981203612
iteration:13      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.000824586041272      mean_v:0.5672768166079186
iteration:14      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.074051610045135      mean_v:0.548537596713286
iteration:15      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.207997491471469      mean_v:0.5326394567661918
iteration:16      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.33292860712856      mean_v:0.5254860134073533
iteration:17      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.343887144364416      mean_v:0.525083574356977
iteration:18      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.39375691074878      mean_v:0.5236695634596981
iteration:19      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.429515500962735      mean_v:0.5201946313329973
iteration:20      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.456794194802642      mean_v:0.5177913043485023
iteration:21      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.459625426605344      mean_v:0.5065497510717251
iteration:22      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.459625426605344      mean_v:0.5065497510717251
iteration:23      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.46372979722917      mean_v:0.5052421094686724
iteration:24      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.47572359211743      mean_v:0.5027719160006382
iteration:25      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.478451874777674      mean_v:0.5023553972342052
iteration:26      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.478451874777674      mean_v:0.5023553972342052
iteration:27      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.485971782505512      mean_v:0.5008074555941857
iteration:28      global m:3.2431439850479364      global v:0.03727586264722049
mean_m:8.485971782505512      mean_v:0.5008074555941857
```

```
iteration:29     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.485971782505512      mean_v:0.5008074555941857
iteration:30     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.485971782505512      mean_v:0.5008074555941857
iteration:31     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.485971782505512      mean_v:0.5008074555941857
iteration:32     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.485971782505512      mean_v:0.5008074555941857
iteration:33     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.485971782505512      mean_v:0.5008074555941857
iteration:34     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.485971782505512      mean_v:0.5008074555941857
iteration:35     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.485971782505512      mean_v:0.5008074555941857
iteration:36     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.485971782505512      mean_v:0.5008074555941857
iteration:37     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.48906506061554      mean_v:0.5006347456597723
iteration:38     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.54103370770812      mean_v:0.49743407825240865
iteration:39     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.54103370770812      mean_v:0.49743407825240865
iteration:40     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.608200465217232      mean_v:0.4947944071725942
iteration:41     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.608200465217232      mean_v:0.4947944071725942
iteration:42     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.62307296551764      mean_v:0.49098836614051833
iteration:43     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.632687813416123      mean_v:0.48719165379414336
iteration:44     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.632687813416123      mean_v:0.48719165379414336
iteration:45     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.68386467538774      mean_v:0.48207839047303425
iteration:46     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.68386467538774      mean_v:0.48207839047303425
iteration:47     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.748218265399338      mean_v:0.4790217443346046
iteration:48     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.748218265399338      mean_v:0.4790217443346046
iteration:49     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.748218265399338      mean_v:0.4790217443346046
iteration:50     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.748218265399338      mean_v:0.4790217443346046
iteration:51     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.748218265399338      mean_v:0.4790217443346046
iteration:52     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.761181310340762      mean_v:0.47838397046318276
```

```
iteration:53    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.761181310340762    mean_v:0.47838397046318276
iteration:54    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.761181310340762    mean_v:0.47838397046318276
iteration:55    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.761181310340762    mean_v:0.47838397046318276
iteration:56    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.780514376834034    mean_v:0.4769043789035641
iteration:57    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.780514376834034    mean_v:0.4769043789035641
iteration:58    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.780514376834034    mean_v:0.4769043789035641
iteration:59    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.780514376834034    mean_v:0.4769043789035641
iteration:60    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.780514376834034    mean_v:0.4769043789035641
iteration:61    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.78657981224358    mean_v:0.4767575502372347
iteration:62    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.78657981224358    mean_v:0.4767575502372347
iteration:63    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.78657981224358    mean_v:0.4767575502372347
iteration:64    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.78657981224358    mean_v:0.4767575502372347
iteration:65    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.78657981224358    mean_v:0.4767575502372347
iteration:66    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.78657981224358    mean_v:0.4767575502372347
iteration:67    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.78657981224358    mean_v:0.4767575502372347
iteration:68    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.78657981224358    mean_v:0.4767575502372347
iteration:69    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.796450635269284    mean_v:0.475967926455196
iteration:70    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.796450635269284    mean_v:0.475967926455196
iteration:71    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.852850387394428    mean_v:0.47342600267147644
iteration:72    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.852850387394428    mean_v:0.47342600267147644
iteration:73    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.859091312512755    mean_v:0.4723600165110453
iteration:74    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.859091312512755    mean_v:0.4723600165110453
iteration:75    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.859091312512755    mean_v:0.4723600165110453
iteration:76    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:8.859091312512755    mean_v:0.4723600165110453
```

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iteration:77     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.859091312512755       mean_v:0.47236000165110453
iteration:78     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.867437889799476       mean_v:0.472343683463987
iteration:79     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.867437889799476       mean_v:0.472343683463987
iteration:80     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.922327875494958       mean_v:0.47168120519956575
iteration:81     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.922327875494958       mean_v:0.47168120519956575
iteration:82     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.927834619581699       mean_v:0.47165563904447483
iteration:83     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.927834619581699       mean_v:0.47165563904447483
iteration:84     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.927834619581699       mean_v:0.47165563904447483
iteration:85     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.927834619581699       mean_v:0.47165563904447483
iteration:86     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.927834619581699       mean_v:0.47165563904447483
iteration:87     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.927834619581699       mean_v:0.47165563904447483
iteration:88     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.927834619581699       mean_v:0.47165563904447483
iteration:89     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.927834619581699       mean_v:0.47165563904447483
iteration:90     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.927834619581699       mean_v:0.47165563904447483
iteration:91     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.927834619581699       mean_v:0.47165563904447483
iteration:92     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.927834619581699       mean_v:0.47165563904447483
iteration:93     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.960537207424641       mean_v:0.46956114765955137
iteration:94     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.960537207424641       mean_v:0.46956114765955137
iteration:95     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.960537207424641       mean_v:0.46956114765955137
iteration:96     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.960537207424641       mean_v:0.46956114765955137
iteration:97     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.975730124637485       mean_v:0.46782809315947815
iteration:98     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.975730124637485       mean_v:0.46782809315947815
iteration:99     global m:3.2431439850479364     global v:0.03727586264722049
mean_m:8.980678966119886       mean_v:0.4677542693424039
iteration:100    global m:3.2431439850479364     global v:0.03727586264722049
mean_m:9.013435753211379       mean_v:0.4674222849565558
```

```
iteration:101    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:102    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:103    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:104    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:105    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:106    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:107    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:108    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:109    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:110    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:111    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:112    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.013435753211379     mean_v:0.4674222849565558
iteration:113    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.080638987496496     mean_v:0.4615089086326771
iteration:114    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.080638987496496     mean_v:0.4615089086326771
iteration:115    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.080638987496496     mean_v:0.4615089086326771
iteration:116    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.080638987496496     mean_v:0.4615089086326771
iteration:117    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.080638987496496     mean_v:0.4615089086326771
iteration:118    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.080638987496496     mean_v:0.4615089086326771
iteration:119    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.080638987496496     mean_v:0.4615089086326771
iteration:120    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.080638987496496     mean_v:0.4615089086326771
iteration:121    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.084190011993051     mean_v:0.4614224261394702
iteration:122    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.084190011993051     mean_v:0.4614224261394702
iteration:123    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.140802738144993     mean_v:0.45408448099857196
iteration:124    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.140802738144993     mean_v:0.45408448099857196
```

```
iteration:125    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.140802738144993       mean_v:0.45408448099857196
iteration:126    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:127    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:128    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:129    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:130    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:131    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:132    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:133    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:134    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:135    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:136    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:137    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:138    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:139    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:140    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:141    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:142    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:143    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:144    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:145    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:146    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:147    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
iteration:148    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586       mean_v:0.45344942319905385
```

```
iteration:149    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586    mean_v:0.45344942319905385
iteration:150    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586    mean_v:0.45344942319905385
iteration:151    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586    mean_v:0.45344942319905385
iteration:152    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586    mean_v:0.45344942319905385
iteration:153    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586    mean_v:0.45344942319905385
iteration:154    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586    mean_v:0.45344942319905385
iteration:155    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.161667985245586    mean_v:0.45344942319905385
iteration:156    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.168636424690485    mean_v:0.45153992414241656
iteration:157    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.169863458424807    mean_v:0.4514711707807146
iteration:158    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.169863458424807    mean_v:0.4514711707807146
iteration:159    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:160    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:161    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:162    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:163    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:164    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:165    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:166    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:167    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:168    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:169    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:170    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:171    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
iteration:172    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649    mean_v:0.451060445883777
```

```
iteration:173    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649       mean_v:0.451060445883777
iteration:174    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649       mean_v:0.451060445883777
iteration:175    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649       mean_v:0.451060445883777
iteration:176    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649       mean_v:0.451060445883777
iteration:177    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649       mean_v:0.451060445883777
iteration:178    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649       mean_v:0.451060445883777
iteration:179    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649       mean_v:0.451060445883777
iteration:180    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649       mean_v:0.451060445883777
iteration:181    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649       mean_v:0.451060445883777
iteration:182    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170090195983649       mean_v:0.451060445883777
iteration:183    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170954148620368       mean_v:0.45069210132351145
iteration:184    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170954148620368       mean_v:0.45069210132351145
iteration:185    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170954148620368       mean_v:0.45069210132351145
iteration:186    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170954148620368       mean_v:0.45069210132351145
iteration:187    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170954148620368       mean_v:0.45069210132351145
iteration:188    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170954148620368       mean_v:0.45069210132351145
iteration:189    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.170954148620368       mean_v:0.45069210132351145
iteration:190    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.171060630381108       mean_v:0.4506129750586115
iteration:191    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.171060630381108       mean_v:0.4506129750586115
iteration:192    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.171060630381108       mean_v:0.4506129750586115
iteration:193    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.171060630381108       mean_v:0.4506129750586115
iteration:194    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.171060630381108       mean_v:0.4506129750586115
iteration:195    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.171060630381108       mean_v:0.4506129750586115
iteration:196    global m:3.2431439850479364    global v:0.03727586264722049
mean_m:9.171060630381108       mean_v:0.4506129750586115
```

iteration:197   global m:3.2431439850479364   global v:0.03727586264722049
mean_m:9.171060630381108   mean_v:0.4506129750586115
iteration:198   global m:3.2431439850479364   global v:0.03727586264722049
mean_m:9.171060630381108   mean_v:0.4506129750586115
iteration:199   global m:3.2431439850479364   global v:0.03727586264722049
mean_m:9.171060630381108   mean_v:0.4506129750586115
iteration:200   global m:3.2431439850479364   global v:0.03727586264722049
mean_m:9.171060630381108   mean_v:0.4506129750586115

per class sample Feature	per class sample train_sz	k_nn	ELM	SVM	BPNN
100	10	0.63420523138833	0.40925553319919517	0.6909456740442655	0.6935613682092555
100	20	0.6959758551307847	0.17283702213279678	0.7267605633802817	0.7269617706237425
100	50	0.7712273641851106	0.7663983903420523	0.8162977867203219	0.8217303822937626
100	100	0.8450704225352113	0.8422535211267606	0.8907444668008049	0.8583501006036217
100	150	0.8849094567404426	0.8472837022132796	0.9193158953722333	0.8700201207243461
100	200	0.9036217303822938	0.8603621730382294	0.9364185110663984	0.8796780684104628
100	450	0.9923541247484909	0.882897384305835	0.9949698189134809	0.8945674044265594

iteration:1   global m:1.9210905153304338   global v:0.21767006069421768
mean_m:7.712399627678097   mean_v:1.0165892974287272
iteration:2   global m:5.312853164970875   global v:0.10126627516001463
mean_m:7.807876139841974   mean_v:0.9742835509963333
iteration:3   global m:5.312853164970875   global v:0.10126627516001463
mean_m:7.922726924978196   mean_v:0.947763582393527
iteration:4   global m:5.312853164970875   global v:0.10126627516001463
mean_m:8.008616419546307   mean_v:0.9423521123081445
iteration:5   global m:5.312853164970875   global v:0.10126627516001463
mean_m:8.066621528975666   mean_v:0.9120688173919916
iteration:6   global m:5.312853164970875   global v:0.10126627516001463
mean_m:8.27624116782099   mean_v:0.8668597956746816
iteration:7   global m:5.312853164970875   global v:0.10126627516001463
mean_m:8.315379097275436   mean_v:0.8528331873193383
iteration:8   global m:5.312853164970875   global v:0.10126627516001463
mean_m:8.366631913743912   mean_v:0.8174621487036348
iteration:9   global m:5.312853164970875   global v:0.10126627516001463
mean_m:8.572104605026544   mean_v:0.7955385181307792
iteration:10   global m:5.312853164970875   global v:0.10126627516001463
mean_m:8.804451974220575   mean_v:0.7738755745440722

iteration:11   global m:5.312853164970875   global v:0.10126627516001463
mean_m:8.924559446759522   mean_v:0.7506612521037459
iteration:12   global m:5.312853164970875   global v:0.10126627516001463
mean_m:8.953649688251316   mean_v:0.7358490647003054
iteration:13   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.12504012759775   mean_v:0.7150785525515676
iteration:14   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.131802640967072   mean_v:0.7149878786131739
iteration:15   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.172802140824496   mean_v:0.7134086572006345
iteration:16   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.193434291966259   mean_v:0.7087412248179317
iteration:17   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.221950347311795   mean_v:0.6950716680288315
iteration:18   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.235271759517492   mean_v:0.6949544085562229
iteration:19   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.235271759517492   mean_v:0.6949544085562229
iteration:20   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.270282261408866   mean_v:0.6937735974043607
iteration:21   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.285013213790954   mean_v:0.6903952927142382
iteration:22   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.285013213790954   mean_v:0.6903952927142382
iteration:23   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.356009000279009   mean_v:0.6859268956631422
iteration:24   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.360816626138986   mean_v:0.6817985774576664
iteration:25   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.401994496174156   mean_v:0.6814244870096445
iteration:26   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.472483294568956   mean_v:0.6791818932816386
iteration:27   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.488446817062796   mean_v:0.6790585729852319
iteration:28   global m:5.312853164970875   global v:0.10126627516001463
mean_m:9.488446817062796   mean_v:0.6790585729852319
iteration:29   global m:3.1985440775752068   global v:0.045073246816173196
mean_m:9.502780782096089   mean_v:0.6772043686779216
iteration:30   global m:3.1985440775752068   global v:0.045073246816173196
mean_m:9.563153192661703   mean_v:0.6699031851114705
iteration:31   global m:3.1985440775752068   global v:0.045073246816173196
mean_m:9.56586829405278   mean_v:0.6687533325562254
iteration:32   global m:3.1985440775752068   global v:0.045073246816173196
mean_m:9.569167341254651   mean_v:0.6680025458941237
iteration:33   global m:3.1985440775752068   global v:0.045073246816173196
mean_m:9.569167341254651   mean_v:0.6680025458941237
iteration:34   global m:3.1985440775752068   global v:0.045073246816173196
mean_m:9.60383561294526   mean_v:0.6639738384494558

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iteration:35      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.60383561294526       mean_v:0.6639738384494558
iteration:36      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.60383561294526       mean_v:0.6639738384494558
iteration:37      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.643008112721144      mean_v:0.6618676327029243
iteration:38      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.654962949566544      mean_v:0.6612852334836498
iteration:39      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.65911702554673       mean_v:0.6597547734389082
iteration:40      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.669085767529905      mean_v:0.6550331926951185
iteration:41      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.669085767529905      mean_v:0.6550331926951185
iteration:42      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.669085767529905      mean_v:0.6550331926951185
iteration:43      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.669085767529905      mean_v:0.6550331926951185
iteration:44      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.677704374454915      mean_v:0.6550060548121109
iteration:45      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.677704374454915      mean_v:0.6550060548121109
iteration:46      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.730742789767682      mean_v:0.6520465895766392
iteration:47      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.730742789767682      mean_v:0.6520465895766392
iteration:48      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.731652693264186      mean_v:0.6488387606246397
iteration:49      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.731652693264186      mean_v:0.6488387606246397
iteration:50      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.731652693264186      mean_v:0.6488387606246397
iteration:51      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.731732702068985      mean_v:0.6474413762195036
iteration:52      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.731732702068985      mean_v:0.6474413762195036
iteration:53      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.751852663718164      mean_v:0.6437240185728297
iteration:54      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.774018929563463      mean_v:0.6405277326097711
iteration:55      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.774018929563463      mean_v:0.6405277326097711
iteration:56      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.775381937213242      mean_v:0.6398013604199514
iteration:57      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.775381937213242      mean_v:0.6398013604199514
iteration:58      global m:3.1985440775752068      global v:0.045073246816173196
mean_m:9.78080446343869       mean_v:0.6396820949623361
```

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iteration:59     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.78080446343869          mean_v:0.6396820949623361
iteration:60     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.806289614401758         mean_v:0.6358910819003358
iteration:61     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.806289614401758         mean_v:0.6358910819003358
iteration:62     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.806289614401758         mean_v:0.6358910819003358
iteration:63     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.806289614401758         mean_v:0.6358910819003358
iteration:64     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.806289614401758         mean_v:0.6358910819003358
iteration:65     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.806289614401758         mean_v:0.6358910819003358
iteration:66     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.806289614401758         mean_v:0.6358910819003358
iteration:67     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.806656778417528         mean_v:0.6357066231081262
iteration:68     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.806656778417528         mean_v:0.6357066231081262
iteration:69     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.837393590919673         mean_v:0.6347931127855554
iteration:70     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.837393590919673         mean_v:0.6347931127855554
iteration:71     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.837393590919673         mean_v:0.6347931127855554
iteration:72     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.837393590919673         mean_v:0.6347931127855554
iteration:73     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.837393590919673         mean_v:0.6347931127855554
iteration:74     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.837393590919673         mean_v:0.6347931127855554
iteration:75     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.837393590919673         mean_v:0.6347931127855554
iteration:76     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.837393590919673         mean_v:0.6347931127855554
iteration:77     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.84056790392846          mean_v:0.6339116798946633
iteration:78     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.84056790392846          mean_v:0.6339116798946633
iteration:79     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.84056790392846          mean_v:0.6339116798946633
iteration:80     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.84056790392846          mean_v:0.6339116798946633
iteration:81     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.84056790392846          mean_v:0.6339116798946633
iteration:82     global m:3.1985440775752068     global v:0.045073246816173196
mean_m:9.84056790392846          mean_v:0.6339116798946633
```

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iteration:83    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.84056790392846         mean_v:0.6339116798946633
iteration:84    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.84056790392846         mean_v:0.6339116798946633
iteration:85    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.84056790392846         mean_v:0.6339116798946633
iteration:86    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.840913759805263        mean_v:0.6333435089187697
iteration:87    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.840913759805263        mean_v:0.6333435089187697
iteration:88    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.858905551023781        mean_v:0.6296393447415903
iteration:89    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.858905551023781        mean_v:0.6296393447415903
iteration:90    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.858905551023781        mean_v:0.6296393447415903
iteration:91    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.858905551023781        mean_v:0.6296393447415903
iteration:92    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.863657773770392        mean_v:0.6293901967303828
iteration:93    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.863657773770392        mean_v:0.6293901967303828
iteration:94    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.863657773770392        mean_v:0.6293901967303828
iteration:95    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.863657773770392        mean_v:0.6293901967303828
iteration:96    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.874184625037014        mean_v:0.6273889890359715
iteration:97    global m:3.1985440775752068    global v:0.045073246816173196
mean_m:9.877152266986668        mean_v:0.6254807792650535
iteration:98    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.884475763328373        mean_v:0.6234460290940479
iteration:99    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.884475763328373        mean_v:0.6234460290940479
iteration:100    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.887222418226301        mean_v:0.6188548679323866
iteration:101    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.887222418226301        mean_v:0.6188548679323866
iteration:102    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.887222418226301        mean_v:0.6188548679323866
iteration:103    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.887222418226301        mean_v:0.6188548679323866
iteration:104    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.887222418226301        mean_v:0.6188548679323866
iteration:105    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.887222418226301        mean_v:0.6188548679323866
iteration:106    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.887222418226301        mean_v:0.6188548679323866
```

iteration:107   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.887222418226301   mean_v:0.6188548679323866
iteration:108   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.887222418226301   mean_v:0.6188548679323866
iteration:109   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.887222418226301   mean_v:0.6188548679323866
iteration:110   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.887222418226301   mean_v:0.6188548679323866
iteration:111   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.887222418226301   mean_v:0.6188548679323866
iteration:112   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.887222418226301   mean_v:0.6188548679323866
iteration:113   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.887222418226301   mean_v:0.6188548679323866
iteration:114   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.887222418226301   mean_v:0.6188548679323866
iteration:115   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.887222418226301   mean_v:0.6188548679323866
iteration:116   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.887222418226301   mean_v:0.6188548679323866
iteration:117   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.92346215803176   mean_v:0.6177658394770696
iteration:118   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.92346215803176   mean_v:0.6177658394770696
iteration:119   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.92346215803176   mean_v:0.6177658394770696
iteration:120   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.931126345582307   mean_v:0.6171800889121368
iteration:121   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.931126345582307   mean_v:0.6171800889121368
iteration:122   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.931126345582307   mean_v:0.6171800889121368
iteration:123   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.931126345582307   mean_v:0.6171800889121368
iteration:124   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.931126345582307   mean_v:0.6171800889121368
iteration:125   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.931126345582307   mean_v:0.6171800889121368
iteration:126   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.931126345582307   mean_v:0.6171800889121368
iteration:127   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.931126345582307   mean_v:0.6171800889121368
iteration:128   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.931126345582307   mean_v:0.6171800889121368
iteration:129   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.931126345582307   mean_v:0.6171800889121368
iteration:130   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.931126345582307   mean_v:0.6171800889121368

```
iteration:131    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.931126345582307       mean_v:0.6171800889121368
iteration:132    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.931126345582307       mean_v:0.6171800889121368
iteration:133    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.931126345582307       mean_v:0.6171800889121368
iteration:134    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.931126345582307       mean_v:0.6171800889121368
iteration:135    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.931126345582307       mean_v:0.6171800889121368
iteration:136    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.944132185615599       mean_v:0.6127059508906677
iteration:137    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.944132185615599       mean_v:0.6127059508906677
iteration:138    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.944132185615599       mean_v:0.6127059508906677
iteration:139    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.944132185615599       mean_v:0.6127059508906677
iteration:140    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.944132185615599       mean_v:0.6127059508906677
iteration:141    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.944132185615599       mean_v:0.6127059508906677
iteration:142    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.944132185615599       mean_v:0.6127059508906677
iteration:143    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
iteration:144    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
iteration:145    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
iteration:146    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
iteration:147    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
iteration:148    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
iteration:149    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
iteration:150    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
iteration:151    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
iteration:152    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
iteration:153    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
iteration:154    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.94524016354233        mean_v:0.612639116612263
```

iteration:155   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.94524016354233   mean_v:0.612639116612263
iteration:156   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.94524016354233   mean_v:0.612639116612263
iteration:157   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.94524016354233   mean_v:0.612639116612263
iteration:158   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.94524016354233   mean_v:0.612639116612263
iteration:159   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.94524016354233   mean_v:0.612639116612263
iteration:160   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.94524016354233   mean_v:0.612639116612263
iteration:161   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:162   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:163   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:164   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:165   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:166   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:167   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:168   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:169   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:170   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:171   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:172   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:173   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.952305242903531   mean_v:0.6113775018649176
iteration:174   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.957611604742706   mean_v:0.6113226782204584
iteration:175   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.957611604742706   mean_v:0.6113226782204584
iteration:176   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.957611604742706   mean_v:0.6113226782204584
iteration:177   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.957611604742706   mean_v:0.6113226782204584
iteration:178   global m:2.9484316036105156   global v:0.041124837938696146
mean_m:9.957611604742706   mean_v:0.6113226782204584

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iteration:179    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:180    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:181    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:182    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:183    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:184    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:185    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:186    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:187    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:188    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:189    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:190    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:191    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:192    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:193    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:194    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:195    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:196    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:197    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:198    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:199    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
iteration:200    global m:2.9484316036105156    global v:0.041124837938696146
mean_m:9.957611604742706    mean_v:0.6113226782204584
per class sample Feature        |per class sample train_sz      |k_nn   |ELM
|SVM    |BPNN   |
--------------------------------------------------------------------------------
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```


150	10	0.6313883299798793	0.2947686116700201	0.6617706237424548	0.4533199195171026
150	20	0.7016096579476861	0.5468812877263581	0.7372233400402415	0.6154929577464788
150	50	0.7935613682092555	0.8255533199195171	0.8344064386317908	0.5056338028169014
150	100	0.8571428571428571	0.8885311871227364	0.8971830985915493	0.5915492957746479
150	150	0.9030181086519115	0.8879275653923542	0.9285714285714286	0.6056338028169014
150	200	0.9156941649899396	0.887122736418511	0.9470824949698189	0.6430583501006036
150	450	0.990543259557344	0.8983903420523138	0.9961770623742455	0.7321931589537224

iteration:1   global m:3.1054069660604   global v:0.15449662040919065
mean_m:6.688919490203261   mean_v:0.8147354849800468
iteration:2   global m:3.1054069660604   global v:0.15449662040919065
mean_m:6.918402544856072   mean_v:0.799201016947627
iteration:3   global m:3.1054069660604   global v:0.15449662040919065
mean_m:6.967608560100198   mean_v:0.7967900985106826
iteration:4   global m:3.1054069660604   global v:0.15449662040919065
mean_m:7.084196590930223   mean_v:0.7845686931163073
iteration:5   global m:3.7621065750718117   global v:0.07623639982193708
mean_m:7.224101882725954   mean_v:0.7676290951110423
iteration:6   global m:4.7894426845014095   global v:0.09753881627693772
mean_m:7.489522889181972   mean_v:0.7425070262234658
iteration:7   global m:4.7894426845014095   global v:0.09753881627693772
mean_m:7.545737214908004   mean_v:0.7292738693486899
iteration:8   global m:4.7894426845014095   global v:0.09753881627693772
mean_m:7.55127672560513   mean_v:0.7217491703573614
iteration:9   global m:4.7894426845014095   global v:0.09753881627693772
mean_m:7.563879762515426   mean_v:0.7190032903943211
iteration:10   global m:4.7894426845014095   global v:0.09753881627693772
mean_m:7.563879762515426   mean_v:0.7190032903943211
iteration:11   global m:4.7894426845014095   global v:0.09753881627693772
mean_m:7.697108247429132   mean_v:0.7147213797736913
iteration:12   global m:4.7894426845014095   global v:0.09753881627693772
mean_m:7.870389873981476   mean_v:0.707000907259062
iteration:13   global m:4.7894426845014095   global v:0.09753881627693772
mean_m:7.971582608297467   mean_v:0.7016974642593413
iteration:14   global m:4.7894426845014095   global v:0.09753881627693772
mean_m:8.047984179109335   mean_v:0.6855322277266532
iteration:15   global m:4.7894426845014095   global v:0.09753881627693772
mean_m:8.101198111325502   mean_v:0.6819037519115955
iteration:16   global m:3.7621065750718117   global v:0.07623639982193708
mean_m:8.179873311966658   mean_v:0.6775334191229194

```
iteration:17     global m:3.7621065750718117     global v:0.07623639982193708
mean_m:8.18859896712005          mean_v:0.6772253471147269
iteration:18     global m:3.7621065750718117     global v:0.07623639982193708
mean_m:8.263200727328659          mean_v:0.672197200525552
iteration:19     global m:3.7621065750718117     global v:0.07623639982193708
mean_m:8.265741338655353          mean_v:0.6576700480468571
iteration:20     global m:3.7621065750718117     global v:0.07623639982193708
mean_m:8.265741338655353          mean_v:0.6576700480468571
iteration:21     global m:3.7621065750718117     global v:0.07623639982193708
mean_m:8.305934631749988          mean_v:0.6553858968615532
iteration:22     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.369347035400569          mean_v:0.6392135641281493
iteration:23     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.369347035400569          mean_v:0.6392135641281493
iteration:24     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.369347035400569          mean_v:0.6392135641281493
iteration:25     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.369347035400569          mean_v:0.6392135641281493
iteration:26     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.416064505316317          mean_v:0.620339059450198
iteration:27     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.489970070980489          mean_v:0.6002191211399622
iteration:28     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.491814492680133          mean_v:0.6000300129991956
iteration:29     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.539809347428381          mean_v:0.5961215382558294
iteration:30     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.592465604506433          mean_v:0.5921240779873915
iteration:31     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.592465604506433          mean_v:0.5921240779873915
iteration:32     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.592465604506433          mean_v:0.5921240779873915
iteration:33     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.592465604506433          mean_v:0.5921240779873915
iteration:34     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.610961595885456          mean_v:0.591118355107028
iteration:35     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.610961595885456          mean_v:0.591118355107028
iteration:36     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.610961595885456          mean_v:0.591118355107028
iteration:37     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.610961595885456          mean_v:0.591118355107028
iteration:38     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.610961595885456          mean_v:0.591118355107028
iteration:39     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.610961595885456          mean_v:0.591118355107028
iteration:40     global m:3.2168350983411074     global v:0.03368096949998289
mean_m:8.611169686838984          mean_v:0.5876781970658339
```

```
iteration:41    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.611169686838984      mean_v:0.5876781970658339
iteration:42    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.611169686838984      mean_v:0.5876781970658339
iteration:43    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.611169686838984      mean_v:0.5876781970658339
iteration:44    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.611169686838984      mean_v:0.5876781970658339
iteration:45    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.612891998142004      mean_v:0.5873045925446786
iteration:46    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.612891998142004      mean_v:0.5873045925446786
iteration:47    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.681108151450752      mean_v:0.5853423886396922
iteration:48    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.681940905749798      mean_v:0.5852766632311978
iteration:49    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.702140217870474      mean_v:0.5841763120167889
iteration:50    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.702140217870474      mean_v:0.5841763120167889
iteration:51    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.712476737201214      mean_v:0.5836132865422405
iteration:52    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.712476737201214      mean_v:0.5836132865422405
iteration:53    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.730900101661682      mean_v:0.5766766006522812
iteration:54    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.730900101661682      mean_v:0.5766766006522812
iteration:55    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.743679912686348      mean_v:0.5744431322836318
iteration:56    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.743679912686348      mean_v:0.5744431322836318
iteration:57    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.758960433453321      mean_v:0.5702865174622275
iteration:58    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.758960433453321      mean_v:0.5702865174622275
iteration:59    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946      mean_v:0.5663818642147816
iteration:60    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946      mean_v:0.5663818642147816
iteration:61    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946      mean_v:0.5663818642147816
iteration:62    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946      mean_v:0.5663818642147816
iteration:63    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946      mean_v:0.5663818642147816
iteration:64    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946      mean_v:0.5663818642147816
```

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iteration:65    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946        mean_v:0.5663818642147816
iteration:66    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946        mean_v:0.5663818642147816
iteration:67    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946        mean_v:0.5663818642147816
iteration:68    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946        mean_v:0.5663818642147816
iteration:69    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946        mean_v:0.5663818642147816
iteration:70    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.777483515813946        mean_v:0.5663818642147816
iteration:71    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.789781962856651        mean_v:0.5599600492813624
iteration:72    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.789781962856651        mean_v:0.5599600492813624
iteration:73    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.789781962856651        mean_v:0.5599600492813624
iteration:74    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.789781962856651        mean_v:0.5599600492813624
iteration:75    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.798293284699321        mean_v:0.5593049501278438
iteration:76    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.798293284699321        mean_v:0.5593049501278438
iteration:77    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.830255566388368        mean_v:0.5591102514439262
iteration:78    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.830255566388368        mean_v:0.5591102514439262
iteration:79    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.830255566388368        mean_v:0.5591102514439262
iteration:80    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.830255566388368        mean_v:0.5591102514439262
iteration:81    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.830255566388368        mean_v:0.5591102514439262
iteration:82    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.835824693217873        mean_v:0.5590061251656152
iteration:83    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.835824693217873        mean_v:0.5590061251656152
iteration:84    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.835824693217873        mean_v:0.5590061251656152
iteration:85    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.835824693217873        mean_v:0.5590061251656152
iteration:86    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.835824693217873        mean_v:0.5590061251656152
iteration:87    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.838160940483213        mean_v:0.5588526230514981
iteration:88    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.838160940483213        mean_v:0.5588526230514981
```

```
iteration:89    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.838160940483213       mean_v:0.5588526230514981
iteration:90    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.842265383079647       mean_v:0.5569015668542124
iteration:91    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.842265383079647       mean_v:0.5569015668542124
iteration:92    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.860831498652697       mean_v:0.5531333915353752
iteration:93    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.860831498652697       mean_v:0.5531333915353752
iteration:94    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.860831498652697       mean_v:0.5531333915353752
iteration:95    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.860831498652697       mean_v:0.5531333915353752
iteration:96    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.860831498652697       mean_v:0.5531333915353752
iteration:97    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.860831498652697       mean_v:0.5531333915353752
iteration:98    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.96385415315628        mean_v:0.5483460191008634
iteration:99    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.978684483021498       mean_v:0.5482363301631995
iteration:100    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.978684483021498       mean_v:0.5482363301631995
iteration:101    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.978684483021498       mean_v:0.5482363301631995
iteration:102    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.984478345960378       mean_v:0.5461741209891625
iteration:103    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.984478345960378       mean_v:0.5461741209891625
iteration:104    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.984478345960378       mean_v:0.5461741209891625
iteration:105    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:8.984478345960378       mean_v:0.5461741209891625
iteration:106    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.000778610110283       mean_v:0.545404041048605
iteration:107    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.000778610110283       mean_v:0.545404041048605
iteration:108    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.000778610110283       mean_v:0.545404041048605
iteration:109    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:110    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:111    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:112    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
```

```
iteration:113    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:114    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:115    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:116    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:117    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:118    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:119    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:120    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:121    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:122    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:123    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:124    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:125    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:126    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.00166796773672        mean_v:0.5450258355331608
iteration:127    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:128    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:129    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:130    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:131    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:132    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:133    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:134    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:135    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:136    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
```

```
iteration:137    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:138    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:139    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:140    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:141    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:142    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:143    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:144    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:145    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:146    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:147    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:148    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:149    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:150    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:151    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:152    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:153    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:154    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:155    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:156    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:157    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:158    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:159    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.003779212161898        mean_v:0.5449860691395588
iteration:160    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976        mean_v:0.543807641279418
```

```
iteration:161    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:162    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:163    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:164    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:165    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:166    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:167    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:168    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:169    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:170    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:171    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:172    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:173    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:174    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:175    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:176    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:177    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:178    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:179    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:180    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:181    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:182    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:183    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
iteration:184    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976      mean_v:0.543807641279418
```

```
iteration:185    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976        mean_v:0.543807641279418
iteration:186    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976        mean_v:0.543807641279418
iteration:187    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976        mean_v:0.543807641279418
iteration:188    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976        mean_v:0.543807641279418
iteration:189    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976        mean_v:0.543807641279418
iteration:190    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02576097778976        mean_v:0.543807641279418
iteration:191    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02675052024424        mean_v:0.543555430744309
iteration:192    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02675052024424        mean_v:0.543555430744309
iteration:193    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02675052024424        mean_v:0.543555430744309
iteration:194    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02675052024424        mean_v:0.543555430744309
iteration:195    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02675052024424        mean_v:0.543555430744309
iteration:196    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02675052024424        mean_v:0.543555430744309
iteration:197    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02675052024424        mean_v:0.543555430744309
iteration:198    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02675052024424        mean_v:0.543555430744309
iteration:199    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02675052024424        mean_v:0.543555430744309
iteration:200    global m:3.2168350983411074    global v:0.03368096949998289
mean_m:9.02675052024424        mean_v:0.543555430744309
per class sample Feature        |per class sample train_sz      |k_nn    |ELM
|SVM    |BPNN    |
--------------------------------------------------------------------------------
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--------------------------------------------------------------------------------
---------------------------
200                     |10                      |0.711066398390342
|0.24768611670020121    |0.7008048289738431      |0.4625754527162978      |
200                     |20                      |0.7885311871227364
|0.3869215291750503     |0.8084507042253521      |0.7408450704225352      |
200                     |50                      |0.8587525150905433
|0.8078470824949698     |0.8750503018108652      |0.6722334004024145      |
200                     |100                     |0.903420523138833
|0.8627766599597585     |0.924748490945674       |0.7462776659959759      |
200                     |150                     |0.93158953722334
|0.8754527162977868     |0.9488933601609658      |0.7702213279678068      |
```

```
200                     |200                      |0.952112676056338
|0.8843058350100603     |0.9611670020120724       |0.7438631790744467       |
200                     |450                      |0.9955734406438632
|0.8969818913480885     |0.995774647887324        |0.8114688128772636       |
iteration:1     global m:2.3816559575498104     global v:0.23682990670204163
mean_m:7.184618462473154        mean_v:0.9016900869831442
iteration:2     global m:2.499980576336384     global v:0.04313504113815725
mean_m:7.262806083448231        mean_v:0.8795880457339809
iteration:3     global m:2.499980576336384     global v:0.04313504113815725
mean_m:7.5128680673241615       mean_v:0.8547189112892375
iteration:4     global m:2.499980576336384     global v:0.04313504113815725
mean_m:7.628395259901882        mean_v:0.8385347696160897
iteration:5     global m:2.499980576336384     global v:0.04313504113815725
mean_m:7.731927516236901        mean_v:0.8315680942824111
iteration:6     global m:2.499980576336384     global v:0.04313504113815725
mean_m:7.917842240780592        mean_v:0.8151992988353595
iteration:7     global m:2.499980576336384     global v:0.04313504113815725
mean_m:8.006166063323617        mean_v:0.8076401672465727
iteration:8     global m:2.499980576336384     global v:0.04313504113815725
mean_m:8.065351540893316        mean_v:0.8031561497552321
iteration:9     global m:2.499980576336384     global v:0.04313504113815725
mean_m:8.247187499329447        mean_v:0.8016159165231511
iteration:10     global m:2.499980576336384     global v:0.04313504113815725
mean_m:8.386711204722523        mean_v:0.7995593804074451
iteration:11     global m:2.499980576336384     global v:0.04313504113815725
mean_m:8.576553599089385        mean_v:0.7858147682575509
iteration:12     global m:2.499980576336384     global v:0.04313504113815725
mean_m:8.5841434885934   mean_v:0.7814573254762217
iteration:13     global m:2.499980576336384     global v:0.04313504113815725
mean_m:8.840619323514401        mean_v:0.7702045275969431
iteration:14     global m:2.499980576336384     global v:0.04313504113815725
mean_m:8.876006428115069        mean_v:0.7613237051246687
iteration:15     global m:2.499980576336384     global v:0.04313504113815725
mean_m:8.891415310315788        mean_v:0.7550827446905896
iteration:16     global m:2.499980576336384     global v:0.04313504113815725
mean_m:8.962264314442873        mean_v:0.7474446508008987
iteration:17     global m:2.499980576336384     global v:0.04313504113815725
mean_m:8.962264314442873        mean_v:0.7474446508008987
iteration:18     global m:2.499980576336384     global v:0.04313504113815725
mean_m:9.082485570386051        mean_v:0.7452829391229898
iteration:19     global m:2.499980576336384     global v:0.04313504113815725
mean_m:9.130987380743028        mean_v:0.7412174224946648
iteration:20     global m:2.499980576336384     global v:0.04313504113815725
mean_m:9.207413406185806        mean_v:0.7371593398135156
iteration:21     global m:2.499980576336384     global v:0.04313504113815725
mean_m:9.207413406185806        mean_v:0.7371593398135156
iteration:22     global m:2.499980576336384     global v:0.04313504113815725
mean_m:9.207413406185806        mean_v:0.7371593398135156
```

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iteration:23      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.207413406185806      mean_v:0.7371593398135156
iteration:24      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.21460233207792      mean_v:0.7352625754382461
iteration:25      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.299453546218574      mean_v:0.7343130481895059
iteration:26      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.299453546218574      mean_v:0.7343130481895059
iteration:27      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.299453546218574      mean_v:0.7343130481895059
iteration:28      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.299453546218574      mean_v:0.7343130481895059
iteration:29      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.301413151733577      mean_v:0.7337389256712049
iteration:30      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.355532478243113      mean_v:0.7336335923802108
iteration:31      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.355532478243113      mean_v:0.7336335923802108
iteration:32      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.419726904556155      mean_v:0.7253328630607575
iteration:33      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.419726904556155      mean_v:0.7253328630607575
iteration:34      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.445911983326077      mean_v:0.7241993029695004
iteration:35      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.445911983326077      mean_v:0.7241993029695004
iteration:36      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.445911983326077      mean_v:0.7241993029695004
iteration:37      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.445911983326077      mean_v:0.7241993029695004
iteration:38      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.445911983326077      mean_v:0.7241993029695004
iteration:39      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.456181423291564      mean_v:0.7238433103915304
iteration:40      global m:2.499980576336384      global v:0.04313504113815725
mean_m:9.503508340418339      mean_v:0.7192225398588925
iteration:41      global m:2.558206683024764      global v:0.04312412510626018
mean_m:9.504672862552106      mean_v:0.7192223215382546
iteration:42      global m:2.558206683024764      global v:0.04312412510626018
mean_m:9.506826479174197      mean_v:0.7191826477926224
iteration:43      global m:2.558206683024764      global v:0.04312412510626018
mean_m:9.506826479174197      mean_v:0.7191826477926224
iteration:44      global m:2.558206683024764      global v:0.04312412510626018
mean_m:9.506826479174197      mean_v:0.7191826477926224
iteration:45      global m:2.558206683024764      global v:0.04312412510626018
mean_m:9.51625778991729      mean_v:0.7177027138229459
iteration:46      global m:2.558206683024764      global v:0.04312412510626018
mean_m:9.521217275671662      mean_v:0.7169009178038687
```

```
iteration:47     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.521217275671662     mean_v:0.7169009178038687
iteration:48     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.521217275671662     mean_v:0.7169009178038687
iteration:49     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.521217275671662     mean_v:0.7169009178038687
iteration:50     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.549350675456227     mean_v:0.7162319267448037
iteration:51     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.549350675456227     mean_v:0.7162319267448037
iteration:52     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.549350675456227     mean_v:0.7162319267448037
iteration:53     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.558348012305796     mean_v:0.716201982377097
iteration:54     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.558348012305796     mean_v:0.716201982377097
iteration:55     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.558348012305796     mean_v:0.716201982377097
iteration:56     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.558600214757025     mean_v:0.7154284327756614
iteration:57     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.558600214757025     mean_v:0.7154284327756614
iteration:58     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.565700362436473     mean_v:0.7146255973633379
iteration:59     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.565700362436473     mean_v:0.7146255973633379
iteration:60     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.567177270762622     mean_v:0.7107999337371439
iteration:61     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.567177270762622     mean_v:0.7107999337371439
iteration:62     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.590072838552295     mean_v:0.7021649557631463
iteration:63     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.590072838552295     mean_v:0.7021649557631463
iteration:64     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.590072838552295     mean_v:0.7021649557631463
iteration:65     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.592267855107785     mean_v:0.7009999522101134
iteration:66     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.592267855107785     mean_v:0.7009999522101134
iteration:67     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.592267855107785     mean_v:0.7009999522101134
iteration:68     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.596234705410899     mean_v:0.7009211872983724
iteration:69     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.596234705410899     mean_v:0.7009211872983724
iteration:70     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.596234705410899     mean_v:0.7009211872983724
```

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iteration:71     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.596234705410899     mean_v:0.7009211872983724
iteration:72     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.602955316118896     mean_v:0.6948475239146501
iteration:73     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.602955316118896     mean_v:0.6948475239146501
iteration:74     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.602955316118896     mean_v:0.6948475239146501
iteration:75     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.602955316118896     mean_v:0.6948475239146501
iteration:76     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.602955316118896     mean_v:0.6948475239146501
iteration:77     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.602955316118896     mean_v:0.6948475239146501
iteration:78     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.602955316118896     mean_v:0.6948475239146501
iteration:79     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.602955316118896     mean_v:0.6948475239146501
iteration:80     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.6101764183864  mean_v:0.6940760359633714
iteration:81     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.619563562460243     mean_v:0.6870849292445927
iteration:82     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.619563562460243     mean_v:0.6870849292445927
iteration:83     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.619563562460243     mean_v:0.6870849292445927
iteration:84     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.628661541081964     mean_v:0.6768178397137672
iteration:85     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.64692427907139     mean_v:0.6749991535861045
iteration:86     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.64692427907139     mean_v:0.6749991535861045
iteration:87     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.64692427907139     mean_v:0.6749991535861045
iteration:88     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.64692427907139     mean_v:0.6749991535861045
iteration:89     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.67677154827863     mean_v:0.6697601899970322
iteration:90     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.67677154827863     mean_v:0.6697601899970322
iteration:91     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.67677154827863     mean_v:0.6697601899970322
iteration:92     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.67677154827863     mean_v:0.6697601899970322
iteration:93     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.67677154827863     mean_v:0.6697601899970322
iteration:94     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.67677154827863     mean_v:0.6697601899970322
```

```
iteration:95     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.67677154827863     mean_v:0.6697601899970322
iteration:96     global m:2.558206683024764     global v:0.04312412510626018
mean_m:9.67677154827863     mean_v:0.6697601899970322
iteration:97     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.677401884235442     mean_v:0.6697302122134715
iteration:98     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.677401884235442     mean_v:0.6697302122134715
iteration:99     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.677996046245099     mean_v:0.669580614650622
iteration:100     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.689192728474737     mean_v:0.669299049237743
iteration:101     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.689192728474737     mean_v:0.669299049237743
iteration:102     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.689192728474737     mean_v:0.669299049237743
iteration:103     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.689192728474737     mean_v:0.669299049237743
iteration:104     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.689192728474737     mean_v:0.669299049237743
iteration:105     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.689192728474737     mean_v:0.669299049237743
iteration:106     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.689192728474737     mean_v:0.669299049237743
iteration:107     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.689192728474737     mean_v:0.669299049237743
iteration:108     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.689192728474737     mean_v:0.669299049237743
iteration:109     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.689192728474737     mean_v:0.669299049237743
iteration:110     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.689192728474737     mean_v:0.669299049237743
iteration:111     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.6896010036394  mean_v:0.6692887647263706
iteration:112     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.6896010036394  mean_v:0.6692887647263706
iteration:113     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.6896010036394  mean_v:0.6692887647263706
iteration:114     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.6896010036394  mean_v:0.6692887647263706
iteration:115     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.693238057997078     mean_v:0.6692659642733634
iteration:116     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.693238057997078     mean_v:0.6692659642733634
iteration:117     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.693238057997078     mean_v:0.6692659642733634
iteration:118     global m:2.5897234808653593     global v:0.04162523592822254
mean_m:9.698179609496146     mean_v:0.6692057352885604
```

iteration:119   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.702780656982213   mean_v:0.6684949639067054
iteration:120   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.702780656982213   mean_v:0.6684949639067054
iteration:121   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.702780656982213   mean_v:0.6684949639067054
iteration:122   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.702780656982213   mean_v:0.6684949639067054
iteration:123   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.702780656982213   mean_v:0.6684949639067054
iteration:124   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.702780656982213   mean_v:0.6684949639067054
iteration:125   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.702780656982213   mean_v:0.6684949639067054
iteration:126   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.711642910260707   mean_v:0.6675793578848243
iteration:127   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.711642910260707   mean_v:0.6675793578848243
iteration:128   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.711642910260707   mean_v:0.6675793578848243
iteration:129   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.711642910260707   mean_v:0.6675793578848243
iteration:130   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.711642910260707   mean_v:0.6675793578848243
iteration:131   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.711642910260707   mean_v:0.6675793578848243
iteration:132   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.711642910260707   mean_v:0.6675793578848243
iteration:133   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.712429247070103   mean_v:0.6662488628551364
iteration:134   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.712429247070103   mean_v:0.6662488628551364
iteration:135   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.712429247070103   mean_v:0.6662488628551364
iteration:136   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.712429247070103   mean_v:0.6662488628551364
iteration:137   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.712429247070103   mean_v:0.6662488628551364
iteration:138   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.725134684797377   mean_v:0.663104062192142
iteration:139   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.729654480051249   mean_v:0.6628126592747867
iteration:140   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.729654480051249   mean_v:0.6628126592747867
iteration:141   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.729654480051249   mean_v:0.6628126592747867
iteration:142   global m:2.5897234808653593   global v:0.04162523592822254
mean_m:9.729654480051249   mean_v:0.6628126592747867

```
iteration:143    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.729654480051249    mean_v:0.6628126592747867
iteration:144    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.729654480051249    mean_v:0.6628126592747867
iteration:145    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.729654480051249    mean_v:0.6628126592747867
iteration:146    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.729654480051249    mean_v:0.6628126592747867
iteration:147    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.729654480051249    mean_v:0.6628126592747867
iteration:148    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.729654480051249    mean_v:0.6628126592747867
iteration:149    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.729654480051249    mean_v:0.6628126592747867
iteration:150    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.802314171027392    mean_v:0.660142681133002
iteration:151    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.802314171027392    mean_v:0.660142681133002
iteration:152    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.802314171027392    mean_v:0.660142681133002
iteration:153    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.802314171027392    mean_v:0.660142681133002
iteration:154    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.804537830334157    mean_v:0.6600650152377784
iteration:155    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.804537830334157    mean_v:0.6600650152377784
iteration:156    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.804537830334157    mean_v:0.6600650152377784
iteration:157    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.804537830334157    mean_v:0.6600650152377784
iteration:158    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.804537830334157    mean_v:0.6600650152377784
iteration:159    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.804537830334157    mean_v:0.6600650152377784
iteration:160    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805041951220483    mean_v:0.6595397203974426
iteration:161    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805041951220483    mean_v:0.6595397203974426
iteration:162    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805041951220483    mean_v:0.6595397203974426
iteration:163    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502    mean_v:0.658891834858805
iteration:164    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502    mean_v:0.658891834858805
iteration:165    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502    mean_v:0.658891834858805
iteration:166    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502    mean_v:0.658891834858805
```

```
iteration:167    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:168    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:169    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:170    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:171    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:172    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:173    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:174    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:175    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:176    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:177    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:178    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.805118382554502      mean_v:0.658891834858805
iteration:179    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.87180354712531      mean_v:0.6542227163352072
iteration:180    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.874910836797207      mean_v:0.6539766037277878
iteration:181    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.874910836797207      mean_v:0.6539766037277878
iteration:182    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.874910836797207      mean_v:0.6539766037277878
iteration:183    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.874910836797207      mean_v:0.6539766037277878
iteration:184    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.874910836797207      mean_v:0.6539766037277878
iteration:185    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.874910836797207      mean_v:0.6539766037277878
iteration:186    global m:2.5897234808653593    global v:0.04162523592822254
mean_m:9.874910836797207      mean_v:0.6539766037277878
iteration:187    global m:2.6241365736350417    global v:0.037148494040593505
mean_m:9.889167156592011      mean_v:0.6450681068375707
iteration:188    global m:2.6241365736350417    global v:0.037148494040593505
mean_m:9.889167156592011      mean_v:0.6450681068375707
iteration:189    global m:2.6241365736350417    global v:0.037148494040593505
mean_m:9.889167156592011      mean_v:0.6450681068375707
iteration:190    global m:2.6241365736350417    global v:0.037148494040593505
mean_m:9.889167156592011      mean_v:0.6450681068375707
```

```
iteration:191     global m:2.6241365736350417     global v:0.037148494040593505
mean_m:9.889167156592011        mean_v:0.6450681068375707
iteration:192     global m:2.6241365736350417     global v:0.037148494040593505
mean_m:9.889167156592011        mean_v:0.6450681068375707
iteration:193     global m:2.6241365736350417     global v:0.037148494040593505
mean_m:9.889167156592011        mean_v:0.6450681068375707
iteration:194     global m:2.6241365736350417     global v:0.037148494040593505
mean_m:9.889167156592011        mean_v:0.6450681068375707
iteration:195     global m:2.6241365736350417     global v:0.037148494040593505
mean_m:9.889167156592011        mean_v:0.6450681068375707
iteration:196     global m:2.6241365736350417     global v:0.037148494040593505
mean_m:9.900089927241206        mean_v:0.6442817082628608
iteration:197     global m:2.6241365736350417     global v:0.037148494040593505
mean_m:9.900089927241206        mean_v:0.6442817082628608
iteration:198     global m:2.6241365736350417     global v:0.037148494040593505
mean_m:9.900089927241206        mean_v:0.6442817082628608
iteration:199     global m:2.6241365736350417     global v:0.037148494040593505
mean_m:9.900089927241206        mean_v:0.6442817082628608
iteration:200     global m:2.6241365736350417     global v:0.037148494040593505
mean_m:9.900089927241206        mean_v:0.6442817082628608
```

per class sample Feature	per class sample train_sz	k_nn	ELM	SVM	BPNN
450	10	0.6818913480885311	0.3386317907444668	0.6609657947686117	0.7052313883299799
450	20	0.7770623742454729	0.22313883299798792	0.741046277665996	0.7903420523138833
450	50	0.8492957746478873	0.8050301810865191	0.8096579476861167	0.8285714285714286
450	100	0.9118712273641851	0.8661971830985915	0.8841046277665996	0.8436619718309859
450	150	0.9374245472837022	0.8806841046277666	0.9235412474849095	0.86841046277666
450	200	0.9571428571428572	0.893158953722334	0.9442655935613682	0.852917505030181
450	450	0.9967806841046277	0.9028169014084507	0.9937625754527163	0.8921529175050302

[6]:
```python
train_data_set[0].shape
```

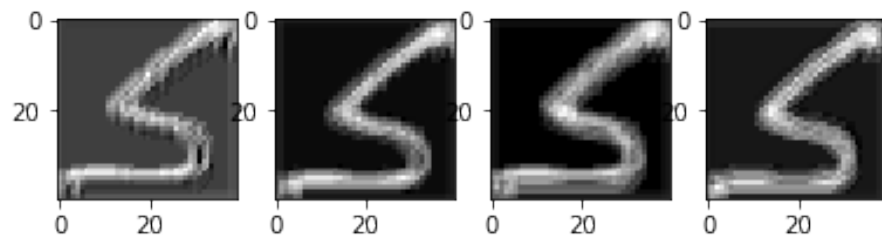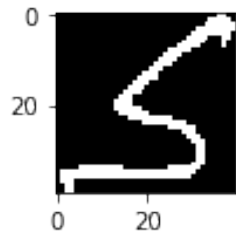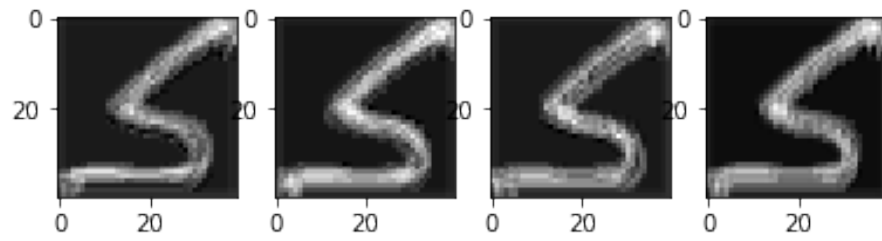[6]: (502, 40, 40, 1)

[7]:
```python
acti_model = models.Model(inputs=model.input, outputs=model.layers[1].output)
acti_model.summary()
```

```
Model: "model_1"

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_7_input (InputLayer)  (None, 40, 40, 1)         0
_____
conv2d_7 (Conv2D)            (None, 40, 40, 8)         208
_____
activation_13 (Activation)   (None, 40, 40, 8)         0
=================================================================
Total params: 208
Trainable params: 208
Non-trainable params: 0
_____
```

[11]:
```python
img=train_set[6][10]
img=np.expand_dims(img,axis=0)
p=acti_model.predict(img)
img=img[0,:,:,0]
img = (img-np.min(img))/(np.max(img)-np.min(img))
img=img*255
fig=plt.figure(figsize=(8,8))
fig.add_subplot(3,5,6)
plt.imshow(img,cmap='gray')
t=[2,3,4,5,12,13,14,15]
for i in range(p.shape[3]):
    img=p[0,:,:,i]
    img = (img-np.min(img))/(np.max(img)-np.min(img))
    img=img*255
    fig.add_subplot(3,5,t[i])
    plt.imshow(img,cmap='gray')
plt.show()
```

[ ]: