



NATIONAL & KAPODISTRIAN UNIVERSITY OF ATHENS

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Multi-parametric Data Analysis and Use in Clinical Practice

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Multi-parametric Data Analysis and Use in Clinical Practice

- Large number of available medical tests
 - New tests are entering medical practice
- Ordinary practice
 - Use of combination of more than one test
 - Use of properly formed ratios



Multi-parametric Data Analysis and Use in Clinical Practice

- Increased Computational Power allows
 - The performance of extensive trials at a vast number of combinations of the adopted tests
 - The extraction of the most powerful combinations
 - The creation of multi-parametric subsets



Multi-parametric Data Analysis and Use in Clinical Practice

- Feature reduction schemes
 - Reduced dimensionality
- Clustering Algorithms



Multi-parametric Data Analysis and Use in Clinical Practice

- Application in the field of Neurology
 - Discrimination between patients with neurosyphilis or other neurological disease



Multi-parametric Data Analysis and Use in Clinical Practice

Patient	Sex	AGE	MMSE	NE	VDRls	FTAs	VDRlcsf	FTAcfsf	PRcsf	Tau
1	1	62,00	12,00	0,00	4,00	4,00	2,00	3,00	69,00	450,00
2	1	57,00	30,00	0,00	4,00	4,00	0,00	0,00	38,00	113,19
3	1	38,00	8,00	1,00	4,00	4,00	4,00	4,00	66,00	64,11
4	2	28,00	30,00	0,00	4,00	4,00	0,00	0,00	25,00	190,47
5	1	45,00	30,00	0,50	2,00	4,00	0,00	0,00	41,00	252,07
6	2	59,00	26,00	0,50	3,00	4,00	1,00	2,00	31,00	341,90
7	1	61,00	30,00	0,00	3,00	4,00	0,00	0,00	28,00	148,48
8	1	44,00	29,00	0,50	4,00	4,00	0,00	3,00	69,00	201,12
9	2	56,00	30,00	0,00	3,00	3,00	0,00	0,00	39,00	109,60
10	1	59,00	29,00	0,00	3,00	4,00	0,00	0,00	44,00	223,11
11	1	43,00	26,00	0,50	4,00	4,00	0,00	0,50	49,00	318,76
12	1	27,00	28,00	0,50	4,00	4,00	0,00	2,00	48,00	367,44
13	2	57,00	26,00	2,00	4,00	4,00	0,00	1,00	44,00	528,17
14	1	48,00	30,00	0,50	3,00	4,00	0,00	3,00	67,00	341,92
15	1	37,00	30,00	0,00	3,00	3,00	0,00	0,00	39,00	214,81
16	1	43,00	30,00	0,00	2,00	3,00	0,00	0,00	36,00	185,21
17	1	61,00	25,00	0,00	4,00	4,00	0,00	0,50	54,00	355,27
18	2	62,00	12,00	3,00	4,00	4,00	3,00	3,00	79,00	704,08
19	2	25,00	30,00	0,00	2,00	3,00	0,00	0,00	30,00	170,32

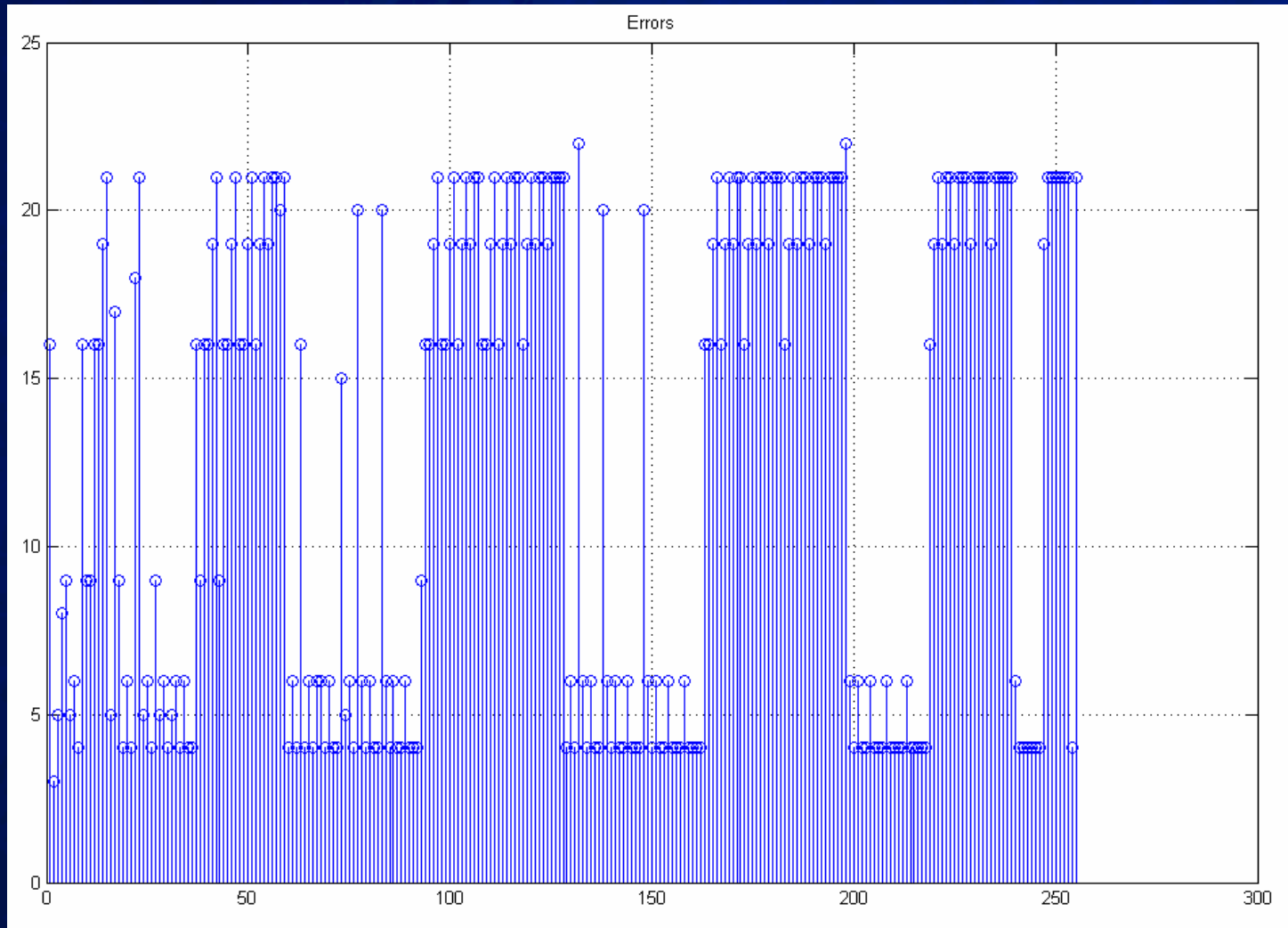


Multi-parametric Data Analysis and Use in Clinical Practice

- No feature reduction
- Clustering algorithm: k-means
 - Fast
 - Easily implemented
 - No training set needed (unsupervised classification)



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Multi-parametric Data Analysis and Use in Clinical Practice

- Other quantities that were measured

$$\text{sensitivity} = \frac{\text{number of True Positives}}{\text{number of True Positives} + \text{number of False Negatives}}$$

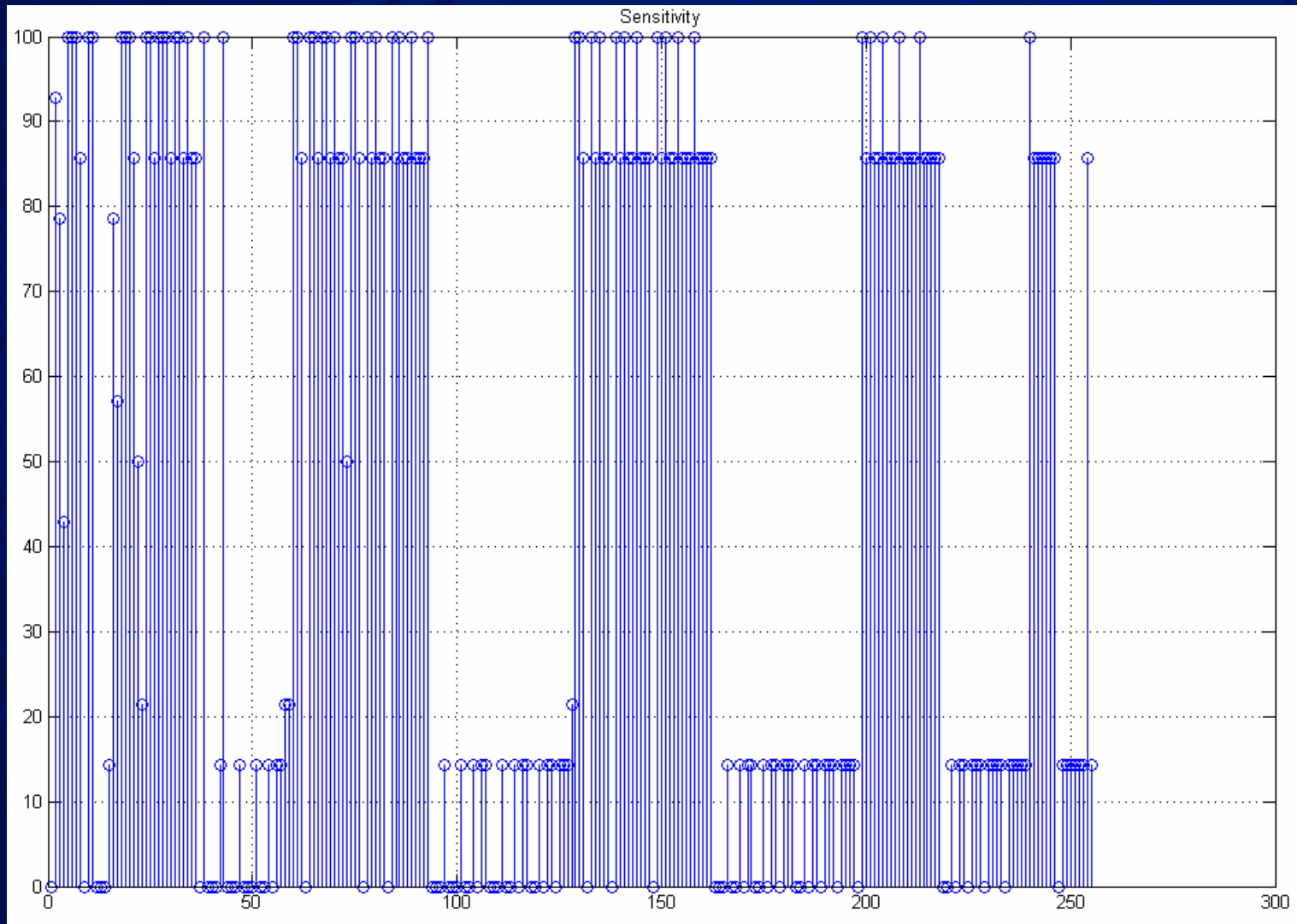
$$\text{specificity} = \frac{\text{number of True Negatives}}{\text{number of True Negatives} + \text{number of False Positives}}$$

$$PPV = \frac{\text{number of True Positives}}{\text{number of True Positives} + \text{number of False Positives}}$$

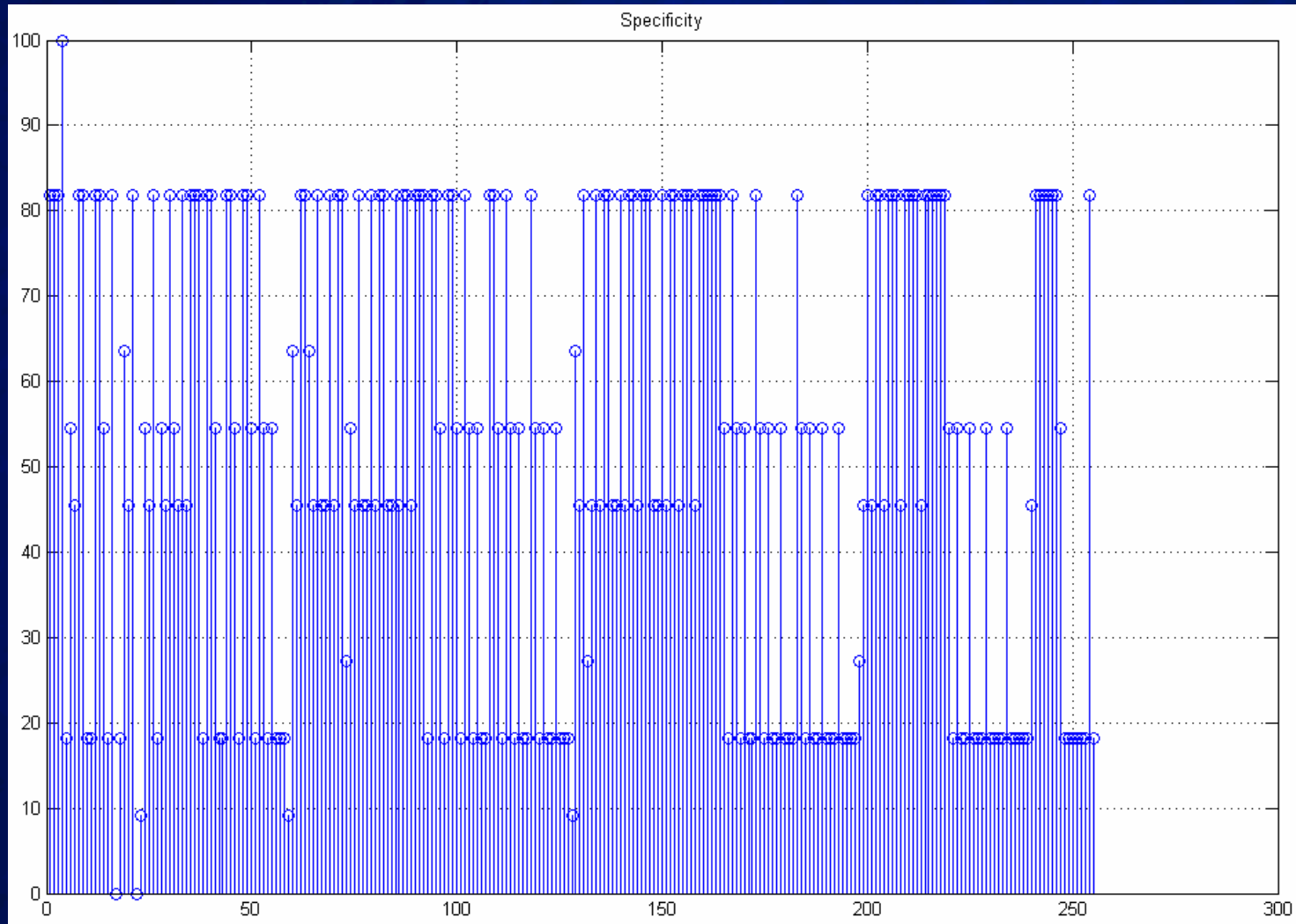
$$NPV = \frac{\text{number of True Negatives}}{\text{number of True Negatives} + \text{number of False Negatives}}$$



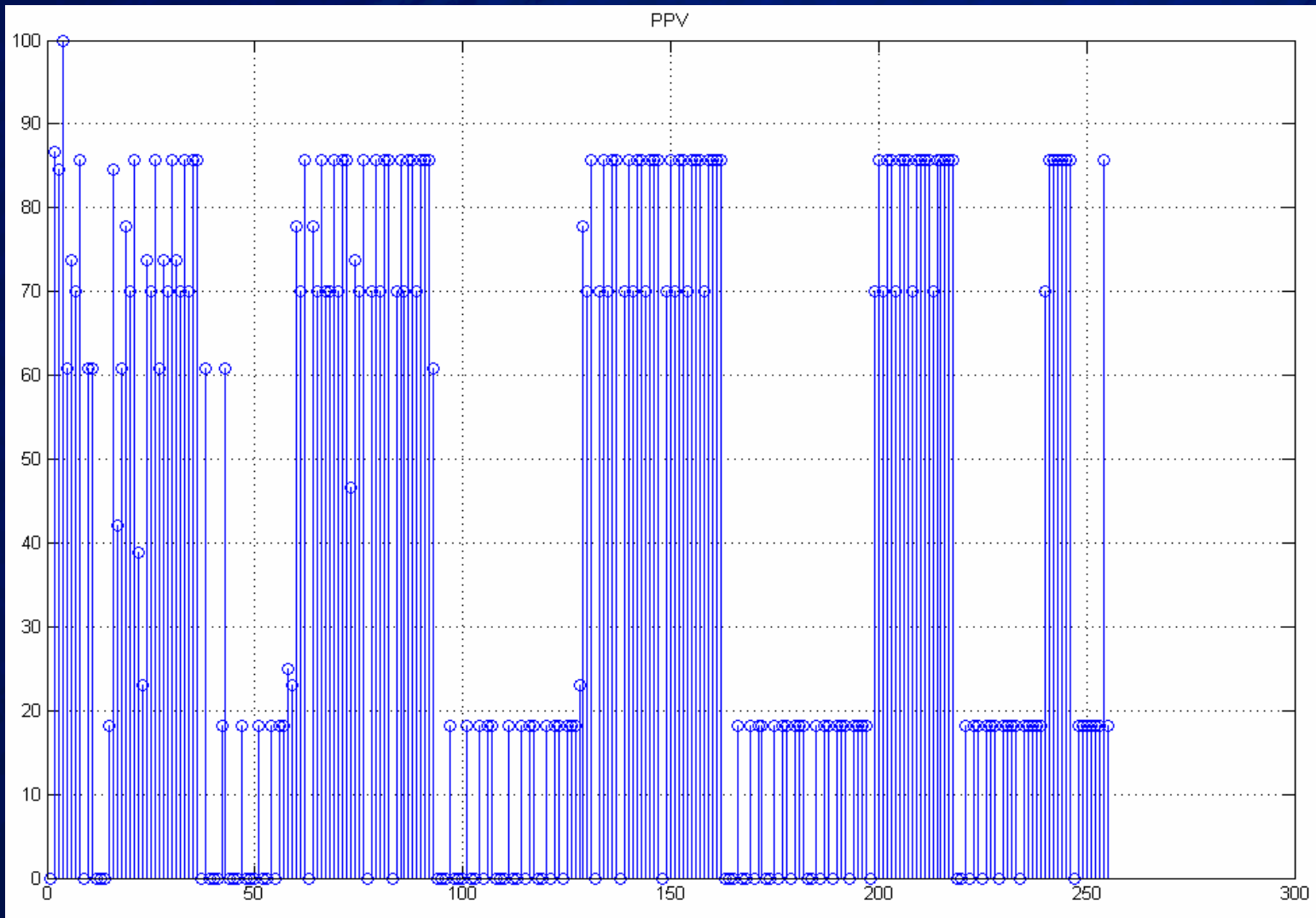
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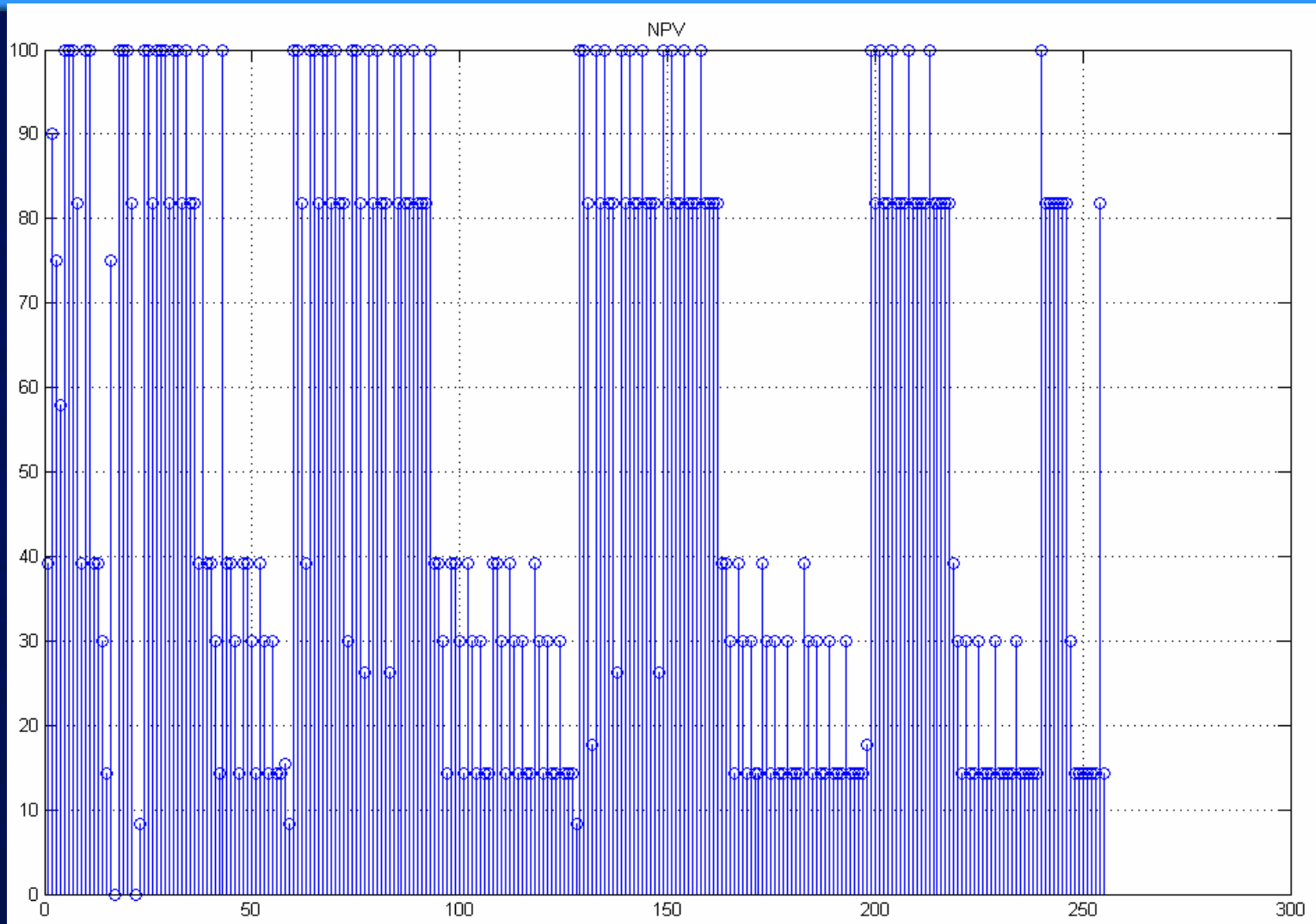
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■ Conclusions

- Multiparametric analysis can be used to classify data from multiple medical tests
- Combined sensitivity and specificity quantities can be constructed using the above techniques
- New tests can be easily tested and their efficiency can be evaluated in a solid mathematical way



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Thank You!

