Impacts of AI: Breast Cancer Detection

By: Ajel Balan, Shanthan Gunti, & Saachi Singh

Positive and Negative Impacts of AI

Positive Impacts

- Takes risk and decrease human error
- Availability
- Environmental Impacts
- Healthcare

Negative Impacts

- Job loss
- Ethical and legal boundaries
- Privacy
- Environmental impacts

AI & Cancer

- Breast cancer is the most common type of cancer.
- Machine learning algorithms have influenced breast cancer detection and prognosis.
- ML Algorithms can sort through mammographies & MRIs to reduce the workload of radiologists.
- These models also increase efficiency in detecting malignant/benign tumors in women with dense breast tissue.
- AI can use ultrasound imaging to increase efficiency to find malignant tumors without the need for invasive biopsies.
- There are new machines that use infrared cameras that detect heat abnormalities to find tumors in people who live in rural areas for 1/10th of the price of mammography equipment.

Algorithm: Support Vector Machine

- What is it?
  - Supervised machine learning model
  - Uses binary linear classification which minimizes the generalization error
- How does it work?
  - First, you have to determine if the data is [linearly separable](#).
  - Then, you can train an SVM model to make accurate predictions.
  - Lastly, you can test the model accuracy using the Confusion Matrix.
- Why was it chosen?
  - Effective in small and large datasets
  - Memory efficient and versatile.
- Outcome:
  - The algorithm was considered successful because it accurately detected cancer instead of healthy cells with a 98% accuracy.

linearly separable
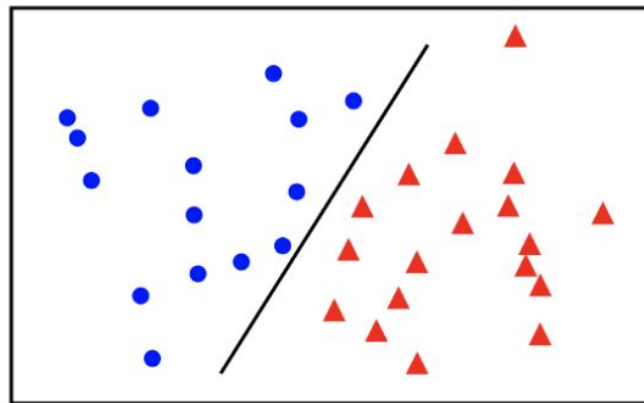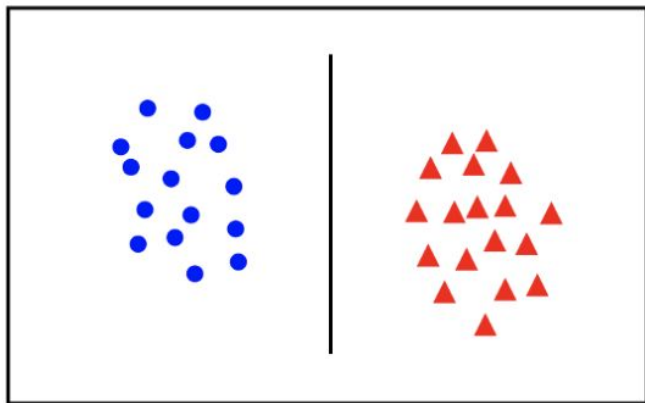
not linearly separable
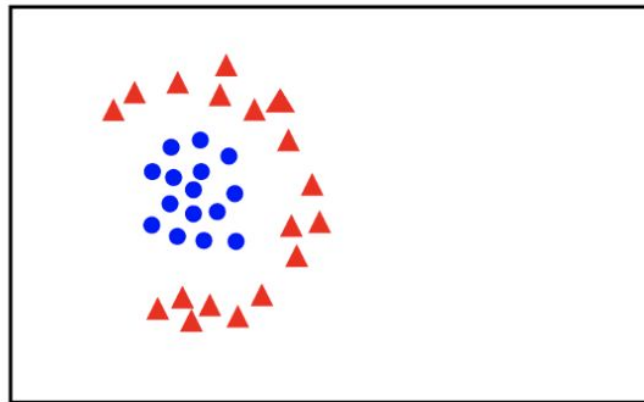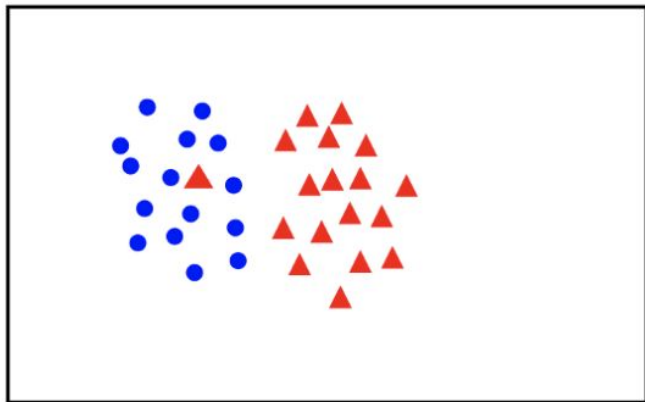
How can artificial intelligence impact our world?

- AI allows us to see correlations between mass amounts of data
    - Find what means correlate to a malignant diagnosis versus benign diagnosis
- There is an algorithm to solve a problem the best
- These predictions can save lives
    - In this case, find the cancer before it becomes terminal

Visuals from Research

Correlation Heatmap
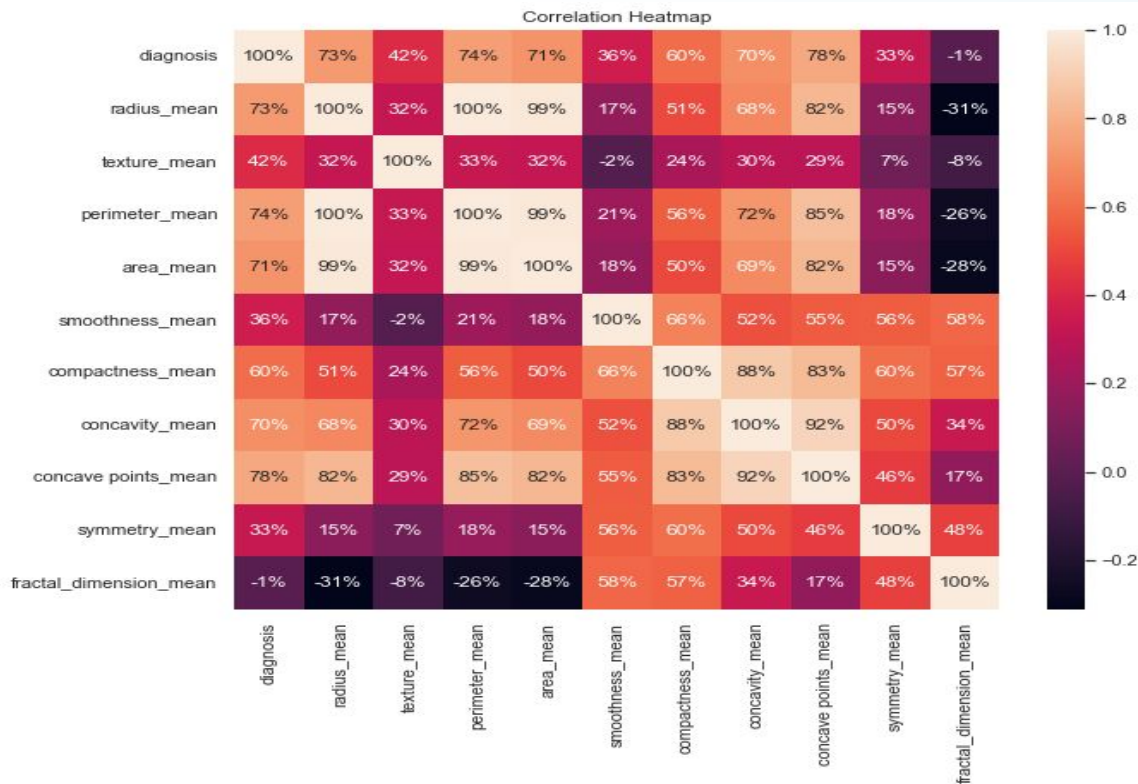
Training Accuracy Results

Logistic Regression Training Accuracy: 99.12087912087912

Decision Tree Training Accuracy: 100.0

Random Forest Training Accuracy: 99.78021978021978

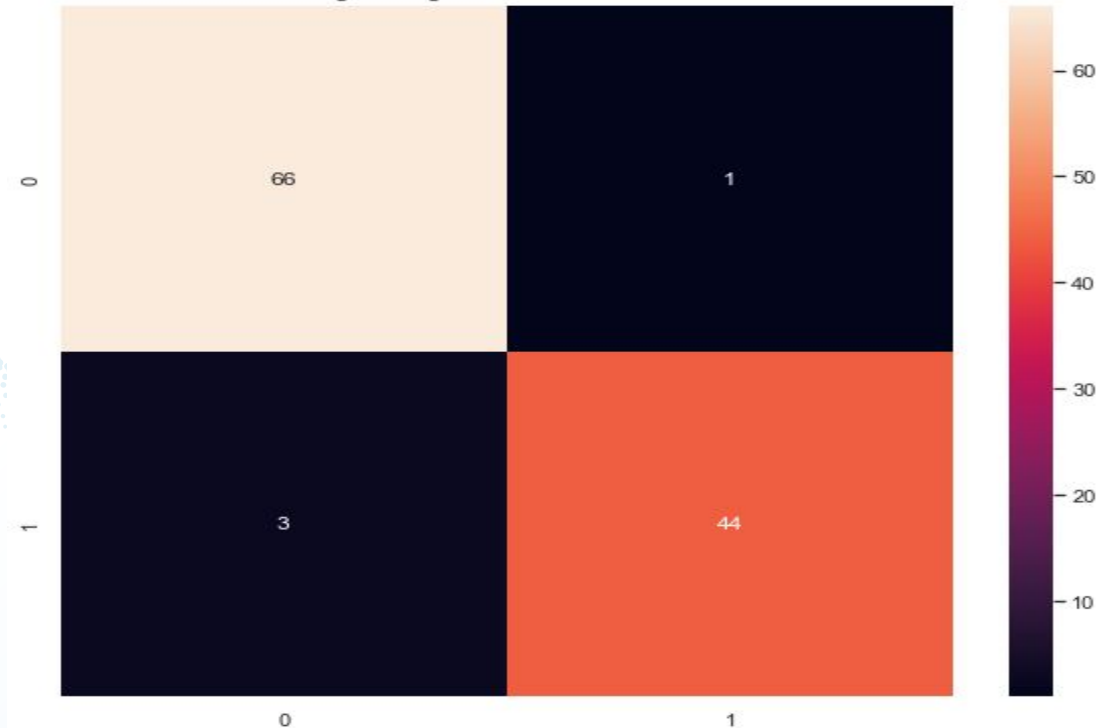SVM Training Accuracy: 98.46153846153847

Logistic Regression

Logistic Regression

	precision	recall	f1-score
0	0.96	0.99	0.97
1	0.98	0.94	0.96
accuracy			0.96
macro avg	0.97	0.96	0.96
weighted avg	0.97	0.96	0.96

96.49122807017544

Logistic Regression Confusion Matrix

Decision Tree

```
Decision Tree

              precision    recall   f1-score

         0        0.94      0.96       0.95
         1        0.93      0.91       0.92


  accuracy                             0.94
 macro avg        0.94      0.94       0.94
weighted avg      0.94      0.94       0.94


93.85964912280701
```


Decision Tree Confusion Matrix
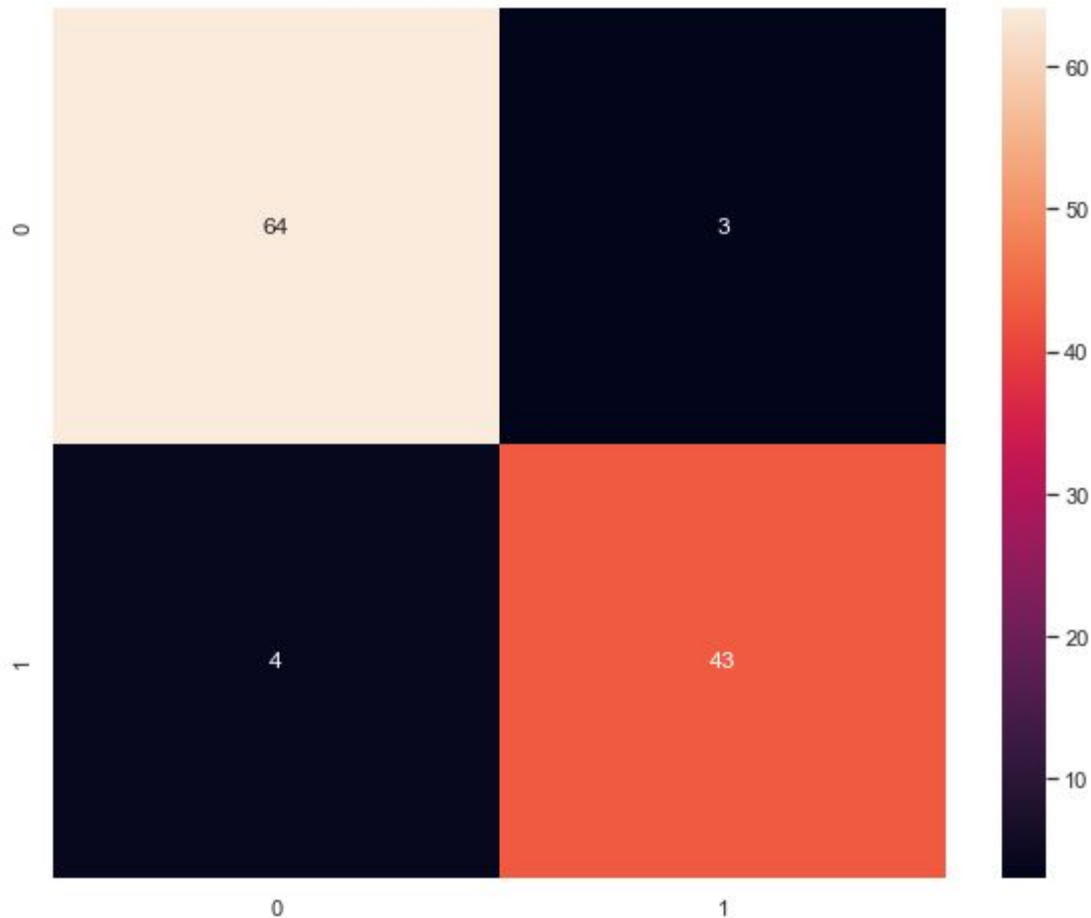
Random Forest

Random Forest

|	precision	recall	f1-score	support
0	0.96	1.00	0.98	67
1	1.00	0.94	0.97	47
accuracy			0.97	114
macro avg	0.98	0.97	0.97	114
weighted avg	0.97	0.97	0.97	114

97.36842105263158

Random Forest Confusion Matrix
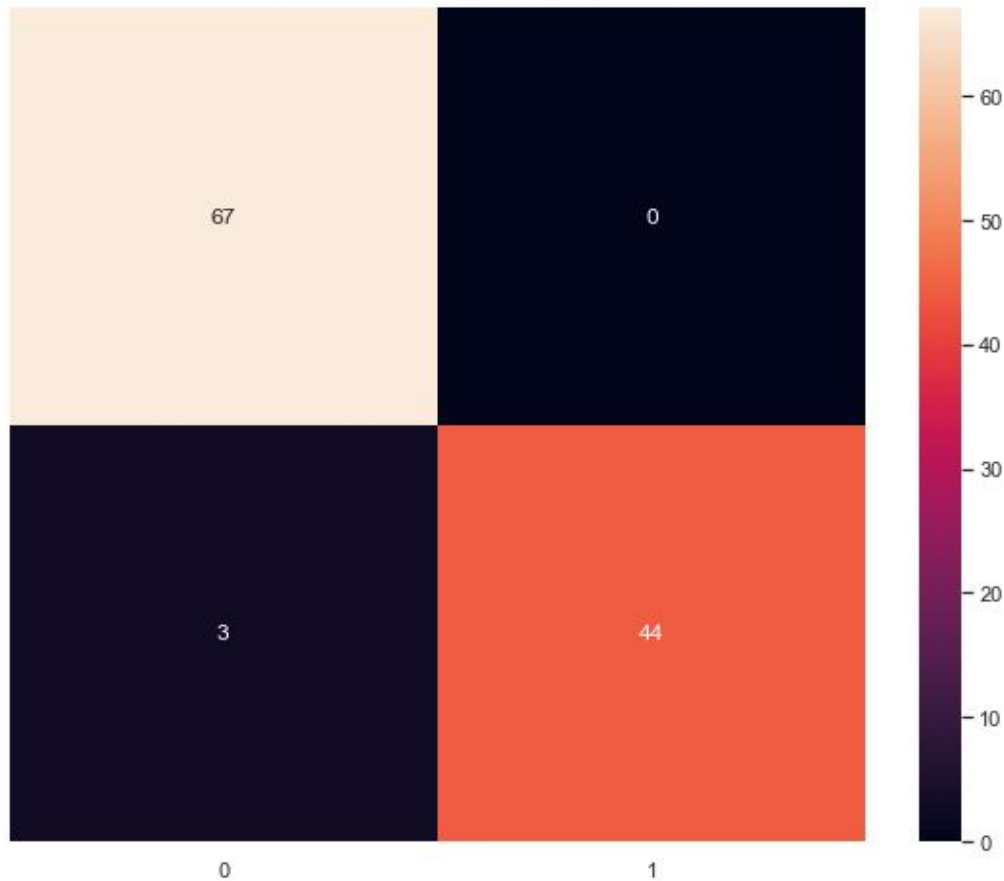
SVM

	precision	recall	f1-score	support
0	0.97	1.00	0.99	67
1	1.00	0.96	0.98	47
accuracy			0.98	114
macro avg	0.99	0.98	0.98	114
weighted avg	0.98	0.98	0.98	114

98.24561403508771

SVM Confusion Matrix

Citations
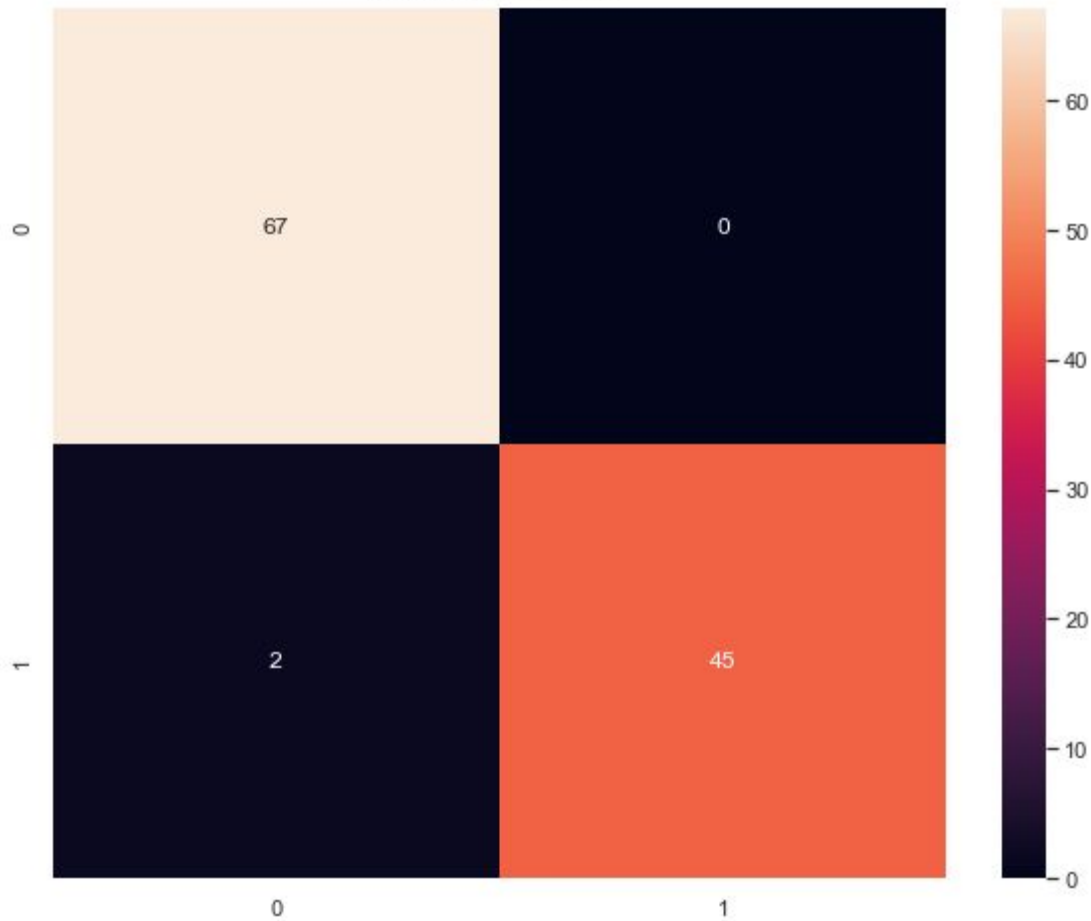
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2. https://towardsdatascience.com/breast-cancer-classification-using-support-vector-machine-svm-a510907d4878#:~:text=A%20Support%20Vector%20Machine%20(SVM)%20is%20a%20binary%20linear%20classification,regression%20and%20even%20outlier%20detection.
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4. https://healthitanalytics.com/news/artificial-intelligence-advances-breast-cancer-detection#:~:text=Sorting%20through%20MRIs%2C%20artificial%20intelligence,a%20patient's%20breast%20cancer%20diagnosis.&text=October%2007%2C%202021%20%2D%20With%20artificial,to%20eliminate%20those%20without%20cancer
5. https://www.kaggle.com/code/buddhiniw/breast-cancer-prediction/data