Introduction to Software Package

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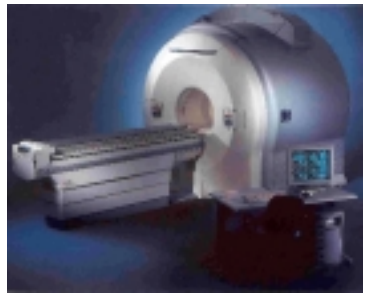
Technical University of Lodz, Poland

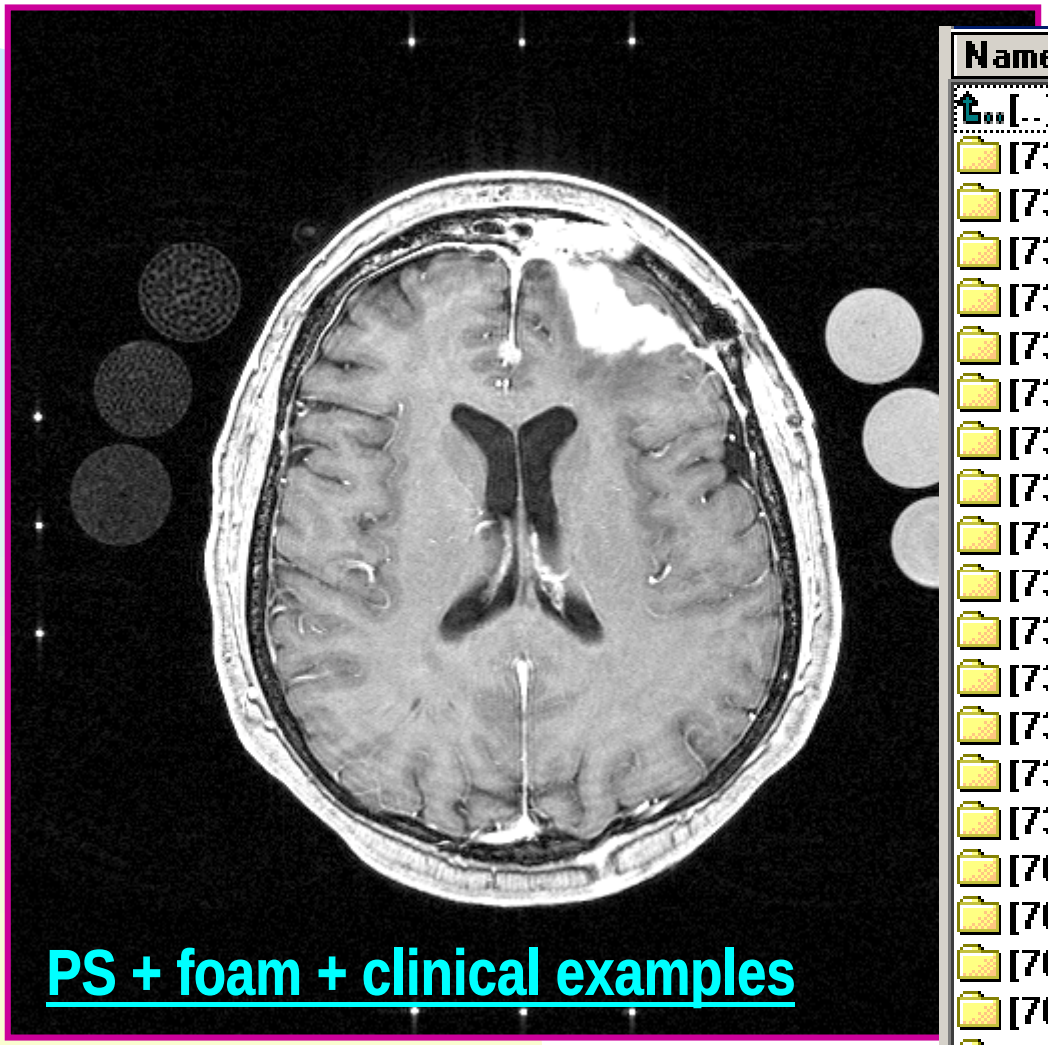
COST B11: “Software and Statistics” Working Group



Goals

- To develop PC MS Windows computer programs with appropriate GUI and agreed set of functions.
- To develop efficient techniques of image processing and pattern recognition, adequate for MRI quantitative texture analysis.

Material (on CD)



PS + foam + clinical examples

d:\brussels2000*.*

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[hans]		<DIR>
[heidelberg]		<DIR>
[lothar]		<DIR>
[software]		<DIR>

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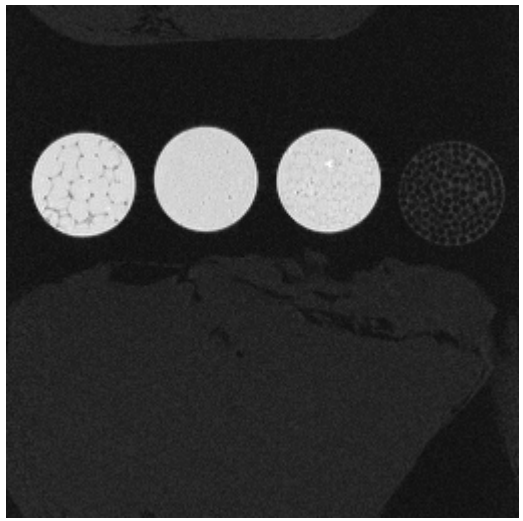
[phantoms]		<DIR>



Phantoms

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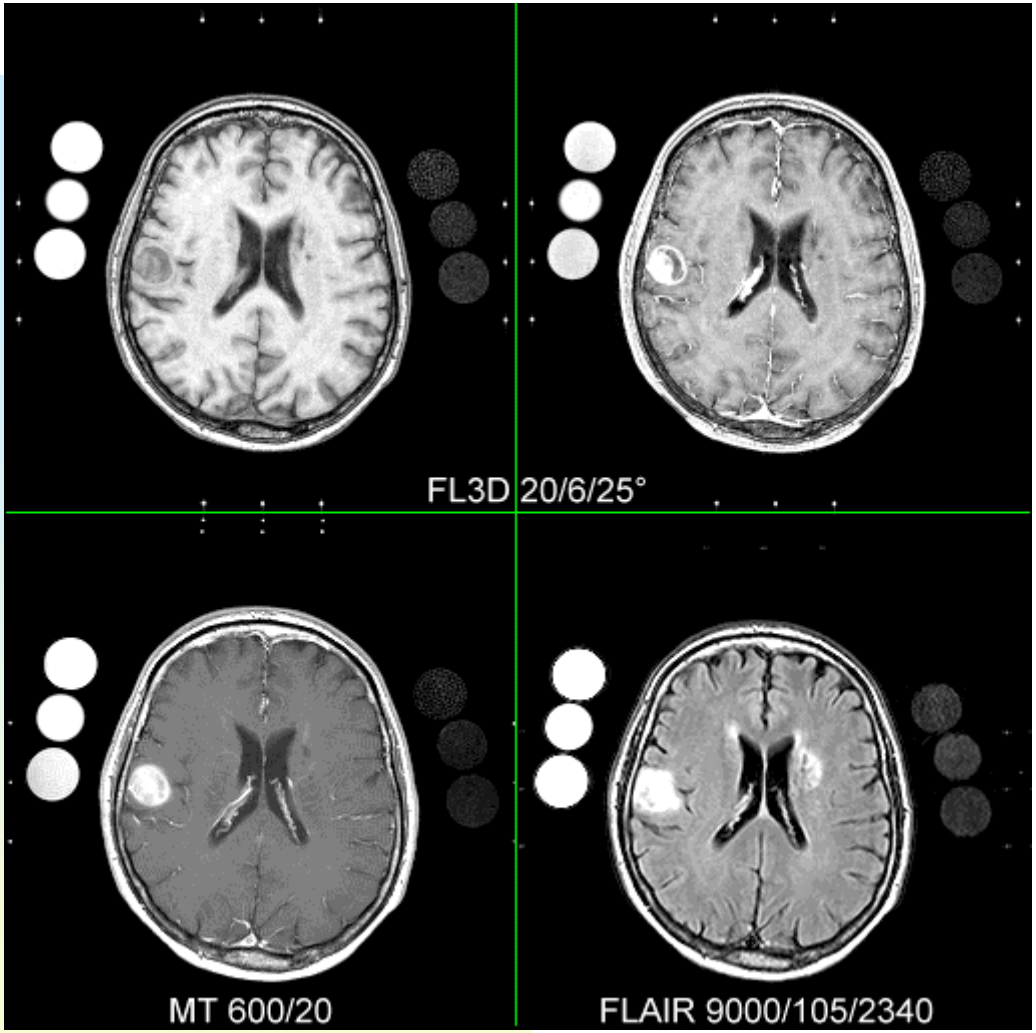
Material (on CD)



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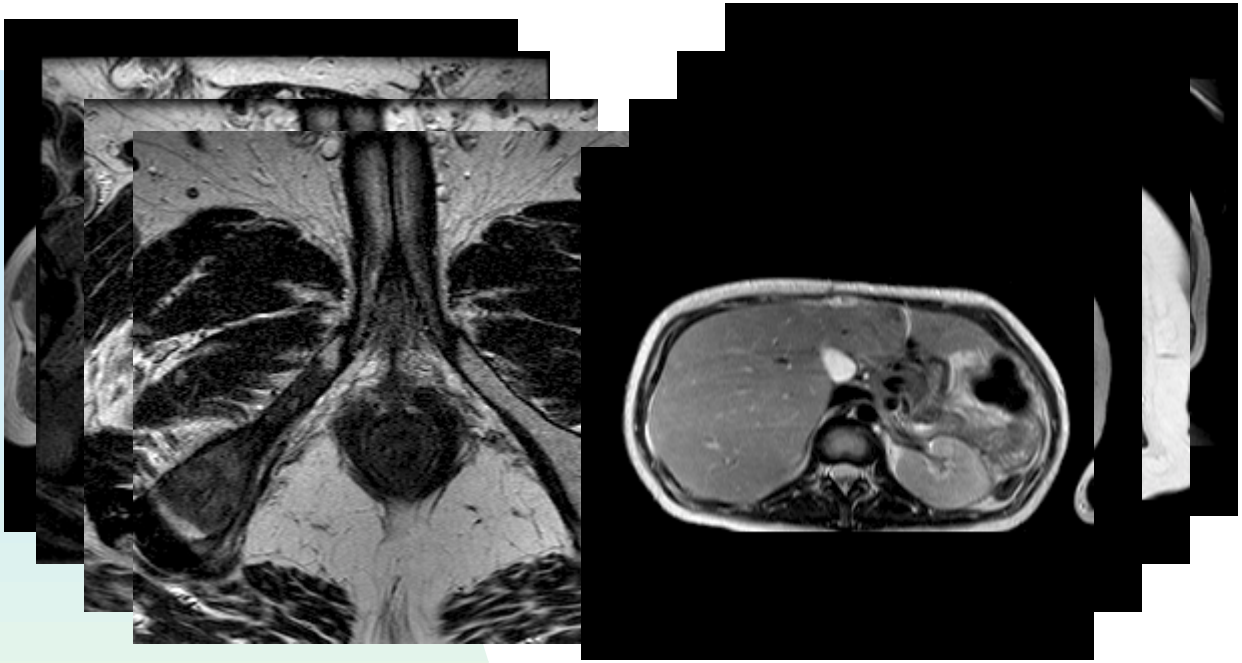
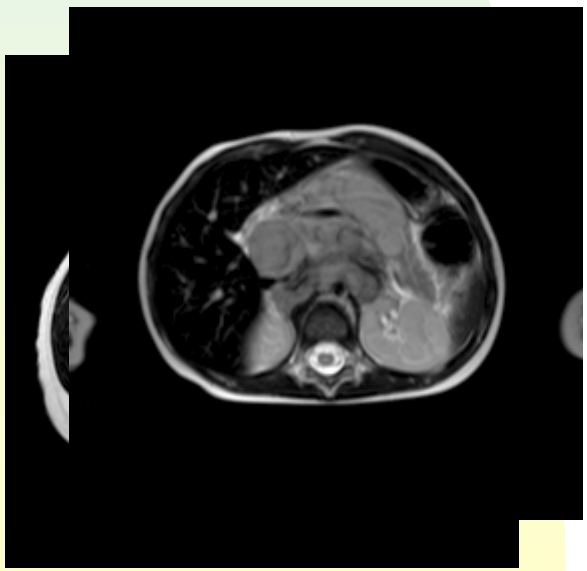
patient #2	eml	2 916 439
patient #3	eml	4 721 313
patient #4(missed ima..	eml	729 197
patient #4	eml	3 267 032
patient #5	eml	2 728 015
patient #6	eml	3 994 162
patient #7 (last one)	eml	3 994 173

Patient data

Material (on CD)





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d:\brussels2000\hans\aarhus_cost_

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[ratimages]		<DIR>
readme	txt	1 401

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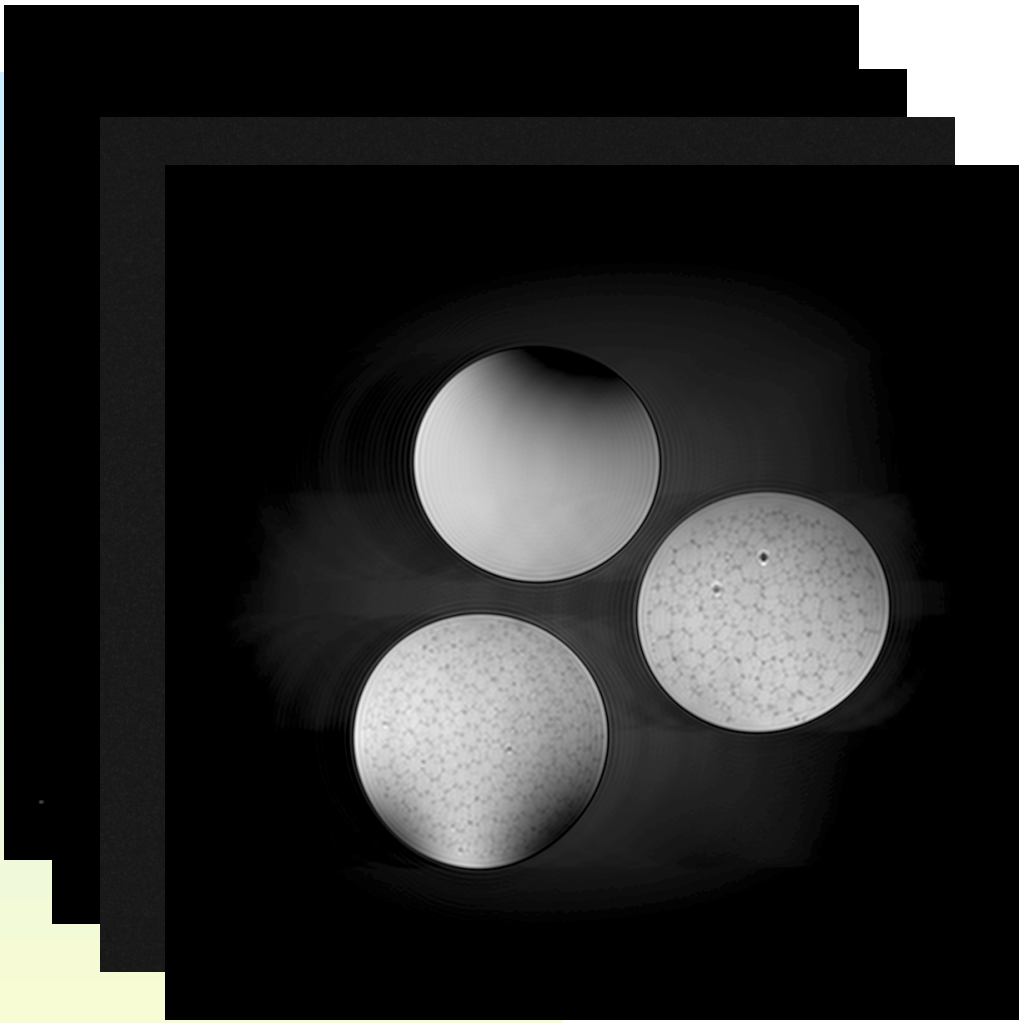

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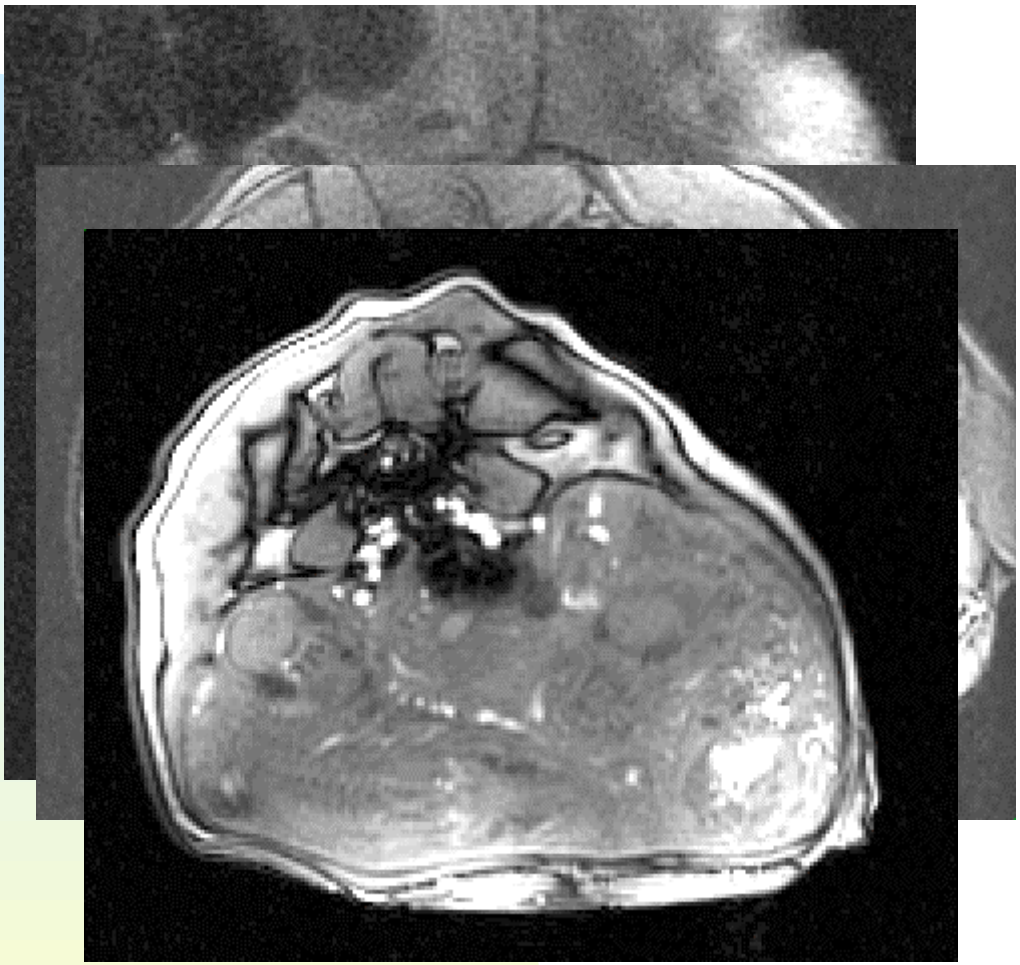

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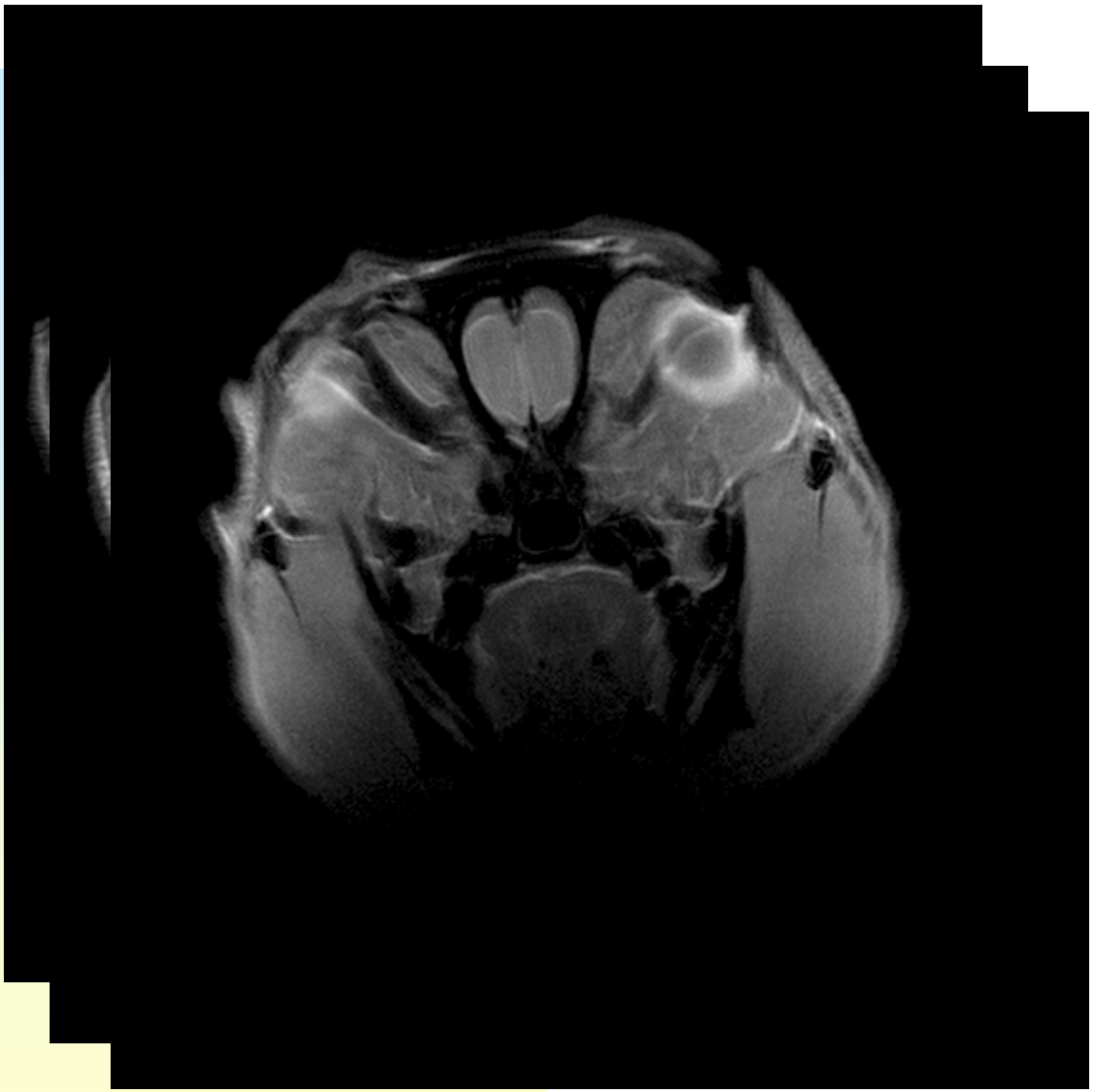

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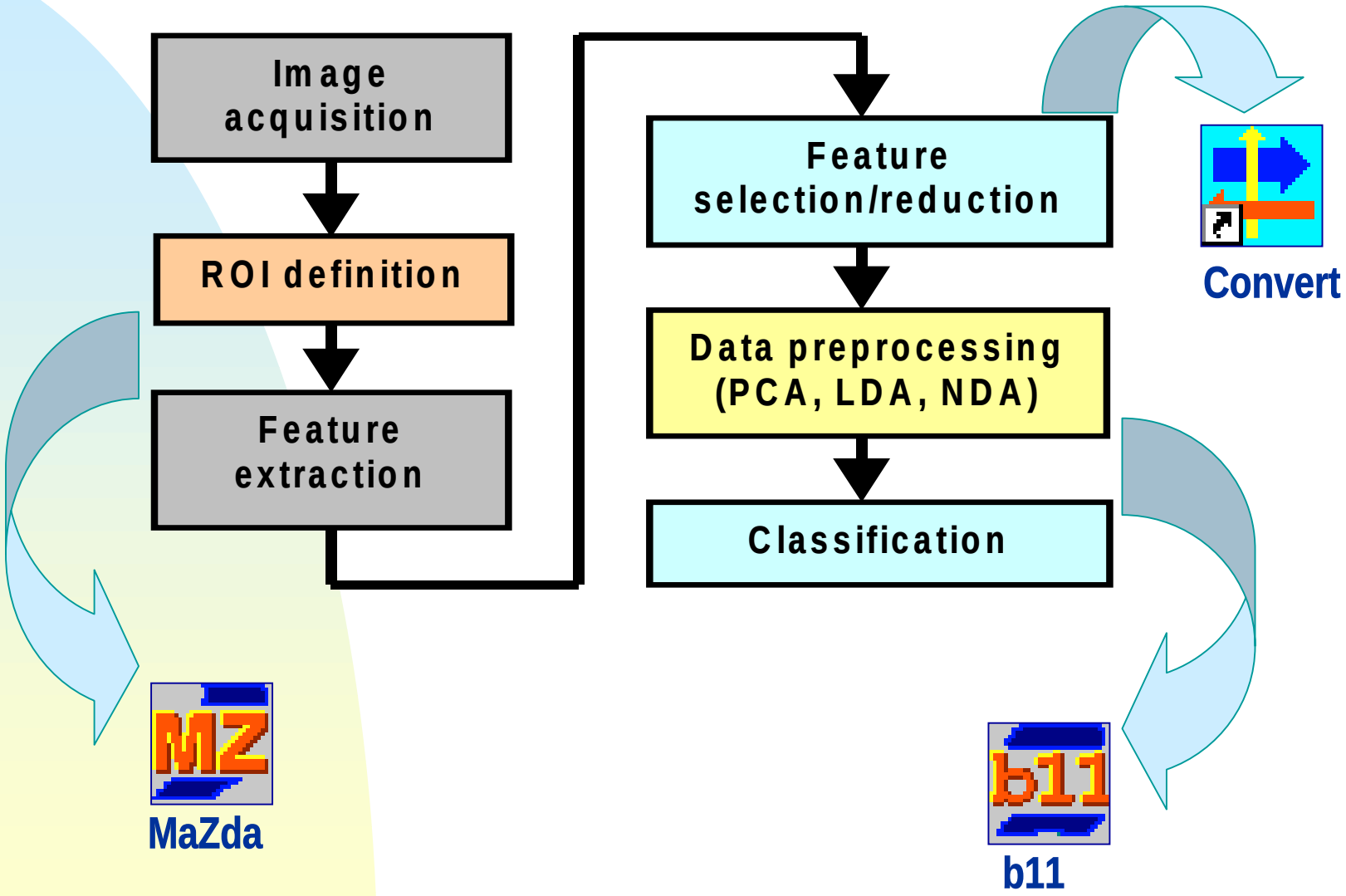
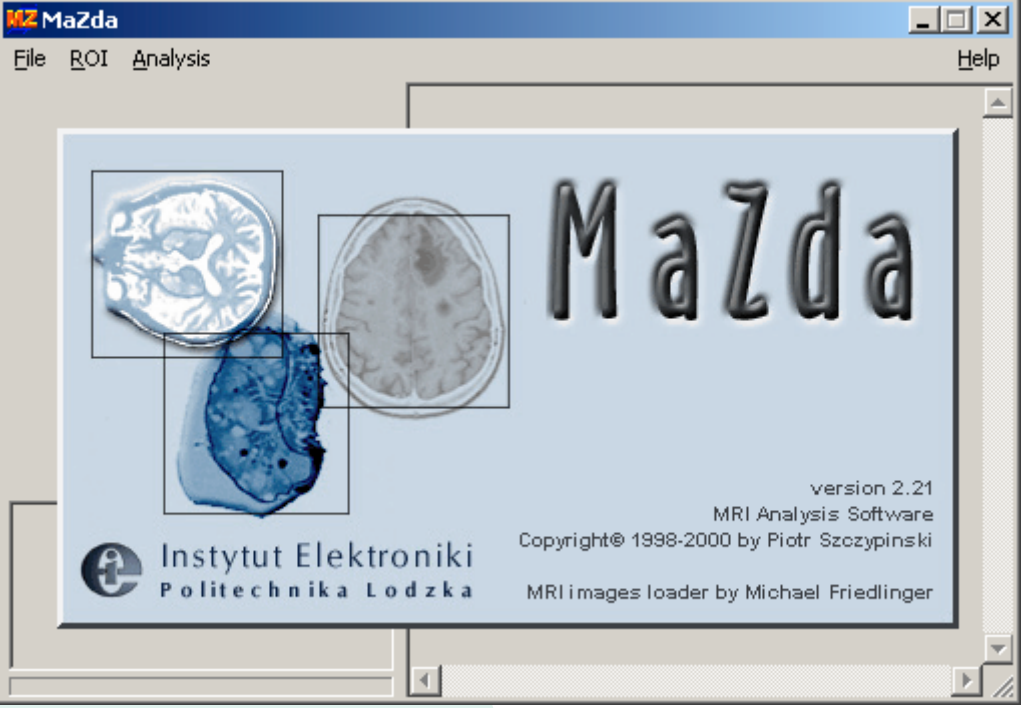
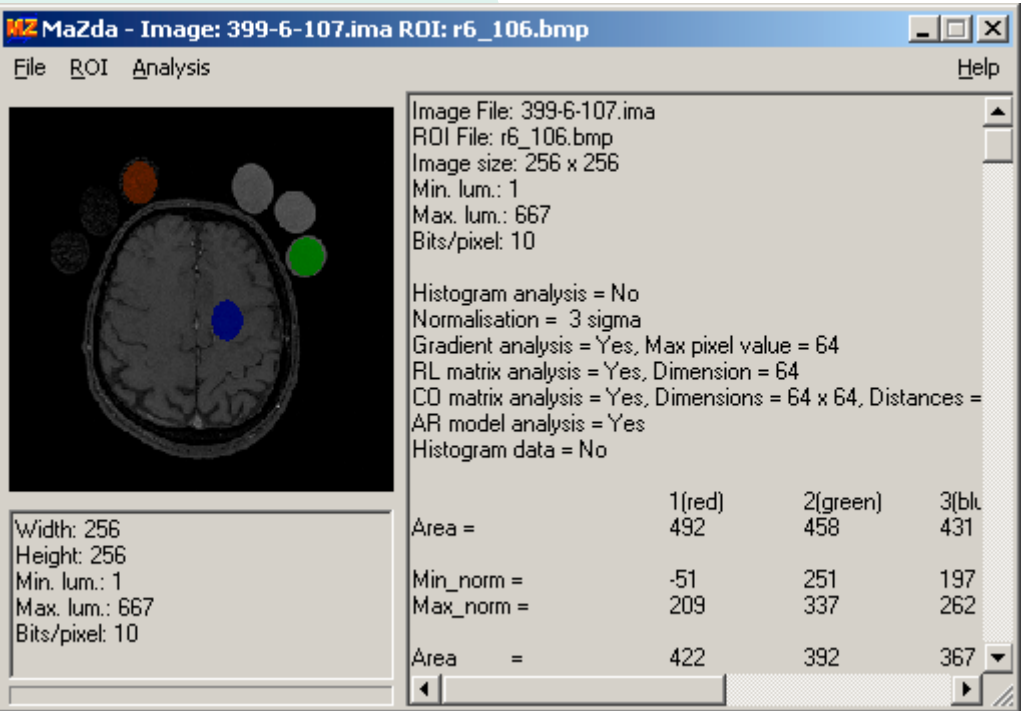
readme	txt	1 401

Methods



MaZda, ver. 2.21





Feature extraction

Input: images in 11 file formats

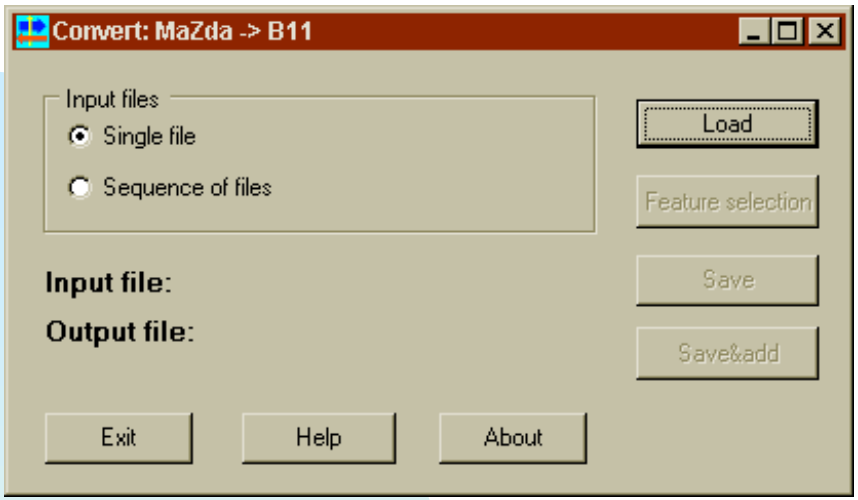
Methods

histogram, gradient, CO matrix,
AR model (total of 259 features)

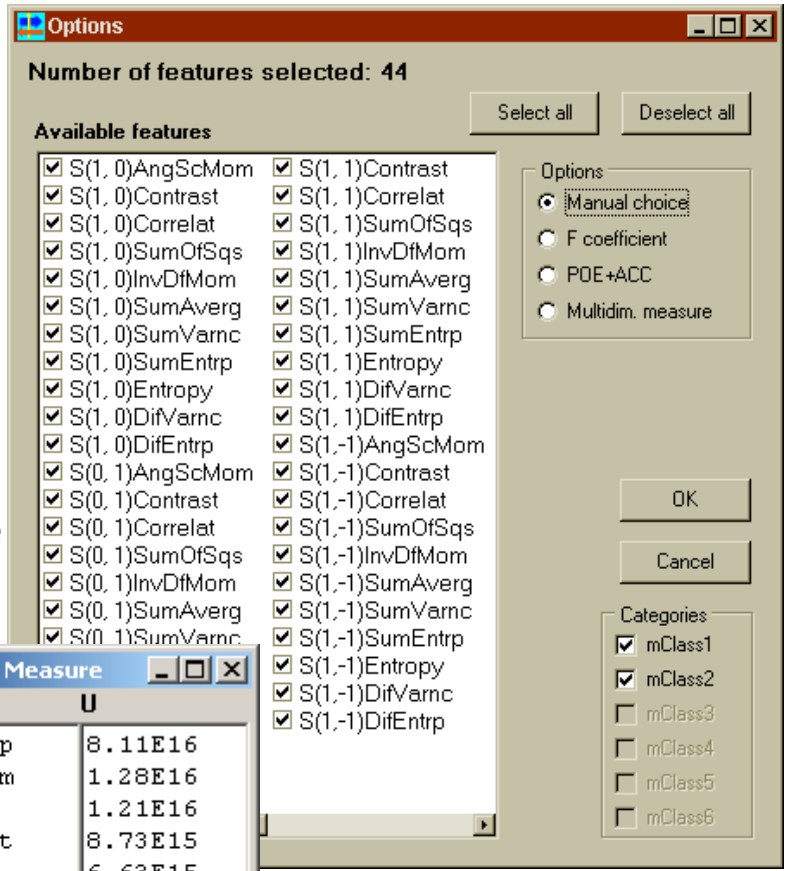
Output:

- (*.par) text file,
- (*.bmp) histograms
- (*.bmp) feature maps

Convert



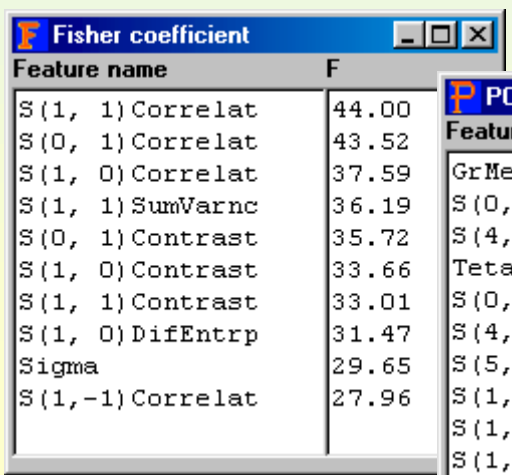
Feature selection

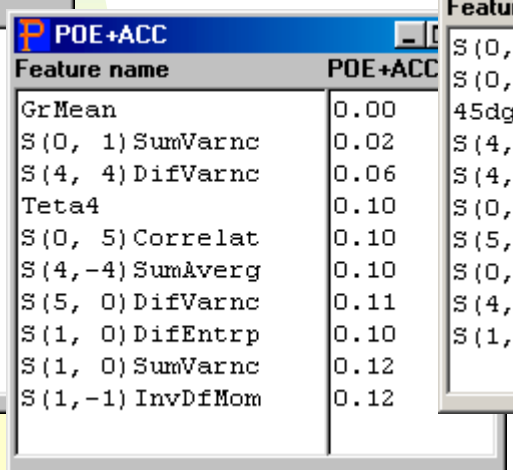


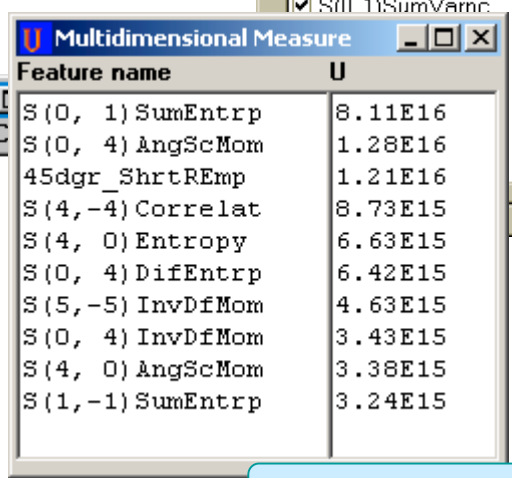
Input: (*.par) files from MaZda

Methods: Fisher coefficient, POE+ACC, multidimesional analysis of variance, manual choice

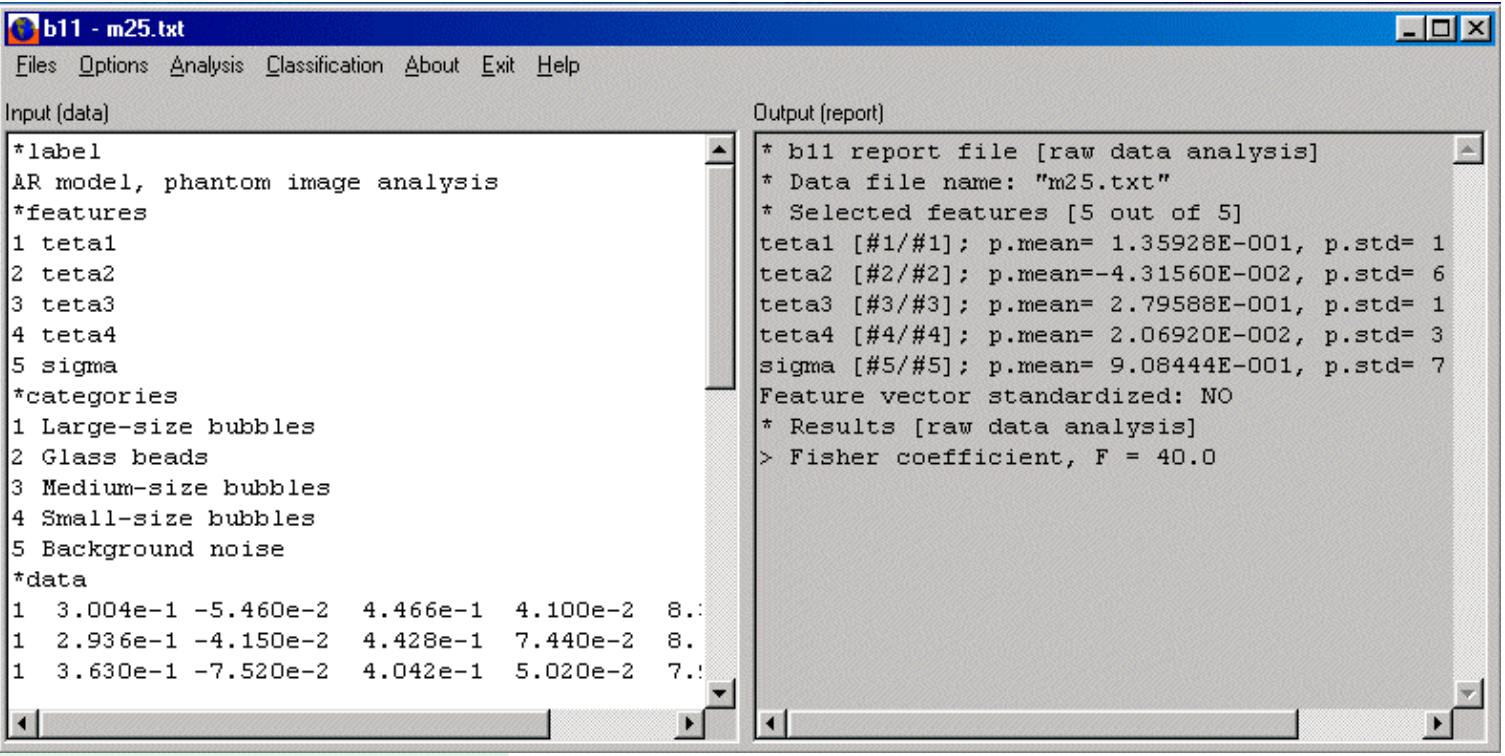
Output: (*.sel) files





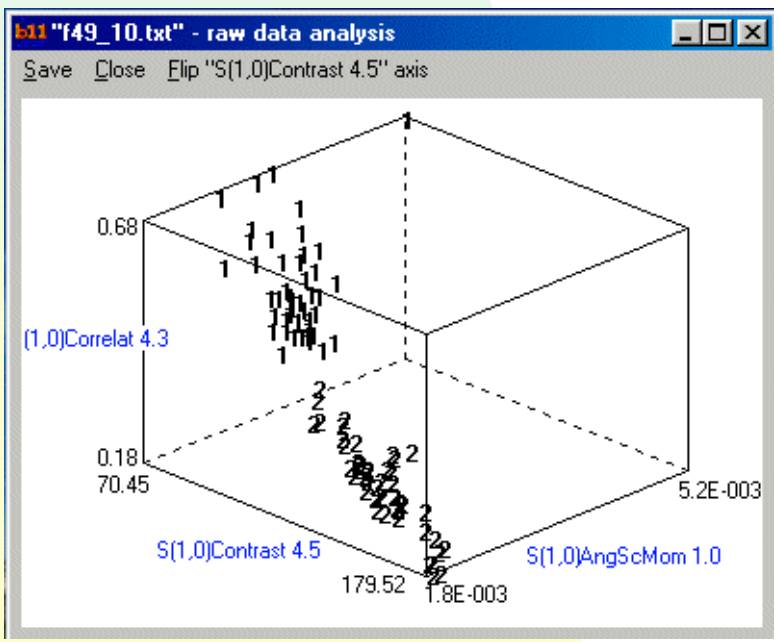


B11



Input
- (*.sel) files

Output
- text files,
- BMP graphs

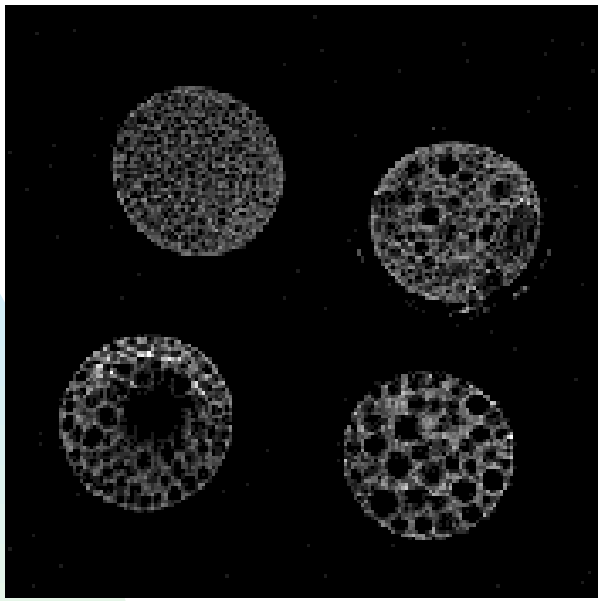


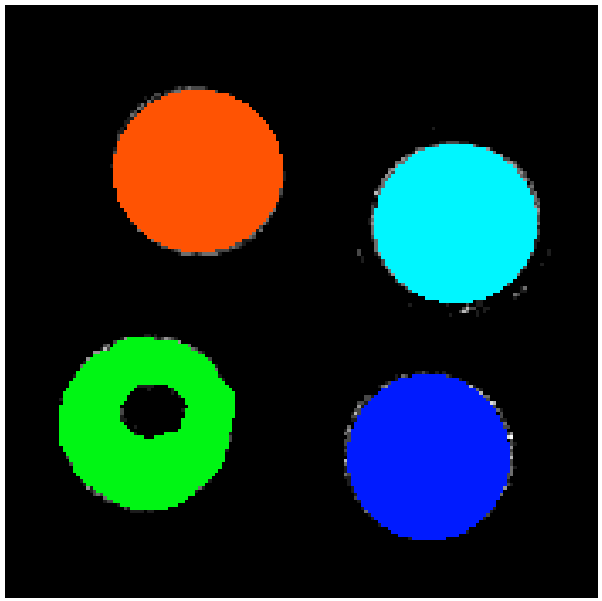
Analysis, classification

Methods
- data analysis: raw, PCA, LDA, NDA
- classification: k-NN, neural network

Example - PS phantom image analysis

22 images





class 1
class 2
class 3
class 4

MaZda → 22 (*.par) files, each contains 259 texture parameters

Convert → 2 (*.sel) files, each of 10 parameters (F, POE)

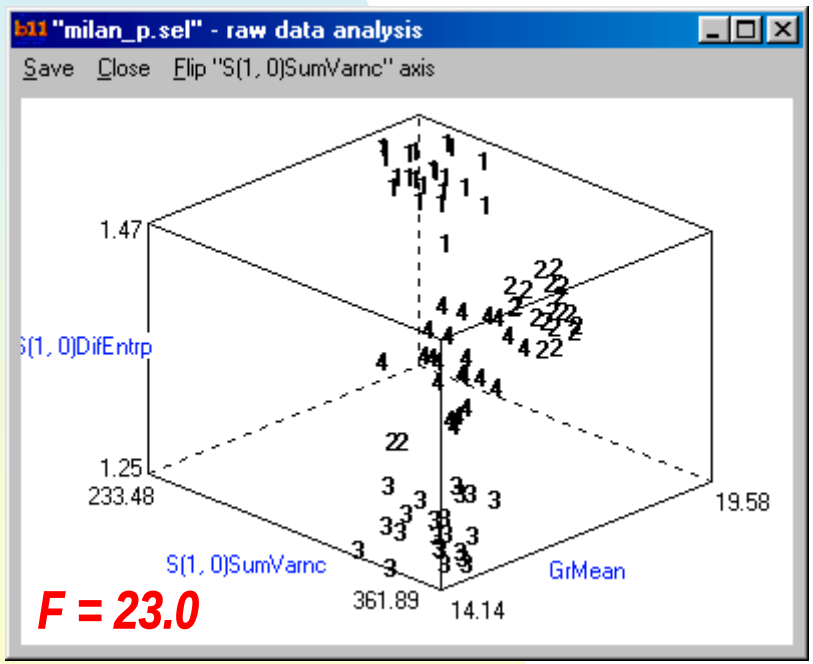
b11 → Exploratory data analysis and classification

Example - PS phantom image analysis

b11

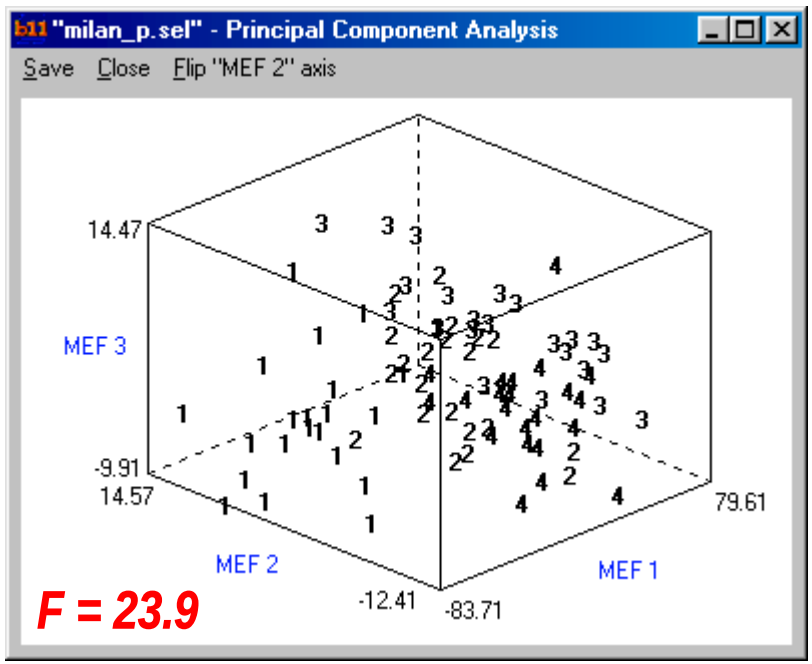
Exploratory data analysis and classification

Raw data



***1-NN*: 8 classification errors**

First 3 PCAs



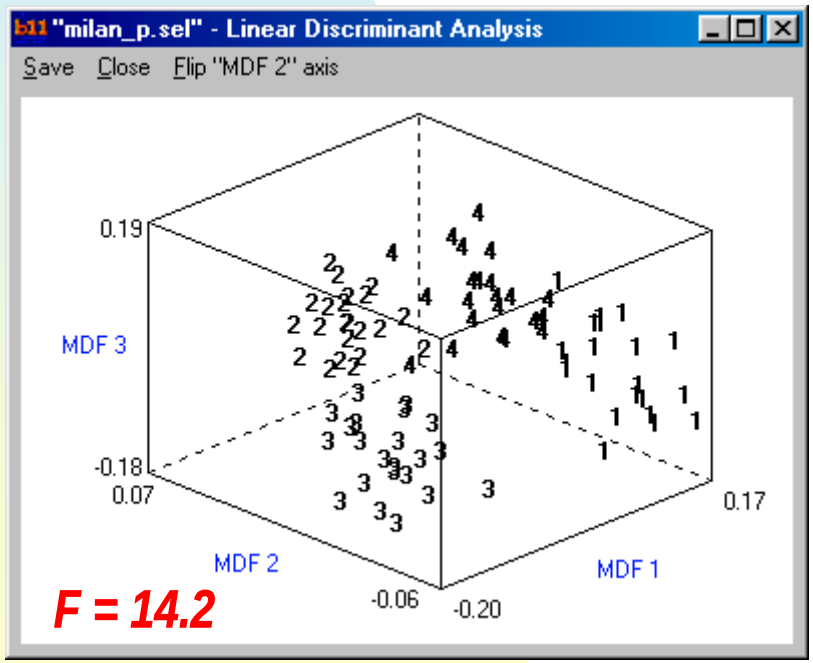
***1-NN*: 10 classification errors**

Example - PS phantom image analysis

b11

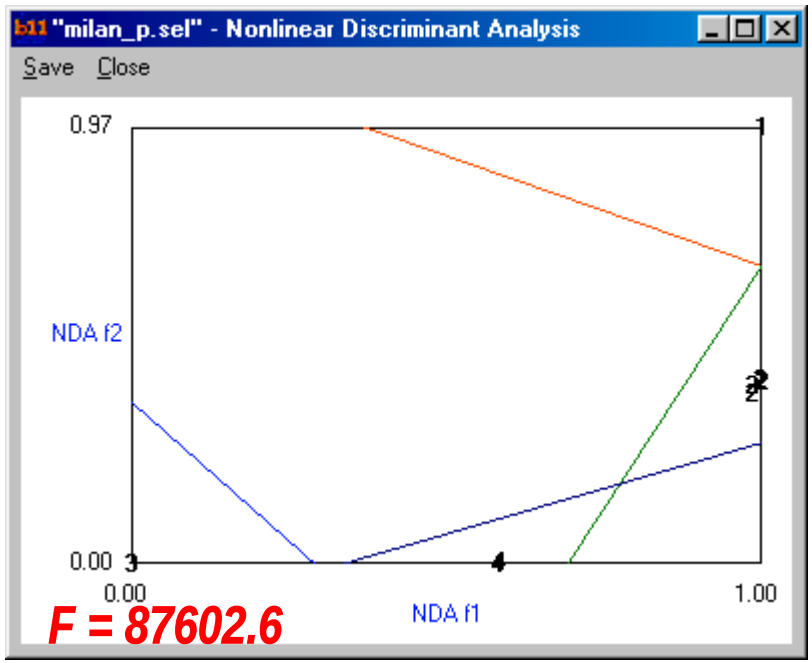
Exploratory data analysis and classification

Linear Discriminant Analysis



1-NN: 0 classification errors

Nonlinear Discriminant Analysis



0 classification errors

Projects under way

- MaZda: ROI editor (to replace MS Paint).
- MaZda: new texture features (wavelets and mathematical morphology).
- MaZda: reading header of image files, supporting new image file standards.
- MaZda: image brightness scaling (optionally manual/auto).
- MaZda: integration of tools (ROIEdit, BMPView).
- Convert: feature reduction and selection techniques.
- B11: testing on separate data sets (PCA, LDA, ANN).
- Extensive experiments using test object and biological MRI.