Diagnosing Breast Cancer

Diagnostic Wisconsin Breast Cancer Database

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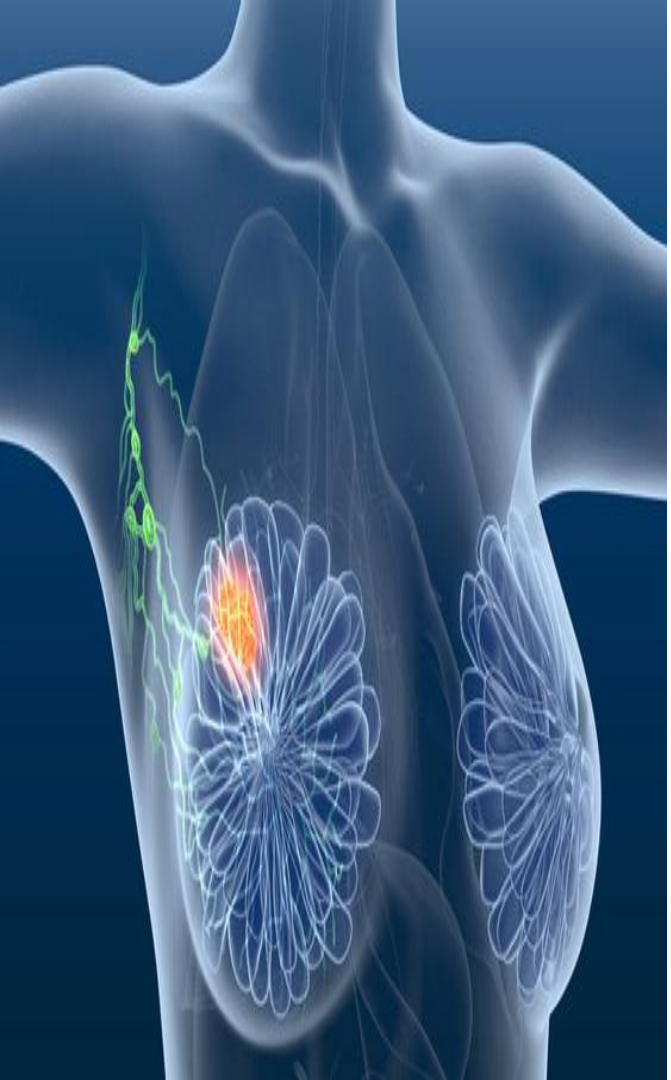


Agenda

- Breast Cancer Facts & Figures
- Screening and Diagnosing
- Developing a new method of assessment

- Data set
- Data Analysis
- Conclusion

Breast Cancer

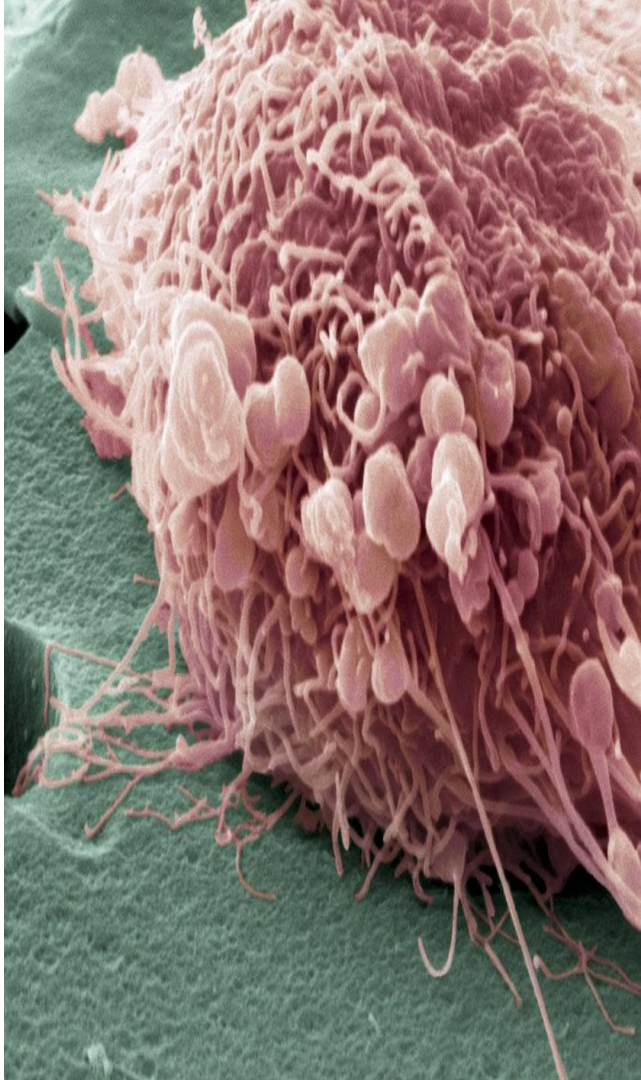
Facts and Figures - UK

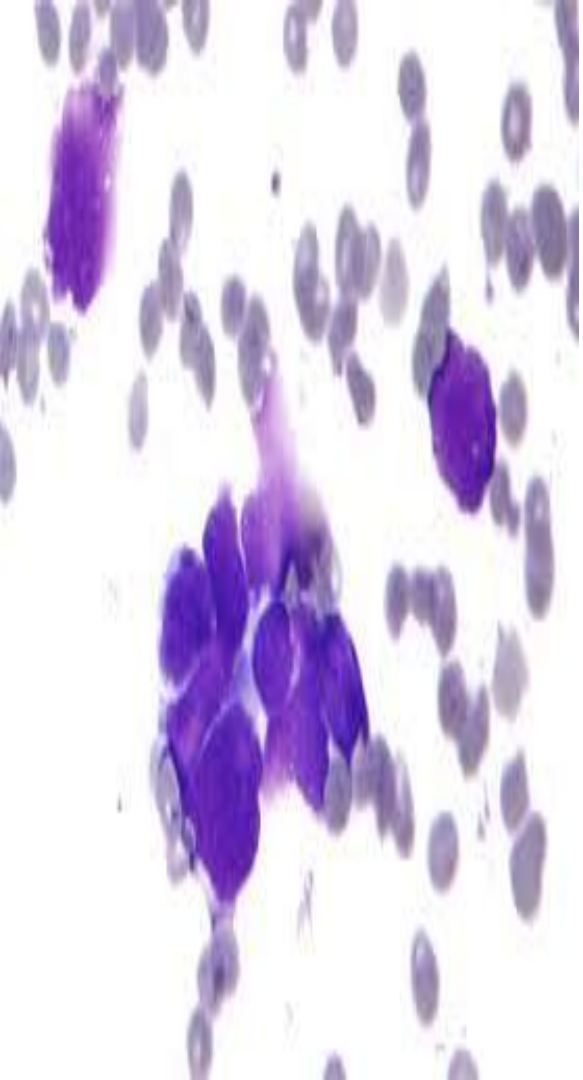
- There are around 55,200 new **breast cancer** cases every year, that's around 150 per day (Cancer Research UK).

Current methods of screening and Diagnosis:

- Clinical and breast self - exam
- Sonogram
- MRI
- Mammography (X-rays)

- Current rate of False Negatives: 9.4%
- Screening is expensive and laborious
- Predictive model for identifying malignant tumours could save lives and money!!!





Wisconsin breast cancer dataset

- 569 patients - all identified as having breast tumour
- Benign group (B) - 357
- Malignant group (M) - 212

Method

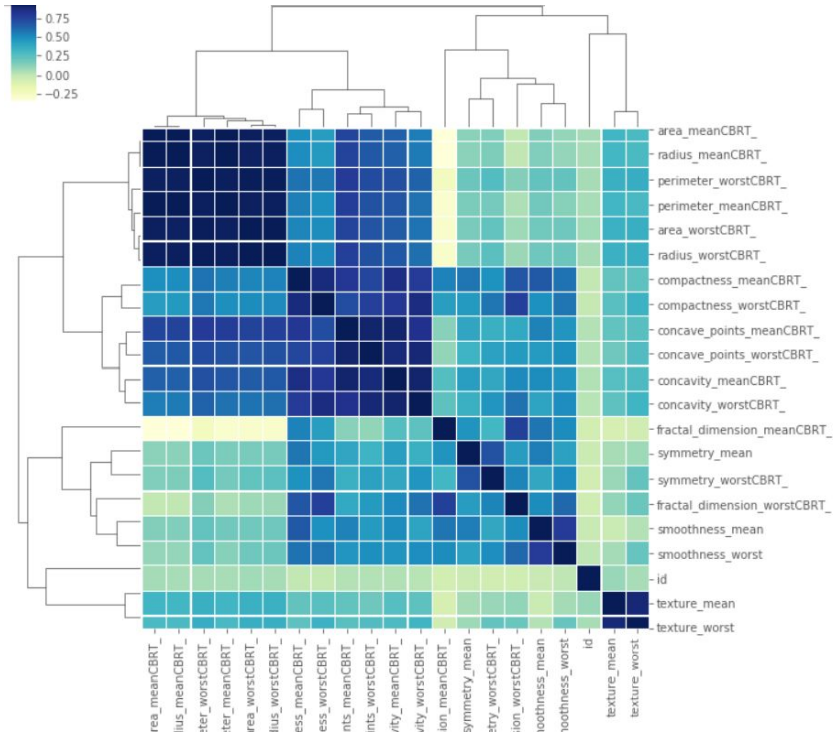
- Processing of x-ray images (Mammography)
- Tumours were classified according to their physical characteristics, including area, concavity, etc.
- 20 physical aspects
- Identify characteristics specific to Malignant tumours

Are there any strong associations among the physical aspects of the tumours?

9 characteristics were strongly correlated to each other

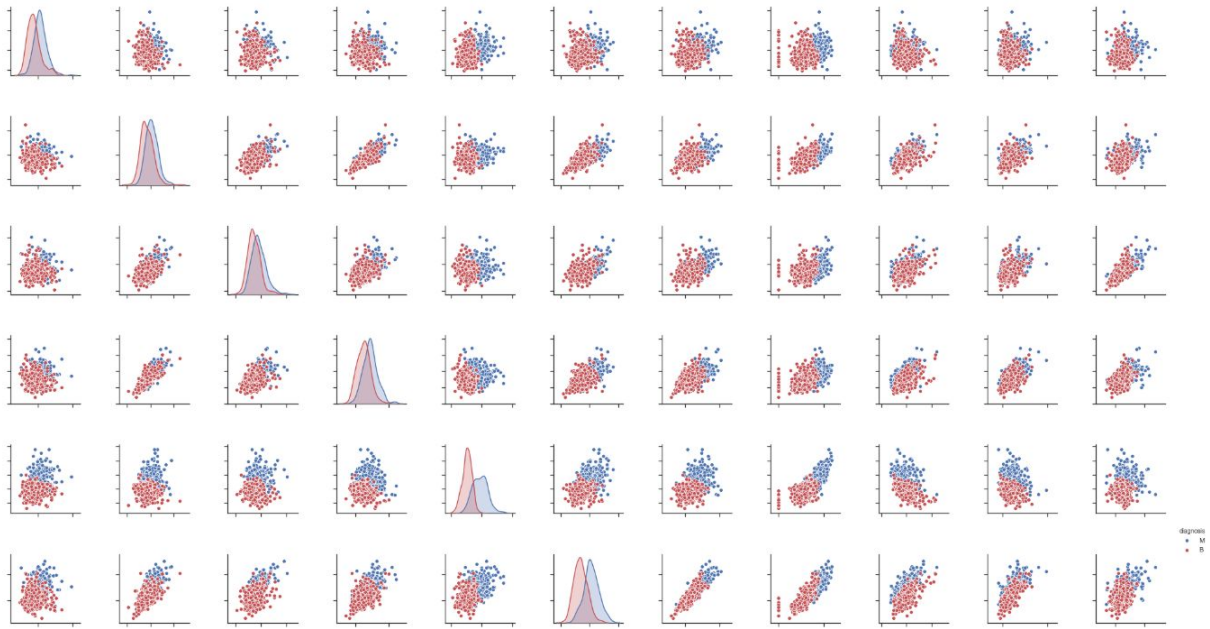
1. Texture_worst
2. Area _worst
3. Concave_points _worst
4. Concavity_mean
5. Concativity_worst
6. Perimeter_mean
7. Perimeter_worst
8. Radius_mean
9. Radius_worst

Graph showing Correlations among the physical aspects of Tumours



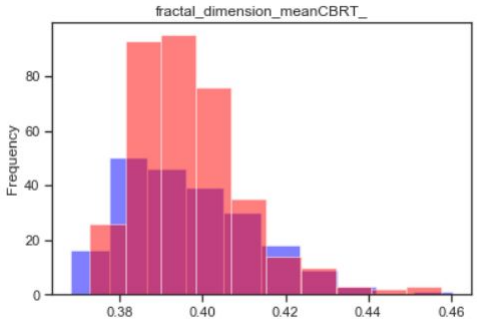
Are the physical characteristics significantly different between groups ?

Graph showing the distribution of the Mean characteristics of the tumours for both B and M experimental groups



Not significantly different between Benign and Malignant groups:

Fractal Dimension Mean



Are physical aspects good predictors for diagnosing malignant Breast Cancer?

Figure showing the significant predicting physical characteristics of Malignant Breast Cancer

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-4.0944	0.362	-11.296	0.000	-4.806	-3.382
texture_mean	0.0195	0.003	6.985	0.000	0.014	0.025
smoothness_mean	-1.9390	2.028	-0.956	0.340	-5.923	2.045
symmetry_mean	0.4833	0.753	0.642	0.521	-0.996	1.962
smoothness_worst	4.6579	1.066	4.371	0.000	2.565	6.751
area_meanCBRT_	0.1953	0.016	12.533	0.000	0.165	0.226
compactness_meanCBRT_	-0.6416	0.603	-1.063	0.288	-1.827	0.544
compactness_worstCBRT_	-0.2944	0.343	-0.858	0.391	-0.968	0.379
concave_points_meanCBRT_	0.9387	0.271	3.461	0.001	0.406	1.471
fractal_dimension_worstCBRT_	2.6669	0.818	3.261	0.001	1.060	4.273
symmetry_worstCBRT_	1.3917	0.463	3.004	0.003	0.482	2.302

RSquared: 0.717

Good predictors of Malignant Breast Cancer:

Texture_mean

Smoothness_mean

Area_mean

Concave_points_mean

Fractual_dimension_worst

Conclusion

- **55,000 people are diagnosed with breast cancer every year** in the UK, which is one of the highest causes for mortality in women.
- Current screening and diagnosis are laborious and expensive, with **9.4% false negatives in diagnose rates.**
- **It is possible** to process X-ray images to **identify unique physical aspects of tumours**, in order to correctly diagnose malignant breast cancer
- **Texture, Smoothness, Area, Concave points, and fractal dimension of the worst tumour cells** are significantly different in Benign and malignant cancer, and can be used a predictors for diagnose.

If you have been affected by the issues raised in this presentation, please access the following links:

Cancer research UK
https://www.cancerresearchuk.org/about-cancer/breast-cancer/getting-diagnosed

Breast Cancer now
https://breastcancernow.org/

Breast Cancer support
https://breastcancersupport.org.uk/

THANK YOU

- 11,399 deaths from breast cancer (2015 - 2017).
- 78% survival rate
- 23% of breast cancer are preventable
- More than 1 in 10 breast cancer cases are diagnosed late in England (2014), Scotland (2014-2015) and Northern Ireland (2010-2014).