IJCNN 2012 Competition

Classification of Psychiatric Problems Based on Saccades

Organizers:

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- Edward Gorzelańczyk, Collegium Medicum, Nicolaus Copernicus University, Poland (we are very grateful for timely donation of, and in-depth insight into the competition data)
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Saccades Measurement Process

Three types of measurements:
- visually guided saccades (VG)
- visually guided saccades with time gaps of 200 ms between presentations of visual stimulus (GAP)
- antisaccades, where an observer is required to make an eye movement away from visual stimulus to its mirror position (AT)

Six patient groups:
- Alcoholism (VG, GAP)
- Alzheimer's disease (VG, GAP, AT)
- Opioid dependence (prior to administering synthetic opioid) (VG, AT)
- Opioid dependence (after administering synthetic opioid) (VG, AT)
- Parkinson's disease (VG)
- Schizophrenia (VG, AT)

Not all measurements were available for all patient groups!
Psychiatrists and neuropsychologists accumulate a lot of data about eye movements, and the availability of saccadometers increases even more. Eye movement recordings may serve as an early differential diagnostic tool for many psychiatric conditions. Measurements are very simple!

Do saccades measurements carry sufficient information to distinguish different medical conditions?
Competition's Objectives - 2

From machine learning perspective, the data is challenging - it is a real-world data, and not a toy/synthetic dataset!

Variable number of measurements (between 40 and 50) in each file

Three distinct types of experimental conditions

Patient data is limited (about 150 records), and very unbalanced

Balanced accuracy with full confusion matrix are needed for performance evaluation

Statistical properties are similar across patient groups!
Competition's Objectives - 3

Figures due to P. Walecki and E. Gorzelańczyk

- *a* - alcoholics
- *ad* - Alzheimer's disease
- *c* - elderly
- *i* - unmarked data
- *m* - patients treated with morphine
- *pd* - Parkinson's disease
- *s* - schizophrenia
- *u* - opioid dependence (both groups)

Vertical bars denote 95% confidence interval.
Which data representation to choose? Some novel representation would be perhaps very useful for short time series at our disposal.

Which classifier shall be employed? It should be the best fit for a data representation at hand.

A very valuable feedback for physicians would be information which features of the signal are most important for distinguishing between patient groups.

Poor competition results would indicate that saccades should be measured in more complex experimental conditions.
Winning Solution

We proceed now to the presentation of the competition's winners.

Thank you for your kind attention.