Portfolio assignment 15

30 min: Train a decision tree to predict the species of a penguin based on their characteristics.

- Split the penguin dataset into a train (70%) and test (30%) set.
- Use the train set to fit a DecisionTreeClassifier. You are free to to choose which columns you want to use as feature variables and you are also free to choose the max_depth of the tree. **Note**: Some machine learning algorithms can not handle missing values. You will either need to
  - replace missing values (with the mean or most popular value). For replacing missing values you can use .fillna(<value>) https://pandas.pydata.org/docs/reference/api/pandas.Series.fillna.html (https://pandas.pydata.org/docs/reference/api/pandas.Series.fillna.html)
  - remove rows with missing data. You can remove rows with missing data with .dropna() https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.dropna.html (https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.dropna.html)
- Use your decision tree model to make predictions for both the train and test set.
- Calculate the accuracy for both the train set predictions and test set predictions.
- Is the accurracy different? Did you expect this difference?
- Use the plot_tree_classification function above to create a plot of the decision tree. Take a few minutes to analyse the decision tree. Do you understand the tree?

Optional: Perform the same tasks but try to predict the sex of the pinguin based on the other columns

In [1]:

```python
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
import seaborn as sns
from sklearn import tree
import graphviz

def plot_tree_classification(model, features, class_names):
    # Generate plot data
    dot_data = tree.export_graphviz(model, out_file=None,
                          feature_names=features,
                          class_names=class_names,
                          filled=True, rounded=True,
                          special_characters=True)

    # Turn into graph using graphviz
    graph = graphviz.Source(dot_data)

    # Write out a pdf
    graph.render("decision_tree")

    # Display in the notebook
    return graph
```

In [2]:

```python
penguins = sns.load_dataset("penguins")
penguins.dropna(axis=0, inplace= True)
```

In [3]:

```
penguins_train, penguins_test = train_test_split(penguins, test_size = 0.3, stratify=pengui
print(penguins_train.shape, penguins_test.shape)
```

```
(233, 7) (100, 7)
```

In [4]:

```
features= ['flipper_length_mm']
dt_classification = DecisionTreeClassifier(max_depth = 3) # Increase max_depth to see effec
dt_classification.fit(penguins_train[features], penguins_train['species'])
```

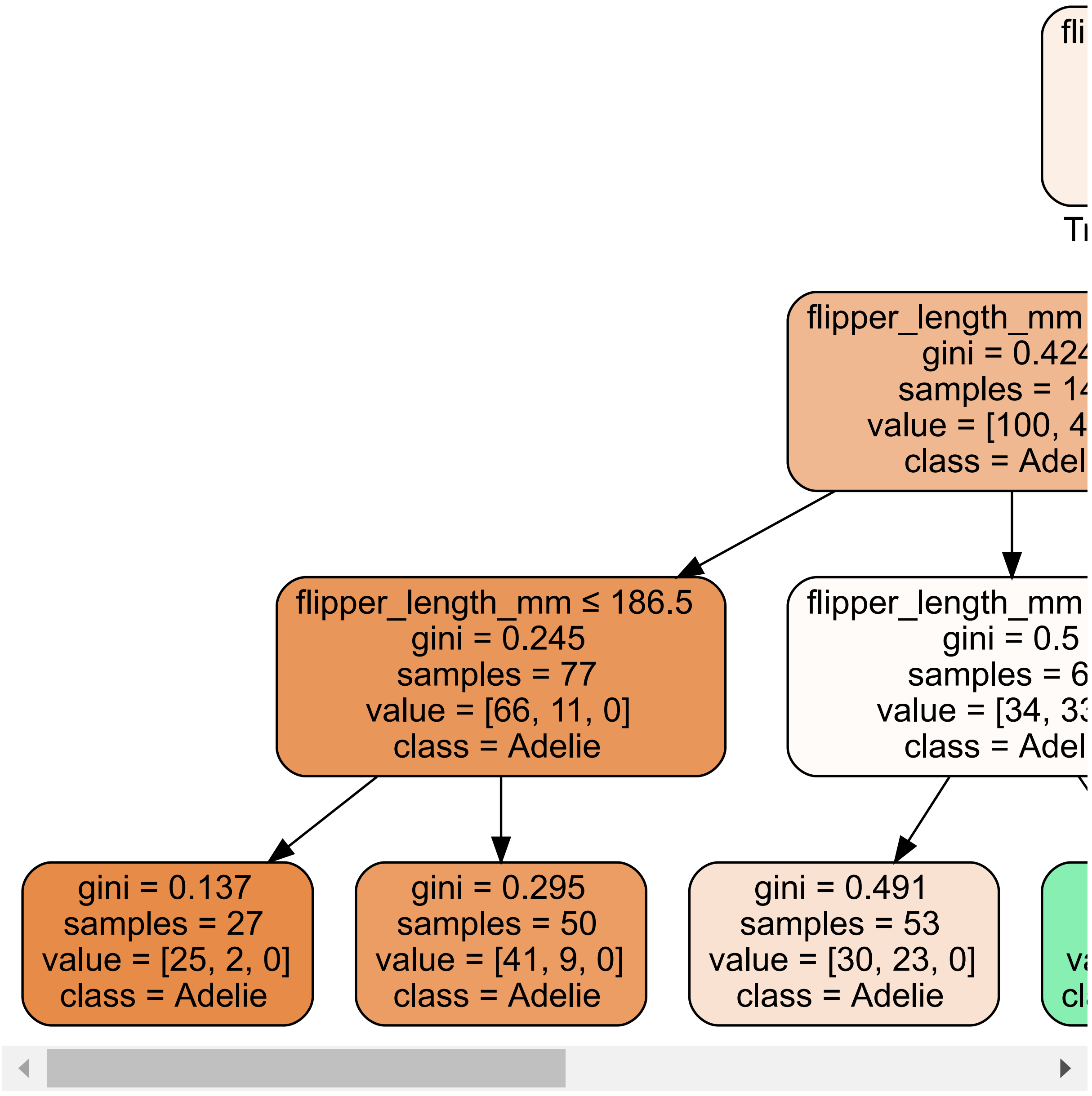
Out[4]:

```
DecisionTreeClassifier(max_depth=3)
```

In [5]:

```
plot_tree_classification(dt_classification, features, penguins.species.unique())
```

Out[5]:



fli
Tr
flipper_length_mm
gini = 0.424
samples = 14
value = [100, 4
class = Adel
flipper_length_mm ≤ 186.5
gini = 0.245
samples = 77
value = [66, 11, 0]
class = Adelie
flipper_length_mm
gini = 0.5
samples = 6
value = [34, 33
class = Adel
gini = 0.137
samples = 27
value = [25, 2, 0]
class = Adelie
gini = 0.295
samples = 50
value = [41, 9, 0]
class = Adelie
gini = 0.491
samples = 53
value = [30, 23, 0]
class = Adelie
va
cl