

AI Mammography [Radiology] Model

By Olajide Ajayi

Vendor Evaluation & Analytics

■ Executed Projects

- Chronic Disease Management (MA) – Stochastic Processes - Birth and Death Process (Markov Chain).
- Behavioral Health – Game Theory - Pay Off Matrix.
- SNF – Operations Research – Linear Programming.
- Denial Rate Analysis – Genetic Algorithm.
- Design of Experiment - ANOVA.
- Statistical Process Control.
- Monte Carlo Simulation.
- Plus other Statistical Techniques.

Rationale and Background

■ **Traditional Approach - Imaging Services**

- Currently, total length of procedure on the average is approximately 20 minutes to 1 hour.
- The actual scanning takes few minutes.
- Examination and confirmation of images to ensure accuracy is time consuming.

■ **Proposed Model – AI Imaging Services**

- The intent is to significantly reduce duration of procedure.
- More accurate and sufficient quality of conclusion from images.

■ **Advantages of New Model**

- Image processing capability is better than any expert/trained eye – Radiologist/Technician.
- Robust pool of historical images compared to any one singular system or provider.
- Learns faster from mistakes - less diagnostic errors [most common type of medical mistake¹].

■ **Limitation**

Relatively new - limited success stories using this model.

¹U.S. Department of Health and Human Services/Agency for Healthcare Research and Quality - June, 2017.

Business Model Validation

Preview

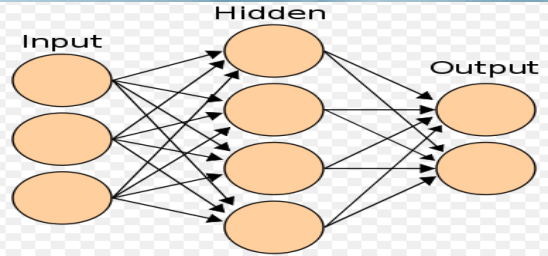
- Problem – Assigning individual to a group based on characteristics.
Classification or discrimination.

■ Literature Review

- Anthropology – Jaw bone.
- Jaundice - Surgery or not.
- Taxonomy – Generic & Specie.
- Flury and Riedwyl (1990) – Bank notes (bills).
- Rao (1973) – Discrimination procedures.

Model Objectives

- Determine variability of characteristics.
- Detect minute details in differentiation.
- Discriminate between the two groups.



Skeletal Machine Learning Model.

Simple Discriminant Analysis

■ Variables

- Groups – I and II.
- Z is Response Variable.
- Independent variables – Breast density, mostly quantitative measurements **X**.

■ Discriminant Function

- Fisher's Linear Discriminant Function.
- Classification Rule – Z Score.
- Power of Discriminant Function.
- Misclassification error, Sensitivity and Specificity.
- PCA and FCA.

■ Model Extension

- Multi-Variable Discriminant Analysis.
- Quadratic Discriminant Function.