

Project 3 Team 3: Giuliano Falcone, Madeline Febinger, Oliver Lee, Spencer Viviano  
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CSC 470-01: Machine Learning  
Dr. Bloodgood

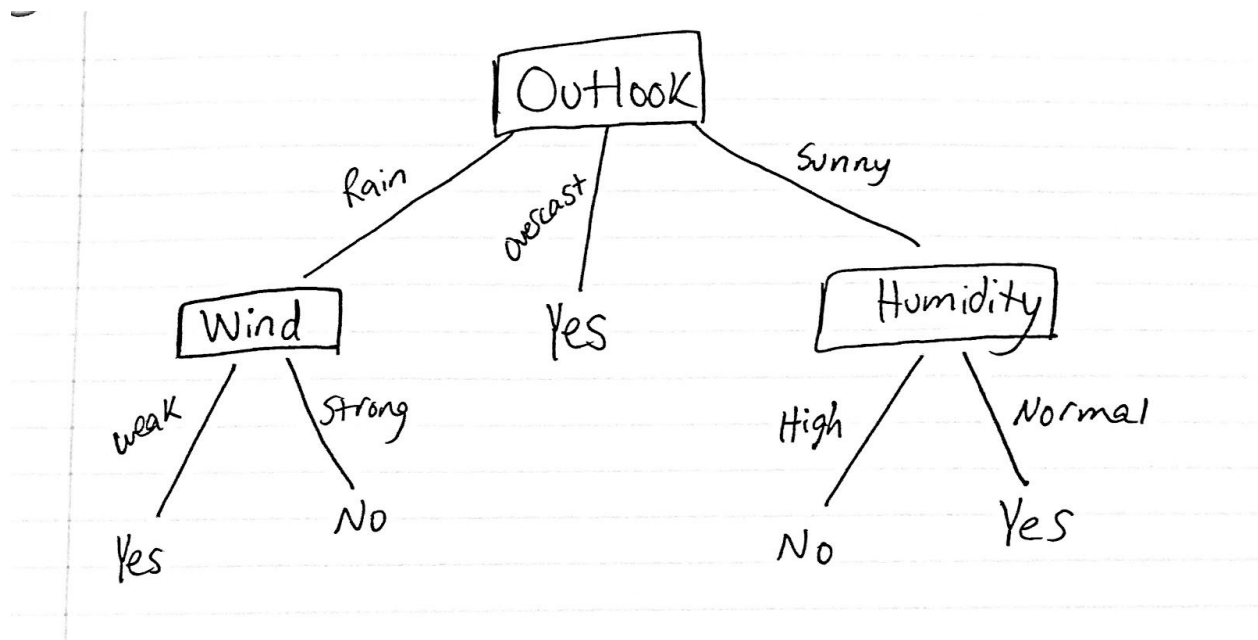
Please see the README file included with this submission for instructions on how to run this program.

**Task 1:** Implementation located in the file ID3.java

**Task 2:** Output for the 14 PlayTennis examples from class

```
Outlook has children: [Rain,Wind] [Overcast,Yes] [Sunny,Humidity]  
Wind has children: [Weak,Yes] [Strong,No]  
Humidity has children: [High,No] [Normal,Yes]
```

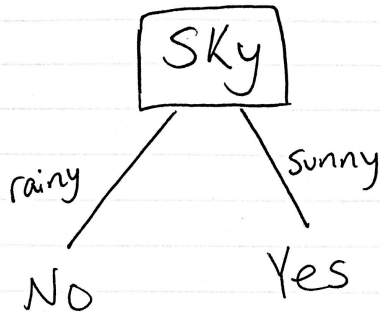
The following tree is described above:



**Task 3:** Output for the 4 EnjoySport examples

Sky has children: [Rainy,No] [Sunny,Yes]

The following tree is described above:



**What is the relationship between the learned decision tree and the version space that is learned from these same examples?**

ID3 uses a “hill-climbing search” through the set of all possible decision trees, with information gain as its evaluation function. The hill-climbing search is a heuristic, so the hypothesis that ID3 creates is not guaranteed to be optimal. The decision tree represents one of the members of the version space.

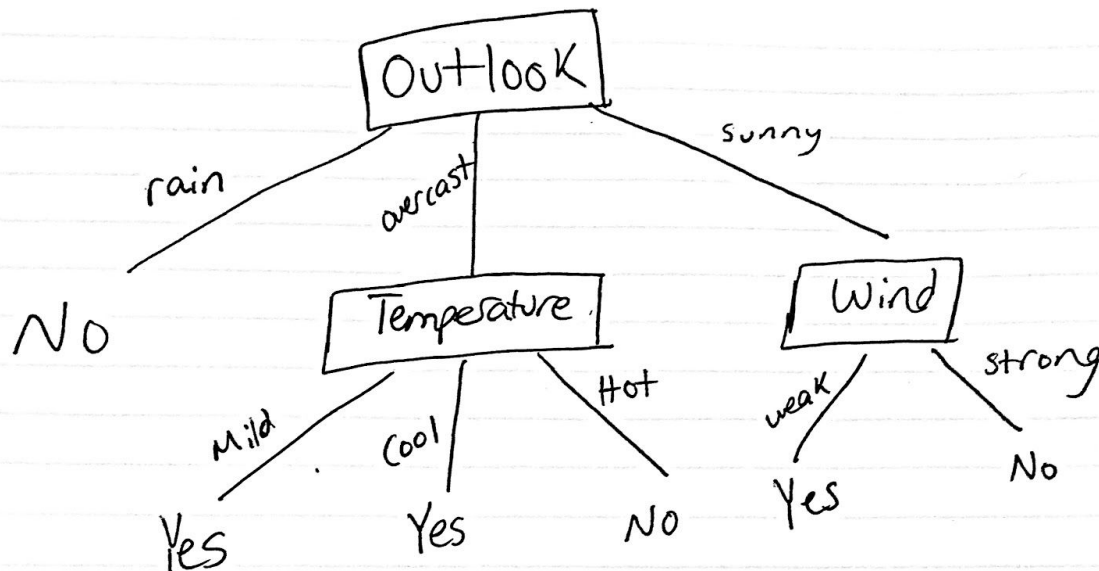
**Is the learned tree equivalent to one of the members of the version space?**

Yes. For example, for Task 2, the hypothesis  $\langle \text{Sunny}, ?, ?, ? \rangle$  is a member of the version space.

#### Task 4: Output for new set of PlayTennis data

See `task4.txt` for the training examples.

```
Outlook has children: [Rain,No] [Overcast,Temperature] [Sunny,Wind]
Temperature has children: [Mild,Yes] [Cool,Yes] [Hot,No]
Wind has children: [Weak,Yes] [Strong,No]
```



#### D5.

1. Anything positive the team enjoyed or learned from this assignment.
  - a. We gained a better understanding of the ID3 algorithm.
2. Anything negative the team didn't like about this assignment.
  - a. None.
3. Any parts of this assignment the team found easy.
  - a. Implementing entropy and information gain.
4. Any parts of this assignment the team found challenging or couldn't get working correctly.
  - a. It was challenging debugging the ID3 algorithm because it is recursive, but we eventually got it working.
5. How the team functioned, including details such as what each team member contributed, how the team communicated with each other, and how team software development & design was accomplished.
  - a. All team members contributed to the software development process. The team collaborated on GitHub and used GroupMe to communicate.
6. Any other remarks the team wants to make.
  - a. None.