Mushrooms

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Why Mushrooms?
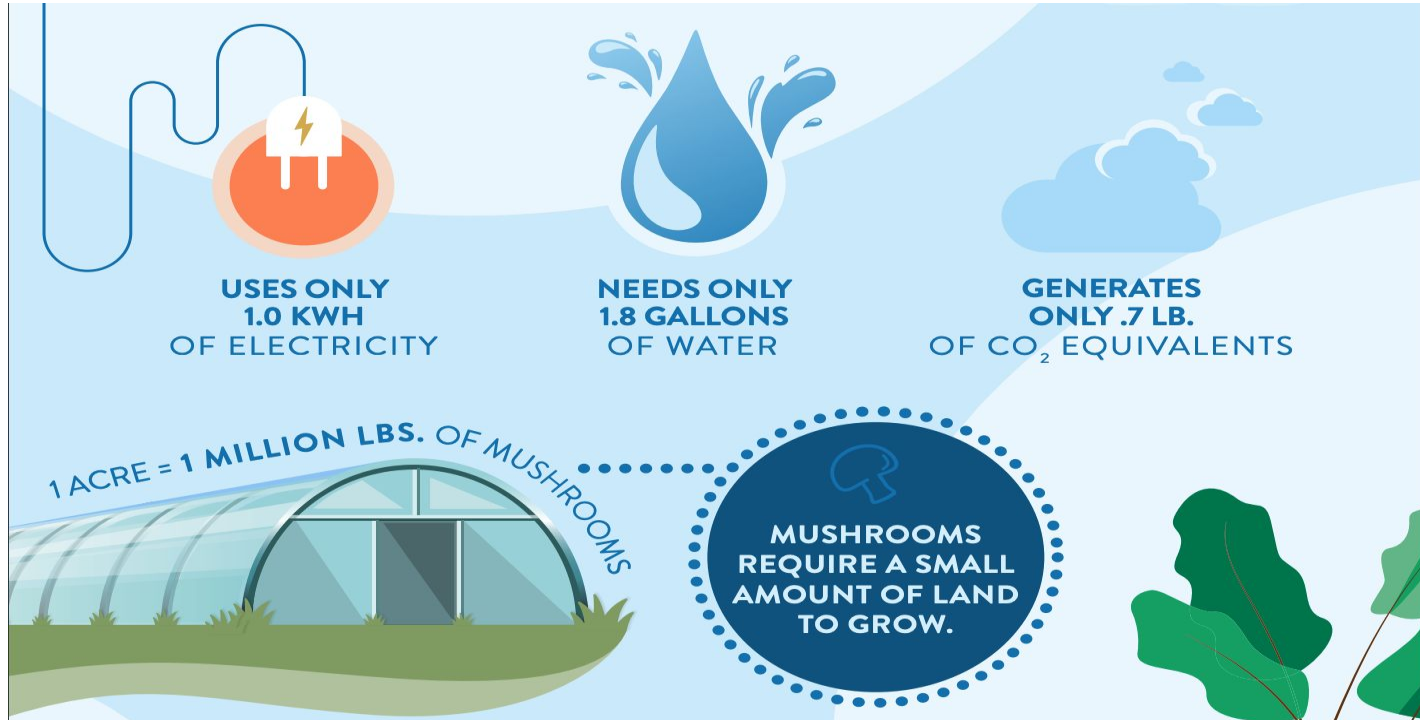
Nutritional Value

- Vitamin D
- Potassium
- B Vitamins
- Weight Management
- Rich in Niacin

0 grams of cholesterol

0 grams of fat

More than 12 vitamins and minerals[1]

Up to 4.9mg of the antioxident ergothioneine[2]

excellent source of 3 different B vitamins[4]

Why Mushrooms?

"One of the most sustainably produced foods in the United States"

Why Mushrooms?

Flavor Profile: Umami

- The fifth basic taste after sweet, salty, bitter, and sour
- Savory, brothy, rich, or meaty taste sensation
- Flavor enhancement
- Counterbalances saltiness
- Highlights sweetness while lessening bitterness

Exploring Edible vs. Poisonous Mushrooms

Data

- 173 species from 23 families
- Physical characteristics (i.e. cap diameter, stem height, odor, etc.)
- Growth characteristics (i.e. habitat, season, etc.)

Exploratory Data Analysis

- Frequency of different mushroom characteristics in the dataset (statistics and visualizations)
- Relationships between features via correlation metrics

Model Approach and Results

Goal

- Build a model to accurately classify a mushroom as either edible or poisonous
  - Considerations: Outliers, concentrations of data on extreme ends of distributions, etc.
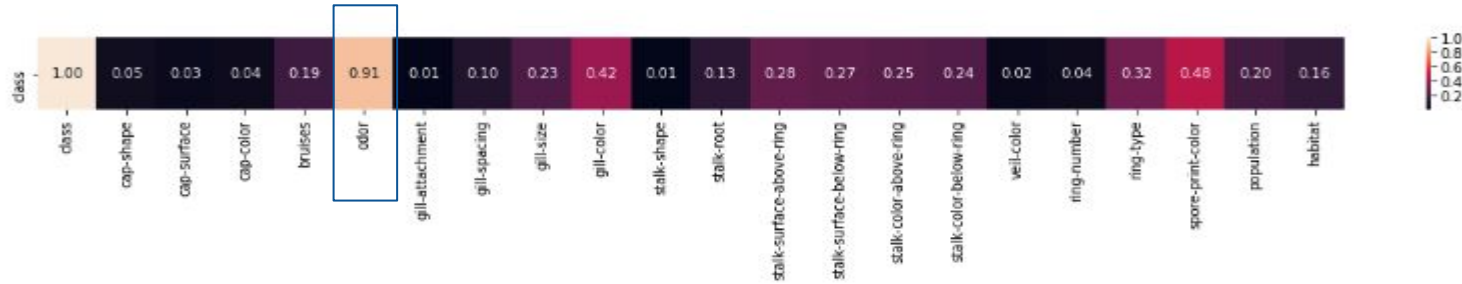
Evaluation

- Accuracy and Sensitivity

Results

- 100% across both metrics!

Findings and Recommendations

- If the mushroom smells, it's likely harmful!

- No other significant predictors. A mushroom's edibility status is a function of most / if not all of the characteristics

Besides a mushroom's odor (which is still a bit ambiguous), it's hard to determine if a mushroom is safe to consume!

Model and Data Limitations, Next Steps

- Many of a mushroom's physical characters are interrelated as they age (i.e. cap shape and surface)
    - Can be addressed by extending the data to create entries for different stages of a mushroom species' lifespan

- Inadequate representation of a mushroom's characteristics (i.e. 12 colors)
    - Employing image classifiers to extract a more robust depiction of a mushroom
- Many classification algorithms require lots of computational power
    - Cloud processing

Exploring Edible Mushrooms in U.S. Consumer Markets

Datasets

- Area, production, volume of sales, price per pound, value, number of growers, etc. from the USDA National Agricultural Statistics Service

Analysis

- Compared annual trends across different metrics and retail segments (i.e. total U.S. dollar sales)

Findings: Retail

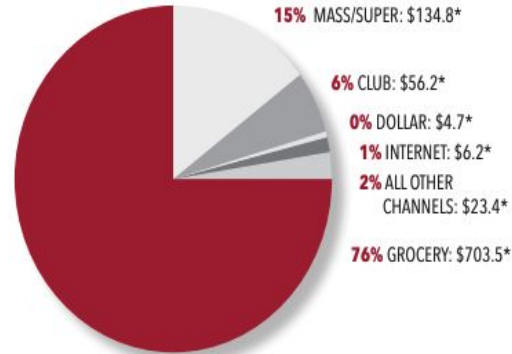- Considerable and consistent growth across the years 2014-2018

2018 +5.4%   2017 +4.2%   2016 +3.9%   2015 +3.8%   2014 +2.8%

Volume and Dollar Sales of All Varieties are Soaring*

Mushroom Sales Dollars and Pounds 2018 vs 2017

MUSHROOM VARIETY	DOLLAR % CHANGE	VOLUME % CHANGE
White	3.5%	3.2%
Brown	6.7%	7.9%
Specialty	16.8%	16.4%
Value Added	22.1%	26.2%
Total Category	5.4%	5.1%

Channel $ Share of Mushroom Purchases - 2018

- 15% MASS/SUPER: $134.8*
- 6% CLUB: $56.2*
- 0% DOLLAR: $4.7*
- 1% INTERNET: $6.2*
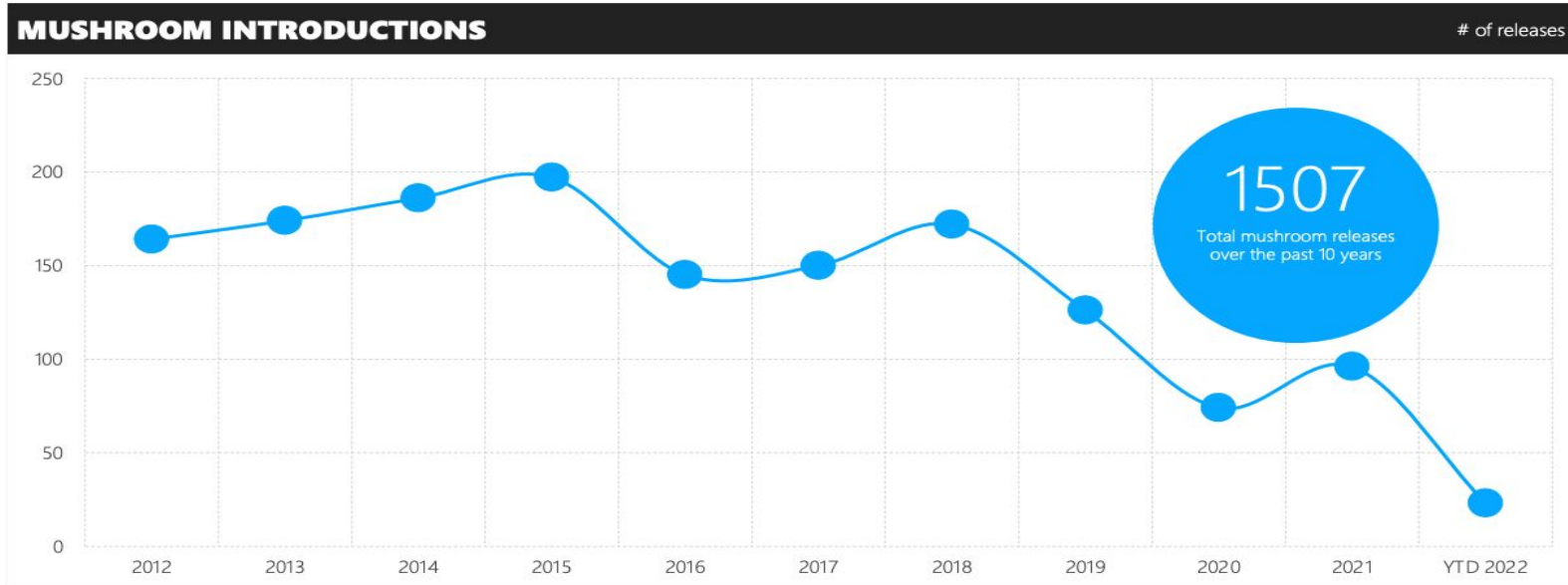- 2% ALL OTHER CHANNELS: $23.4*
- 76% GROCERY: $703.5*

*SALES BY CHANNEL IN MILLIONS

Findings: Food Service

- General decrease in the number of mushroom related menu item releases over the past decade

Next Steps

- Build models for inferential purposes to predict any relevant key metric (i.e. price per pound, volume of sales, etc.)

- Explore other components of the mushroom consumer market, such as production and shipping trends

- Dive deeper and research key drivers behind growth in the retail segment

Conclusions

- Mushrooms are diverse. If you're looking to pick out ones that are safe to consume, it's quite a challenging task
  - Thankfully, we have experts and strong machine learning models!

- Growth trends in volume and dollar sales of mushrooms in the retail industry over the past eight years, with grocery channels possessing the majority channel share

- Decrease in the number of mushroom related items introduced in food service