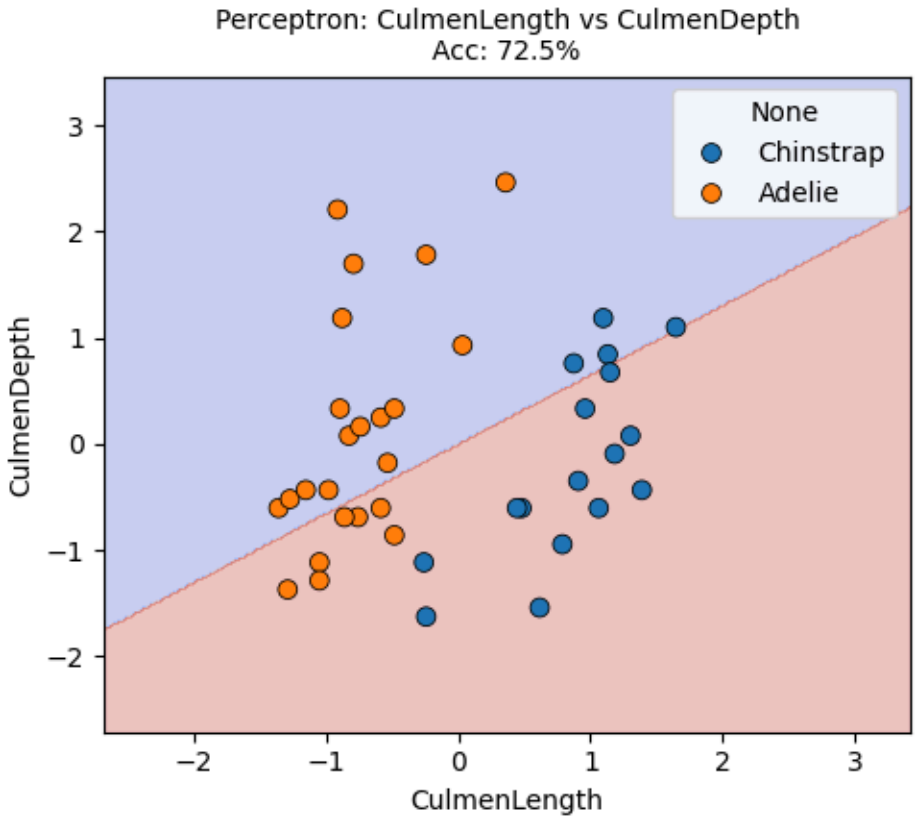
Task 1

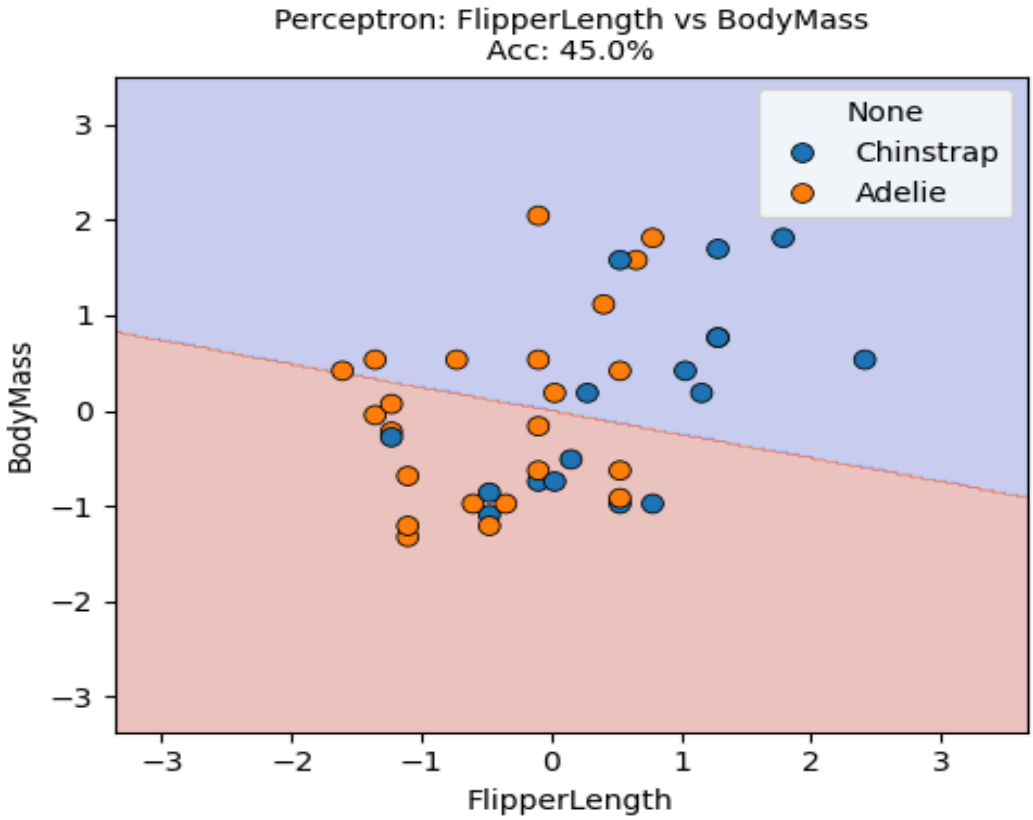
Team 42

- ## Perceptron Algorithm

Plot 1 (CulmenLength vs CulmenDepth, Acc: 72.5%):
This pair performs **moderately**. The plot shows a noticeable overlapping region in the center. This overlap demonstrates that these two features alone are not fully sufficient for clear discrimination.

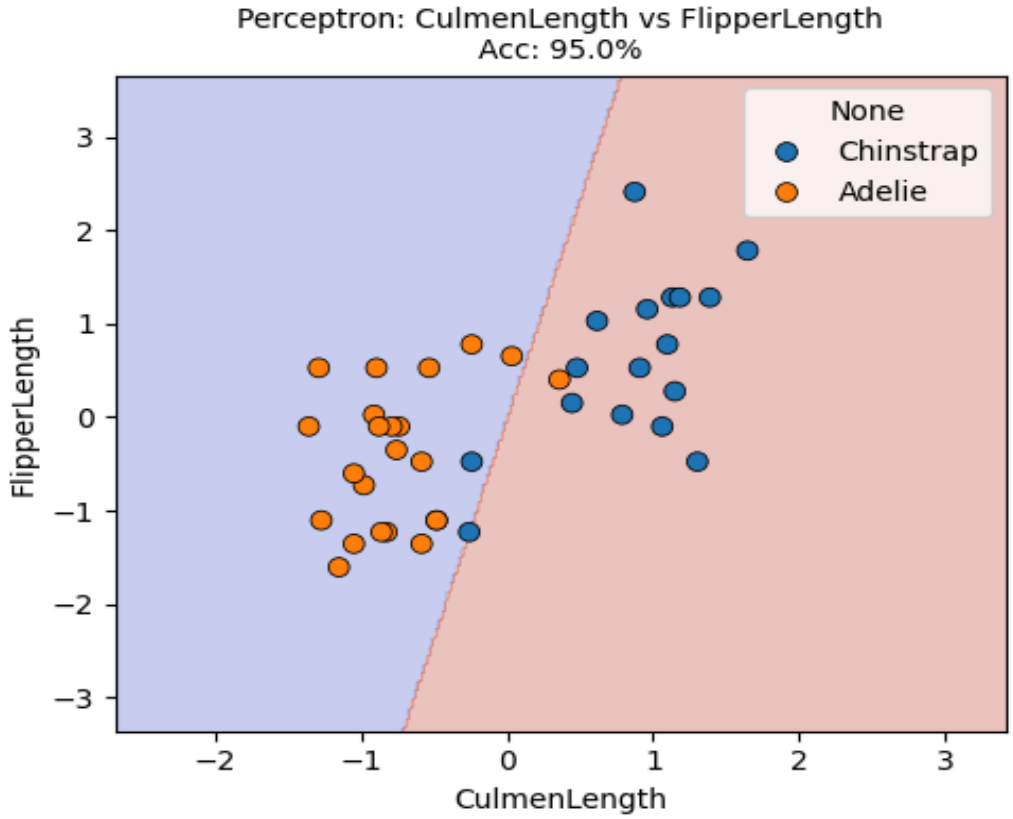


Plot 2 (FlipperLength vs BodyMass, Acc: 45.0%):
This pair performs **poorly**. The plot shows extensive overlapping regions where the 'Adelie' and 'Chinstrap' data points are completely intermingled. The decision boundary is almost horizontal, cutting arbitrarily through the mixed data and indicating very weak linear separability.



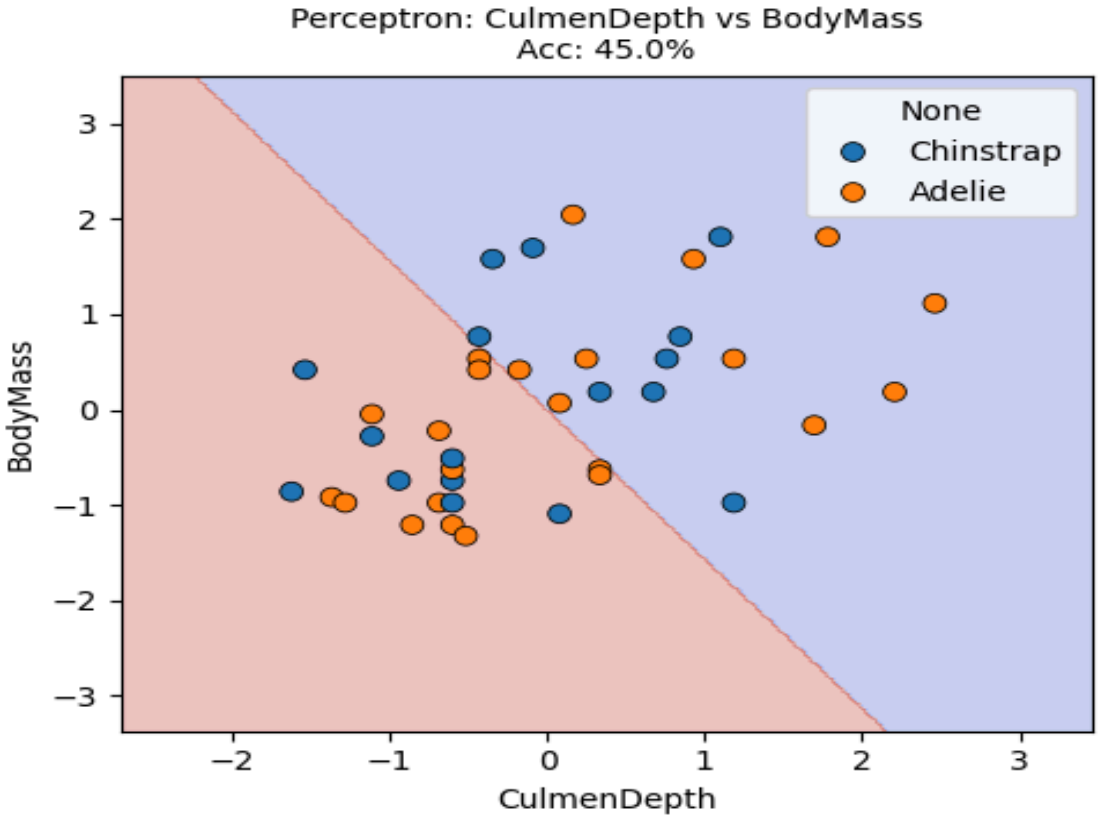
Plot 3 (CulmenLength vs FlipperLength, Acc: 95.0%):
This combination also provides **excellent discrimination**.

The 'Adelie' and 'Chinstrap' classes are clearly separated with minimal overlap. The decision boundary is a steep diagonal line, almost vertical, which suggests that **CulmenLength** is the dominant feature driving this strong linear separation.



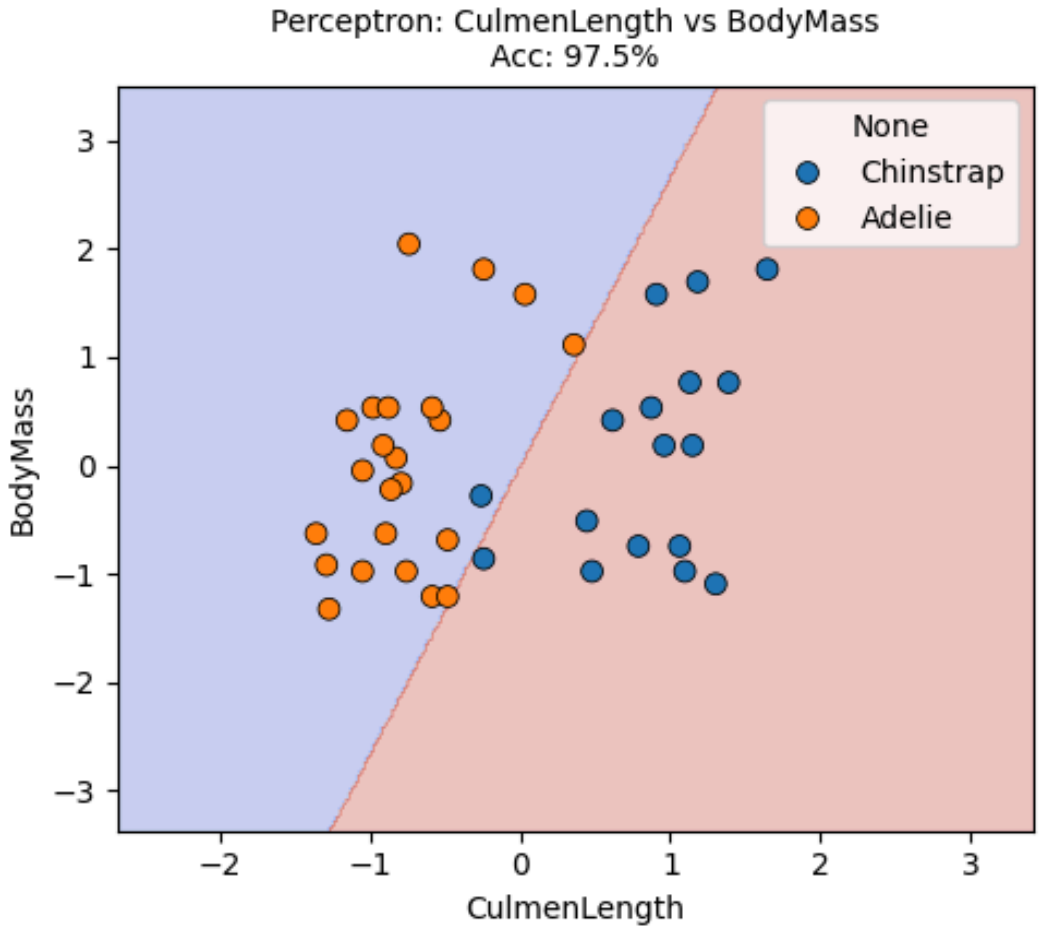
Plot 4 (CulmenDepth vs BodyMass, Acc: 45.0%):

This pair performs **poorly**. The data points for both classes are heavily mixed, and there is no clear pattern or separation.



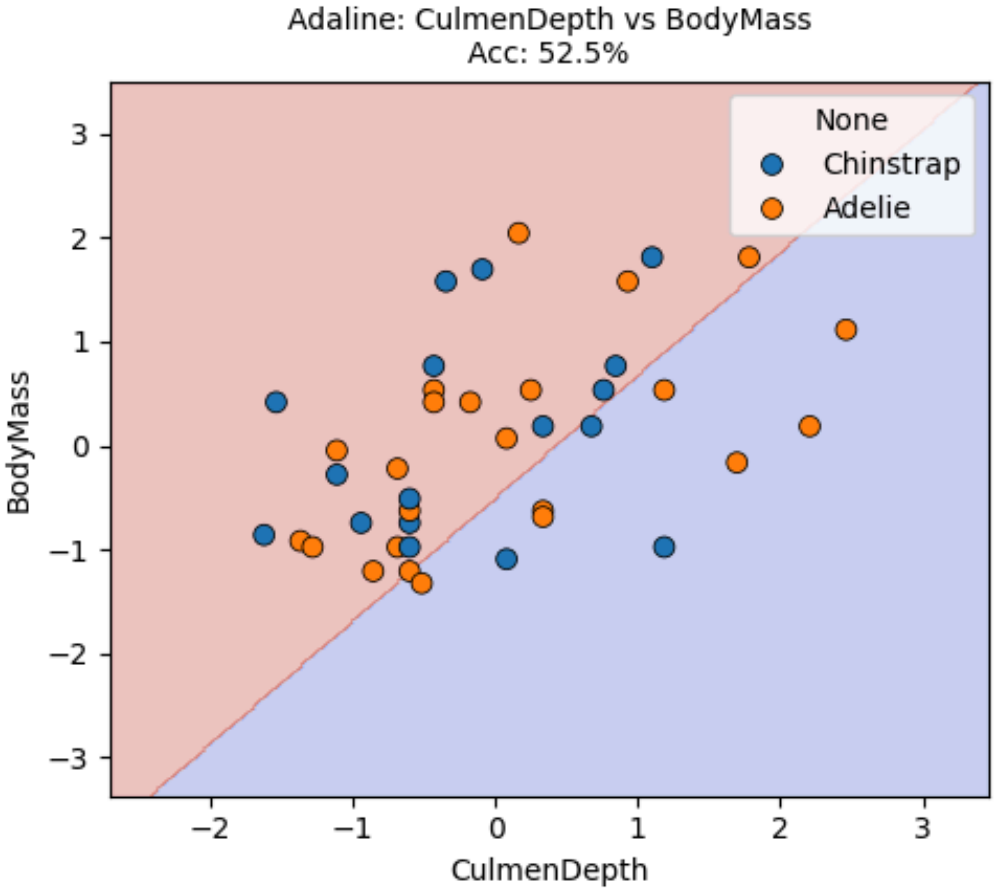
Plot 5 (CulmenLength vs BodyMass, Acc: 97.5%):
This feature combination demonstrates **excellent discriminative power**.

The data is almost perfectly linearly separable, allowing the Perceptron algorithm to find a decision boundary that cleanly separates the vast majority of points.



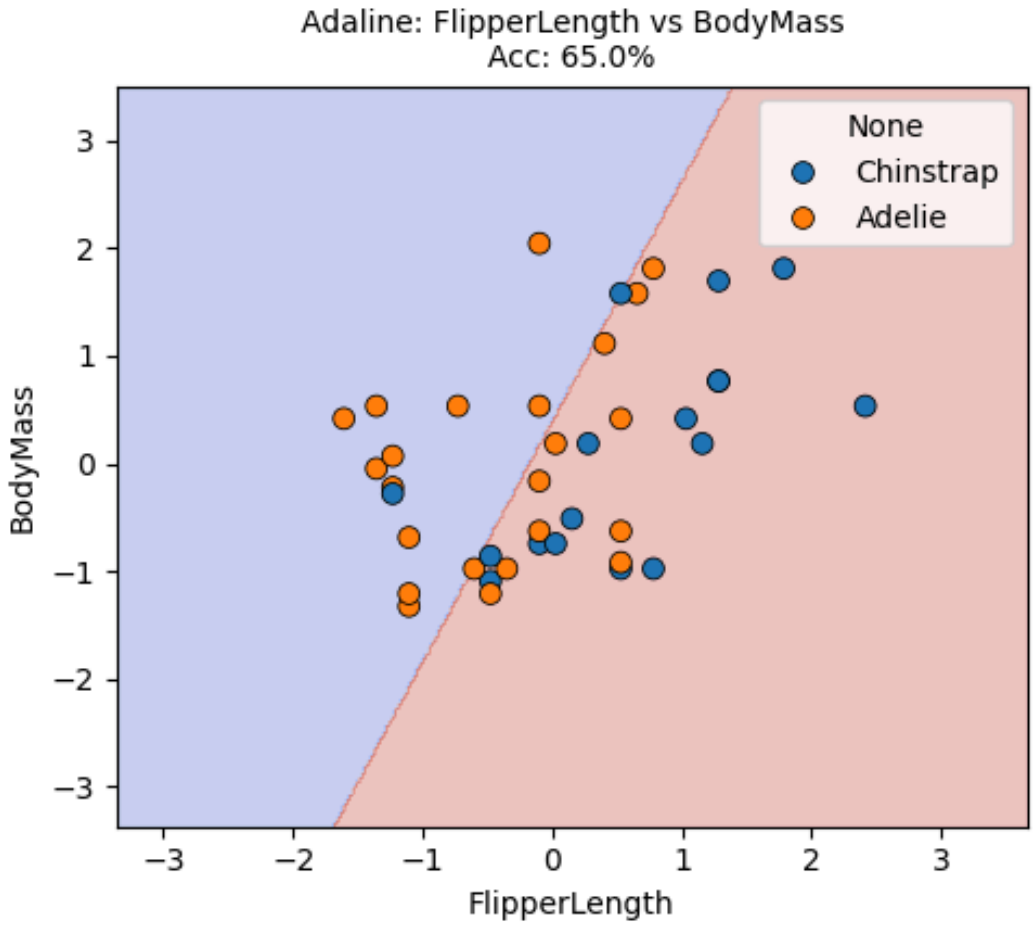
- **Adaline Algorithm**

Plot 1 (CulmenDepth vs BodyMass, Acc: 52.5%):
his pair performs **poorly**. The plot shows extensive overlapping regions, with data points from both classes heavily intermingled in a single cloud. The decision boundary is a diagonal line, but it is arbitrary and ineffective. This indicates a clear lack of linear separability.

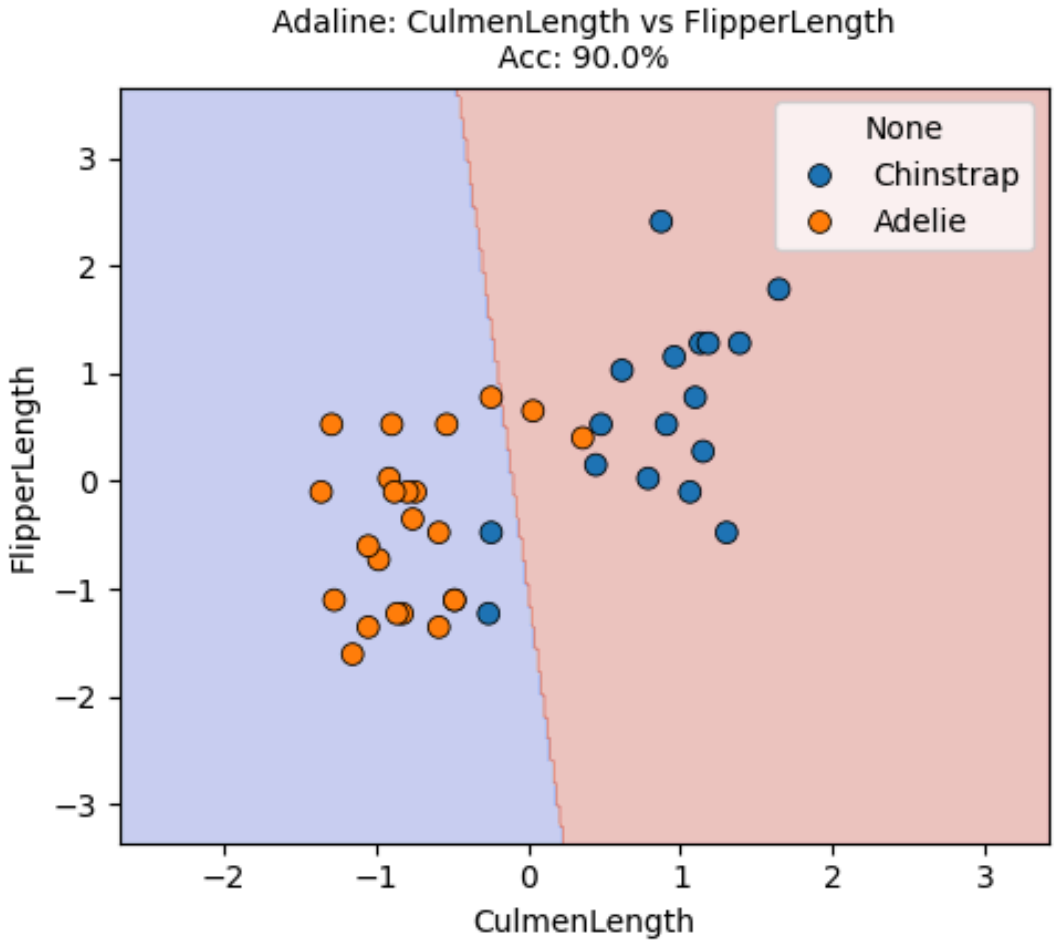


Plot 2 (FlipperLength vs BodyMass, Acc: 65.0%):

This pair performs **moderately**. The decision boundary is a diagonal line that attempts to find a separation, but it cuts through the mixed cluster, showing weak linear separability.

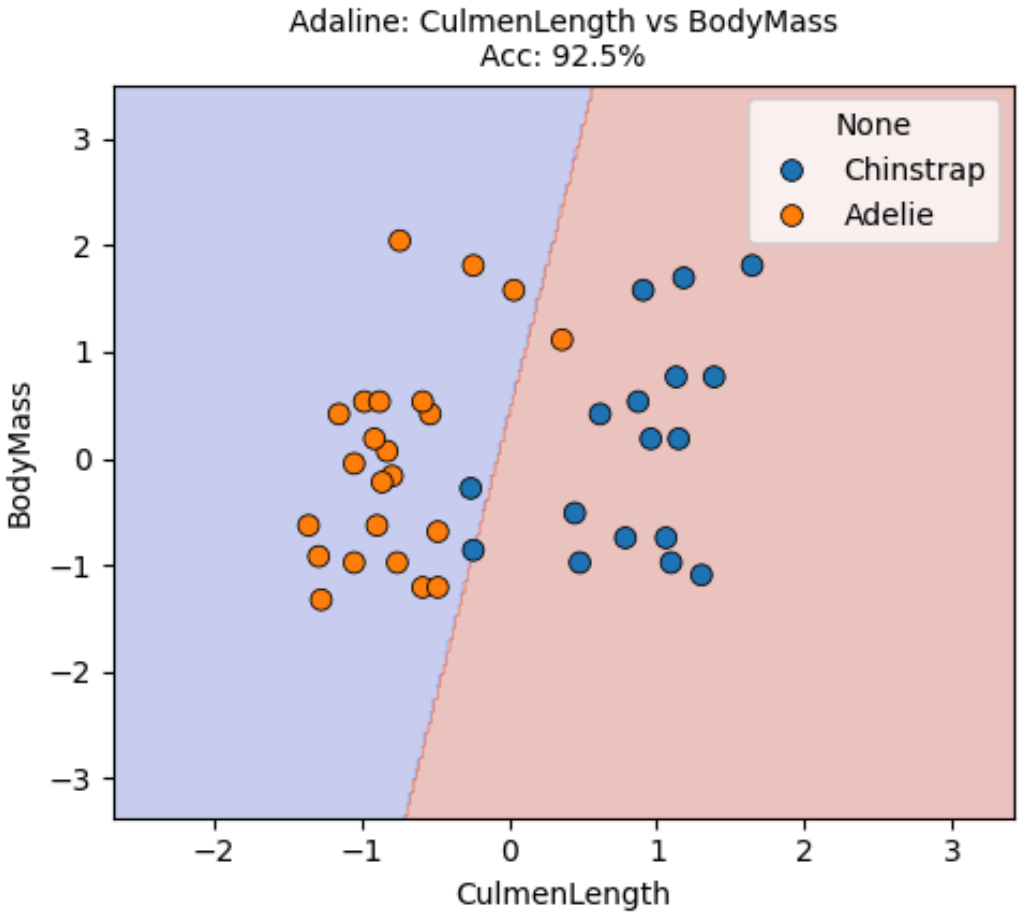


Plot 3 (CulmenLength vs FlipperLength, Acc: 90.0%):
This pair performs very well. The slight overlap between classes indicates that these features provide strong, though not perfect, discrimination.



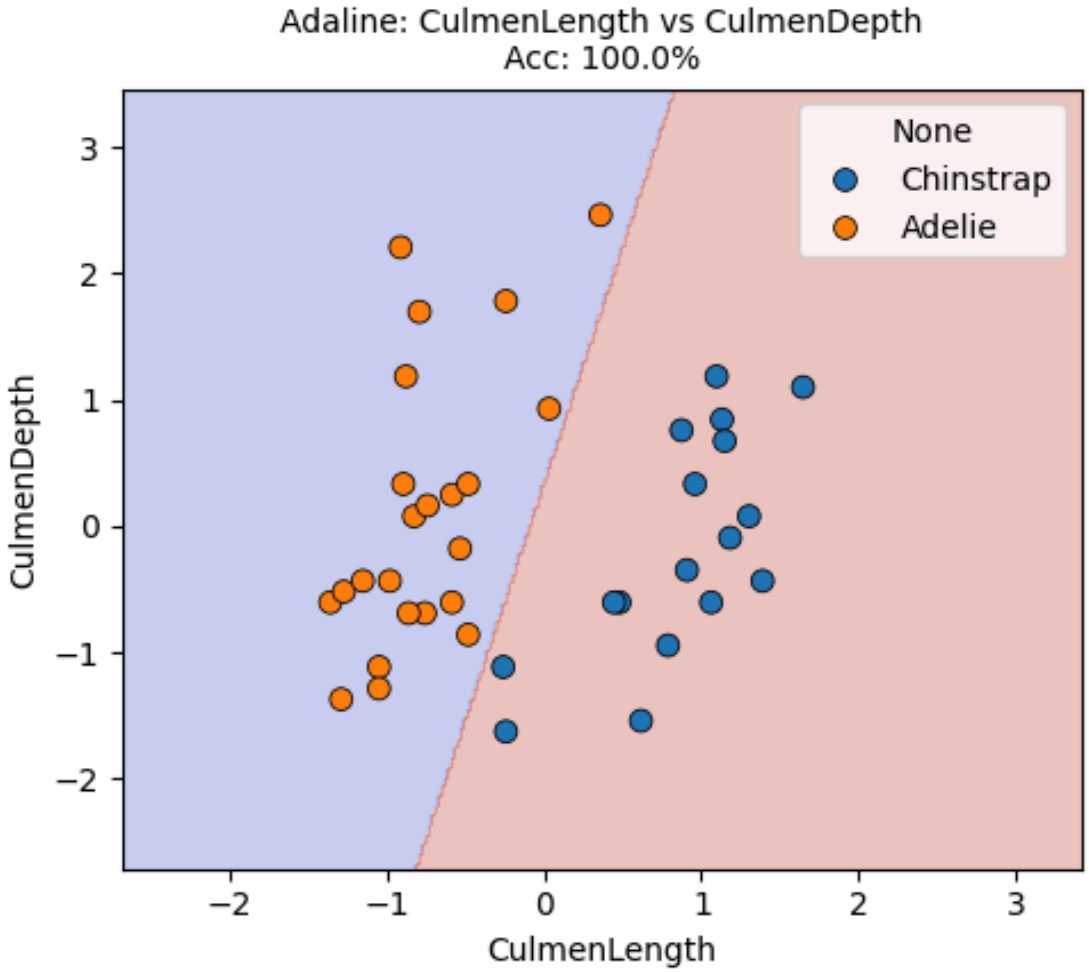
Plot 4 (CulmenLength vs BodyMass, Acc: 92.5%):

This pair performs **very well**. The 'Adelie' and 'Chinstrap' classes are well-separated with only minimal overlap. This indicates that these features are highly effective for discrimination.



Plot 5 (CulmenLength vs CulmenDepth , 100%):

This pair performs **exceptionally well.** The complete lack of overlap shows that these two features are perfectly sufficient for discrimination. The decision boundary is a clean diagonal line that correctly separates every point, demonstrating perfect linear separability.



Conclusion: Highest Accuracy Features

After running both algorithms, the feature combinations that achieved the highest accuracy were:

- **For the Perceptron algorithm:** The highest accuracy was **97.5%**, achieved using the feature combination of **CulmenLength vs. BodyMass**.
- **For the Adaline algorithm:** The highest accuracy was a perfect **100.0%**, achieved using the feature combination of **CulmenLength vs. CulmenDepth**.