MEDINFO23

8 – 12 JULY 2023 | SYDNEY, AUSTRALIA

@twitterhandle

Defining the boundaries of psychiatric and medical knowledge: applying cartographic principles to self-organizing maps

Andrew Amos

Associate Lecturer

James Cook University, Townsville

Boundaries of Psychiatric Knowledge

- Director of Training – Psychiatry
- Training curriculum
  - Knowledge
  - Skills
  - Aptitudes

- Data Mining Medical Databases
- Visualising knowledge networks
- Self-organising maps

Expert vs Empirical Knowledge Boundaries

Expert

- Inductive
- Experience-based
- Individual bias
- Group bias
- Difficult to analyse

Empirical

- Deductive
- Data-based
- Feature/variable selection bias
- Training data biases
- Systematic analysis

Taxonomy – Medical Subject Headings

Schizophrenia MeSH Descriptor Data 2023

Details | Qualifiers | MeSH Tree Structures | Concepts

Mental Disorders [F03]
- Schizophrenia Spectrum and Other Psychotic Disorders [F03.700]
  - Affective Disorders, Psychotic [F03.700.150]
  - Capgras Syndrome [F03.700.300]
  - Delusional Parasitosis [F03.700.356]
  - Morgellons Disease [F03.700.412]
  - Paranoid Disorders [F03.700.450]
  - Psychotic Disorders [F03.700.675]
  - **Schizophrenia [F03.700.750]**
    - Schizophrenia, Catatonic [F03.700.750.300]
    - Schizophrenia, Disorganized [F03.700.750.350]
    - Schizophrenia, Paranoid [F03.700.750.600]
    - Schizophrenia, Treatment-Resistant [F03.700.750.650]
    - Shared Paranoid Disorder [F03.700.750.700]

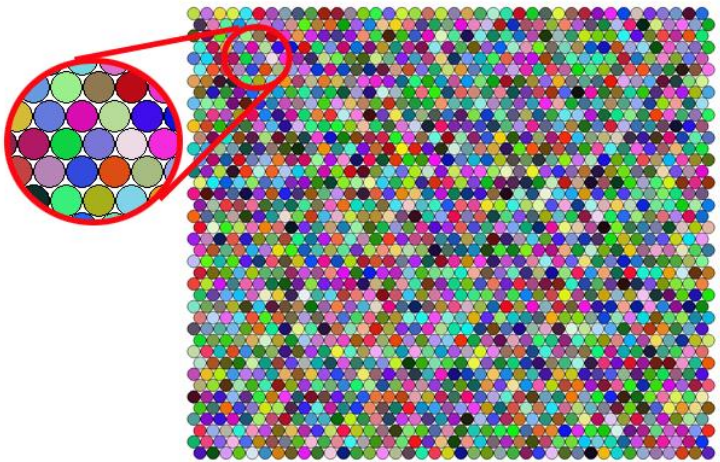
Gender Dysphoria MeSH Descriptor Data 2023

Details | Qualifiers | MeSH Tree Structures | Concepts

Mental Disorders [F03]
- Sexual Dysfunctions, Psychological [F03.835]
  - Dyspareunia [F03.835.199]
  - Erectile Dysfunction [F03.835.400]
  - **Gender Dysphoria [F03.835.550]**
  - Premature Ejaculation [F03.835.700]
  - Sexual and Gender Disorders [F03.835.750]
  - Vaginismus [F03.835.900]

Self-organizing map – Kohonen (2001)

UNTRAINED SOM



INPUTS

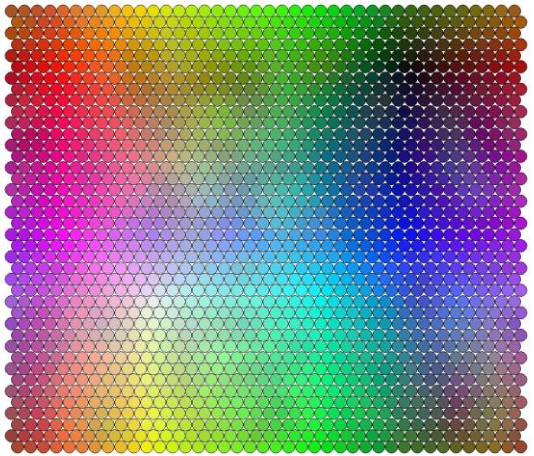
DISCRIMINANT FUNCTION

$$d_j(\mathbf{x}) = \sum_{i=1}^{D} (x_i - w_{ji})^2$$

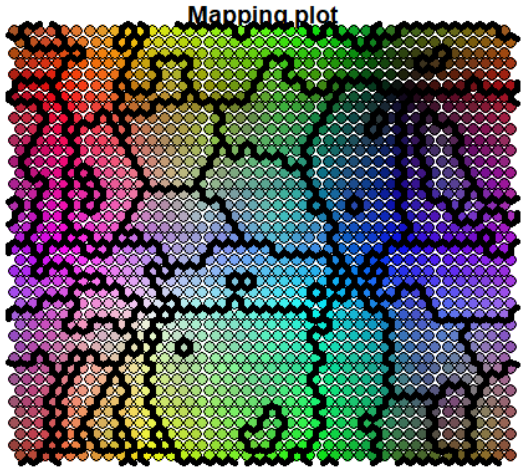
WEIGHT CALIBRATION

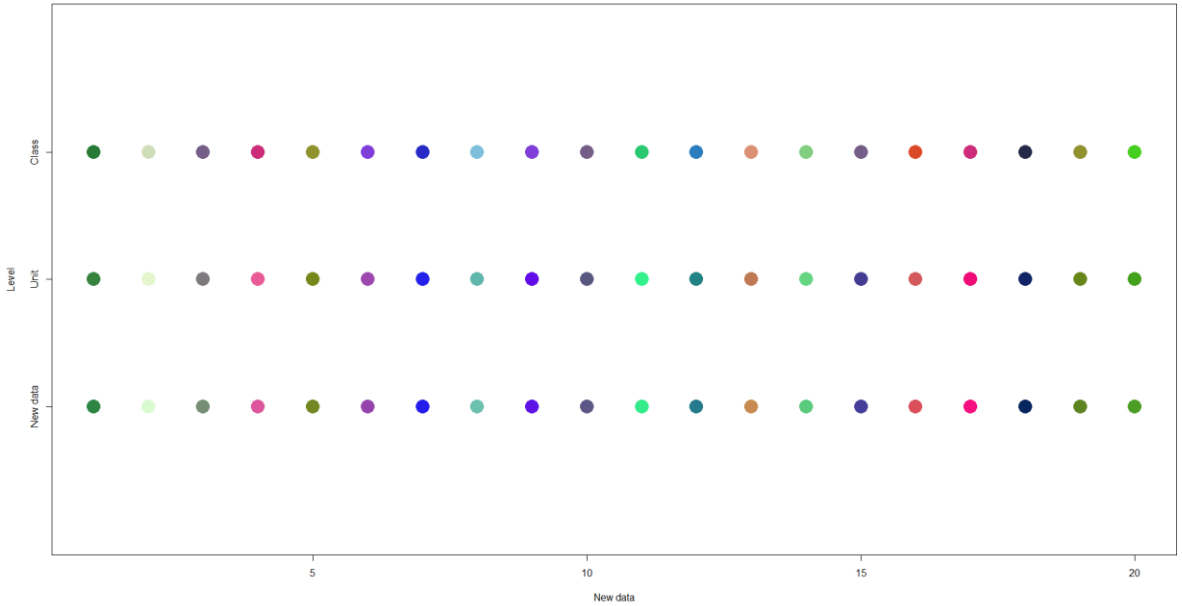
$$\Delta w_{ji} = \eta(t) \,.\, T_{j,I(\mathbf{x})}(t) \,.\, (x_i - w_{ji})$$

TRAINED SOM

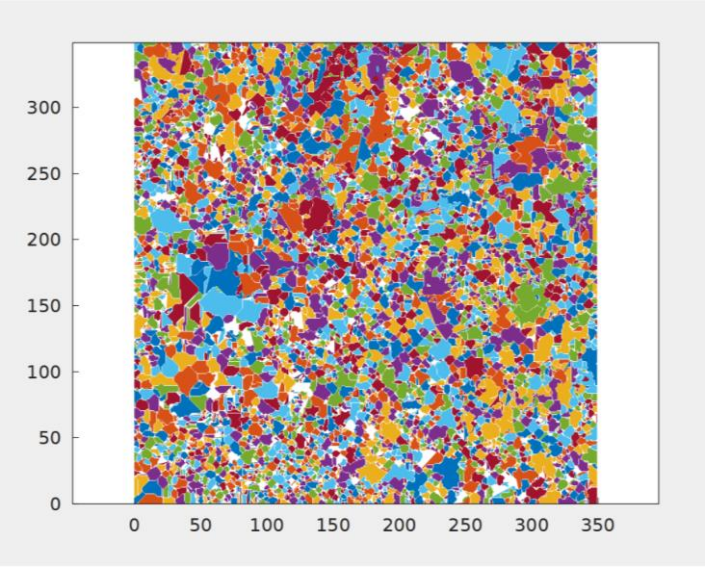


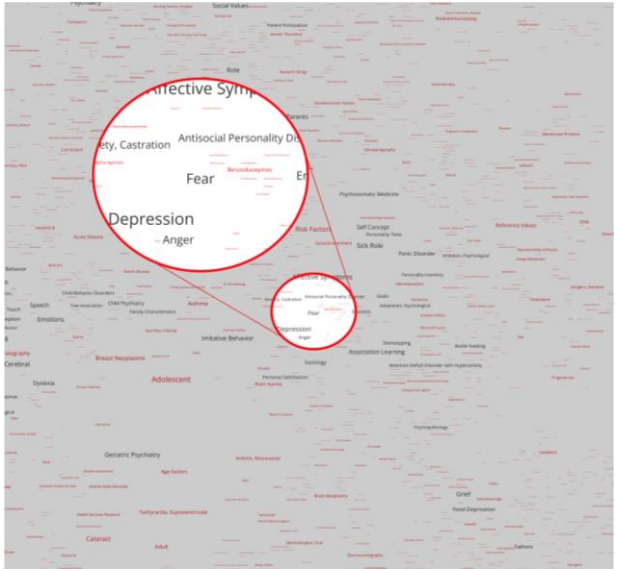
SOM – Categorisation of new data





Self-organized map – psychiatry





Applications

- Curriculum development
- Emerging topics
- Declining topics
- Assessment

- Identifying biases