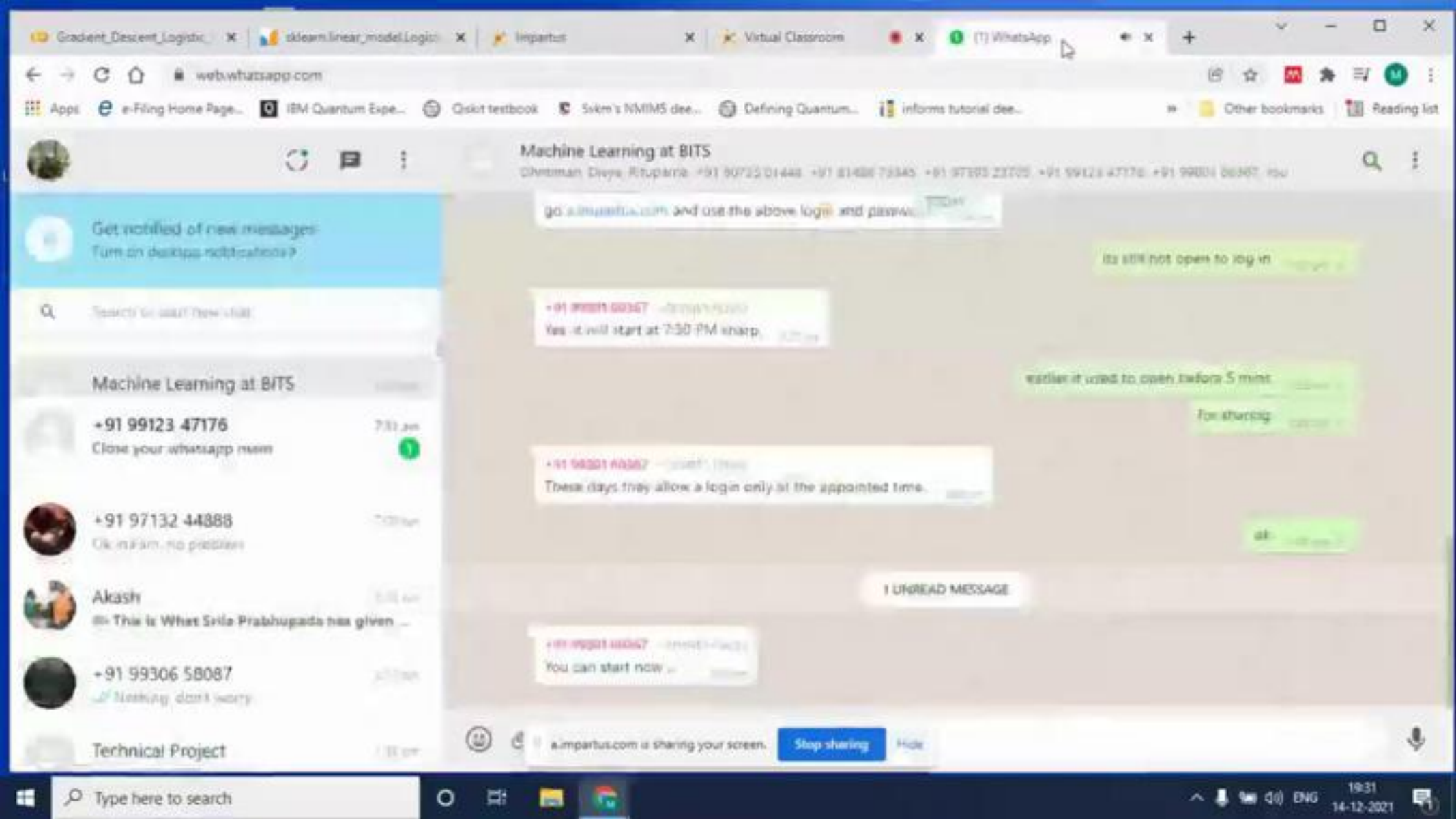
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Logistic Regression, Gradient Descent

Loss function,

Python implementation

Logistic Regression

Logistic regression is a probabilistic model, used to establish the relationship between a binary dependent variable and one or more independent variables. Let X_i be the independent variable (training variable) and Y be the dependent variable. Linear Regression predicts probability of outcome of binary dependent variable (Y) and the output lies between 0 and 1. The prediction equation between X_i and Y is

$$ln(\frac{p}{1-p}) = b_0 + b_1x_1 + b_2x_2 + b_3x_3 \ldots b_nx_n$$

$ln(\frac{p}{1-p})$ is *log odds* and denotes the likelihood of the event taking place. It maps the probability between 0 and 1. The terms $b_0, b_1, b_2 \ldots$ are parameters estimated during training of each record. The above equation can be rewritten as

$$\frac{p}{1-} = e^{b_0+b_1x_1+b_2x_2+b_3x_3 \ldots b_nx_n}$$

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$$\frac{p}{}$$

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colab.research.google.com/drive/1Dsp6j7qjVVVvMkDpG1wnWMiFXWcwam1y#scrollTo=mwHCjogkPjry

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$$\frac{p}{1-p} = e^{b_0 + b_1x_1 + b_2x_2 + b_3x_3 \ldots b_nx_n}$$

simplifying it further

$$p = \frac{e^{b_0 + b_1x_1 + b_2x_2 + b_3x_3 \ldots b_nx_n}}{1 + e^{b_0 + b_1x_1 + b_2x_2 + b_3x_3 \ldots b_nx_n}}$$

or

$$p = \frac{1}{1 + e^{-(b_0 + b_1x_1 + b_2x_2 + b_3x_3 \ldots b_nx_n)}}$$

This is the equation of the "Sigmoid Function" given by:

$$\sigma(x) = \frac{1}{}$$

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$$1+e^{-(\theta_0+\theta_1x_1+\theta_2x_2)}$$

This is the equation of the "Sigmoid Function" given by:

$$\sigma(x) = \frac{1}{1+e^{-x}}$$

Deriving the sigmoid function,

$$\sigma'(x) = \frac{d}{dX}\sigma(x) = \frac{d}{dX}\frac{1}{(1+e^{-X})}$$

$$= \frac{d}{dX}(1+e^{-X})^{-1}$$

Using reciprocal rule, then rule of linearity,

$$= -(1+e^{-X})^{-2}.\frac{d}{dX}(1+e^{-X})$$

$$= -(1+e^{-X})^{-2}.(\frac{d}{dX}[1]+\frac{d}{dX}[e^{-X}])$$

Derivative of constant is 0,

$$= -(1+e^{-X})^{-2}.(0+e^{-X}\frac{d}{dX}[-X])$$

$$= (1+e^{-X})^{-2}.e^{-X}$$

$$= \frac{e^{-X}}{(1+e^{-X})}$$

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Now we will be using the above derived equation to make our predictions. Before that we will train our model to obtain the values of our parameters $b_0, b_1, b_2 \ldots$ that result in least error. This is where the error or loss function comes in.

Loss Function

Loss functions are used to calculate error in a model. There are two types of Loss functions. L1 and L2.

L1 loss function is used to minimize the error which is the sum of the all the absolute differences between the true value and the predicted value.

L2 Loss Function L2 Loss Function is used to minimize the error which is the sum of the all the squared differences between the true value and the predicted value.

The cost function of linear regression L1 and L2 can't be used in logistic regression because it is a non-convex function of weights. Optimizing algorithms like i.e gradient descent only converge convex function into a global minimum.

J = - ylog(h(x)) - (1 - y)log(1 - h(x))

here, y is the real target value

h(x) = sigmoid(wx + b)

For y = 0,

J = - log(1 - h(x))

and y = 1

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$$= -(1+e^{-X})^{-2}.\frac{d}{dX}(1+e^{-X})$$

$$= -(1+e^{-X})^{-2}.(\frac{d}{dX}[1]+\frac{d}{dX}[e^{-X}])$$

Derivative of constant is 0,

$$= -(1+e^{-X})^{-2}.(0+e^{-X}\frac{d}{dX}[-X])$$

$$= (1+e^{-X})^{-2}.e^{-X}$$

$$= \frac{e^{-X}}{(1+e^{-X})^2}$$

$$= \frac{1}{(1+e^{-X})}.\frac{e^{-X}+1-1}{(1+e^{-X})}$$

$$= \frac{1}{(1+e^{-X})}.(\frac{1+e^{-X}}{1+e^{-X}}-\frac{1}{1+e^{-X}})$$

$$= \frac{1}{(1+e^{-X})}.(1-\frac{1}{1+e^{-X}})$$

$$= \sigma(X).(1-\sigma(X))$$

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Derivative of constant is 0,

$$
\begin{aligned}
&= -(1+e^{-X})^{-2}.(0+e^{-X}\frac{d}{dX}[-X]) \\
&= (1+e^{-X})^{-2}.e^{-X} \\
&= \frac{e^{-X}}{(1+e^{-X})^2} \\
&= \frac{1}{(1+e^{-X})}.\frac{e^{-X}+1-1}{(1+e^{-X})} \\
&= \frac{1}{(1+e^{-X})}.(\frac{1+e^{-X}}{1+e^{-X}}-\frac{1}{1+e^{-X}}) \\
&= \frac{1}{(1+e^{-X})}.(1-\frac{1}{1+e^{-X}}) \\
&= \sigma(X).(1-\sigma(X))
\end{aligned}
$$

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one vs rest is used for multiclass in logistic regression

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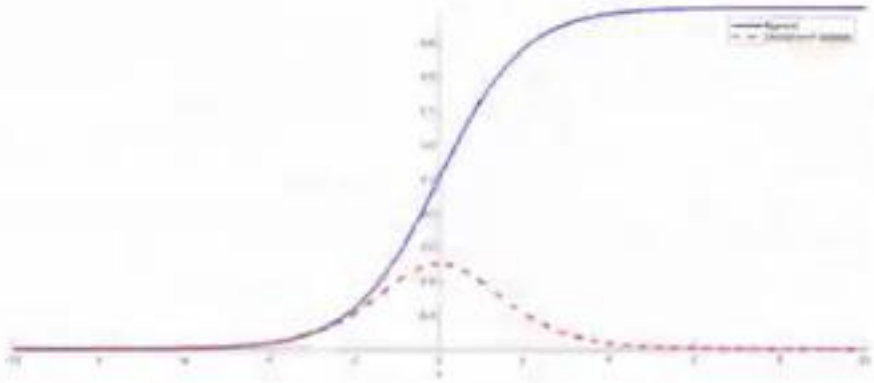
$$= \frac{1}{(1+e^{-X})} \cdot \left(\frac{1+e^{-X}}{1+e^{-X}} - \frac{1}{1+e^{-X}}\right)$$

$$= \frac{1}{(1+e^{-X})} \cdot \left(1 - \frac{1}{1+e^{-X}}\right)$$

$$= \sigma(X).(1-\sigma(X))$$



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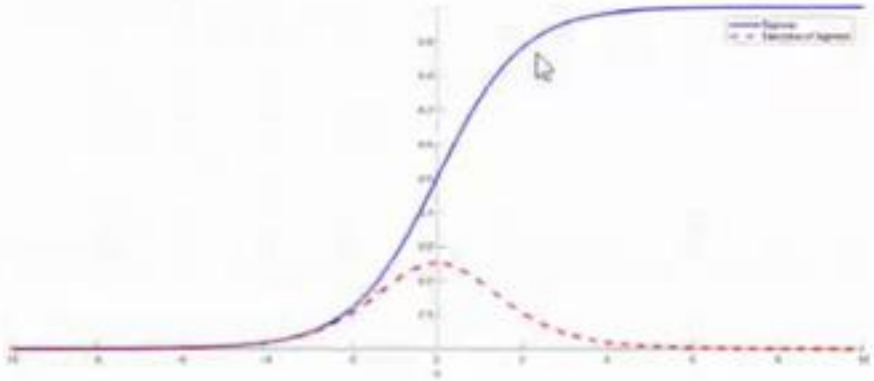
$$= \frac{1}{(1+e^{-X})} . (1 - \frac{1}{1+e^{-X}})$$
$$= \sigma(X) . (1 - \sigma(X))$$



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and y = 1,

J = - log(h(x))

Gradient Calculation :

repeat until convergence {

tmpi = wi - alpha * dwi

wi = tmpi }

where alpha is the learning rate.

Using the chain rule

$$\frac{\partial J}{\partial w} = \frac{\partial J}{\partial a} \bullet \frac{\partial a}{\partial z} \bullet \frac{\partial z}{\partial w}$$

here, a = sigmoid(z) and z = wx + b.

```
# Importing libraries
import pandas as pd
import numpy as np
from sklearn import preprocessing
import matplotlib.pyplot as plt
plt.rc("font", size=14)
```

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Using the chain rule

$$\frac{\partial J}{\partial w} = \frac{\partial J}{\partial a} \cdot \frac{\partial a}{\partial z} \cdot \frac{\partial z}{\partial w}$$

here, a = sigmoid(z) and z = wx + b

```
# Importing libraries
import pandas as pd
import numpy as np
from sklearn import preprocessing
import matplotlib.pyplot as plt
plt.rc("font", size=14)
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
import seaborn as sns
sns.set(style="white")
sns.set(style="whitegrid", color_codes=True)
```

[4]
```
from google.colab import files
uploaded = files.upload()
import io
data = pd.read_csv(io.BytesIO(uploaded['diabetes.csv']))
data.head()
```

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```
[5] data = data.dropna()
    print(data.shape)
    print(list(data.columns))

    (768, 9)
    ['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age', 'Out
```

```
[6] data['Outcome'].value_counts()
    sns.countplot(x='Outcome',data=data, palette='hls')
    plt.show()
```

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[6] data['Outcome'].value_counts()
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    plt.show()
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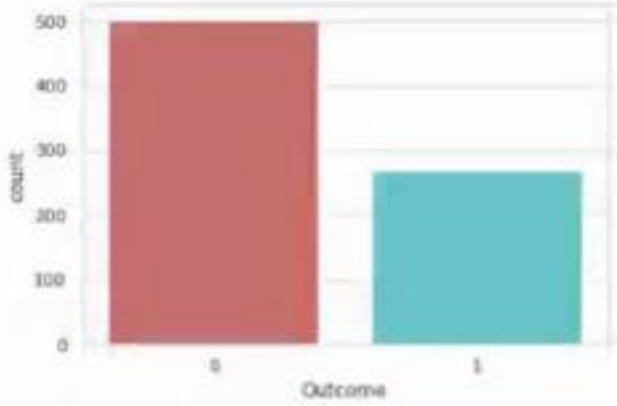


```
[7] # Logistic Regression
    class LogitRegression() :
        def __init__( self, learning_rate, iterations):
```

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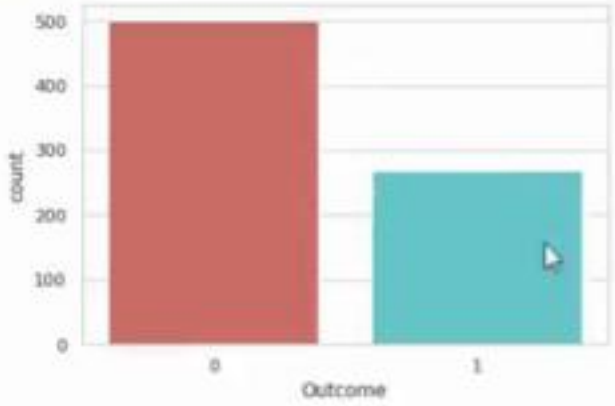
sns.countplot(x='Outcome',data=data, palette='hls')
plt.show()
```

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ABHAY RAMESH JUNGHARE joined

K GIRISH GOPINATHAN joined

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Gradient_Descent_Logistic_Regression.ipynb

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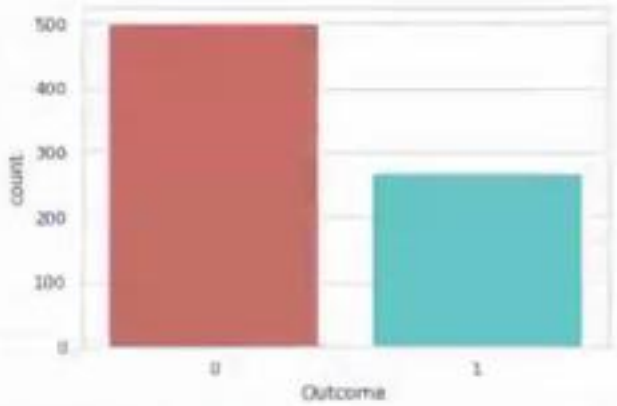
```
[5] (768, 9)
['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age', 'Out
```

```
data['Outcome'].value_counts()
sns.countplot(x='Outcome',data=data, palette='hls')
plt.show()
```



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using MSE

Arijit Barat
lease square error

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ABHAY RAMESH JUNGHARE joined

K GIRISH GOPINATHAN joined

Alok
how they are different

model 1 and Model 2

Rakhi Nandy
Yes Ma'am

Seelam Reshma Mon...
yes mam.

Gunasekaran R
Mam, are you balancing the data points?

S Bhagath
what will be model2?

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Gradient_Descent_Logistic_Regression.ipynb

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[6]

[7]

```
# Logistic Regression
class LogitRegression() :
    def __init__( self, learning_rate, iterations ) :
        self.learning_rate = learning_rate
        self.iterations = iterations

    # Function for model training
    def fit( self, X, Y ) :
        # no_of_training_examples, no_of_features
        self.m, self.n = X.shape
        # weight initialization
        self.W = np.zeros( self.n )
        self.b = 0
        self.X = X
        self.Y = Y

        # gradient descent learning
```

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how they are different

model 1 and Model 2

Yes Ma'am

yes mam.

Mam, are you balancing the data points?

what will be model2?

Both are scikit learn Model ?

do we need to maintain the balanced data for regression case?

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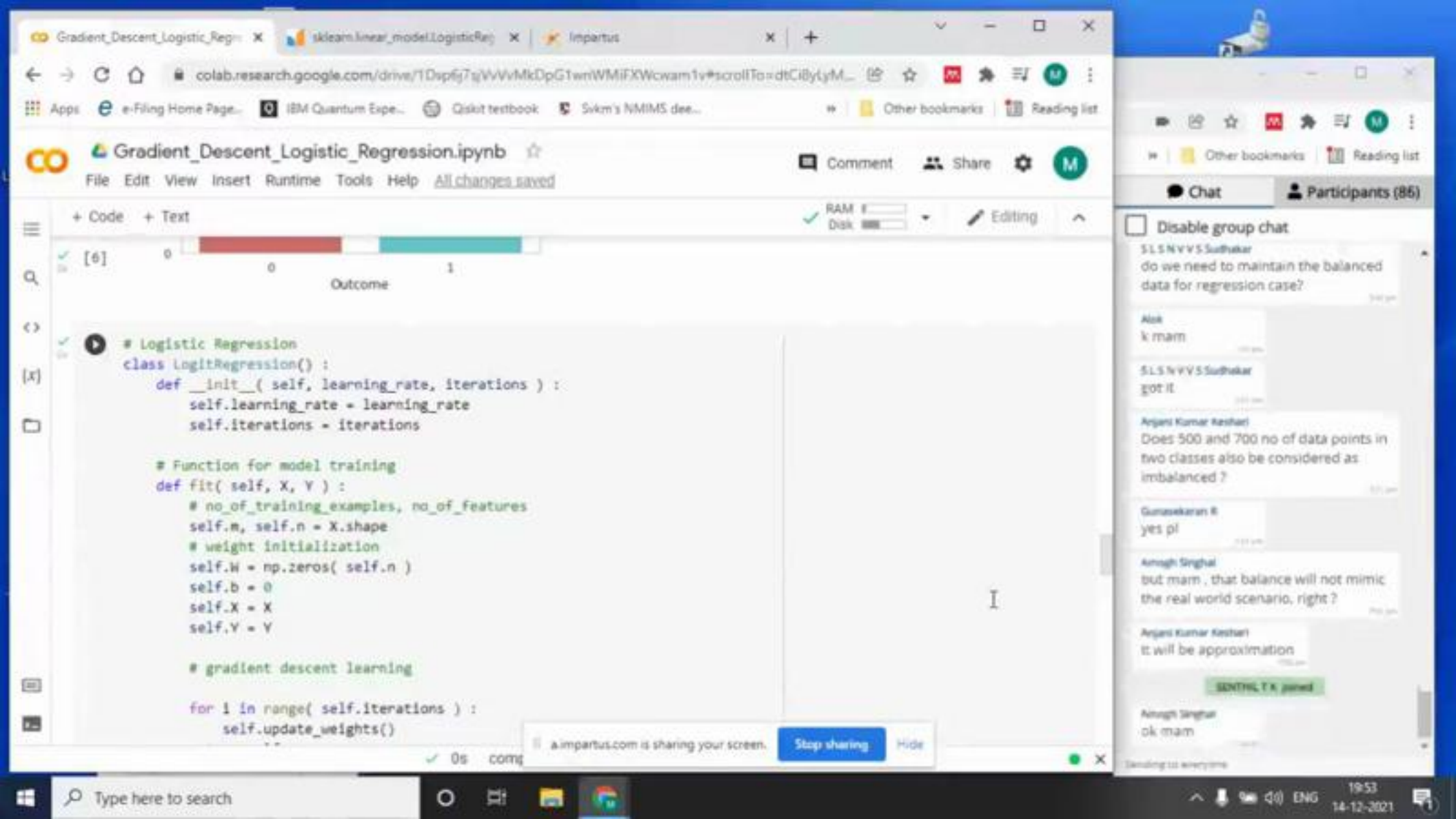
Gradient_Descent_Logistic_Regression.ipynb
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[6]
0
1
Outcome
Logistic Regression
class LogitRegression() :
def __init__(self, learning_rate, iterations) :
self.learning_rate = learning_rate
self.iterations = iterations
# Function for model training
def fit(self, X, Y) :
no_of_training_examples, no_of_features
self.m, self.n = X.shape
# weight initialization
self.W = np.zeros(self.n)
self.b = 0
self.X = X
self.Y = Y
# gradient descent learning
for i in range(self.iterations) :
self.update_weights()
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Participants (86)
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do we need to maintain the balanced data for regression case?
k mam
got it
Does 500 and 700 no of data points in two classes also be considered as imbalanced ?
yes pl
but mam , that balance will not mimic the real world scenario, right ?
It will be approximation
ok mam
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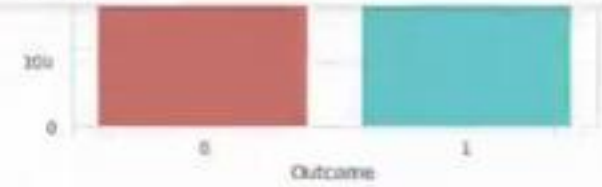
[6]



[7]

```
# Logistic Regression
class LogitRegression() :
    def __init__( self, learning_rate, iterations ) :
        self.learning_rate = learning_rate
        self.iterations = iterations

    # Function for model training
    def fit( self, X, Y ) :
        # no_of_training_examples, no_of_features
        self.m, self.n = X.shape
        # weight initialization
        self.W = np.zeros( self.n )
        self.b = 0
        self.X = X
        self.Y = Y

        # gradient descent learning
```

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S L S N V V S Sudhakar
do we need to maintain the balanced data for regression case?

Alok
k mam

S L S N V V S Sudhakar
got it

Anjani Kumar Kashari
Does 500 and 700 no of data points in two classes also be considered as imbalanced ?

Gunasekaran R
yes pl

Amogh Singhal
but mam , that balance will not mimic the real world scenario. right ?

Anjani Kumar Kashari
it will be approximation

SENTHIL T K joined

Amogh Singhal
ok mam

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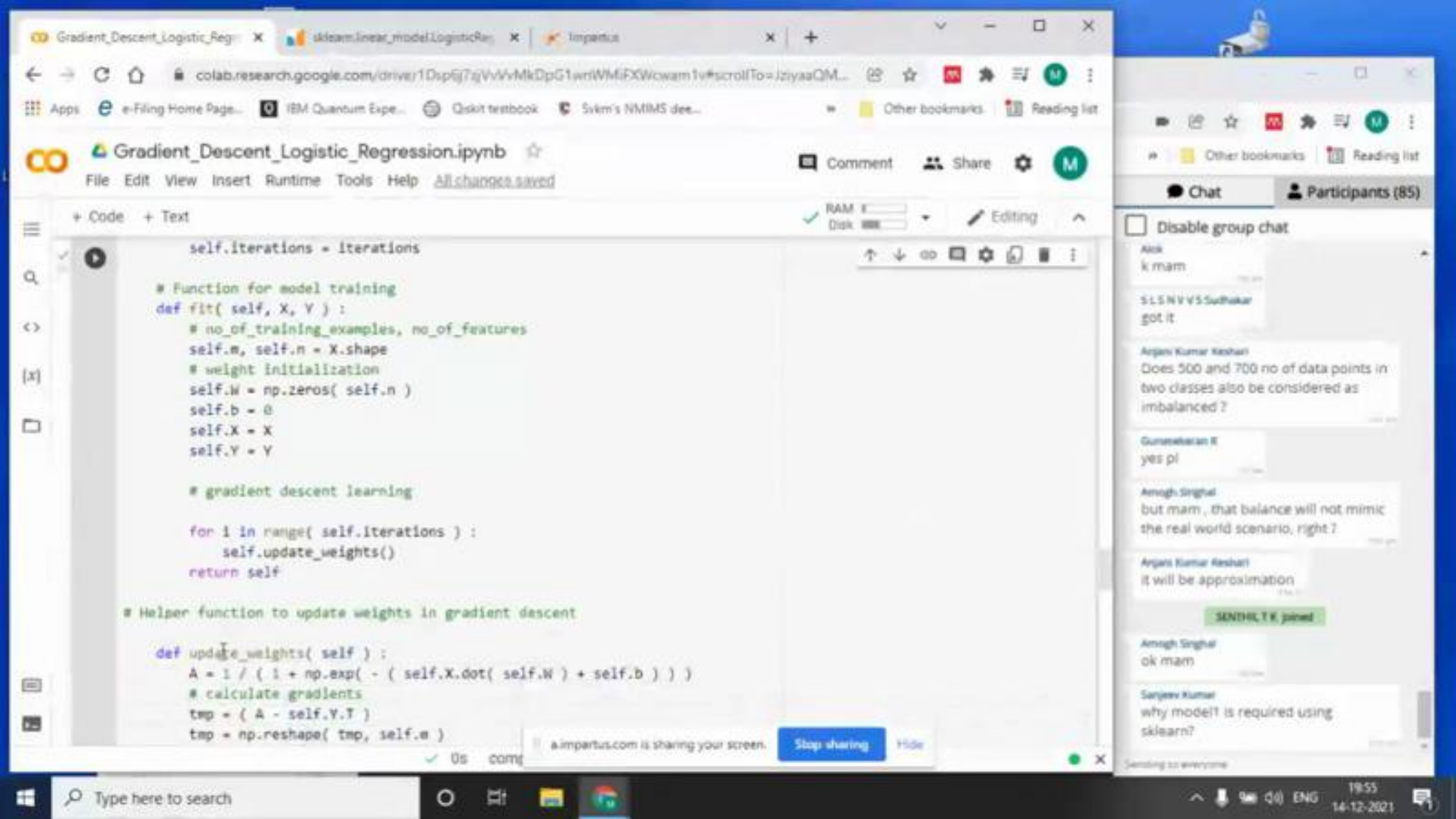
Gradient_Descent_Logistic_Regression.ipynb
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Editing
self.iterations = iterations
# Function for model training
def fit(self, X, Y) :
no_of_training_examples, no_of_features
self.m, self.n = X.shape
# weight initialization
self.W = np.zeros(self.n)
self.b = 0
self.X = X
self.Y = Y
# gradient descent learning
for i in range(self.iterations) :
self.update_weights()
return self
Helper function to update weights in gradient descent
def update_weights(self) :
A = 1 / (1 + np.exp(- (self.X.dot(self.W) + self.b)))
# calculate gradients
tmp = (A - self.Y.T)
tmp = np.reshape(tmp, self.m)
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Alok
k mam
S L S N V V S Sudhakar
got it
Anjani Kumar Keshari
Does 500 and 700 no of data points in two classes also be considered as imbalanced ?
Gunaseelaran R
yes pl
Amogh Singhal
but mam , that balance will not mimic the real world scenario, right ?
Anjani Kumar Keshari
it will be approximation
SENTHIL T K joined
Amogh Singhal
ok mam
Sanjeev Kumar
why model1 is required using sklearn?
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14-12-2021

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```
[5] data = data.dropna()
    print(data.shape)
    print(list(data.columns))

    (768, 9)
    ['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age', 'Out
```

```
[6] data['Outcome'].value_counts()
    sns.countplot(x='Outcome',data=data, palette='hls')
    plt.show()
```

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S L S N V V S Sudhakar
got it

Anjani Kumar Keshari
Does 500 and 700 no of data points in two classes also be considered as imbalanced ?

Gunasekaran R
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Amogh Singhal
but mam , that balance will not mimic the real world scenario, right ?

Anjani Kumar Keshari
it will be approximation

SENTHIL T K joined

Amogh Singhal
ok mam

Sanjeev Kumar
why model1 is required using sklearn?

1st line is related to sigmoid function?

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```
        # no_of_training_examples, no_of_features
        self.m, self.n = X.shape
        # weight initialization
        self.W = np.zeros( self.n )
        self.b = 0
        self.X = X
        self.Y = Y

        # gradient descent learning

        for i in range( self.iterations ) :
            self.update_weights()
        return self

# Helper function to update weights in gradient descent

    def update_weights( self ) :
        A = 1 / ( 1 + np.exp( - ( self.X.dot( self.W ) + self.b ) ) )
        # calculate gradients
        tmp = ( A - self.Y.T )
        tmp = np.reshape( tmp, self.m )
        dW = np.dot( self.X.T, tmp ) / self.m
        db = np.sum( tmp ) / self.m
        # update weights
        self.W = self.W - self.learning_rate *
```

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got it

Anjani Kumar Keshari
Does 500 and 700 no of data points in two classes also be considered as imbalanced ?

Gunasekaran R
yes pl

Amogh Singhal
but mam , that balance will not mimic the real world scenario, right ?

Anjani Kumar Keshari
it will be approximation

SENTHIL T K joined

Amogh Singhal
ok mam

Sanjeev Kumar
why model1 is required using sklearn?

1st line is related to sigmoid function?

ARAVIND P joined

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```
[5] data = data.dropna()
    print(data.shape)
    print(list(data.columns))

    (768, 9)
    ['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age', 'Out
```

```
[6] data['Outcome'].value_counts()
    sns.countplot(x='Outcome',data=data, palette='bwr')
    plt.show()
```

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got it

Anjani Kumar Keshari
Does 500 and 700 no of data points in two classes also be considered as imbalanced ?

Gunasekaran R
yes pl

Anugh Singhal
but mam , that balance will not mimic the real world scenario, right ?

Anjani Kumar Keshari
it will be approximation

SENTHIL Y K joined

Anugh Singhal
ok mam

Sanjeev Kumar
why model1 is required using sklearn?

1st line is related to sigmoid function?

ARAVIND P joined

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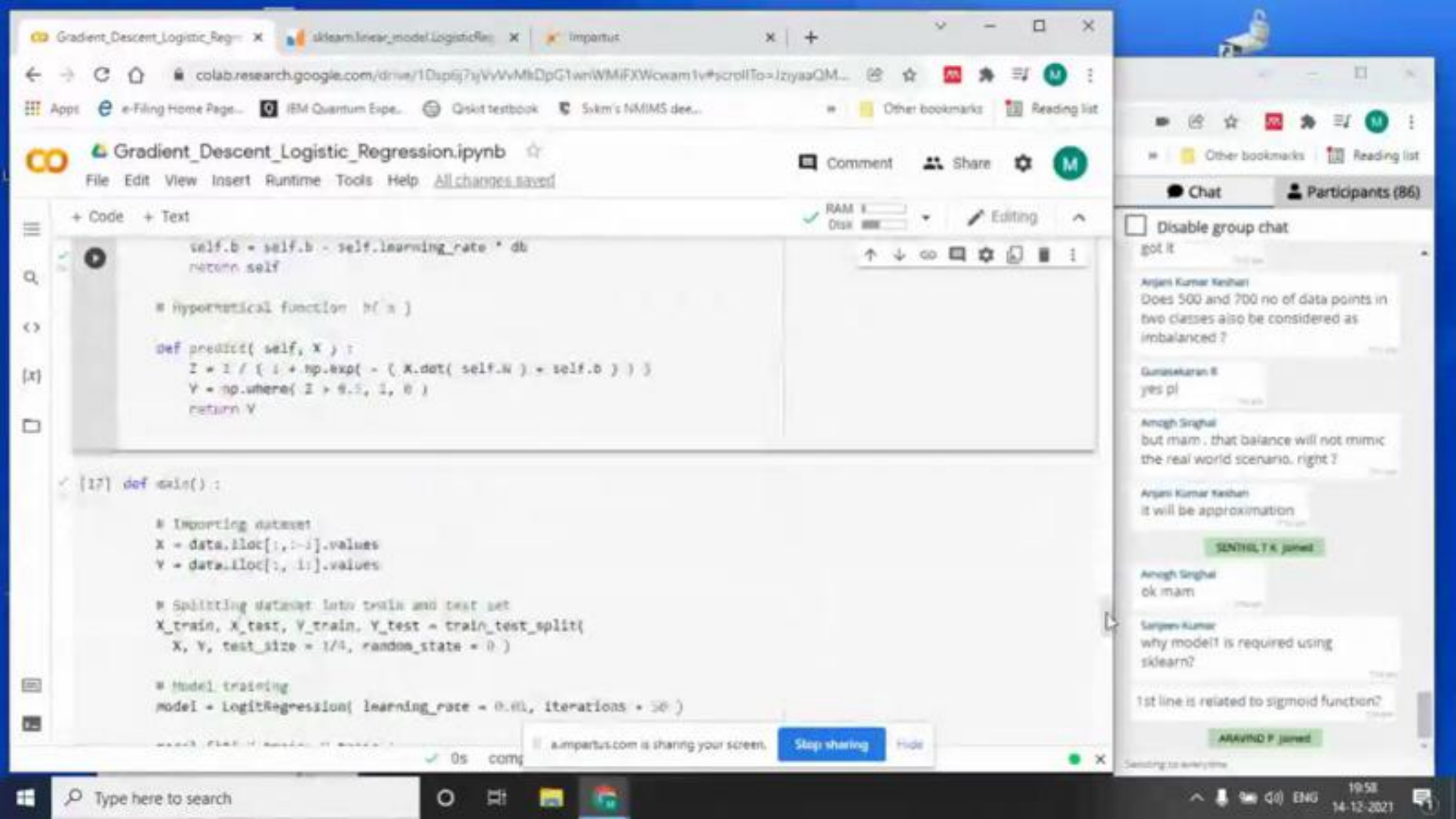
Gradient_Descent_Logistic_Regression.ipynb
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self.b = self.b - self.learning_rate * db
return self
Hypothetical function h(x)
def predict(self, X) :
Z = 1 / (1 + np.exp(- (X.dot(self.W) + self.b)))
Y = np.where(Z > 0.5, 1, 0)
return Y
[17] def main() :
# Importing dataset
X = data.iloc[:,:-1].values
Y = data.iloc[:, 1:].values
# Splitting dataset into train and test set
X_train, X_test, Y_train, Y_test = train_test_split(
X, Y, test_size = 1/4, random_state = 0)
# Model training
model = LogitRegression(learning_rate = 0.01, iterations = 50)
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got it
Anjani Kumar Keshari
Does 500 and 700 no of data points in two classes also be considered as imbalanced ?
Gunasekaran R
yes pl
Anugh Singhal
but mam . that balance will not mimic the real world scenario. right ?
Anjani Kumar Keshari
it will be approximation
SENTHIL T K joined
Anugh Singhal
ok mam
Sanjeev Kumar
why model1 is required using sklearn?
1st line is related to sigmoid function?
ARAVIND P joined
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19:58
14-12-2021

Gradient_Descent_Logistic_Regression.ipynb

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```
        for i in range( self.iterations ) :
            self.update_weights()
        return self

# Helper function to update weights in gradient descent

    def update_weights( self ) :
        A = 1 / ( 1 + np.exp( - ( self.X.dot( self.W ) + self.b ) ) )
        # calculate gradients
        tmp = ( A - self.Y.T )
        tmp = np.reshape( tmp, self.m )
        dW = np.dot( self.X.T, tmp ) / self.m
        db = np.sum( tmp ) / self.m
        # update weights
        self.W = self.W - self.learning_rate * dW
        self.b = self.b - self.learning_rate * db
        return self

    # Hypothetical function  h( x )

    def predict( self, X ) :
        Z = 1 / ( 1 + np.exp( - ( X.dot( self.W ) + self.b ) ) )
        Y = np.where( Z > 0.5, 1, 0 )
        return Y
```

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yes p!

but mam , that balance will not mimic the real world scenario. right?

it will be approximation

SENTHIL T K joined

ok mam

why model1 is required using sklearn?

1st line is related to sigmoid function?

ARAVIND P joined

where we are calculating error in our function mam ..

ANSHUU PUN joined

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Gradient_Descent_Logistic_Regression.ipynb

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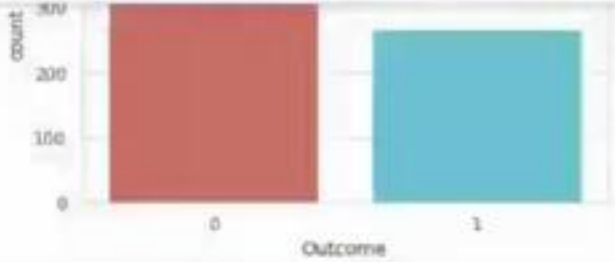
[6]




```
# Logistic Regression
class LogitRegression() :
    def __init__( self, learning_rate, iterations ) :
        self.learning_rate = learning_rate
        self.iterations = iterations

    # Function for model training
    def fit( self, X, Y ) :
        # no_of_training_examples, no_of_features
        self.m, self.n = X.shape
        # weight initialization
        self.W = np.zeros( self.n )
        self.b = 0
        self.X = X
```

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yes pl

but mam , that balance will not mimic the real world scenario. right ?

it will be approximation

ok mam

why model1 is required using sklearn?

1st line is related to sigmoid function?

where we are calculating error in our function mam ..

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Gradient_Descent_Logistic_Regression.ipynb

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```
def main() :

    # Importing dataset
    X = data.iloc[:,:-1].values
    Y = data.iloc[:, -1:].values

    # Splitting dataset into train and test set
    X_train, X_test, Y_train, Y_test = train_test_split(
      X, Y, test_size = 1/4, random_state = 0 )

    # Model training
    model = LogitRegression( learning_rate = 0.01, iterations = 1000 )

    model.fit( X_train, Y_train )
    model1 = LogisticRegression(solver='lbfgs', max_iter=10)
    model1.fit( X_train, Y_train)

    # Prediction on test set
    Y_pred = model.predict( X_test )
    Y_pred1 = model1.predict( X_test )

    # measure performance
    correctly_classified = 0
```

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why model1 is required using sklearn?

1st line is related to sigmoid function?

Where we are calculating error in our function mam ..

but we are not comparing with real outputs

yes mam

mam cant hear you

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Gradient_Descent_Logistic_Regression.ipynb

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```
def main() :

    # Importing dataset
    X = data.iloc[:,:-1].values
    Y = data.iloc[:, 4:].values

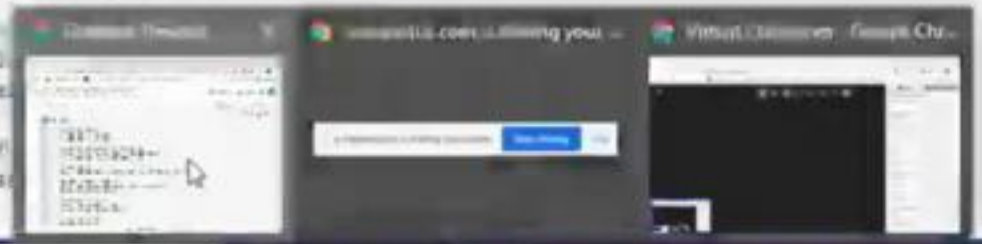
    # splitting dataset into train and test set
    X_train, X_test, Y_train, Y_test = train_test_split(
      X, Y, test_size = 1/4, random_state = 0 )

    # Model training
    model = LogitRegression( learning_rate = 0.01, iterations = 1000 )

    model.fit( X_train, Y_train )
    model1 = LogisticRegression(solver='lbfgs', max_iter=10)
    model1.fit( X_train, Y_train)

    # Prediction
    Y_pred = model
    Y_pred1 = model

    # accuracy
    correctly_clas
```



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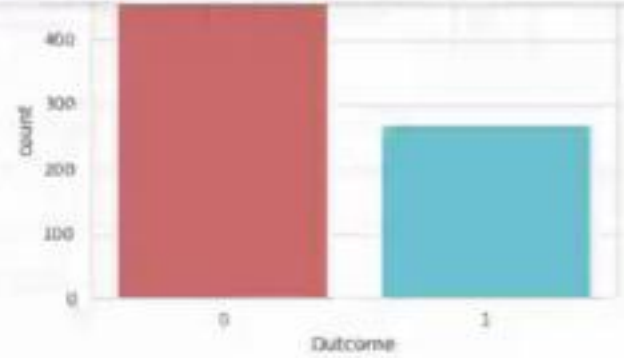
[4]



[7]

```
# Logistic Regression
class LogitRegression() :
    def __init__( self, learning_rate, iterations ) :
        self.learning_rate = learning_rate
        self.iterations = iterations

    # function for model training
    def fit( self, X, Y ) :
        # no_of_training_examples, no_of_features
        self.m, self.n = X.shape
        # weight initialization
```

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Bohra Aman Dinesh: No Audio

Sandeep Wadhwa: No AV

Geeta Ramani Bala P...: now we can

Alok: yes

Bohra Aman Dinesh: Back

Seelam Reshma Mon...: now we can

Chitra Devi A: yes

Vanitha Jestley: resumed

Bohra Aman Dinesh: Yes

Sandeep Wadhwa: yes back now

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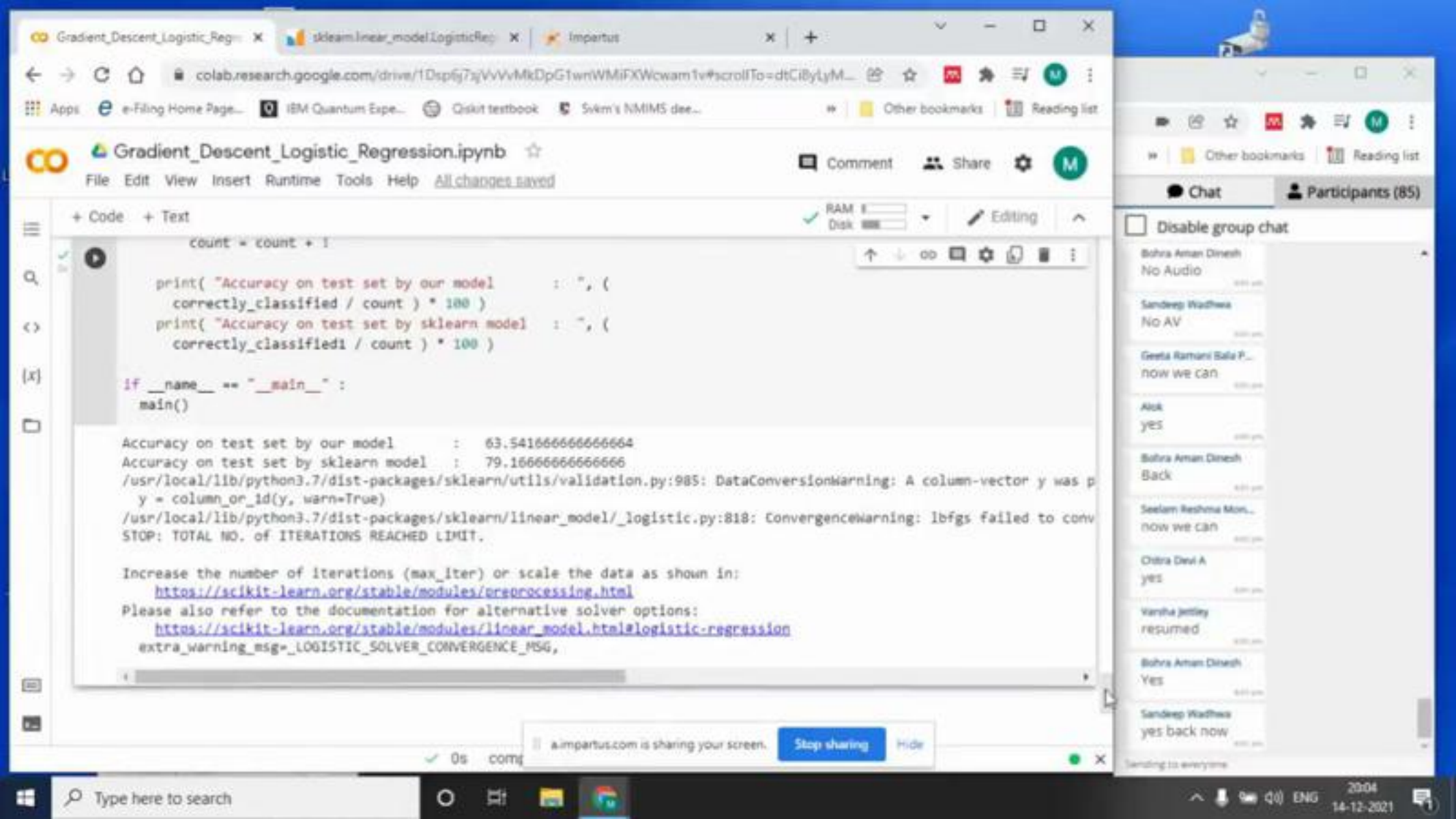
Gradient_Descent_Logistic_Regression.ipynb
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count = count + 1
print("Accuracy on test set by our model : ", (
correctly_classified / count) * 100)
print("Accuracy on test set by sklearn model : ", (
correctly_classified1 / count) * 100)
if __name__ == "__main__" :
main()
Accuracy on test set by our model : 63.541666666666664
Accuracy on test set by sklearn model : 79.16666666666666
/usr/local/lib/python3.7/dist-packages/sklearn/utils/validation.py:985: DataConversionWarning: A column-vector y was p
y = column_or_1d(y, warn=True)
/usr/local/lib/python3.7/dist-packages/sklearn/linear_model/_logistic.py:818: ConvergenceWarning: lbfgs failed to conv
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.
Increase the number of iterations (max_iter) or scale the data as shown in:
https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
extra_warning_msg=_LOGISTIC_SOLVER_CONVERGENCE_MSG,
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Bohra Aman Dinesh
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Sandeep Wadhwa
No AV
Geeta Ramani Balla P...
now we can
Alok
yes
Bohra Aman Dinesh
Back
Seelam Reshma Mon...
now we can
Chitra Devi A
yes
Varsha Jetley
resumed
Bohra Aman Dinesh
Yes
Sandeep Wadhwa
yes back now
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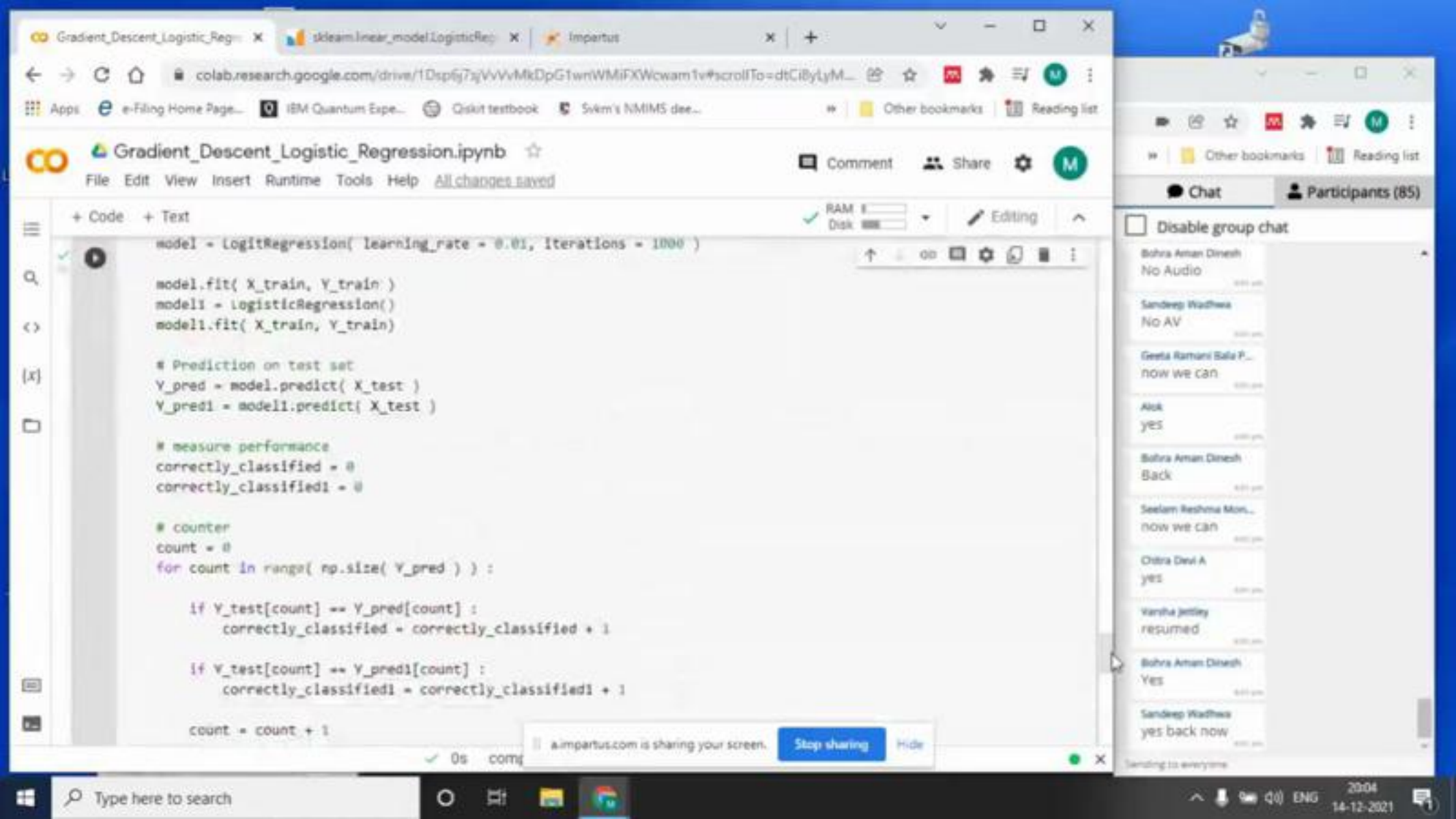
ENG
20:04
14-12-2021


Gradient_Descent_Logistic_Regression.ipynb
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model = LogitRegression(learning_rate = 0.01, iterations = 1000)
model.fit(X_train, Y_train)
model1 = LogisticRegression()
model1.fit(X_train, Y_train)
# Prediction on test set
Y_pred = model.predict(X_test)
Y_pred1 = model1.predict(X_test)
# measure performance
correctly_classified = 0
correctly_classified1 = 0
# counter
count = 0
for count in range(np.size(Y_pred)) :
if Y_test[count] == Y_pred[count] :
correctly_classified = correctly_classified + 1
if Y_test[count] == Y_pred1[count] :
correctly_classified1 = correctly_classified1 + 1
count = count + 1
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No Audio
No AV
now we can
yes
Back
now we can
yes
resumed
Yes
yes back now
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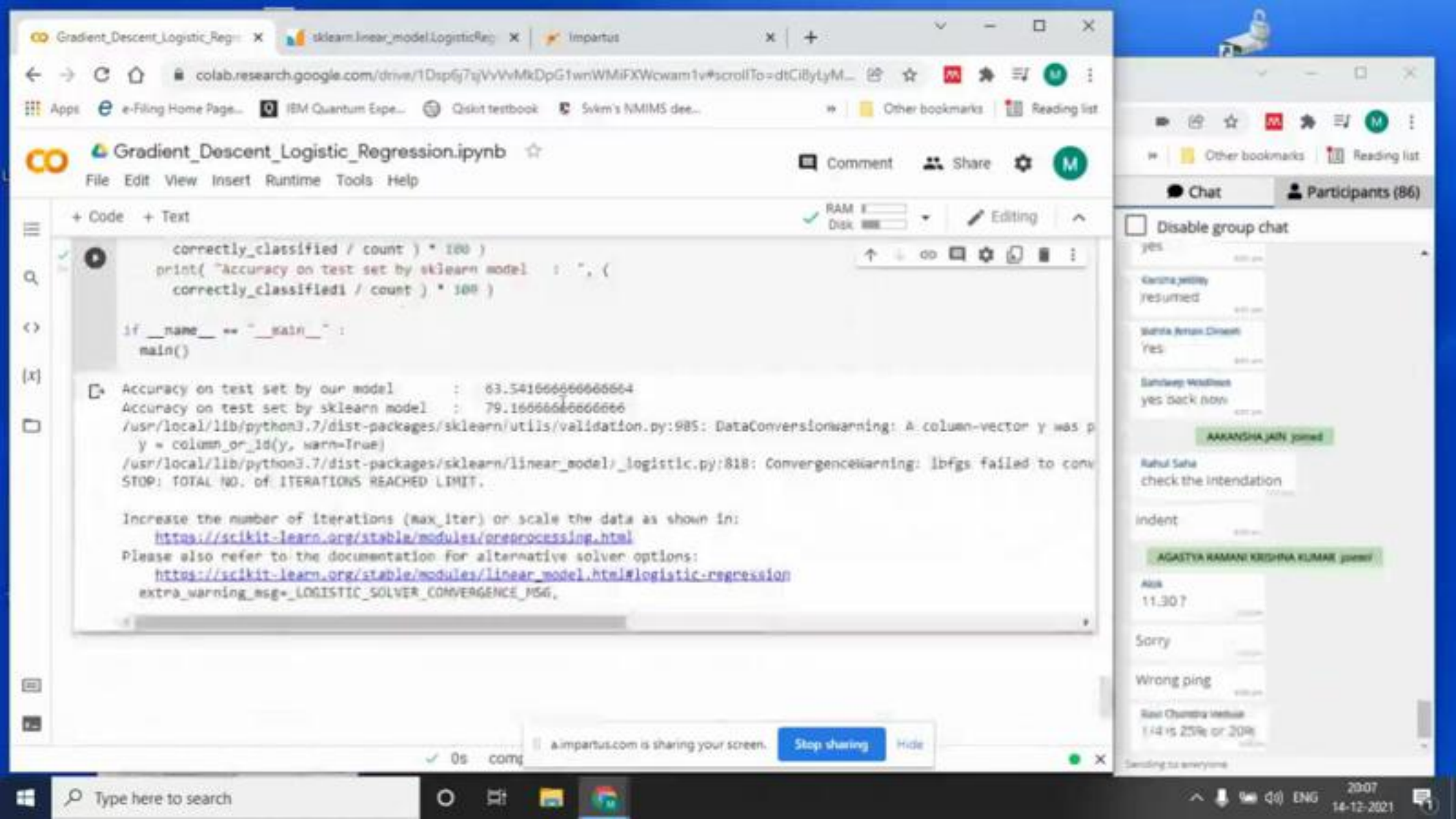
20:04
14-12-2021


Gradient_Descent_Logistic_Regression.ipynb
File Edit View Insert Runtime Tools Help
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correctly_classified / count) * 100)
print("Accuracy on test set by sklearn model : ", (
correctly_classified1 / count) * 100)
if __name__ == "__main__" :
main()
Accuracy on test set by our model : 63.541666666666664
Accuracy on test set by sklearn model : 79.16666666666666
/usr/local/lib/python3.7/dist-packages/sklearn/utils/validation.py:985: DataConversionWarning: A column-vector y was p
y = column_or_1d(y, warn=True)
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STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.
Increase the number of iterations (max_iter) or scale the data as shown in:
https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
extra_warning_msg=_LOGISTIC_SOLVER_CONVERGENCE_MSG,
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yes
resumed
Yes
yes back now
AAKANSHA JAIN joined
check the intendation
indent
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```
    print( "Accuracy on test set by our model       : ", (
      correctly_classified / count ) * 100 )
    print( "Accuracy on test set by sklearn model   : ", (
      correctly_classified1 / count ) * 100 )

if __name__ == "__main__" :
  main()
```

```
Accuracy on test set by our model       :  72.91666666666666
Accuracy on test set by sklearn model   :  79.16666666666666
/usr/local/lib/python3.7/dist-packages/sklearn/utils/validation.py:985: DataConversionWarning: A column-vector y was p
  y = column_or_1d(y, warn=True)
/usr/local/lib/python3.7/dist-packages/sklearn/linear_model/_logistic.py:818: ConvergenceWarning: lbfgs failed to conv
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
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  extra_warning_msg=_LOGISTIC_SOLVER_CONVERGENCE_MSG,
```

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change LR

regularization

How to decide on no of iterations for good fit

learning rate

yes

Mam, one thing is not clear.. Weights are updated at each iteration by comparing the result with actual value whether to increase or decrease weights.. but we are not comparing with result here and updating weights

on what params do we select the right solver

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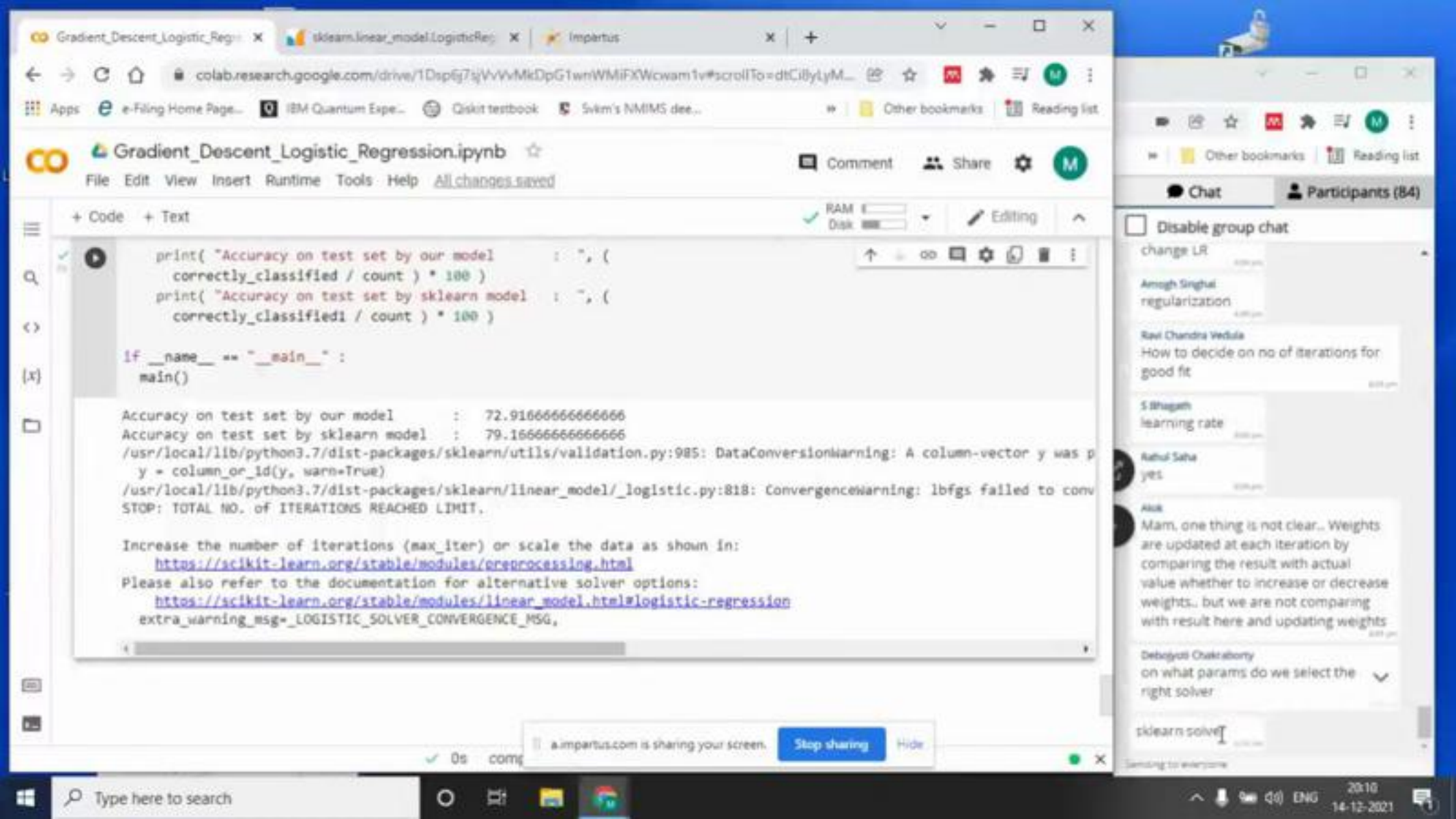
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change LR
Amogh Singhal
regularization
Ravi Chandra Vedula
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S Bhagath
learning rate
Rahul Saha
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sklearn solver
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```
[7]         # weight initialization
            self.W = np.zeros( self.n )
            self.b = 0
            self.X = X
            self.Y = Y

            # gradient descent learning

            for i in range( self.iterations ) :
                self.update_weights()
            return self

    # Helper function to update weights in gradient descent

        def update_weights( self ) :
            A = 1 / ( 1 + np.exp( - ( self.X.dot( self.W ) + self.b ) ) )
            # calculate gradients
            tmp = ( A - self.Y.T )
            tmp = np.reshape( tmp, self.m )
            dW = np.dot( self.X.T, tmp ) / self.m
            db = np.sum( tmp ) / self.m
            # update weights
            self.W = self.W - self.learning_rate * dW
            self.b = self.b - self.learning_rate * db
            return self
```

0s comp

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regularization

Ravi Chandra Vedula
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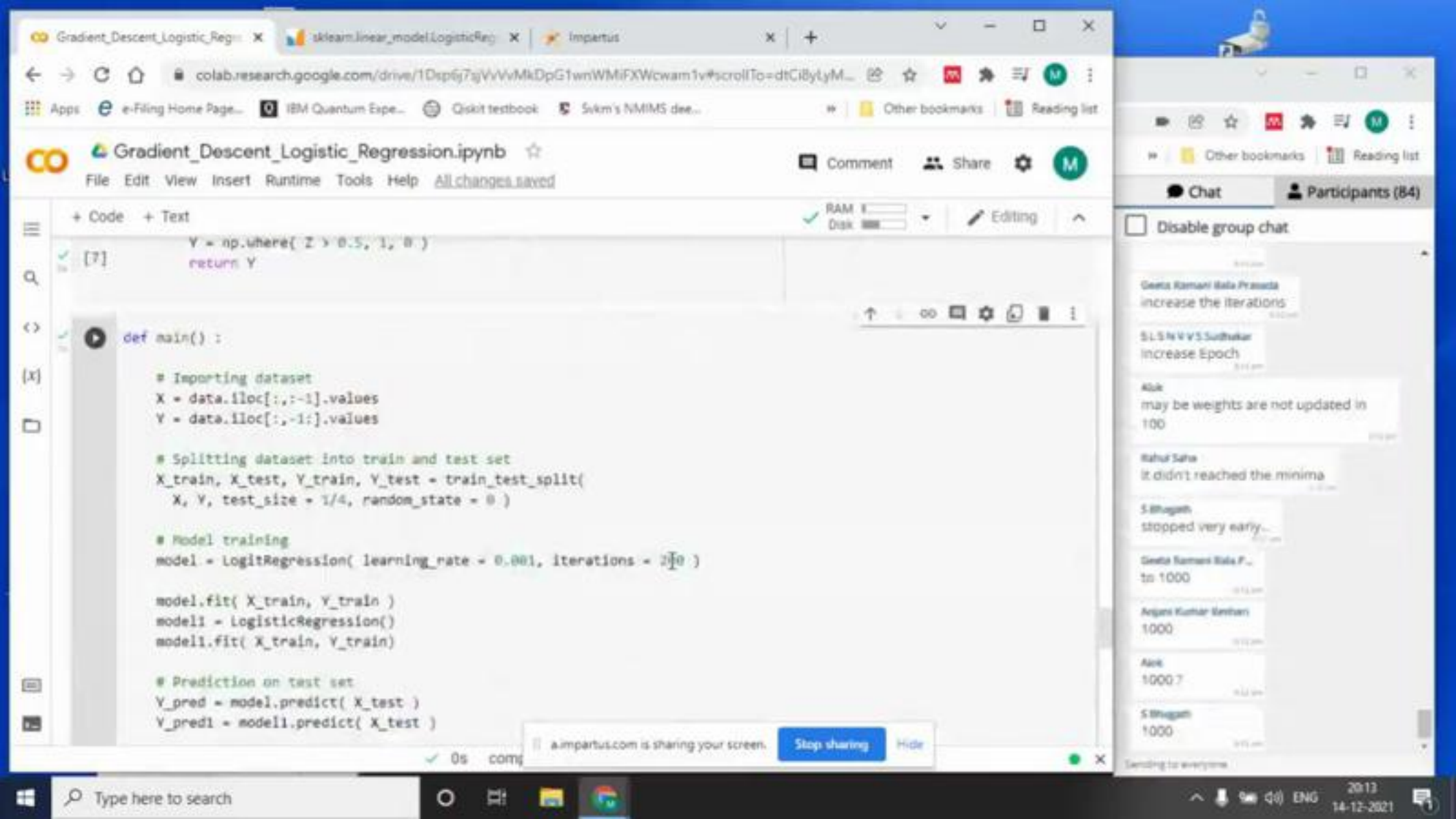
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[7] Y = np.where(Z > 0.5, 1, 0)
return Y
def main() :
# Importing dataset
X = data.iloc[:,:-1].values
Y = data.iloc[:,-1:].values
# Splitting dataset into train and test set
X_train, X_test, Y_train, Y_test = train_test_split(
X, Y, test_size = 1/4, random_state = 0)
# Model training
model = LogitRegression(learning_rate = 0.001, iterations = 200)
model.fit(X_train, Y_train)
model1 = LogisticRegression()
model1.fit(X_train, Y_train)
# Prediction on test set
Y_pred = model.predict(X_test)
Y_pred1 = model1.predict(X_test)
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increase the iterations
increase Epoch
may be weights are not updated in 100
It didn't reached the minima
stopped very early...
to 1000
1000
1000 ?
1000
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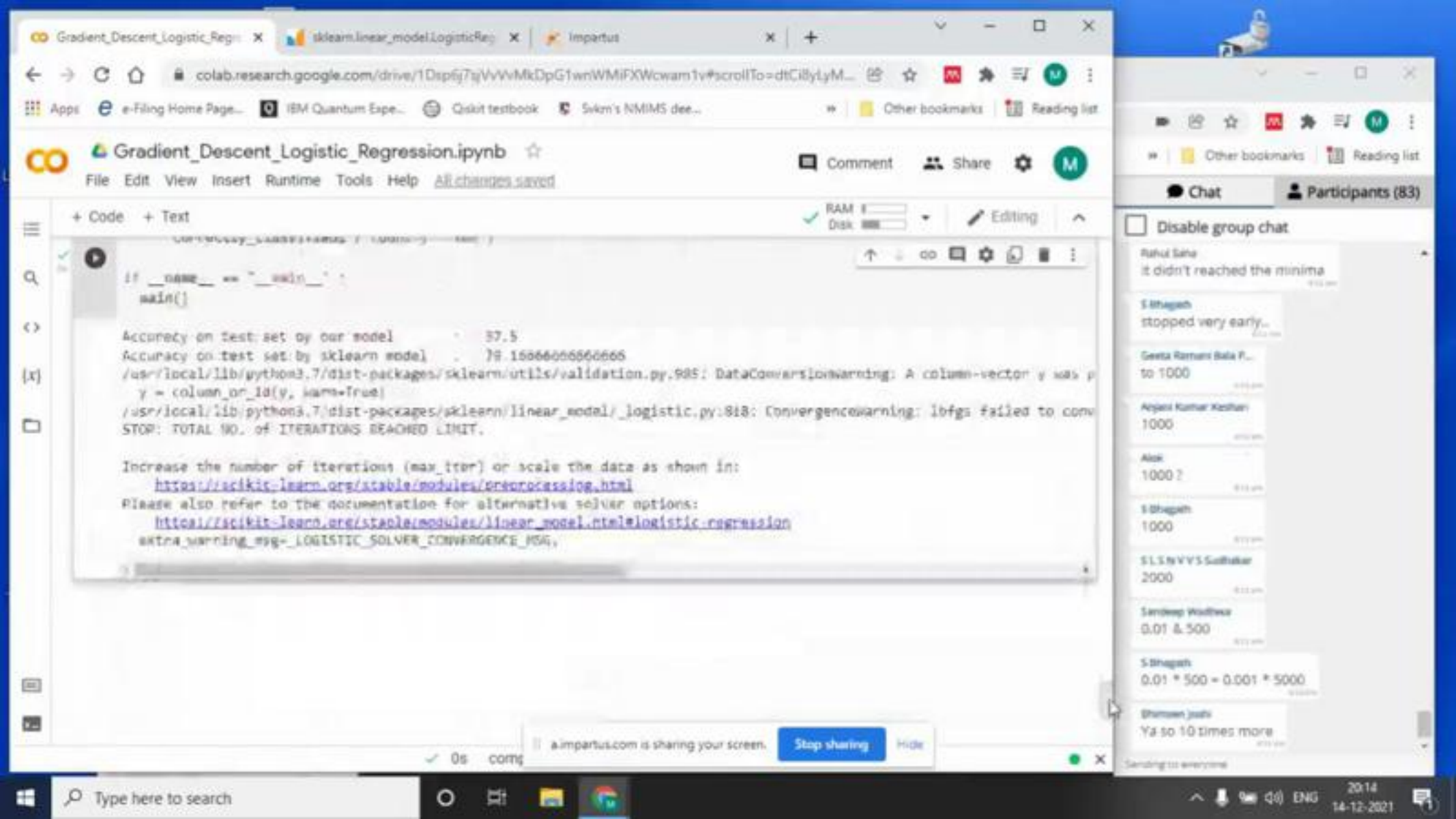
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stopped very early..
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S L S N V V S Sudhakar
2000
Sandeep Wadhwa
0.01 & 500
S Bhagath
0.01 * 500 = 0.001 * 5000
Bhimsen Joshi
Ya so 10 times more
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Now we will be using the above derived equation to make our predictions. Before that we will train our model to obtain the values of our parameters $b_0, b_1, b_2 \ldots$ that result in least error. This is where the error or loss function comes in.

Loss Function

Loss functions are used to calculate error in a model. There are two types of Loss functions. L1 and L2.
L1 loss function is used to minimize the error which is the sum of the all the absolute differences between the true value and the predicted value.
L2 Loss Function L2 Loss Function is used to minimize the error which is the sum of the all the squared differences between the true value and the predicted value

The cost function of linear regression L1 and L2 can't be used in logistic regression because it is a non-convex function of weights. Optimizing algorithms like i e gradient descent only converge convex function into a global minimum.

J = - ylog(h(x)) - (1 - y)log(1 - h(x))

here, y is the real target value

h(x) = sigmoid(wx + b)

For y = 0,

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Bhimsen Joshi
Ya so 10 times more

Seelam Reshma Mon...
5000 ?

Anjani Kumar Keshari
lr = 0.005

Alok
Loop thru

Gaurav Anand
I remember we used Tou for learning rate

Anjani Kumar Keshari
hypertuning

M R Vijay Krishnan
Gridsearch

Random searchok

Alok
0.01 + 500

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The "balanced" mode uses the values of y to automatically adjust weights inversely proportional to class frequencies in the input data as `n_samples / (n_classes * np.bincount(y))`.

Note that these weights will be multiplied with sample_weight (passed through the fit method) if sample_weight is specified.

New in version 0.17: class_weight='balanced'

random_state : *int, RandomState instance, default=None*

Used when `solver == 'sag'` 'saga' or 'liblinear' to shuffle the data. See Glossary for details.

solver : *{'newton-cg', 'lbfgs', 'liblinear', 'sag', 'saga'}, default='lbfgs'*

Algorithm to use in the optimization problem. Default is 'lbfgs'. To choose a solver, you might want to consider the following aspects:

- For small datasets, 'liblinear' is a good choice, whereas 'sag' and 'saga' are faster for large ones;
- For multiclass problems, only 'newton-cg', 'sag', 'saga' and 'lbfgs' handle multinomial loss;
- 'liblinear' is limited to one-versus-rest schemes.

Warning: The choice of the algorithm depends on the penalty chosen:

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Alok: Loop thru

Gaurav Anand: I remember we used Tou for learning rate

Anjani Kumar Kashari: hypertuning

M B Vijay Krishnan: Gridsearch

Random searchok

Alok: 0.01 * 500

S L S N V V S Sudhakar: can't we normalize the data?

ok

Dharitri Panigrahy: for assignment can we use sklearn ?

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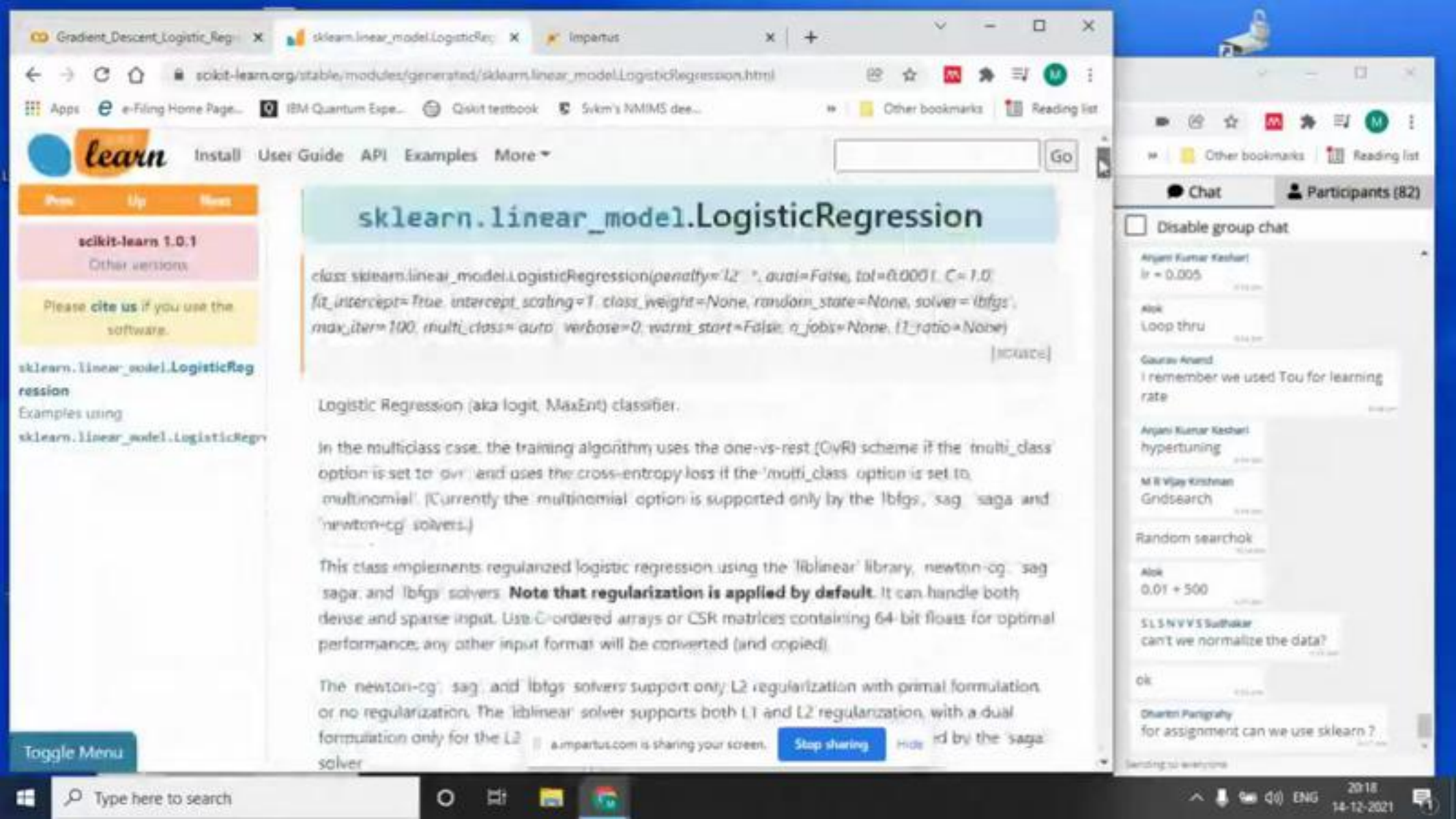
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[source]
Logistic Regression (aka logit, MaxEnt) classifier.
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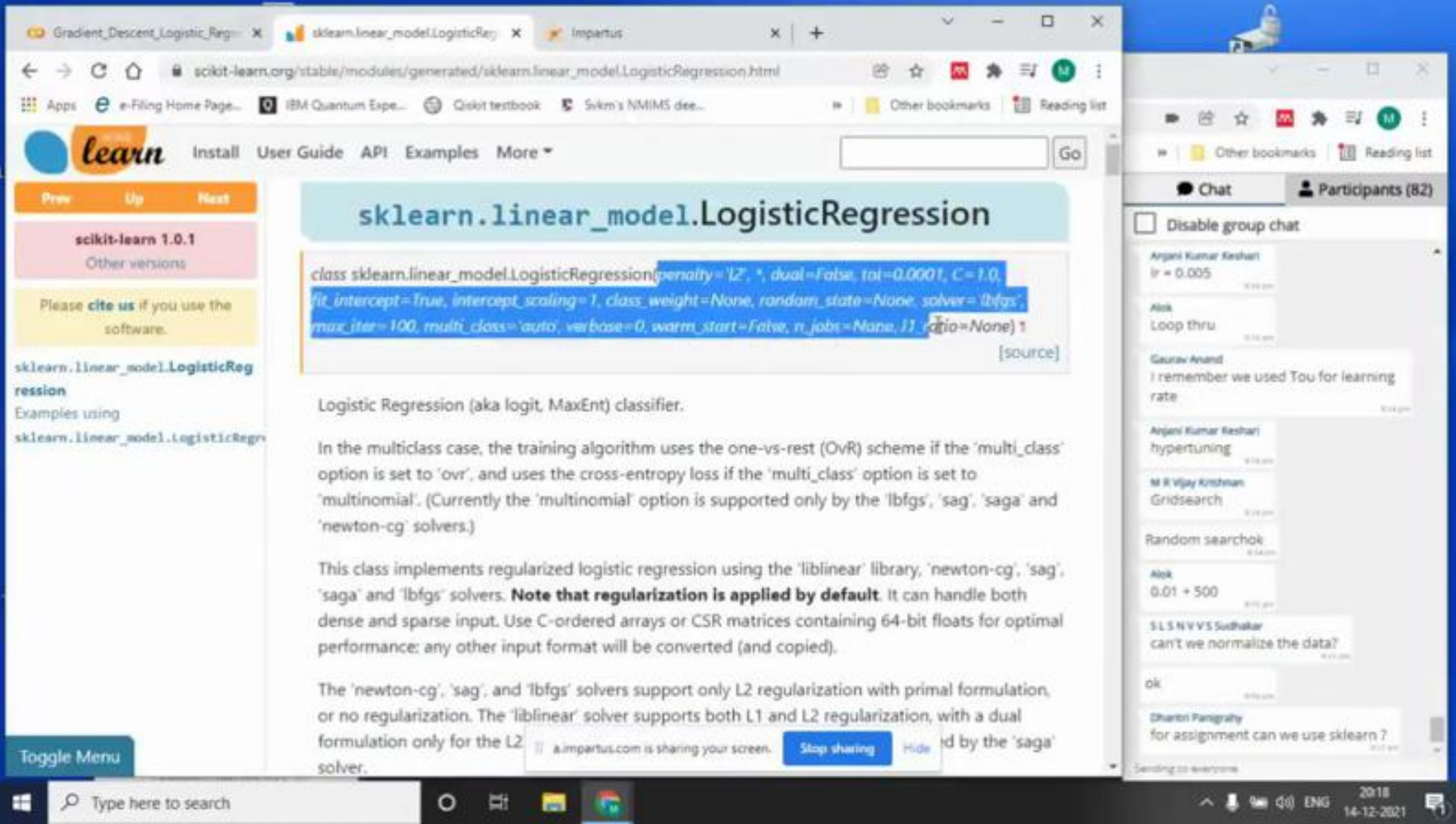
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I remember we used Tou for learning rate

Anjani Kumar Kashari: hypertuning

M R Vijay Krishnan: Gridsearch

Random searchok

Alok: 0.01 + 500

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Alok: L1 and L2 are not covered
M R Vijay Krishnan: Ok
Mulasa Lakshmi Sow...: Lasso and Ridge
S L S N V V S Sudhakar: Those are
Arijit Barat: not covered
Seelam Reshma Mon...: no
Jayathirtha Ramacha...: Not yet mam
Mulasa Lakshmi Sow...: nope
Rahul Saha: |lambda|/2
Alok: No mam

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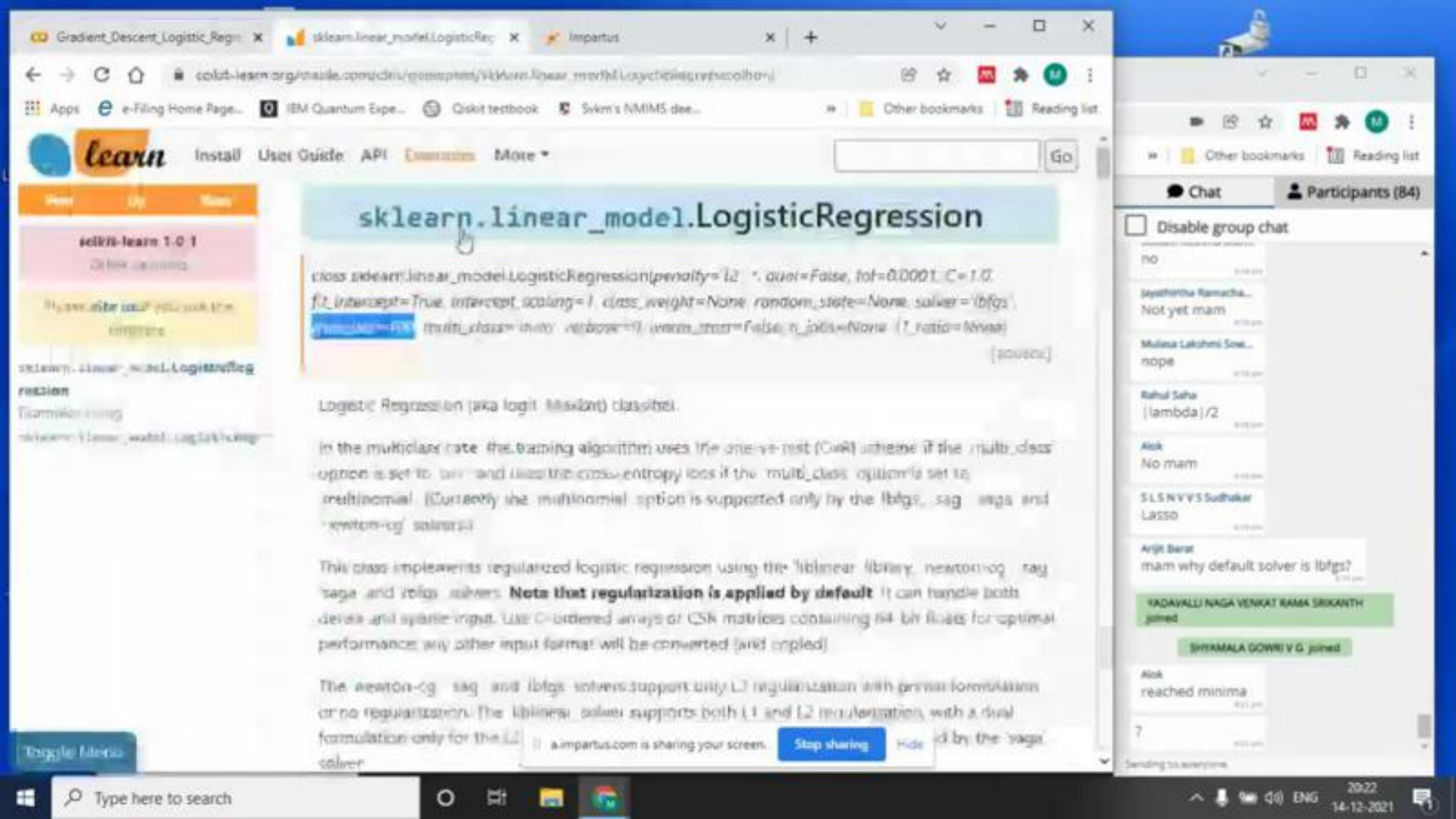
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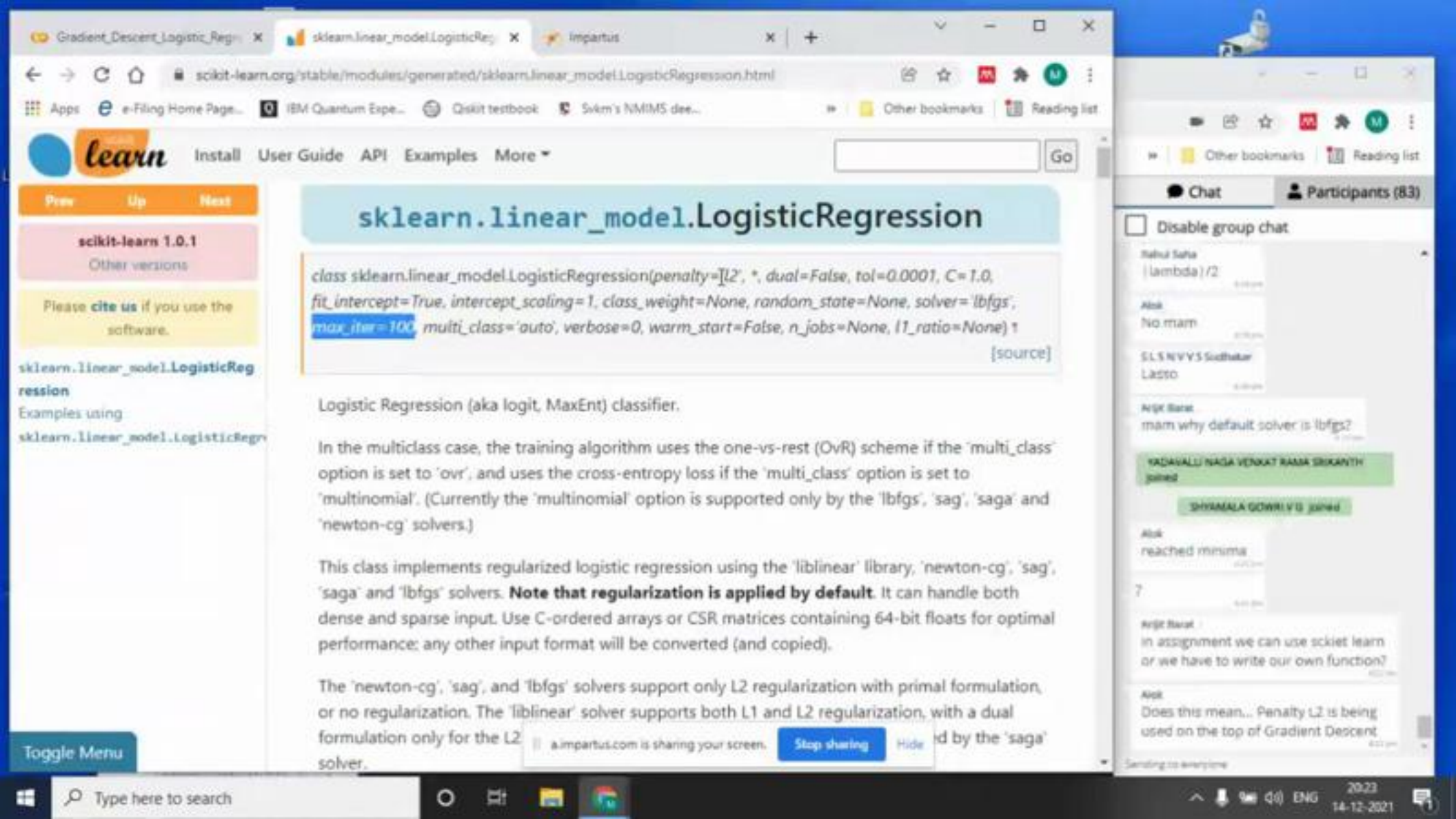
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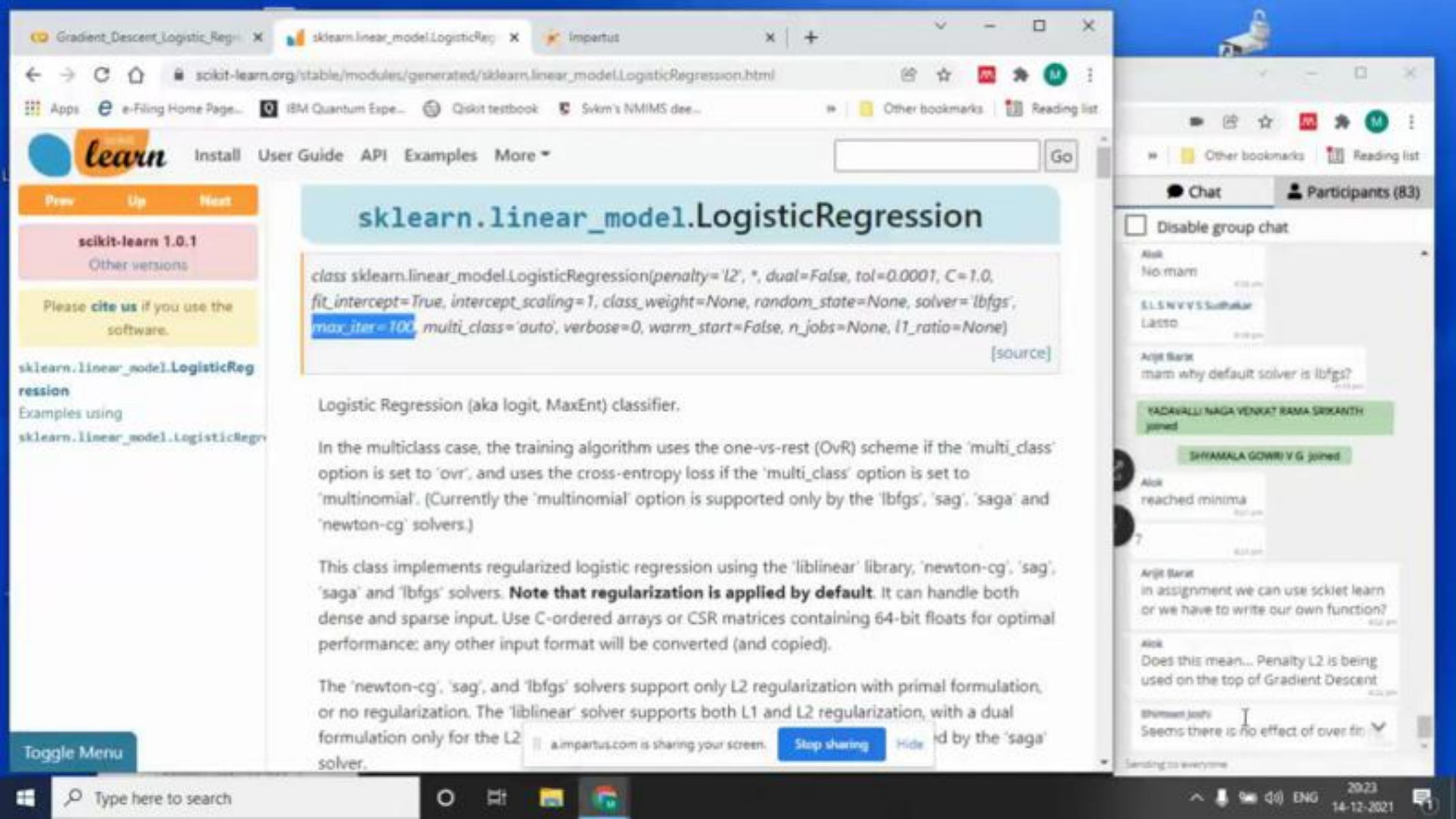
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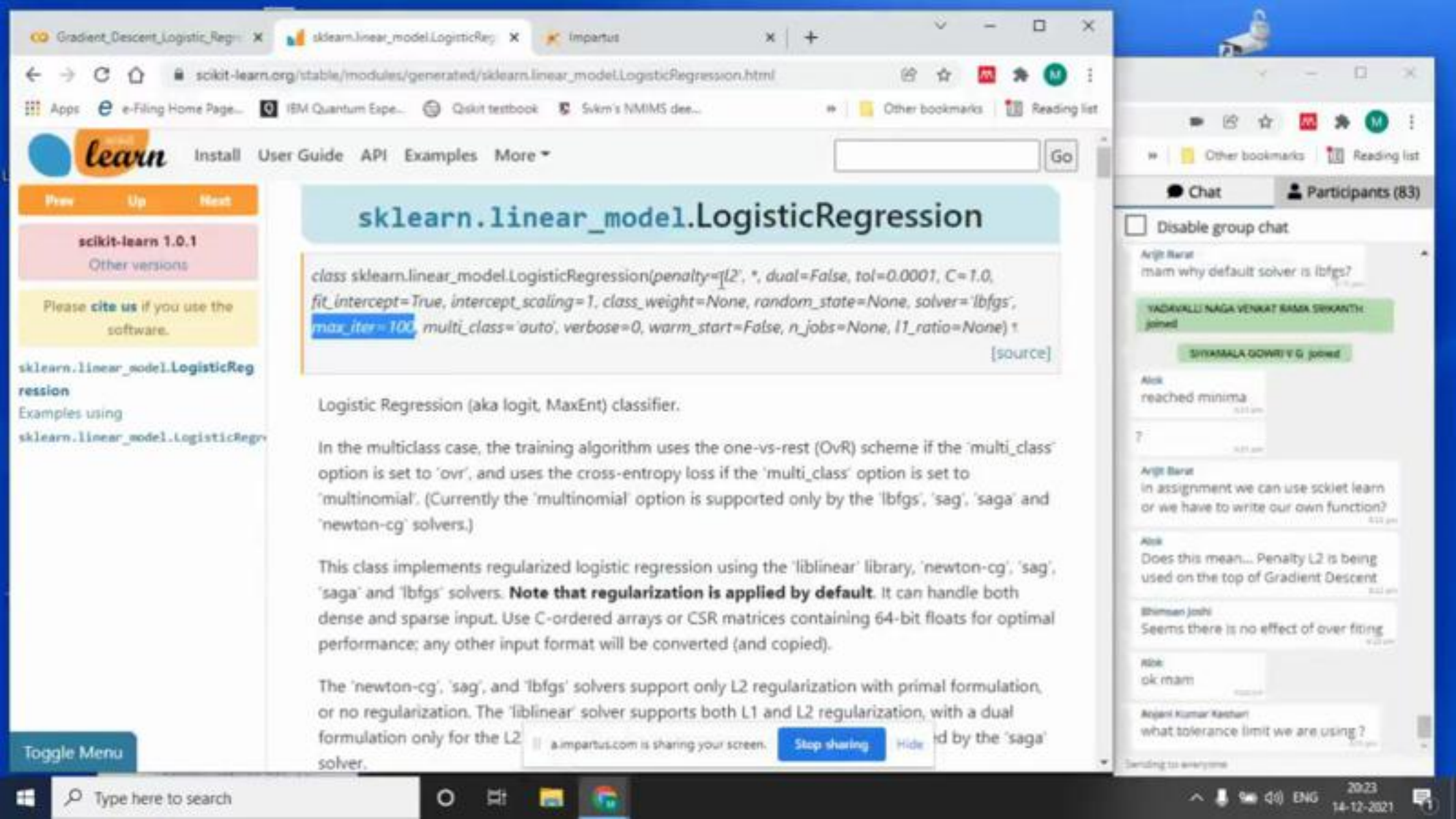
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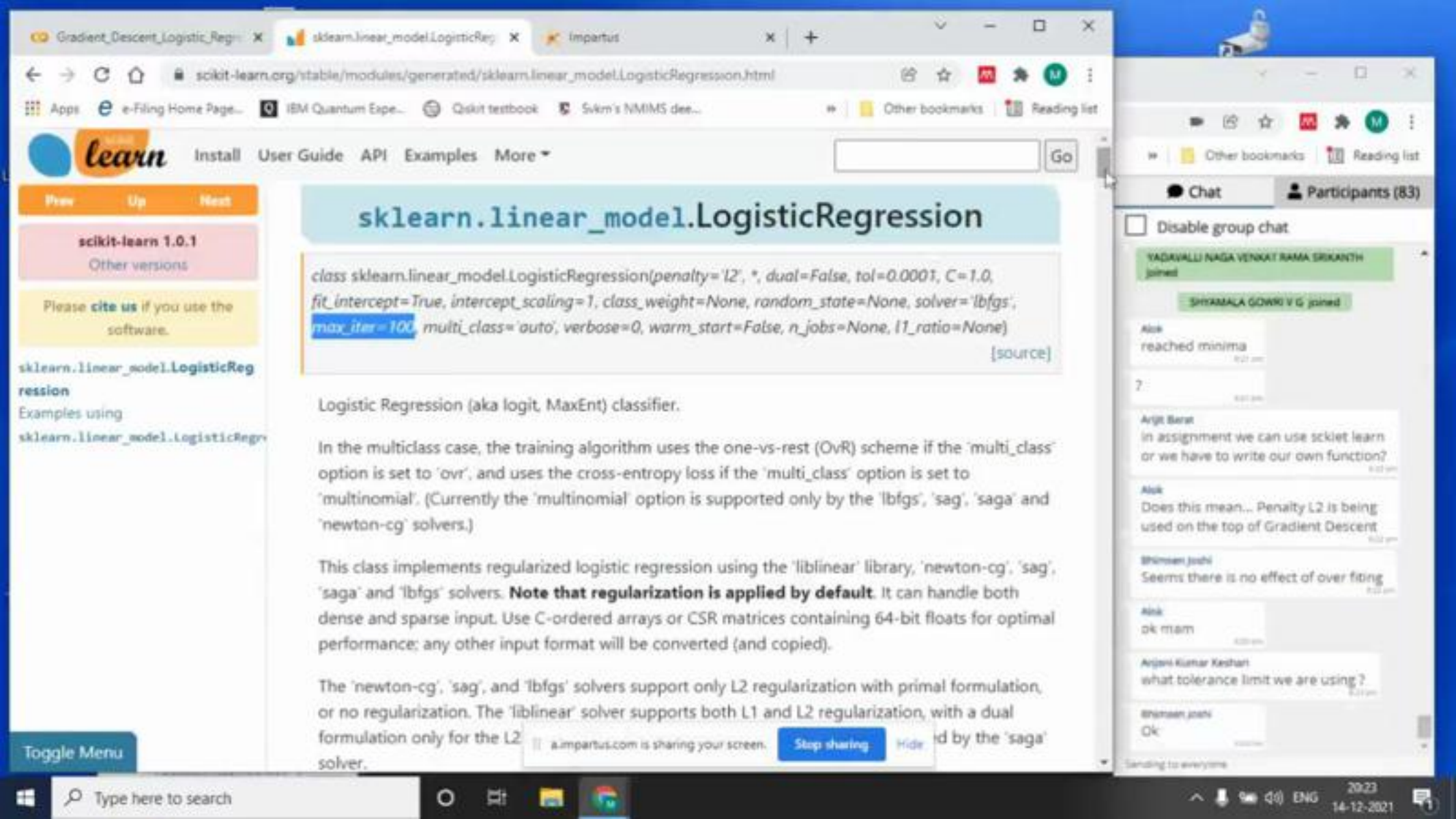
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Read more in the User Guide.

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Specify the norm of the penalty:

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New in version 0.19: l1 penalty with SAGA solver (allowing 'multinomial' + L1)

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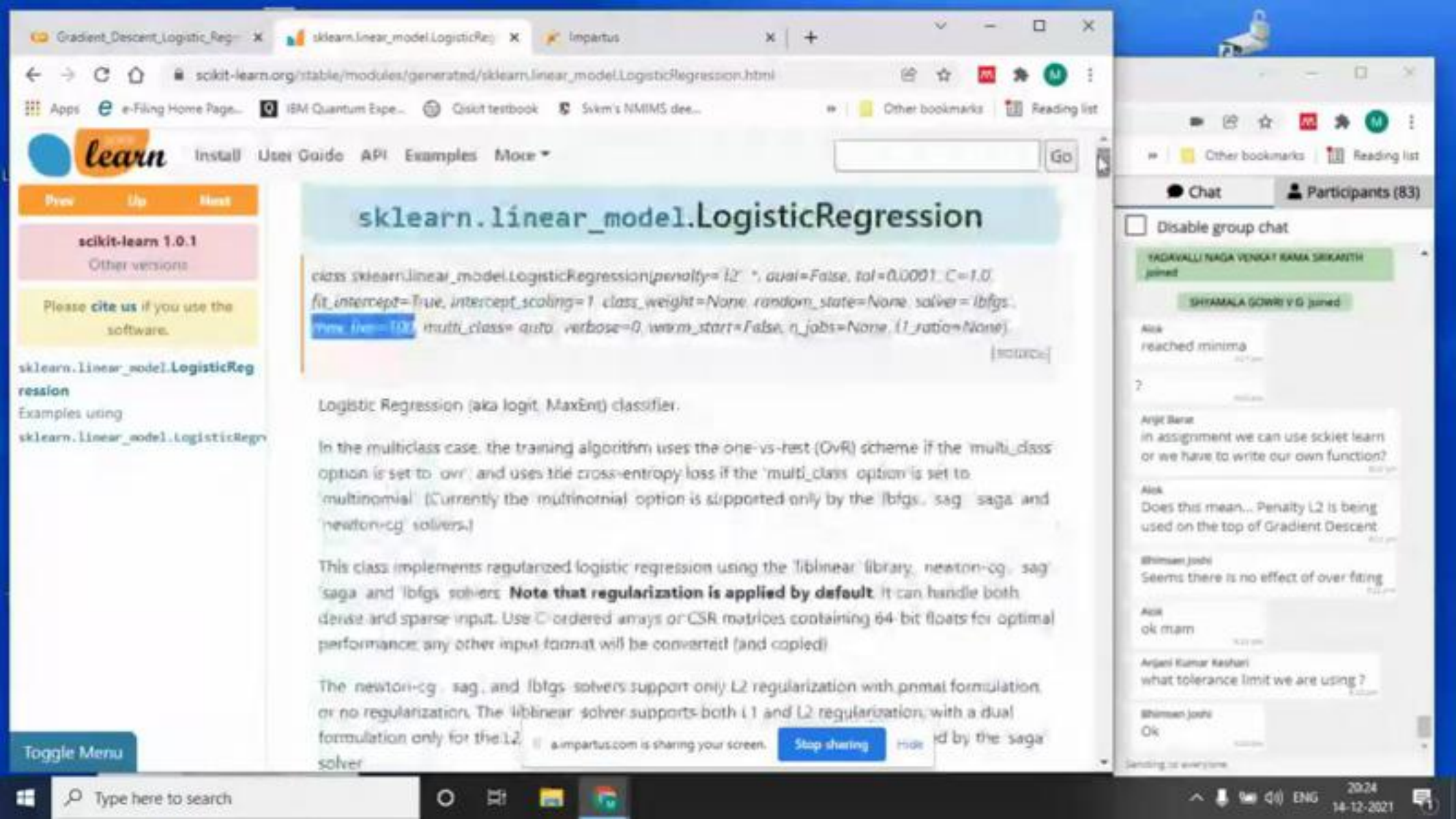
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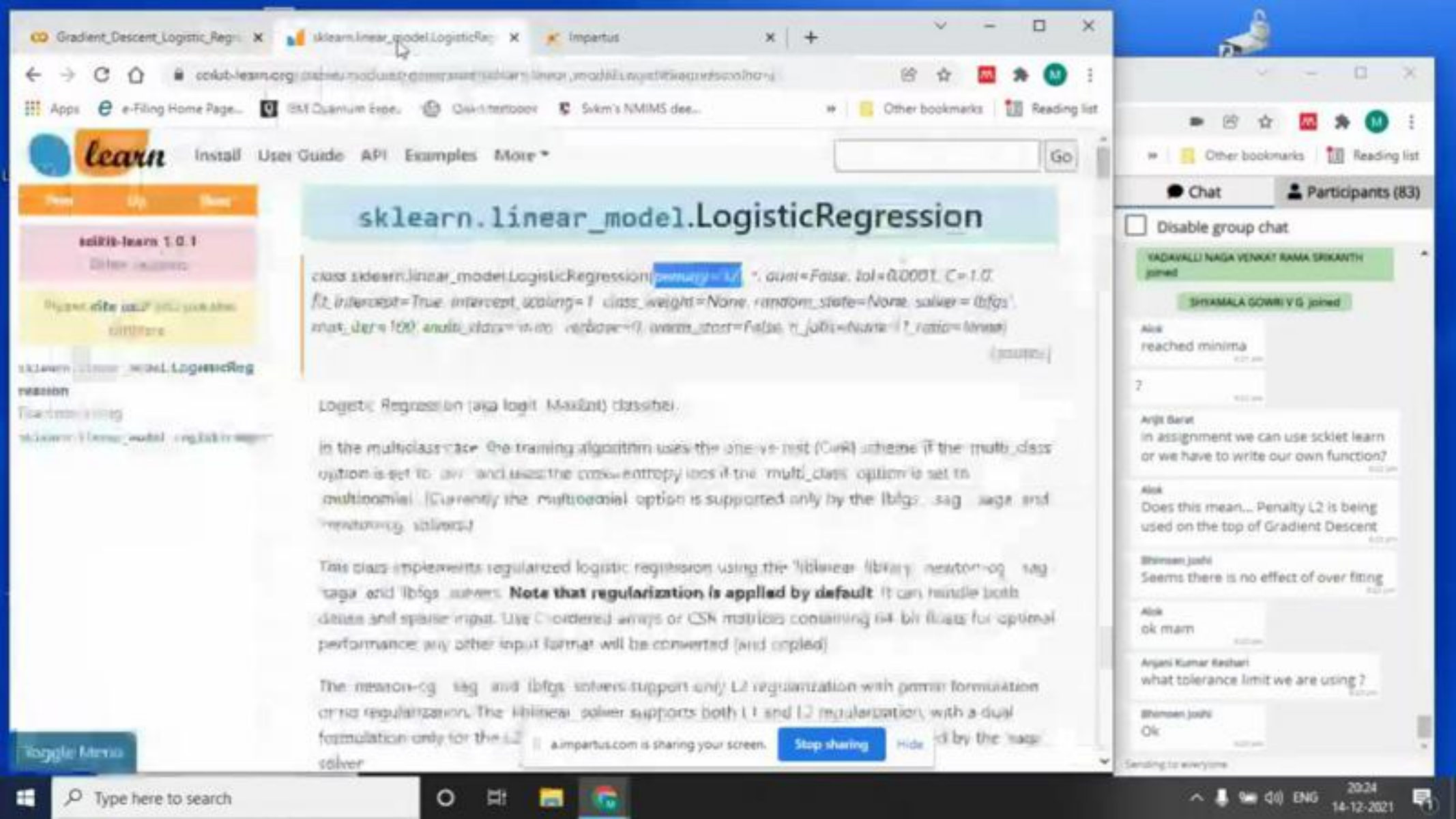
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Tolerance for stopping criteria.

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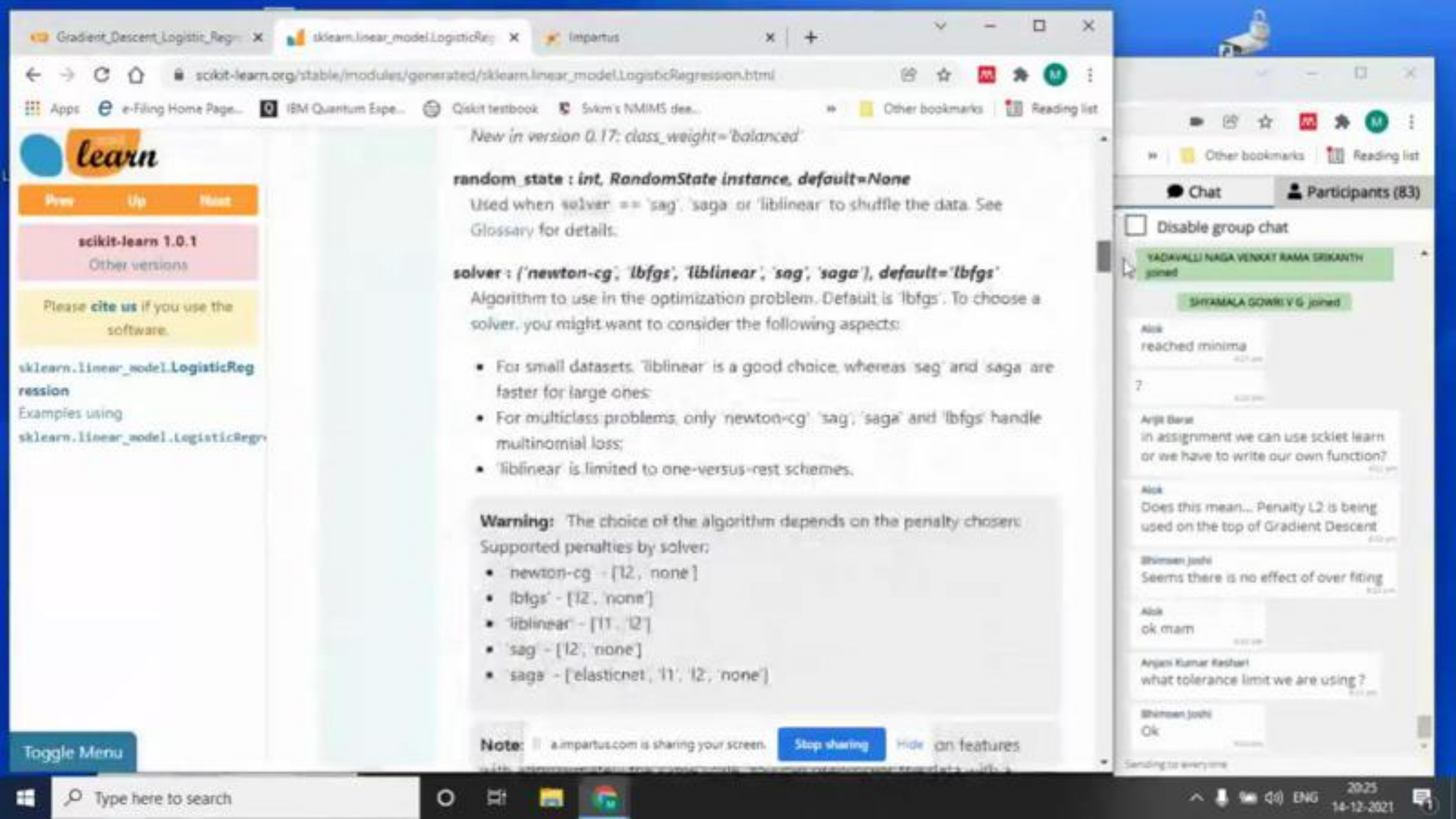
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random_state : int, RandomState instance, default=None
Used when solver == 'sag', 'saga' or 'liblinear' to shuffle the data. See Glossary for details.
solver : {'newton-cg', 'lbfgs', 'liblinear', 'sag', 'saga'}, default='lbfgs'
Algorithm to use in the optimization problem. Default is 'lbfgs'. To choose a solver, you might want to consider the following aspects:
For small datasets, 'liblinear' is a good choice, whereas 'sag' and 'saga' are faster for large ones;
For multiclass problems, only 'newton-cg', 'sag', 'saga' and 'lbfgs' handle multinomial loss;
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newton-cg - ['l2', 'none']
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'liblinear' - ['l1', 'l2']
'sag' - ['l2', 'none']
'saga' - ['elasticnet', 'l1', 'l2', 'none']
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SHYAMALA GOWRI V G joined
Alok
reached minima
?
Arijit Barai
in assignment we can use sciket learn or we have to write our own function?
Alok
Does this mean... Penalty L2 is being used on the top of Gradient Descent
Bhimsen Joshi
Seems there is no effect of over fiting
Alok
ok mam
Anjani Kumar Keshari
what tolerance limit we are using ?
Bhimsen Joshi
Ok
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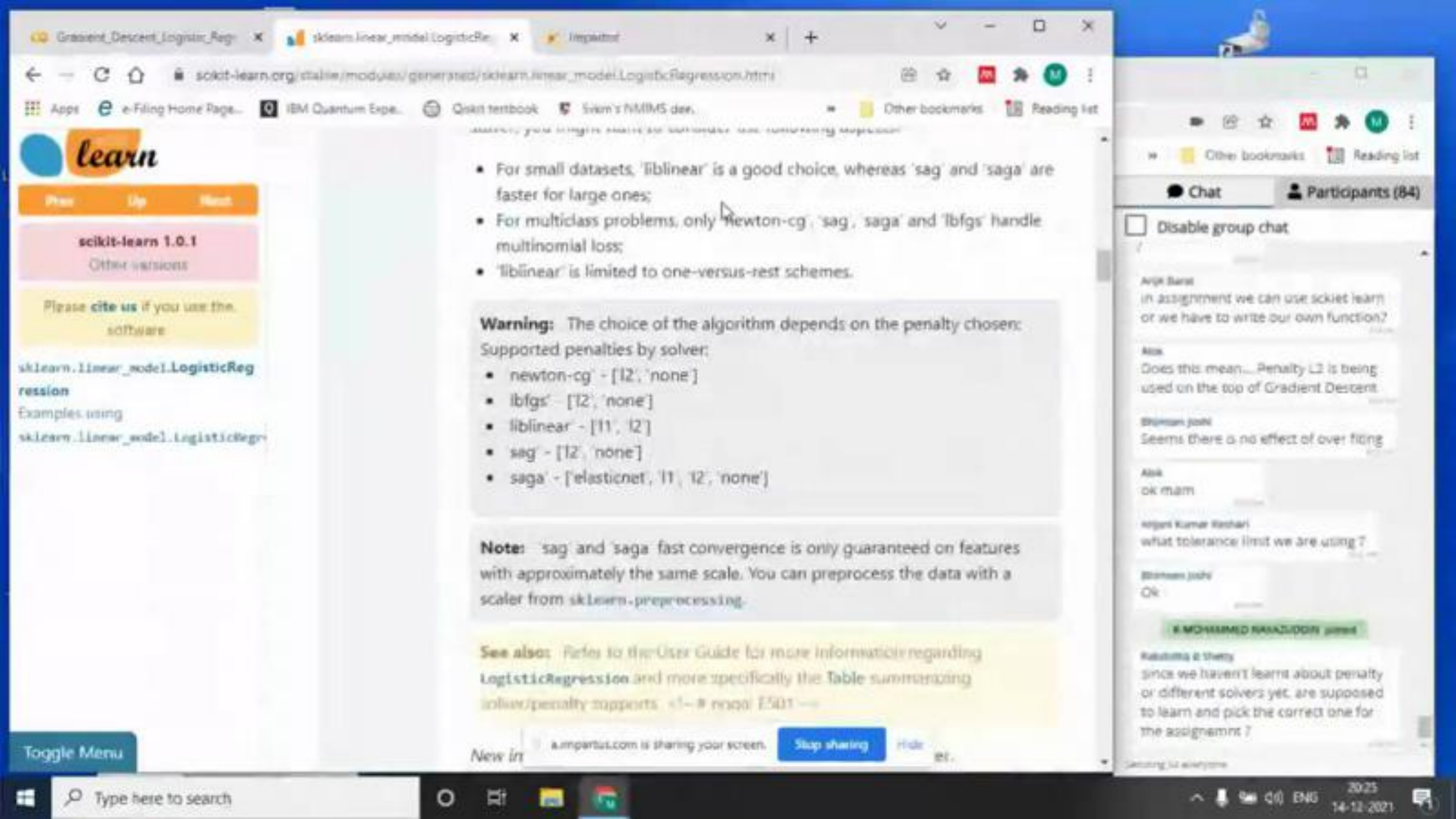
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Note: 'sag' and 'saga' fast convergence is only guaranteed on features with approximately the same scale. You can preprocess the data with a scaler from sklearn.preprocessing.
See also: Refer to the User Guide for more information regarding LogisticRegression and more specifically the Table summarizing solver/penalty supports
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Rakshitha K Shetty
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Examples using sklearn.linear_model.LogisticRegr

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See also: Refer to the User Guide for more information regarding LogisticRegression and more specifically the Table summarizing solver/penalty supports. <!-- # noqa: E501 -->

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Rakshitha B Shetty
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okay

Sending to everyone

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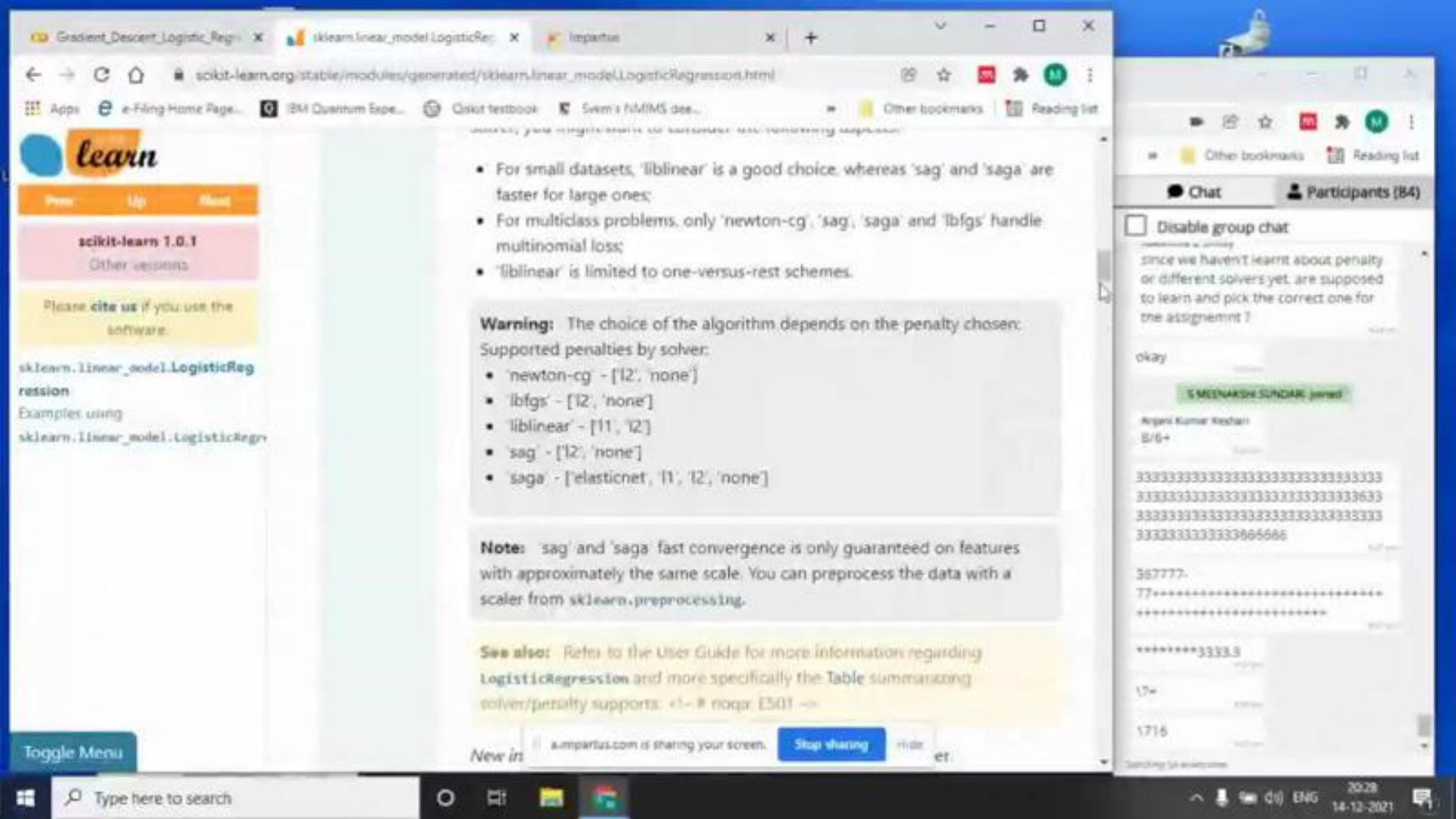
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okay
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Anjani Kumar Keshari
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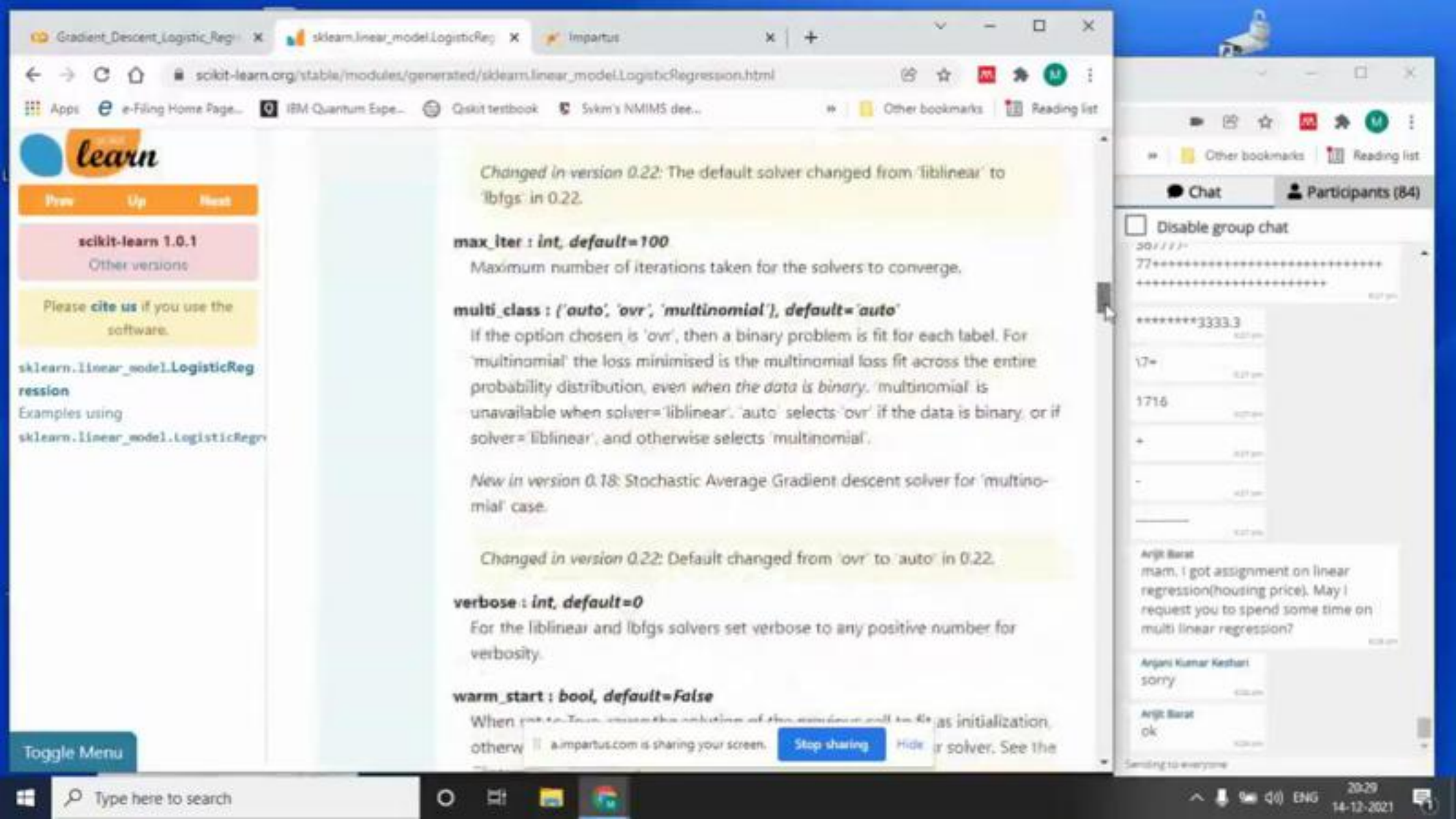
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Examples using
sklearn.linear_model.LogisticRegr
Changed in version 0.22: The default solver changed from 'liblinear' to 'lbfgs' in 0.22.
max_iter : int, default=100
Maximum number of iterations taken for the solvers to converge.
multi_class : {'auto', 'ovr', 'multinomial'}, default='auto'
If the option chosen is 'ovr', then a binary problem is fit for each label. For 'multinomial' the loss minimised is the multinomial loss fit across the entire probability distribution, even when the data is binary. 'multinomial' is unavailable when solver='liblinear'. 'auto' selects 'ovr' if the data is binary, or if solver='liblinear', and otherwise selects 'multinomial'.
New in version 0.18: Stochastic Average Gradient descent solver for 'multinomial' case.
Changed in version 0.22: Default changed from 'ovr' to 'auto' in 0.22.
verbose : int, default=0
For the liblinear and lbfgs solvers set verbose to any positive number for verbosity.
warm_start : bool, default=False
as initialization,
solver. See the
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Arijit Barat
mam, I got assignment on linear regression(housing price). May I request you to spend some time on multi linear regression?
Anjani Kumar Keshari
sorry
Arijit Barat
ok
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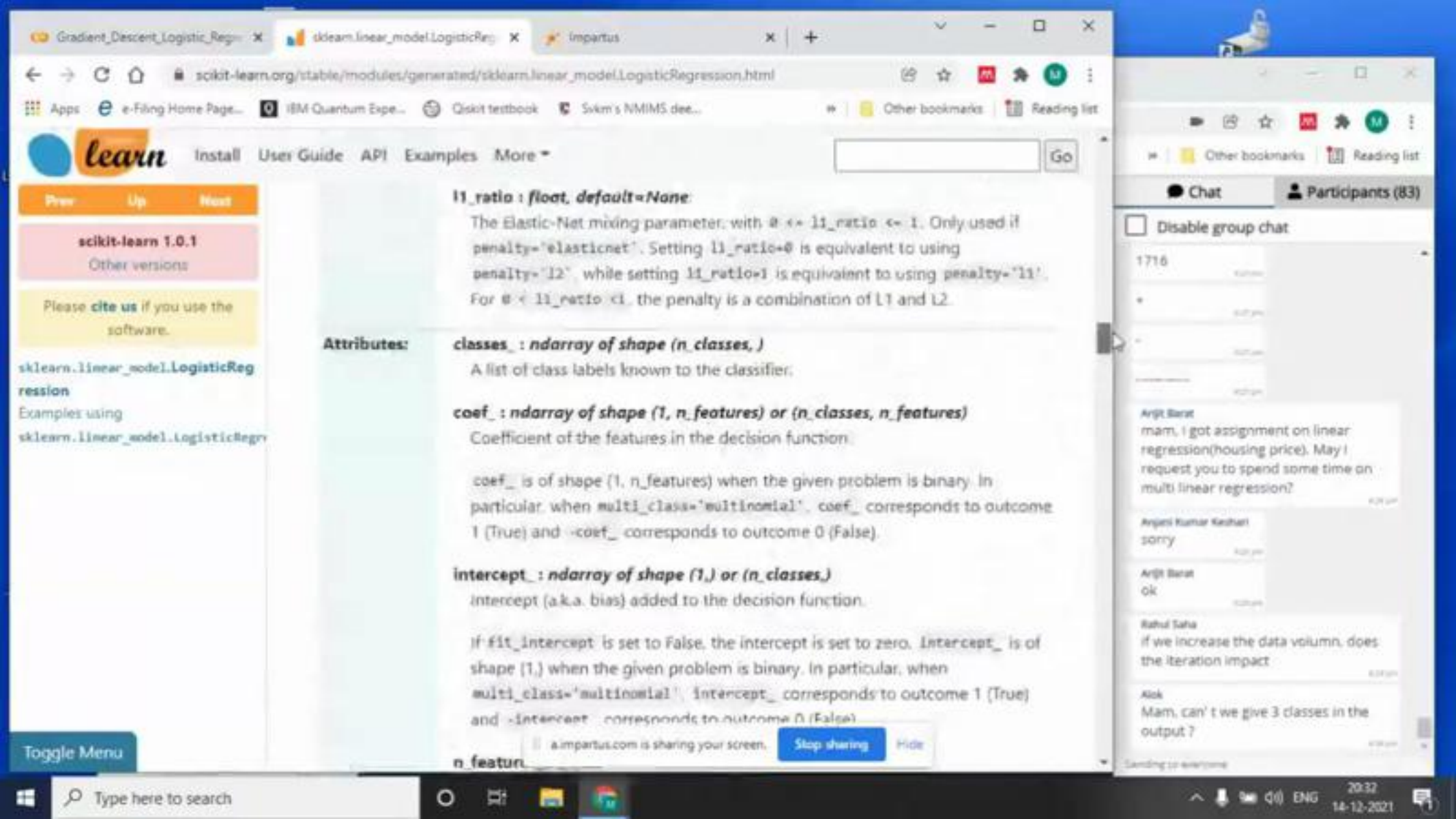
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Examples using sklearn.linear_model.LogisticRegr
l1_ratio : float, default=None
The Elastic-Net mixing parameter, with 0 <= l1_ratio <= 1. Only used if penalty='elasticnet'. Setting l1_ratio=0 is equivalent to using penalty='l2', while setting l1_ratio=1 is equivalent to using penalty='l1'. For 0 < l1_ratio <1, the penalty is a combination of L1 and L2.
Attributes:
classes_ : ndarray of shape (n_classes,)
A list of class labels known to the classifier.
coef_ : ndarray of shape (1, n_features) or (n_classes, n_features)
Coefficient of the features in the decision function.
coef_ is of shape (1, n_features) when the given problem is binary. In particular, when multi_class='multinomial', coef_ corresponds to outcome 1 (True) and -coef_ corresponds to outcome 0 (False).
intercept_ : ndarray of shape (1,) or (n_classes,)
Intercept (a.k.a. bias) added to the decision function.
If fit_intercept is set to False, the intercept is set to zero. intercept_ is of shape (1,) when the given problem is binary. In particular, when multi_class='multinomial', intercept_ corresponds to outcome 1 (True) and -intercept_ corresponds to outcome 0 (False).
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mam, I got assignment on linear regression(housing price). May I request you to spend some time on multi linear regression?
Anjani Kumar Keshari
sorry
Arijit Barat
ok
Rahul Saha
if we increase the data volumn, does the iteration impact
Alok
Mam, can' t we give 3 classes in the output ?
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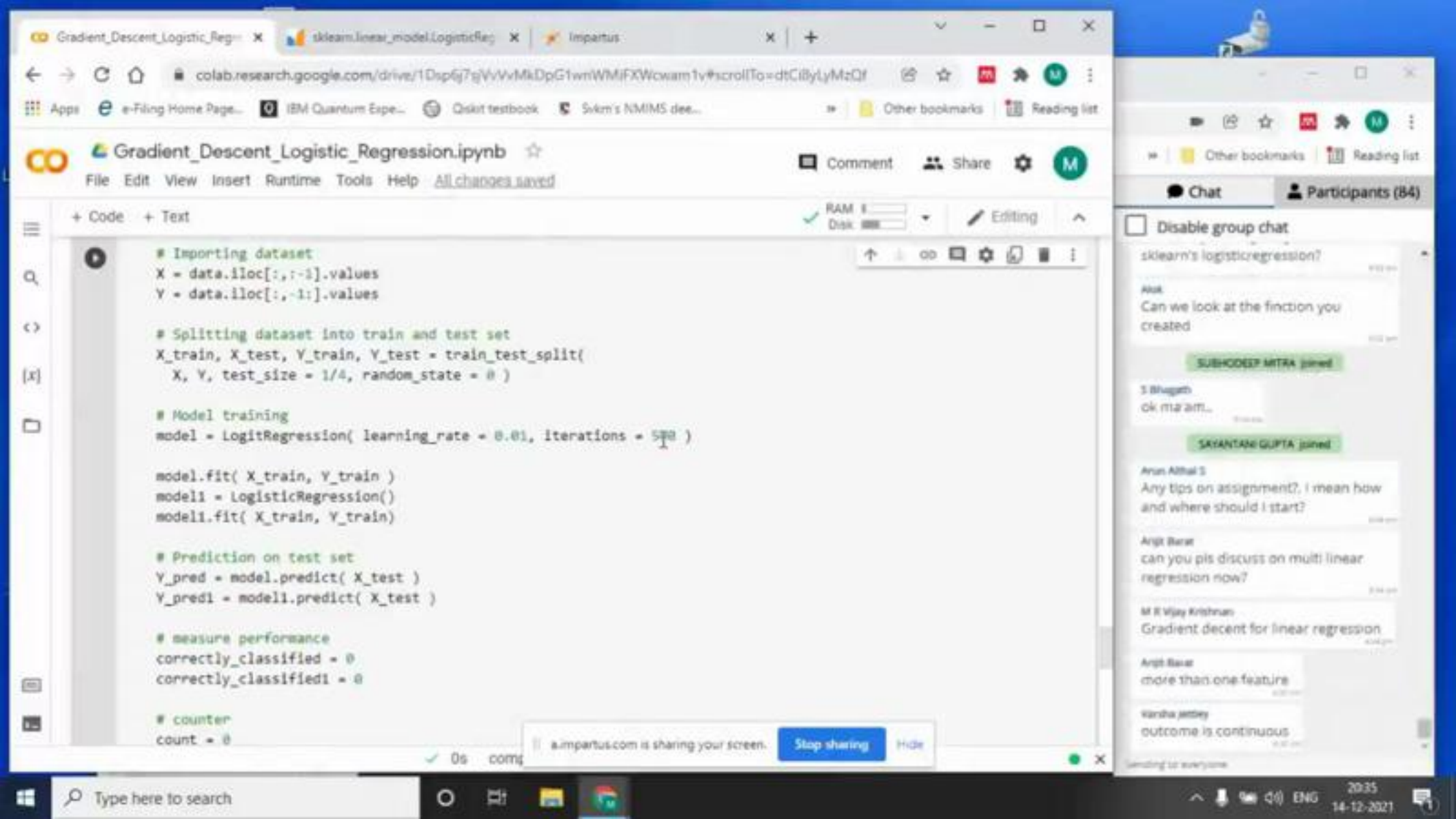
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# Importing dataset
X = data.iloc[:,:-1].values
Y = data.iloc[:,-1:].values
# Splitting dataset into train and test set
X_train, X_test, Y_train, Y_test = train_test_split(
X, Y, test_size = 1/4, random_state = 0)
# Model training
model = LogitRegression(learning_rate = 0.01, iterations = 500)
model.fit(X_train, Y_train)
model1 = LogisticRegression()
model1.fit(X_train, Y_train)
# Prediction on test set
Y_pred = model.predict(X_test)
Y_pred1 = model1.predict(X_test)
# measure performance
correctly_classified = 0
correctly_classified1 = 0
# counter
count = 0
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sklearn's logisticregression?
Can we look at the finction you created
SUBHODEEP MITRA joined
ok ma am..
SAYANTANI GUPTA joined
Any tips on assignment?, I mean how and where should I start?
can you pls discuss on multi linear regression now?
Gradient decent for linear regression
more than one feature
outcome is continuous
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colab.research.google.com/drive/1Dsp6j7gjVvVvMkDpG1wnWMiFXWowarm1v#scrollTo=dtCiByLyMzQf

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Logistic Regression, Gradient Descent

Loss function,

Python implementation

Logistic Regression

Logistic regression is a probabilistic model, used to establish the relationship between a binary dependent variable and one or more independent variables. Let X_i be the independent variable (training variable) and Y be the dependent variable. Linear Regression predicts probability of outcome of binary dependent variable (Y) and the output lies between 0 and 1. The prediction equation between X_i and Y is

$$ln(\frac{p}{1-p}) = b_0 + b_1x_1 + b_2x_2 + b_3x_3 \ldots b_nx_n$$

$ln(\frac{p}{1-p})$ is log odds and denotes the likelihood of the event taking place. It maps the probability between 0 and 1. The terms $b_0, b_1, b_2 \ldots$ are parameters estimated during training of each record. The above equation can be rewritten as

$$\frac{p}{1-p} = e^{b_0+b_1x_1+b_2x_2+b_3x_3 \ldots b_nx_n}$$

simplifying it further

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S Bhagath
ok ma'am,,

SAYANTANI GUPTA joined

Arun Abhat S
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M R Vijay Krishnan
Gradient decent for linear regression

Arijit Barat
more than one feature

Vanisha Jaidev
outcome is continuous

Rajesh R
Linear is continuous

S Bhagath
continous

Sending to everyone

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```
data = pd.read_csv(io.BytesIO(uploaded['diabetes.csv']))
data.head()
```

diabetes.csv

- **diabetes.csv**(application/vnd.ms-excel) - 23873 bytes, last modified: 9/21/2019 - 100% done

Saving diabetes.csv to diabetes.csv

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35	0	33.6	0.627	50	1
1	1	85	66	29	0	26.6	0.351	31	0
2	8	183	64	0	0	23.3	0.672	32	1
3	1	89	66	23	94	28.1	0.167	21	0
4	0	137	40	35	168	43.1	2.288	33	1

```
[5] data = data.dropna()
    print(data.shape)
    print(list(data.columns))

    (760, 9)
    ['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age', 'Out
```

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S Bhagath: ok ma'am..

SAYANTANI GUPTA joined

Arun Aithal S: Any tips on assignment?, I mean how and where should I start?

Arijit Barat: can you pls discuss on multi linear regression now?

M R Vijay Krishnan: Gradient decent for linear regression

Arijit Barat: more than one feature

Varsha Jetley: outcome is continuous

Rajesh A: linear is continuous

S Bhagath: continous

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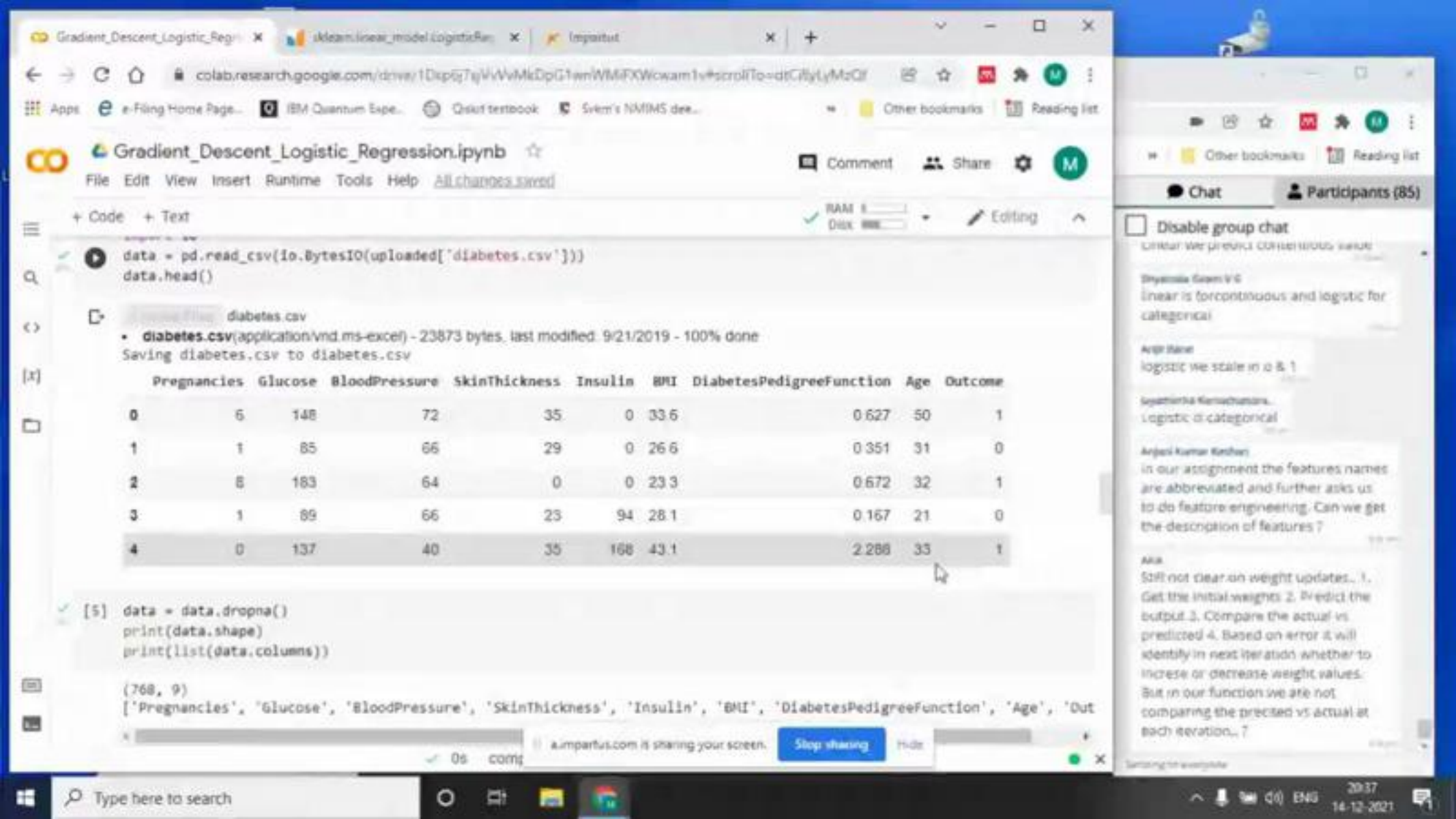
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data.head()
diabetes.csv
diabetes.csv(application/vnd.ms-excel) - 23873 bytes, last modified: 9/21/2019 - 100% done
Saving diabetes.csv to diabetes.csv
Pregnancies Glucose BloodPressure SkinThickness Insulin BMI DiabetesPedigreeFunction Age Outcome
0 6 148 72 35 0 33.6 0.627 50 1
1 1 85 66 29 0 26.6 0.351 31 0
2 8 183 64 0 0 23.3 0.672 32 1
3 1 89 66 23 94 28.1 0.167 21 0
4 0 137 40 35 168 43.1 2.288 33 1
[5] data = data.dropna()
print(data.shape)
print(list(data.columns))
(768, 9)
['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age', 'Out
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Linear is forcontinuous and logistic for categorical
logistic we scale in 0 & 1
Logistic is categorical
in our assignment the features names are abbreviated and further asks us to do feature engineering. Can we get the description of features ?
Still not clear on weight updates.. 1. Get the initial weights 2. Predict the output 3. Compare the actual vs predicted 4. Based on error it will identify in next iteration whether to increse or decrease weight values. But in our function we are not comparing the precited vs actual at each iteration.. ?
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    print(list(data.columns))
```

```
(768, 9)
['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age', 'Out
```

```
[6] data['Outcome'].value_counts()
    sns.countplot(x='Outcome',data=data, palette='hls')
    plt.show()
```

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Logistic is categorical

In our assignment the features names are abbreviated and further asks us to do feature engineering. Can we get the description of features ?

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Gradient decent for linear regression

I told multi linear regression means if we have more than one x column (feature), and simple linear regression means only one x feature column.

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```
# Helper function to update weights in gradient descent

    def update_weights( self ) :
        A = 1 / ( 1 + np.exp( - ( self.X.dot( self.W ) + self.b ) ) )
        # calculate gradients
        tmp = ( A - self.Y.T )
        tmp = np.reshape( tmp, self.m )
        dW = np.dot( self.X.T, tmp ) / self.m
        db = np.sum( tmp ) / self.m
        # update weights
        self.W = self.W - self.learning_rate * dW
        self.b = self.b - self.learning_rate * db
        return self

    # Hypothetical function  h( x )

    def predict( self, X ) :
        Z = 1 / ( 1 + np.exp( - ( X.dot( self.W ) + self.b ) ) )
        Y = np.where( Z > 0.5, 1, 0 )
        return Y
```

[21] def main() :

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Alok
Still not clear on weight updates.. 1. Get the initial weights 2. Predict the output 3. Compare the actual vs predicted 4. Based on error it will identify in next iteration whether to increse or decrease weight values. But in our function we are not comparing the precited vs actual at each iteration.. ?

M R Vijay Krishnan
Gradient decent for linear regression

Arijit Bishi
I told multi linear regression means if we have more than one x column (feature), and simple linear regression means only one x feature column.

Alok
But where we are comparing result in function to update weight

each iteration

ok mam

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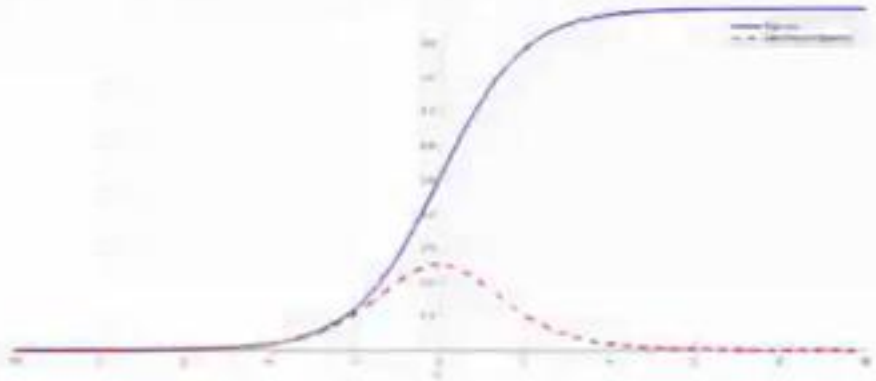
$$= \frac{1}{(1+e^{-X})} \cdot (1 - \frac{1}{1+e^{-X}})$$
$$= \sigma(X) \cdot (1 - \sigma(X))$$



Now we will be using the above derived equation to make our predictions. Before that we will train our model to obtain the values of our parameters $b_0, b_1, b_2 \ldots$ that result in least error. This is where the error or loss function comes in.

Loss Function

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each iteration.. ?

M R Vijay Krishnan
Gradient decent for linear regression

Arijit Barat
I told multi linear regression means if we have more than one x column (feature), and simple linear regression means only one x feature column.

Alok
But where we are comparing result in function to update weight

each iteration

ok mam

got it

Arijit Barat
pls spend some time on linear regression using gradient descent

M R Vijay Krishnan
Gradient decent for linear regression

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Gradient_Descent_Logistic_Regression.ipynb

$b_0, b_1, b_2 \ldots$ are parameters estimated during training of each record. The above equation can be rewritten as

$$\frac{p}{1-p} = e^{b_0+b_1x_1+b_2x_2+b_3x_3 \ldots b_nx_n}$$

simplifying it further

$$p = \frac{e^{b_0+b_1x_1+b_2x_2+b_3x_3 \ldots b_nx_n}}{1+e^{b_0+b_1x_1+b_2x_2+b_3x_3 \ldots b_nx_n}}$$

or

$$p = \frac{1}{1+e^{-(b_0+b_1x_1+b_2x_2+b_3x_3 \ldots b_nx_n)}}$$

This is the equation of the *Sigmoid Function* given by:

$$\sigma(x) = \frac{1}{1+e^{-x}}$$

Deriving the sigmoid function,

$$\sigma'(x) = \frac{d}{dX}\sigma(x) = \frac{d}{dX}\frac{1}{(1+e^{-X})}$$

$$= \frac{d}{dX}(1+e^{-X})^{-1}$$

Using reciprocal rule, then rule of linearity,

$$= -(1+e^{-X}$$

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Gradient_Descent_Logistic_Regression.ipynb

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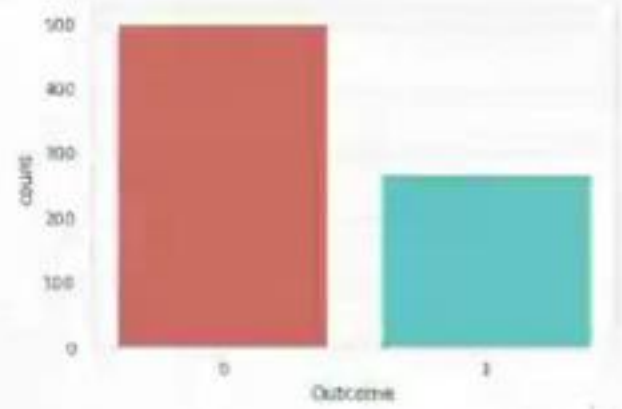
```
[5] print(list(data.columns))

    (768, 9)
    ['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age', 'Out
```

```
data['Outcome'].value_counts()
sns.countplot(x='Outcome',data=data, palette='hls')
plt.show()
```



0s comp

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would you share the colab notebook with us please?

Shyamala Gowri V G
Do we have to do all the preprocessing steps for the give data?

VARANASI SHIVANI joined

Akila
Yes

S Bhagath
yes

Shyamala Gowri V G
Yes mam

Hareesh S V
NO

M R Vijay Krishnan
Yes

Sending to everyone

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ENG 20:44 14-12-2021

Gradient_Descent_Logistic_Regression.ipynb

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[4]

diabetes.csv

- **diabetes.csv**(application/vnd.ms-excel) - 23873 bytes, last modified: 9/21/2019 - 100% done

Saving diabetes.csv to diabetes.csv

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35	0	33.6	0.627	50	1
1	1	85	66	29	0	26.6	0.351	31	0
2	8	183	64	0	0	23.3	0.672	32	1
3	1	89	66	23	94	28.1	0.167	21	0
4	0	137	40	35	168	43.1	2.288	33	1

```
data = data.dropna()
print(data.shape)
print(list(data.columns))
```

```
(768, 9)
['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age', 'Out
```

[6] data['Outcome'].value_counts()

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Yes mam

NO

Yes

Can we use all the functions within sklearn which would be relevant to the assignment?

Outliers mam?

mam can you please also share a similar kind of notebook for linear rgression? because it would be help full for guys who had assignment on linear regression.

thanks

balancing

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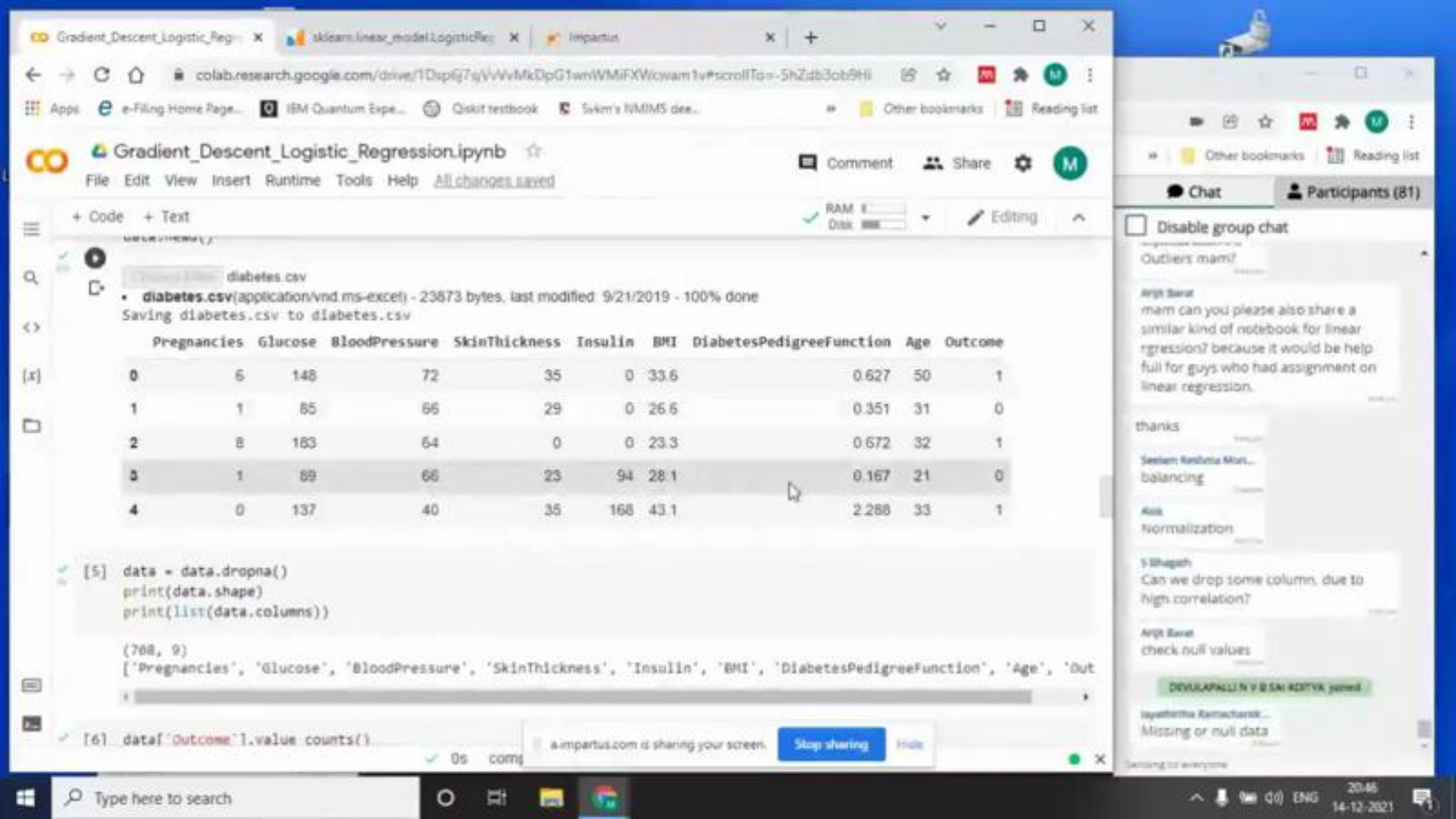
ENG 20:45 14-12-2021


Gradient_Descent_Logistic_Regression.ipynb
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diabetes.csv
diabetes.csv(application/vnd.ms-excel) - 23873 bytes, last modified: 9/21/2019 - 100% done
Saving diabetes.csv to diabetes.csv
Pregnancies Glucose BloodPressure SkinThickness Insulin BMI DiabetesPedigreeFunction Age Outcome
0 6 148 72 35 0 33.6 0.627 50 1
1 1 85 66 29 0 26.6 0.351 31 0
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Outliers mam?
Arijit Barat
mam can you please also share a similar kind of notebook for linear rgression? because it would be help full for guys who had assignment on linear regression.
thanks
balancing
Normalization
S Bhagath
Can we drop some column, due to high correlation?
Arijit Barat
check null values
DEVULAPALLI N V B SAI ADITYA joined
Missing or null data
Other bookmarks
Reading list
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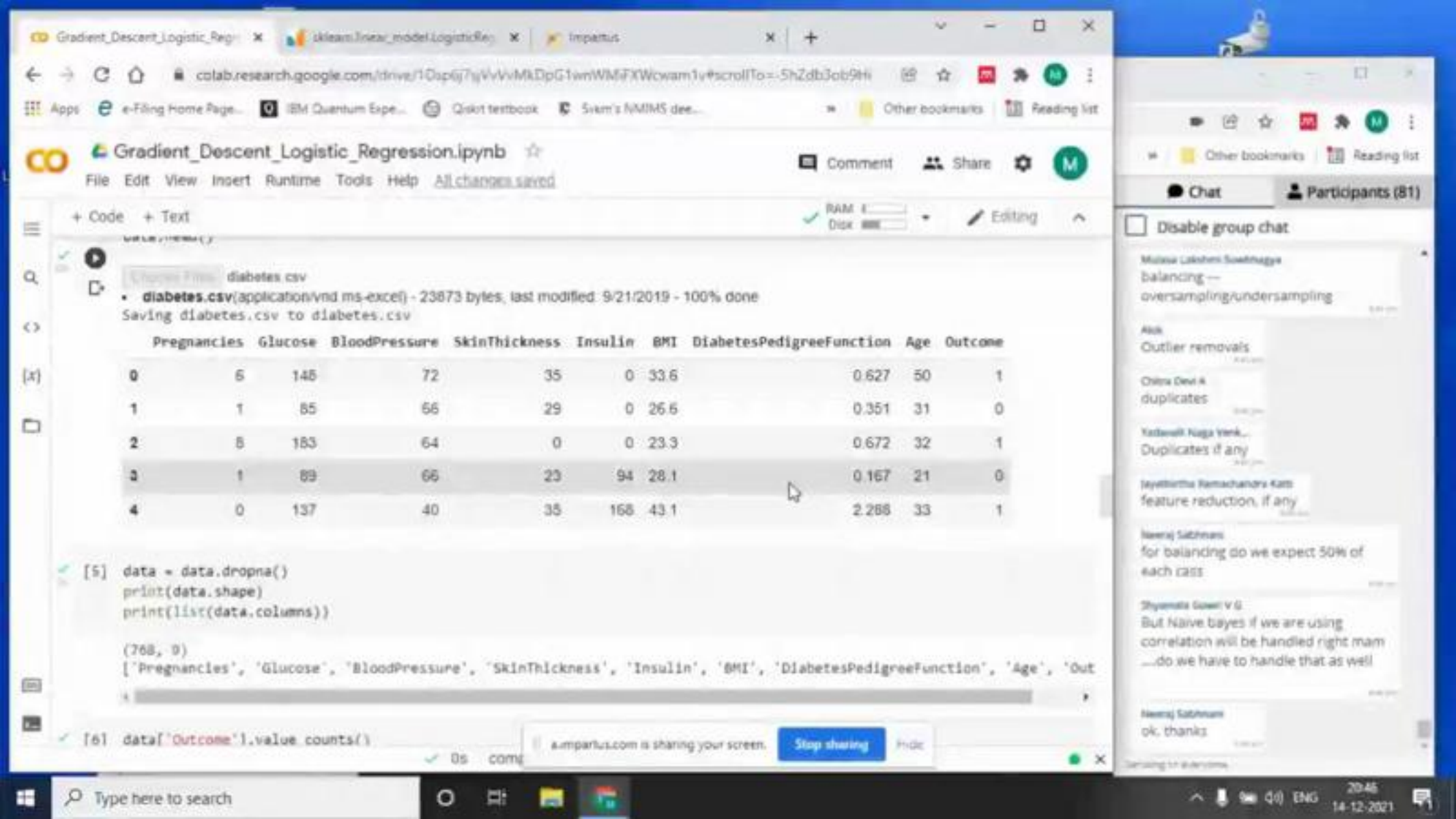
ENG
20:46
14-12-2021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balancing --- oversampling/undersampling
Outlier removals
duplicates
Duplicates if any
feature reduction, if any
for balancing do we expect 50% of each class
But Naive bayes if we are using correlation will be handled right mam ....do we have to handle that as well
ok, thanks
Type here to search
ENG
20:46
14-12-2021

Gradient_Descent_Logistic_Regression.ipynb

diabetes.csv

- **diabetes.csv**(application/vnd.ms-excel) - 23873 bytes, last modified: 5/21/2019 - 100% done

```
Saving diabetes.csv to diabetes.csv
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35	0	33.6	0.627	50	1
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```

[6]
```
data['Outcome'].value_counts()
```

Chat:

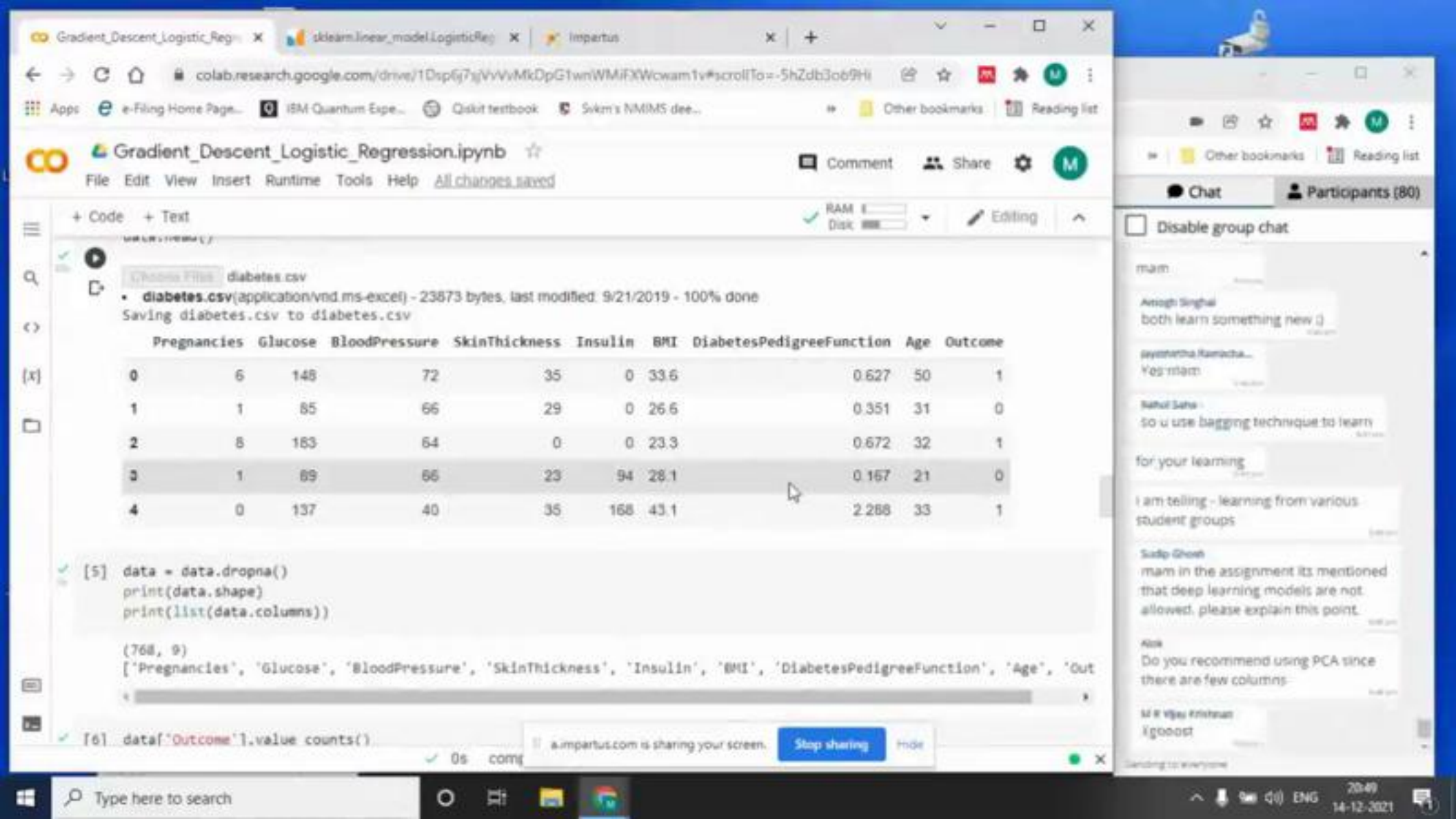
you are right

both learn something new :)

Yes mam

so u use bagging technique to learn

for your learning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Choose Files diabetes.csv
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[6] data['Outcome'].value_counts()
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mam
both learn something new :)
Yes mam
so u use bagging technique to learn
for your learning
i am telling - learning from various student groups
mam in the assignment its mentioned that deep learning models are not allowed. please explain this point.
Do you recommend using PCA since there are few columns
Igoooot
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[4]

Choose Files diabetes.csv

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```

[6] data['Outcome'].value_counts()

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I am telling - learning from various student groups

Sudip Ghosh
mam in the assignment its mentioned that deep learning models are not allowed. please explain this point.

Alok
Do you recommend using PCA since there are few columns

M R Vijay Krishnan
xgboost

Can we use xgboost

Alok
yes

M R Vijay Krishnan
Ok

Alok
what do we have in day after tomorrow webinar mam

ok

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ENG 20:50 14-12-2021

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[4]

Choose Files diabetes.csv

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```

[6] data['Outcome'].value_counts()

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ok mam

Jayathirtha Ramachandra Katti
But, we also have DVI the same day ...

Ravi Chandra Vedula
Same time another webinar

Jayathirtha Ramachandra Katti
DVI got re-scheduled to 16th

Varsha Jettley
yes we have DVI

M R Vijay Krishnan
DVI is tomorrow

Varsha Jettley
webinar on 16dec

M R Vijay Krishnan
They preponed it

Santosh Kumar C V
DVI is on 16th

Varsha Jettley
linear regressiona can it partially idscussed

Sending to everyone

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[4]

Choose Files diabetes.csv

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[5]

```
data = data.dropna()
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print(list(data.columns))
```

```
(768, 9)
['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI', 'DiabetesPedigreeFunction', 'Age', 'Out
```

[6] data['Outcome'].value_counts()

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Amogh Singhal: mam, the idea is not to have the highest accuracy but follow proper process ?

Arijit Barat: thanks mam

Chitra Devi A: thankyou mam

Hareesh S V: thank you ma'm

Bhimsen Joshi: good session.. thank you

Jayathirtha Ramacha...: Thanks mam

Dakshinaya Udaipraki...: Thank you mam

S Krishnamoorthy: Thankyou mam

S Bhagath: Thankyou so much, ma'am..

Sending to everyone

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ENG 20:52 14-12-2021

New in version 0.19: l1 penalty with SAGA solver (allowing 'multinomial' + L1)

dual : *bool, default=False*
Dual or primal formulation. Dual formulation is only implemented for l2 penalty with liblinear solver. Prefer dual=False when n_samples > n_features.

tol : *float, default=1e-4*
Tolerance for stopping criteria.

C : *float, default=1.0*
Inverse of regularization strength; must be a positive float. Like in support vector machines, smaller values specify stronger regularization.

fit_intercept : *bool, default=True*
Specifies if a constant (a.k.a. bias or intercept) should be added to the decision function.

intercept_scaling : *float, default=1*
Useful only when the solver 'liblinear' is used and self.fit_intercept is set to True. In this case, x becomes [x, self.intercept_scaling], i.e. a "synthetic" feature with constant value equal to intercept_scaling is appended to the instance vector. The intercept becomes `intercept_scaling * synthetic_feature_weight`.

Note! t ation as all other feature iture weight

scikit-learn 1.0.1
Other versions

Please **cite us** if you use the software.

sklearn.linear_model.LogisticRegression

Examples using sklearn.linear_model.LogisticRegr

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Thankyou mam

Thankyou so much, ma'am.

Thanks mam

Thank You :)

These upload notebooks link in cam as

will this recording of the session available soon ? I missed the beginning

ok mam

mam I've joined late. Can you pls tell if these notebook links are included in the ppt?

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ENG 20:53 14-12-2021

Gradient_Descent_Logistic_Regression.ipynb

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independent variables. Let X_i be the independent variable (training variable) and Y be the dependent predicts probability of outcome of binary dependent variable (Y) and the output lies between 0 and 1. The prediction equation between X_i and Y is

$$ln(\frac{p}{1-p}) = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 \ldots b_n x_n$$

$ln(\frac{p}{1-p})$ is log odds and denotes the likelihood of the event taking place. It maps the probability between 0 and 1. The terms $b_0, b_1, b_2 \ldots$ are parameters estimated during training of each record. The above equation can be rewritten as

$$\frac{p}{1-p} = e^{b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 \ldots b_n x_n}$$

simplifying it further

$$p = \frac{e^{b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 \ldots b_n x_n}}{1 + e^{b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 \ldots b_n x_n}}$$

or

$$p = \frac{1}{1 + e^{-(b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 \ldots b_n x_n)}}$$

This is the equation of the "Sigmoid Function" given by:

$$\sigma(x) = \frac{1}{1 + e^{-x}}$$

Deriving the sigmoid function

0s completed at 20:53

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S Krishnamoorthy
Thankyou mam

S Bhagath
Thankyou so much, ma'am...

S Kavitha
thanks mam

Bishra Aman Dinesh
Thank You..!!

Harsh Vashisht
Please upload notebook link in canvas.

Subhodeep Mitra
will this recording of the session available soon , i missed the beginning

Anmgh Singhal
ok mam

Vaishnavi Shivani
mam i've joined late. Can you pls tell if these notebook links are included in the ppt?

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Gradient_Descent_Logistic_Regression.ipynb

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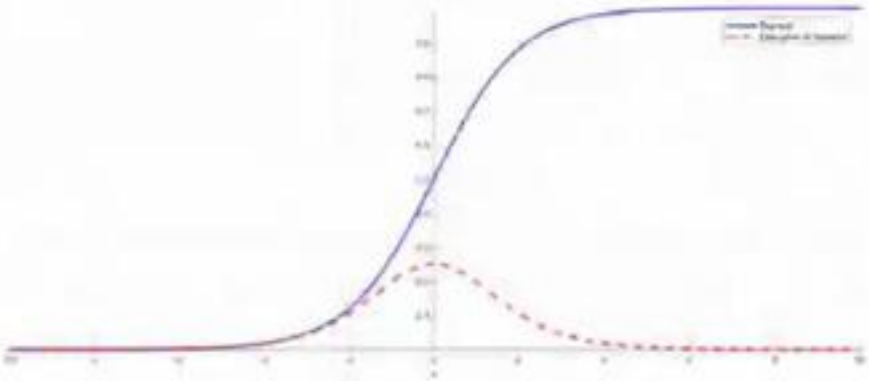
$$= \frac{1}{(1+e^{-X})} . (1 - \frac{1}{1+e^{-X}})$$
$$= \sigma(X) . (1 - \sigma(X))$$



Now we will be using the above derived equation to make our predictions. Before that we will train our model to obtain the values of our parameters $b_0, b_1, b_2 \ldots$ that result in least error. This is where the error or loss function comes in.

Loss Function

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Chat Participants (72)

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S Krishnamoorthy
Thankyou mam

S Bhagath
Thankyou so much, ma'am..

S Kavitha
thanks mam

Bohra Aman Dinesh
Thank You..!!

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Please upload notebook link in canvas.

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ok mam

Varanasi Shivani
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Gradient_Descent_Logistic_Regression.ipynb

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```
[3] import matplotlib.pyplot as plt
plt.rc("font", size=14)
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
import seaborn as sns
sns.set(style="white")
sns.set(style="whitegrid", color_codes=True)
```

```
from google.colab import files
uploaded = files.upload()
import io
data = pd.read_csv(io.BytesIO(uploaded['diabetes.csv']))
data.head()
```

Choose Files diabetes.csv

- **diabetes.csv**(application/vnd.ms-excel) - 23873 bytes, last modified: 9/21/2019 - 100% done

Saving diabetes.csv to diabetes.csv

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mam we are not sure on 16 if linear will be discuss or not. also may postpobe. and assignment is on 1 st jan. so if possible kindly share notebook on linear regression so that we can get the idea and start assignment

is linear SVM same as linear regression ?

Diabetes.csv file where can we find

The python file is in your google colab

can we also attach the requirements file to avoid any dependency conflict

Ahh .... kinda clustering

Features could change from different sources

Type here to search

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Gradient_Descent_Logistic_Regression.ipynb

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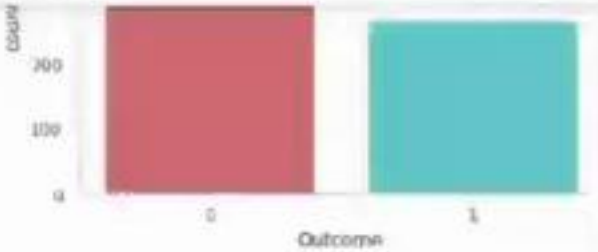
Editing

[6]



[7]

```
# Logistic Regression
class LogitRegression() :
    def __init__ ( self, learning_rate, iterations ) :
        self.learning_rate = learning_rate
        self.iterations = iterations

    # function for model training
    def fit( self, X, Y ) :
        # no_of_training_examples, no_of_features
        self.m, self.n = X.shape
        # weight initialization
        self.w = np.zeros( self.n )
        self.b = 0
        self.X = X
        self.Y = Y
```

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Chat Participants (70)

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[4]

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[6]
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plt.show()
```

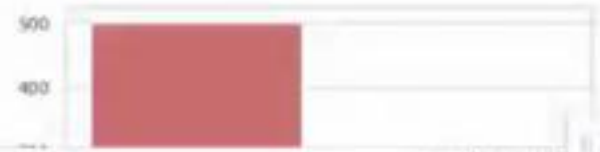

0s comp

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mam we are not sure on 16 if linear will be discuss or not. also may postpobe. and assignment is on 1 st jan. so if possible kindly share notebook on linear regression so that we can get the idea and start assignment.

is linear SVM same as linear regression ?

Diabaties.csv file where can we find

The python file is in your google colab

can we also attach the requirements file to avoid any dependency conflict

Ahh ... kinda clustering

Features could change from different sources

Type here to search

ENG 20:56 14-12-2021