

COMPUTATIONAL INTERACTION ANALYSIS FOR REDOX REACTION PATHWAY

Dhondalay G. K.* , Lemetre C.* , Burnett A.* , Lancashire L. J.+ , Ellis I.O.^ , Martin S.# , Ball G. R.*

* John Van Geest Cancer Research Centre, Nottingham Trent University, Clifton Campus, Clifton Lane, Nottingham NG11 8NS, UK

+ Clinical and Experimental Pharmacology, Paterson Institute for Cancer Research, University of Manchester, Manchester M20 4BX, UK

^ Department of Histopathology, Nottingham University Hospitals Trust and University of Nottingham, Nottingham NG7 2UH, UK

Department of Clinical Oncology, University Hospitals, City Hospital Campus, University of Nottingham, Hucknall Road, Nottingham NG5 1PB, UK

Introduction:

- REDOX and Local Recurrence (LR) in breast cancer
- Artificial Neural Networks (ANN) stepwise Multi Layer Perceptron (MLP) and Back Propagation (BP)
 - Robust, nonlinear and flexible
 - Can handle huge and complex datasets
 - Applications ranging from simple decision making to complex medical intervention determining in cancer

Objectives:

- To compare conventional correlation statistical method (Correlation Coefficient; r) with in-house developed ANN Interaction analysis.
- To use in-house developed ANN to investigate REDOX pathway governing LR.
- To decipher REDOX pathway.

Data Source:

TMA data comprising of 35 primary breast cancer patients upon radiotherapy with LR (9 Positive & 29 Negative) tested with 36 IHC markers for REDOX.

OVERVIEW

Introduction

Objectives

Data Source

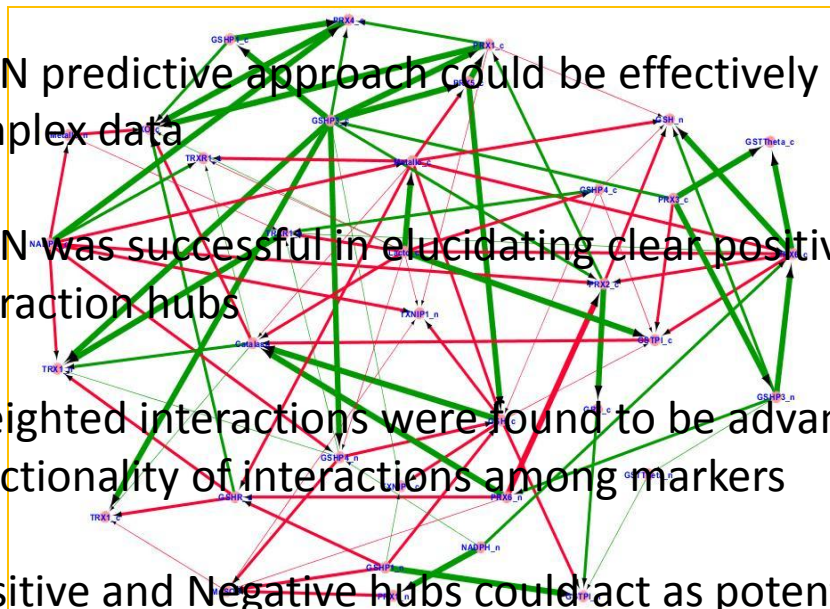
• ANN predictive approach could be effectively used to simplify complex data

• ANN was successful in elucidating clear positive interaction hubs

• Weighted interactions were found to be advantageous for elucidating directionality of interactions among markers

• Positive and Negative hubs could act as potential biomarkers of local recurrence in breast cancer

• Validation with pathway reaction cascades and other sensitive high-throughput expression platforms is suggested



Negative

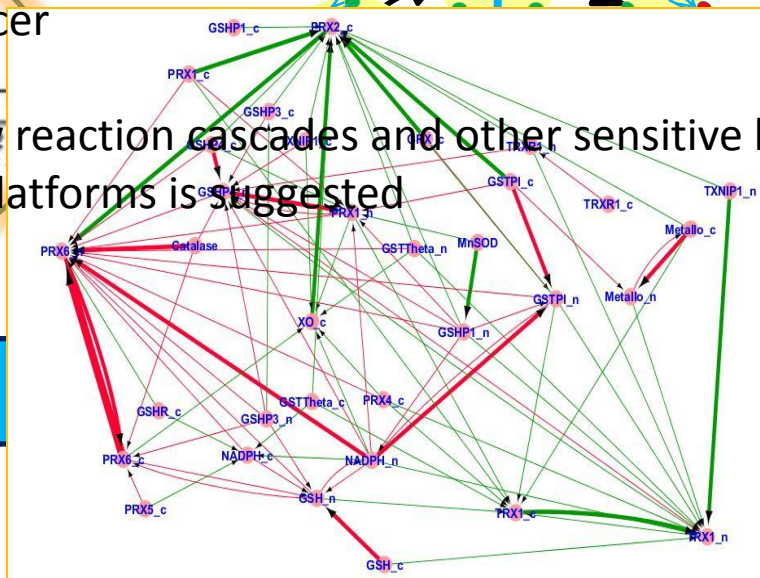
Linear Correlation Model

Interaction Analysis

$$r = \frac{\sum(x-x)(y-y)}{\sqrt{2(x-x)^2(y-y)^2}}$$

Non-linear Interaction Model

CYTOSCAPE



OVERVIEW

Introduction

Objectives

Data Source

Methodology

Results

Discussion

Conclusion