TEAM #1 GROUP PROJECT

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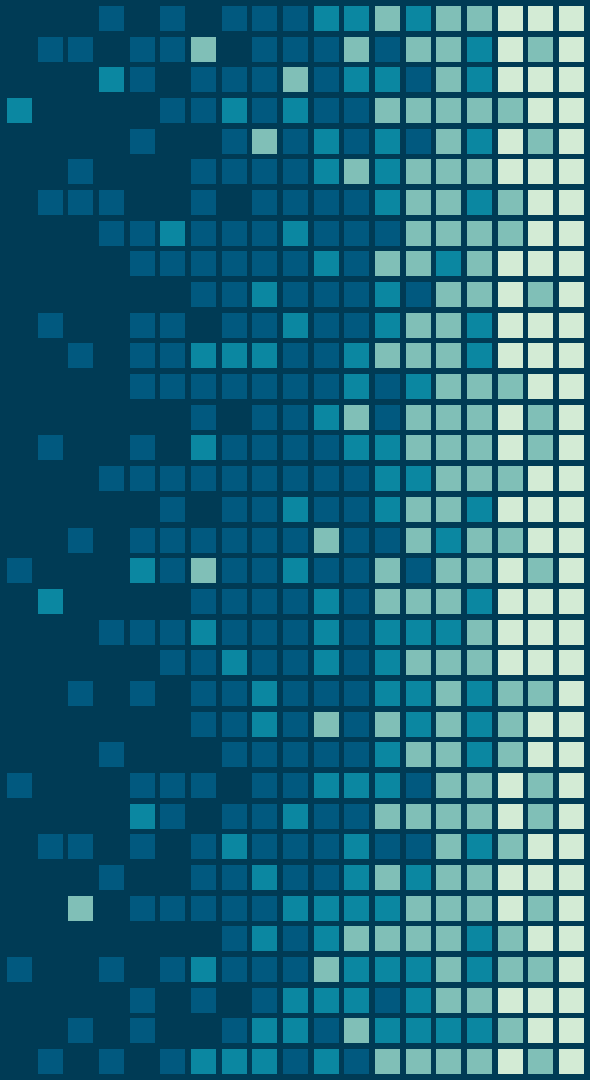
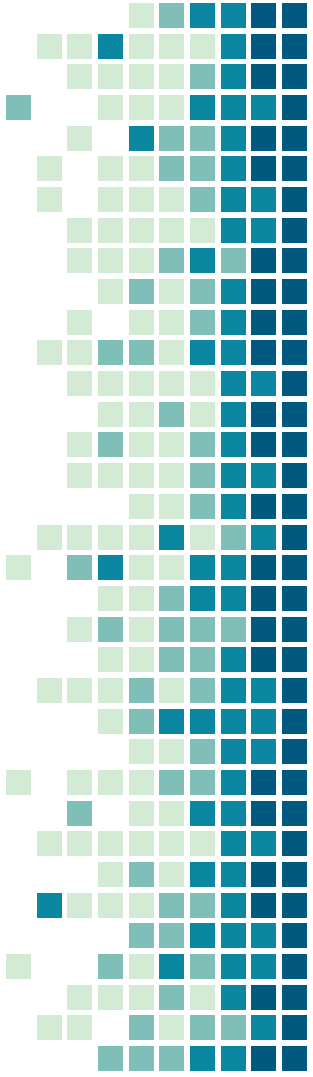


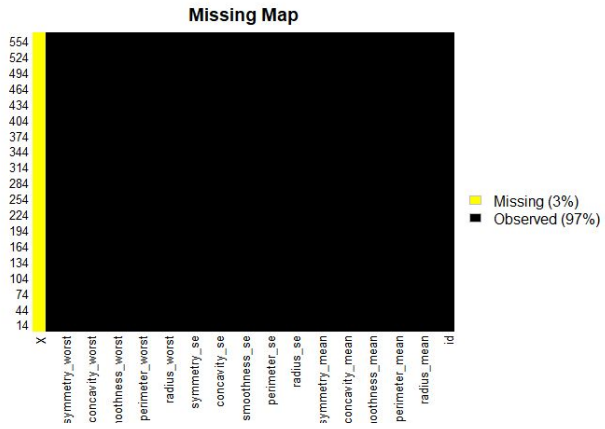
PROJECT INTRODUCTION



EXPLORATORY DATA ANALYSIS

- **Correlation plot** - Made to understand the relationship between multiple variables
- **Box Plot** - Comparison of Mean Radius for Malignant and Benign Tumors
- **Histogram** - Distribution of Radius Mean by Diagnosis
- **Density Plots** - Smoother version of the Histogram

MISSING MAP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524
494
464
434
404
374
344
314
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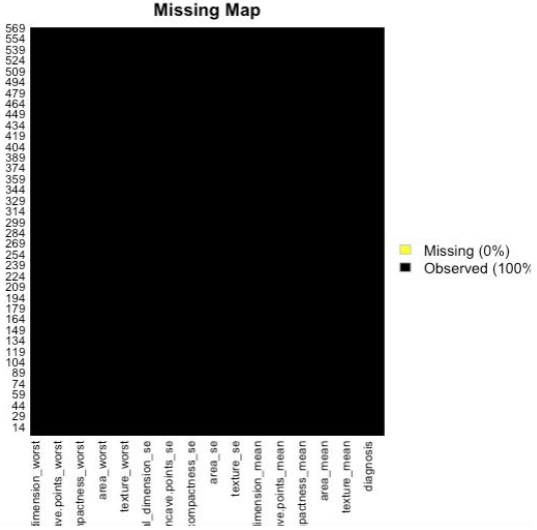
254
224
194
164
134
104
74
44
14
X
symmetry_worst
concavity_worst
perimeter_worst
radius_worst
symmetry_se
concavity_se
smoothness_se
perimeter_se
radius_se
symmetry_mean
concavity_mean
smoothness_mean
perimeter_mean
radius_mean
id
Missing (3%)
Observed (97%)


Missing Map
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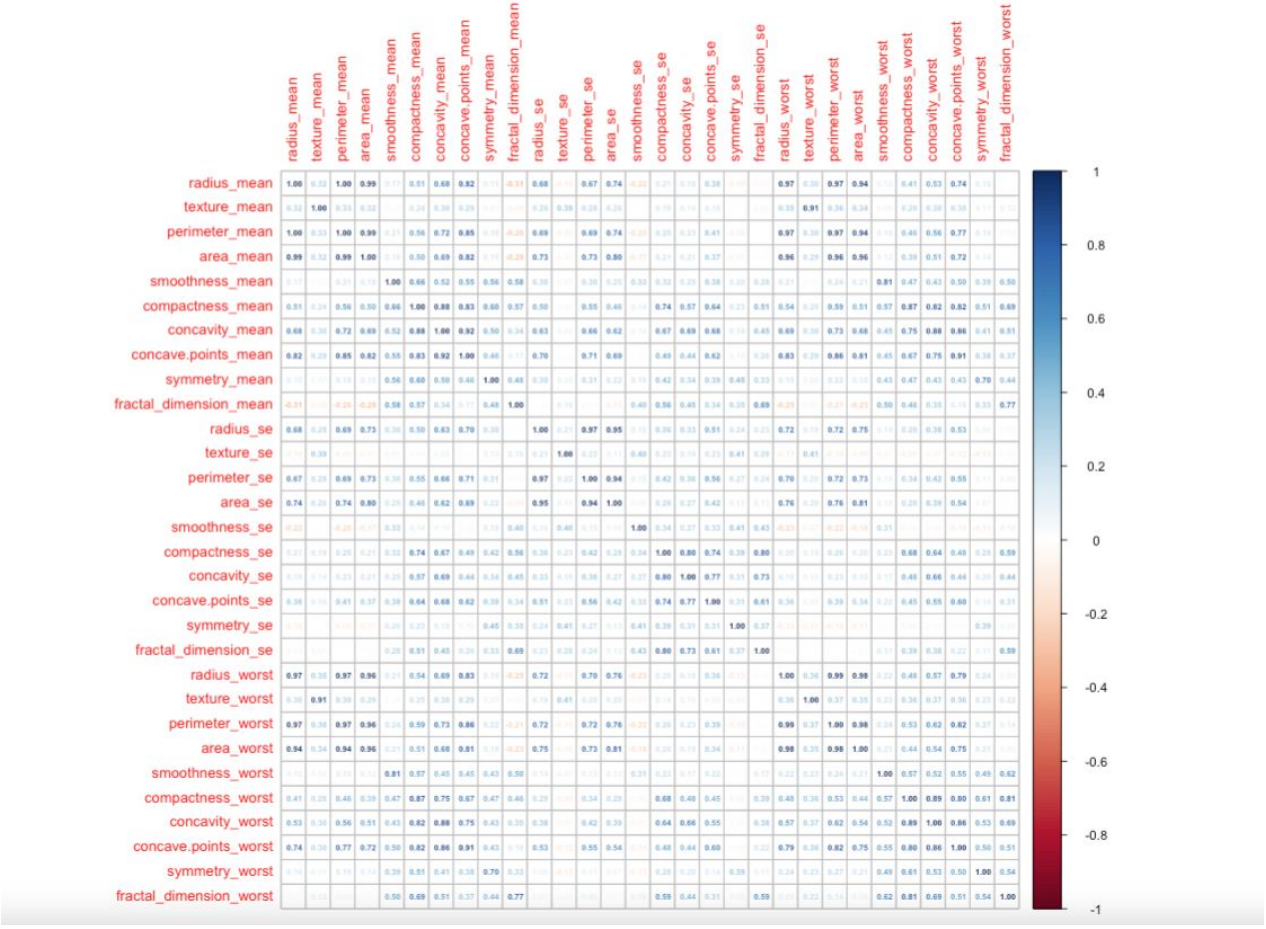
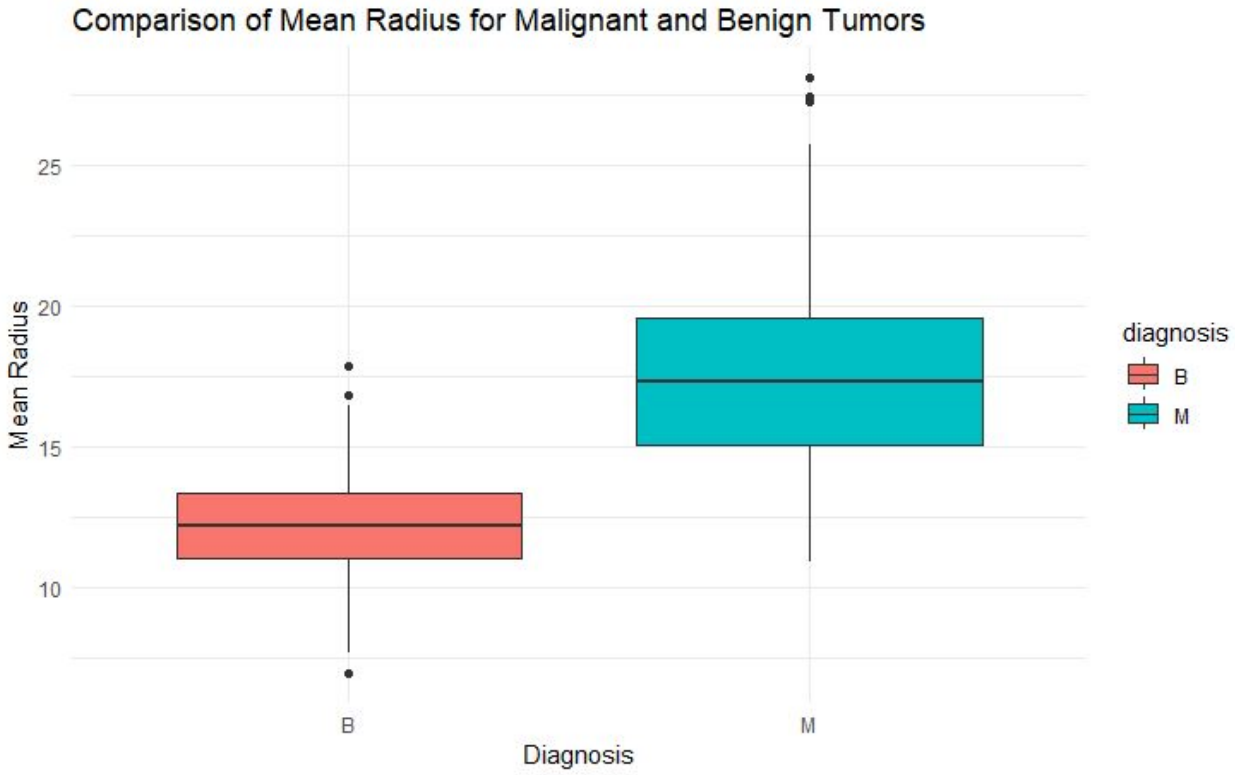
164
149
134
119
104
89
74
59
44
29
14
area_worst
texture_worst
area_se
texture_se
area_mean
texture_mean
diagnosis
Missing (0%)
Observed (100%

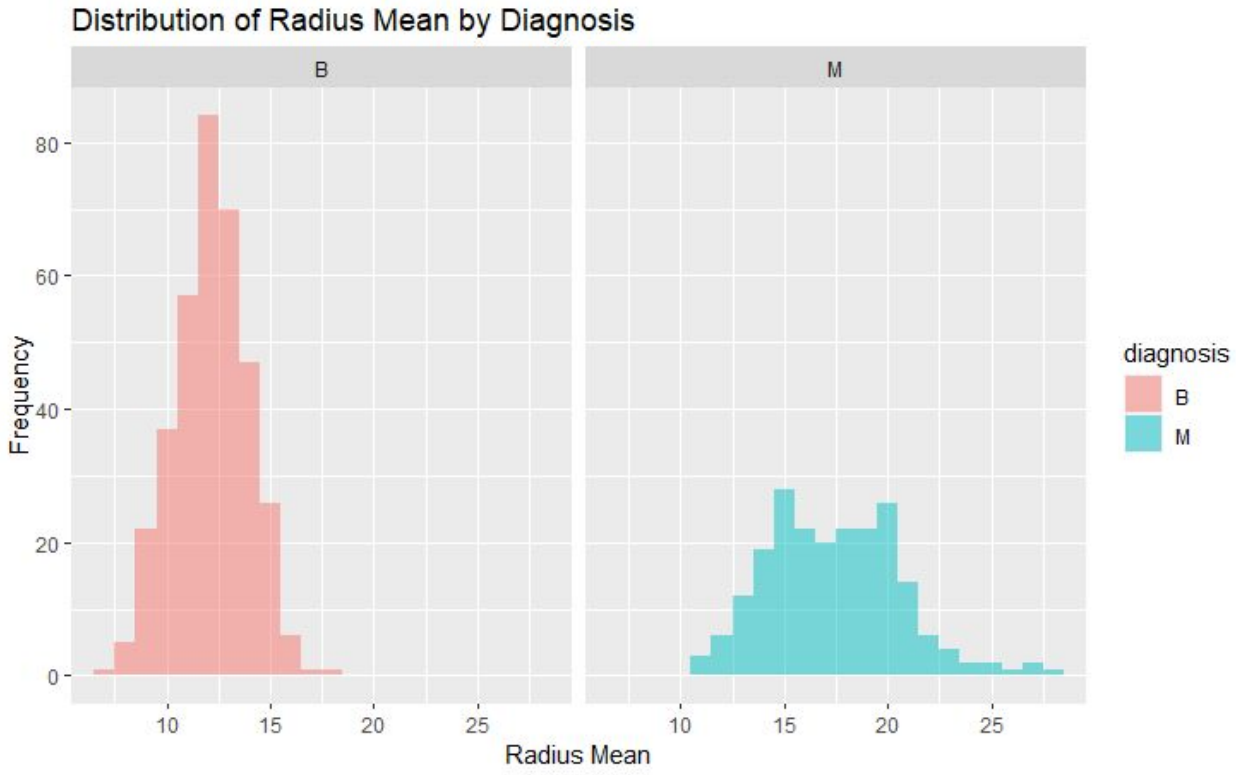
Correlation Plot



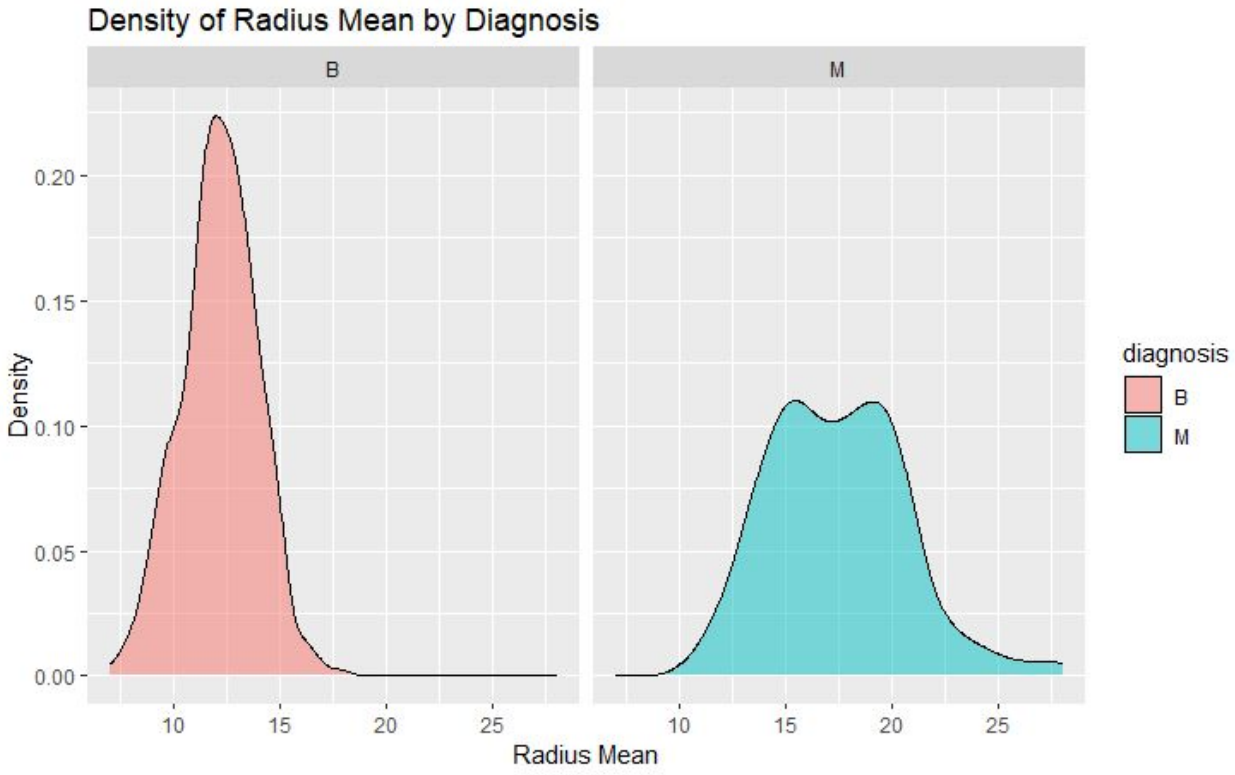
BOX PLOT


Comparison of Mean Radius for Malignant and Benign Tumors
Mean Radius
25
20
15
10
B
M
Diagnosis
diagnosis
B
M

HISTOGRAM


Distribution of Radius Mean by Diagnosis
B
M
Frequency
80
60
40
20
0
10
15
20
25
Radius Mean
diagnosis
B
M

DENSITY PLOTS



PROJECT ALGORITHMS

DECISION TREE

- A tree-like model that makes decisions by recursively splitting data into subsets based on significant features, leading to a set of rules for predicting a target variable

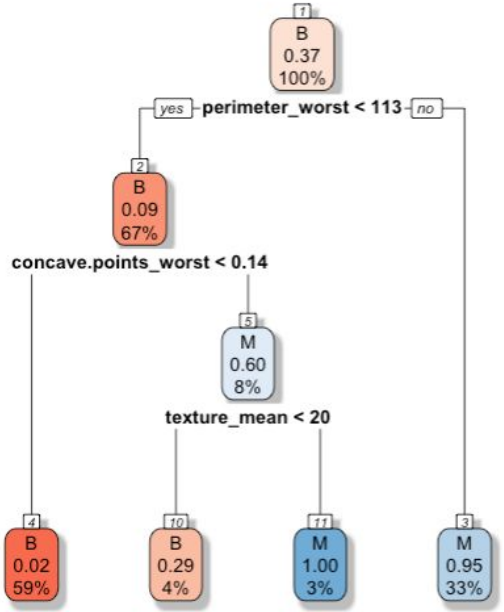
- Why Use Decision Trees?
  - Capable of handling lots of factors, which is present in our data
  - Identify patterns and make decisions based on those patterns
  - The model is similar to the diagnosis process used by physicians - Process of elimination starting using flowcharts.

DECISION TREE EVALUATIONS

	Benign	Malignant
Actual Benign	102	6
Actual Malignant	5	58

- Accuracy: 93.6%
- Precision: 94.4%
- Recall: 95.3%

DECISION TREE EVALUATIONS



K-NEAREST NEIGHBORS

- A model that classifies a data point by considering the majority class of its nearest k neighbors in the feature space.

- Why Use KNN?
  - Capable of handling multiple features in a dataset
  - Suitable for moderate-sized datasets.
  - Makes highly accurate predictions
  - Well-suited for binary classification tasks

K-Nearest Neighbors Evaluations

K =1	Benign	Malignant
Actual Benign	101	6
Actual Malignant	6	57

- Accuracy: 92.9%
- Precision: 90.4%
- Recall: 90.4%

K = 3	Benign	Malignant
Actual Benign	99	8
Actual Malignant	6	57

- Accuracy: 91.7%
- Precision: 87.6%
- Recall: 90.4%

K = 5	Benign	Malignant
Actual Benign	99	8
Actual Malignant	5	58

- Accuracy: 92.3%
- Precision: 87.8%
- Recall: 92.0%

THE ISSUE OF MISCLASSIFICATION

MISCLASSIFICATION

False Positives

- The model predicts a tumor as malignant when it is actually benign.
- It may lead to unnecessary treatments and increased cost of healthcare for patients who don't have cancer.

False Negatives

- The model predicts a tumor as benign when it is actually malignant.
- Delayed diagnosis and treatment for patients with cancer

SUPERVISED ALGORITHM COMPARISON

K-NEAREST NEIGHBOR VS DECISION TREE

KNN

- Best at classifying new observations, and is more accurate when trained on larger datasets
- Better at classifying large data sets, where the boundaries between neighborhoods seems arbitrary (higher variable independence)

Decision Tree

- Better overall for classification for smaller datasets
- This dataset was measuring mostly area and dimensions on images, so the dimensions would be somewhat dependent on each other

ETHICAL IMPLICATIONS

MACHINE LEARNING IN MEDICAL DIAGNOSIS

- Data Collection and Privacy
  - Securing patient consent for data collection and utilization is crucial
  - Being open with patients about how their data will be used and privacy measures taken to protect their personal information plays a significant role in gaining their trust
- Transparency and Accountability
  - Models with a higher level of clarity can help medical professionals better understand the criteria that is used to make predictions
  - Machine learning algorithms can streamline error detection and correction through an iterative process
- Regulatory Frameworks
  - Data systems must comply with legal obligations and follow ethical guidelines

FAIRNESS AND TRANSPARENCY IN PREDICTIONS

- Data Quality and Bias:
  - Reliable data will result in more accurate predictions and can be used with confidence to analyze and make decisions
  - Unfairness in data collection, sometimes even unintentionally, can skew the data in a particular way
  - This leads to unreliable data which may lead to inaccurate predictions and costly decisions
  -
- Ensuring Fairness and Transparency in our Model:
  - Removed the column named 'X' due to all the missing values as shown on the Missing Map ('missmap')

CONCLUSION

- Project Description/Introduction
- Exploratory Data Analysis
- Models & Evaluations
- Issues of Misclassification
- Comparison of Models
- Ethical Implications:
    - ML in Medical Diagnosis &
    - Fairness and Transparency

THANK YOU FOR LISTENING!