Executive Summary

The goal of our project is to provide a model classifying mushroom edibility that can be utilized by mushroom foragers. Mushrooms are commonly eaten throughout the world in a wide variety of cultures, and it is important that foragers know when mushrooms are edible. If a mushroom were to be poisonous, it could severely harm the individual consuming it and even lead to death.

We use a dataset from the UCI Machine Learning repository. The dataset includes hypothetical samples of 23 species of gilled mushrooms taken from *The Audubon Society Field Guide to North American Mushrooms*. Features include cap shape, bruises, population, odor, and spore print color. Via exploratory data analysis, we first determined that the odor and spore print color features best distinguish edibility. Thus, to simplify our models and conclusions, we chose to only use these features in our modeling. After comparing test accuracy results for three different machine learning models (decision tree, naive Bayes classifier, and logistic regression), we chose to continue with the decision tree model.

The decision tree model gave a test accuracy of over 99%. Figure 1 shows the structure of the tree, thus providing mushroom foragers an algorithm for determining edibility. The model can be summarized as follows:
- Anise or almond odor means EDIBLE
- Any other odor means POISONOUS
- Odorless and green spore print means POISONOUS
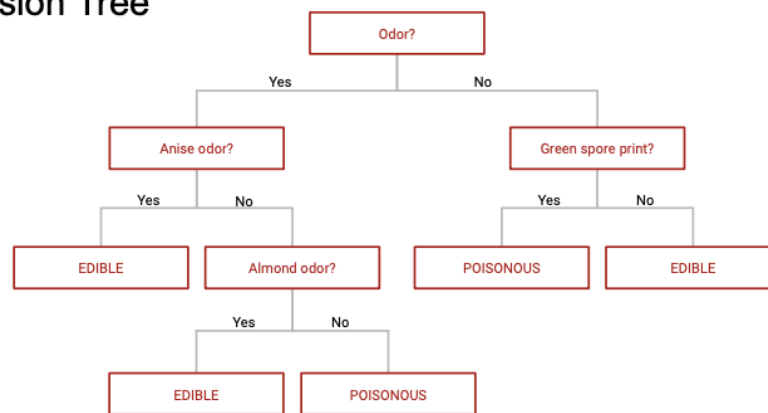- Odorless and non-green spore print means EDIBLE

Figure 1: Schematic of decision tree model.

We recommend that classifying mushrooms based on odor and spore print color will yield a highly accurate result of when a mushroom is edible. However, the small error in accuracy is not something that should be ignored because of the risk it puts foragers at. For instance, there exist poisonous, odorless, and white spore print mushrooms, and these would be misclassified as edible by the model. Therefore, we further recommend consulting field guides and experts if there is any doubt of an exact species of mushroom.