Lesson Plan - Decision Trees

Part 1 - 7 Minutes

Objective & Connection:
By the end of this lesson, students will be able to:

1. Explain how a decision tree functions
2. Calculate and understand Gini impurity
3. Build a decision tree

Explain Topic ("I Do"):

- Recall our lesson yesterday on Support Vector Machines.
- While they are very useful, they are, unfortunately, note very interpretable, as they are a black box method.
- We can train a model in a somewhat similar fashion to SVMs, but in a much more interpretable and supervisable way without the need to scale our data.

Jupyter Notebook

- define and give an example of how decision trees work
- explain Gini scores (expandable section available for more details)
- **Check for understanding:**
    - give examples of lists with Gini scores of 0 and 0.5

Practice Skill ("We Do"):
What do we expect the Gini score of `list_3` to be? (0.375, aka 0.75 * 0.5)

```
list_3 = ['yes', 'yes', 'yes', 'no']
```

If time, ask question 4 (bonus). Otherwise, students can work through it after the lesson.

stop for questions

Part 2 - 5 minutes

Apply Skill ("You Do"):
Walk through creating a decision tree out of the Iris dataset (standard train test split)

- check scores
- check confusion matrix

Show students the actual decision tree that the model was trained on with prewritten code.

Wrap up with pros and cons of decision trees. Foreshadow bagging and random forests for tomorrow/rest of week.

Part 3 - 3 minutes

Assess and Debrief:
stop for questions

- How will I know if students achieved the learning objective? What deliverables will they provide?
    - I'll assess their understanding through the process of creating the decision tree and any questions that may arise. If it seems to be a lot for them, we can create an additional Breakfast Hour lesson and/or address questions in Flex Time.
- How will you debrief the student activity & correct any misconceptions?
    - I'll connect the confusion matrix to the image of the decision tree to hopefully show the intuitive nature of this method.
- How will you link the lesson to future skill set growth and real-world application?
    - I'm going to let them know that a single decision tree is one part of our upcoming lessons on bagging and random forests. I'll also remind them of the real world applications that we explored in this lesson, and, if time allows, discuss the "For Further Consideration" question ("What is an example of a situation in which you feel a decision tree would be useful?")