In [1]:

```
# Load Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import torch
```

In [2]:

```
# Load Dataset
dataset = pd.read_csv('https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data',
                      names=['sepal_length', 'sepal_width', 'petal_length', 'petal_width', 'species'])
dataset.head()
```

Out[2]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa

In [3]:

```
# Preprocessing
dataset['species'] = pd.Categorical(dataset['species']).codes
dataset = dataset.sample(frac=1, random_state=1234)

train_input = dataset.values[:120, :4]
train_target = dataset.values[:120, 4]
test_input = dataset.values[120:, :4]
test_target = dataset.values[120:, 4]
```

In [4]:

```
# Define Neural Network
torch.manual_seed(10)
hidden_units = 5
net = torch.nn.Sequential(
        torch.nn.Linear(4, hidden_units),
        torch.nn.ReLU(), # Activation Function
        torch.nn.Linear(hidden_units, 3)
)
```

In [5]:

```
# Need Optimizer and Loss Function
criterion = torch.nn.CrossEntropyLoss()
optimizer = torch.optim.SGD( # Stochastic Gradient Descent
                net.parameters(),
                lr = 0.1,
                momentum = 0.9
)
```

In [9]:

```
# Train Network
epoch_list = []
loss_list = []
epochs = 50
for epoch in range(epochs):
    inputs = torch.autograd.Variable(torch.Tensor(train_input).float())
    targets =torch.autograd.Variable(torch.Tensor(train_target).long())
    optimizer.zero_grad() # Prevent Accumulation from previous iterations
    out = net(inputs)
    loss = criterion(out, targets)
    loss.backward()
    optimizer.step()

    epoch_list.append(epoch)
    loss_list .append(loss.item())

    # print('Epoch %d Loss: %.4f' % (epoch + 1, loss.item()))
```

In [10]:

```
# Create Dataframe for Visual Representation
epoch_dataset = pd.DataFrame()
epoch_dataset["Epoch Number"] = epoch_list
epoch_dataset["Loss"] = loss_list

epoch_dataset.head()
```

Out[10]:

	Epoch Number	Loss
0	0	0.156184
1	1	0.155270
2	2	0.154372
3	3	0.153490
4	4	0.152624

In [12]:

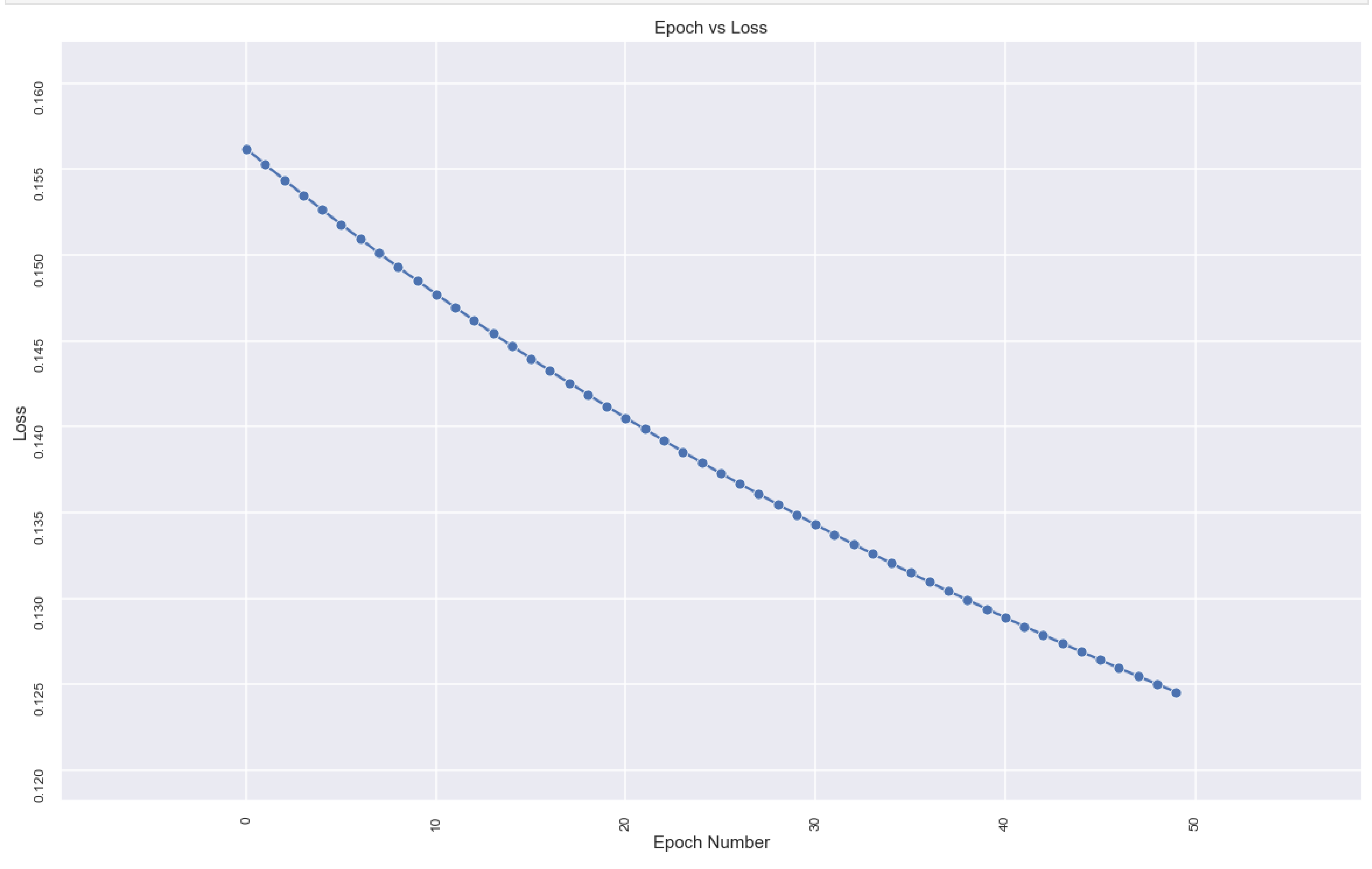
```
# Loss Function Visual Representations
sns.set(rc = {"figure.figsize":(20, 12)}) # width = 8, # height = 3
sns.set_theme(style = "darkgrid")
sns.set_context('talk')

dataset = sns.load_dataset("flights")

sns.lineplot(data = epoch_dataset, # Dataset
             x = 'Epoch Number', # Feature
             y = 'Loss', # Feature
             marker = "o", # Marker
             palette = 'PiYG') # Palette

plt.xlabel('Epoch Number', fontsize = 15) # X-axis label
plt.ylabel('Loss', fontsize = 15) # Y-axis label
plt.title('Epoch vs Loss', fontsize = 15) # Title for graph
plt.xticks(fontsize = 12, rotation = 'vertical') # [] Pass custom values
plt.yticks(fontsize = 12, rotation = 'vertical') # [] Pass custom values
plt.margins(0.2) # Need space beween plot and axes
plt.grid(True) # Apply grid to graph
# #plt.axis([0, 8, 0, 10]) # Set X-Axis and Y-Axis limits 0,8 for X and 0,10 for Y Dont use xticks ad yticks i
# plt.xlim([0, 8]) # Same as axis()
# plt.ylim(0, 10) # Same as axis() Dont use axis() is using this

plt.show()
plt.close()
```



In [13]:

```
# Accuracy Matters
inputs = torch.autograd.Variable(torch.Tensor(test_input).float())
targets = torch.autograd.Variable(torch.Tensor(test_target).long())
optimizer.zero_grad()
out = net(inputs)
_, predicted = torch.max(out.data, 1)
error_count = test_target.size - np.count_nonzero((targets == predicted).numpy())
print('Errors: %d; Accuracy: %d%%' % (error_count, 100 * torch.sum(targets == predicted) / test_target.size))
```

```
Errors: 0; Accuracy: 100%
```

In [1]:

```
# Convert to Python
!jupyter nbconvert --to script "iris_first_neural_ntw_pytorch.ipynb"
```

```
[NbConvertApp] Converting notebook iris_first_neural_ntw_pytorch.ipynb to script
[NbConvertApp] Writing 3711 bytes to iris_first_neural_ntw_pytorch.py
```

In [10]:

```
!jupyter nbconvert --to PDFviaHTML "iris_first_neural_ntw_pytorch.ipynb"
```

```
[NbConvertApp] Converting notebook iris_first_neural_ntw_pytorch.ipynb to pdf
[NbConvertApp] Support files will be in iris_first_neural_ntw_pytorch_files\
[NbConvertApp] Making directory .\iris_first_neural_ntw_pytorch_files
[NbConvertApp] Writing 35598 bytes to notebook.tex
[NbConvertApp] Building PDF
Traceback (most recent call last):
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\Scripts\jupyter-nbconvert-script.py", line 9, in <module>
    sys.exit(main())
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\lib\site-packages\jupyter_core\application.py", line 269, in
launch_instance
    return super().launch_instance(argv=argv, **kwargs)
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\lib\site-packages\traitlets\config\application.py", line 976,
in launch_instance
    app.start()
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\lib\site-packages\nbconvert\nbconvertapp.py", line 414, in st
art
    self.convert_notebooks()
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\lib\site-packages\nbconvert\nbconvertapp.py", line 588, in co
nvert_notebooks
    self.convert_single_notebook(notebook_filename)
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\lib\site-packages\nbconvert\nbconvertapp.py", line 551, in co
nvert_single_notebook
    output, resources = self.export_single_notebook(
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\lib\site-packages\nbconvert\nbconvertapp.py", line 479, in ex
port_single_notebook
    output, resources = self.exporter.from_filename(
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\lib\site-packages\nbconvert\exporters\exporter.py", line 189,
in from_filename
    return self.from_file(f, resources=resources, **kw)
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\lib\site-packages\nbconvert\exporters\exporter.py", line 206,
in from_file
    return self.from_notebook_node(
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\lib\site-packages\nbconvert\exporters\pdf.py", line 194, in f
rom_notebook_node
    self.run_latex(tex_file)
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\lib\site-packages\nbconvert\exporters\pdf.py", line 164, in r
un_latex
    return self.run_command(
  File "C:\Users\KishanT\Anaconda3\envs\deep_baba\lib\site-packages\nbconvert\exporters\pdf.py", line 111, in r
un_command
    raise OSError(
OSError: xelatex not found on PATH, if you have not installed xelatex you may need to do so. Find further instr
uctions at https://nbconvert.readthedocs.io/en/latest/install.html#installing-tex.
```