Early recognition of Alzheimer Disease

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Contents

Alzheimer's disease

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Diagnosis
There is no straightforward test for AD.

Treatment
There is currently no cure for Alzheimer's disease, which worsens as it progresses, and eventually leads to death.

Input data

	Psychoogical tests				MEG[1]	
SUBJECT	MSE	REY	IQprf	IQver	FRQ	RARE
A1	30	25	136	116	1	1
A2	30	23	130	136	1	1
A3	30	26	138	138	1	1
A4	29	18	124	129	0	1
A5	29	25	116	110	0	1
A6	29	26	131	144	0	1
A7	30	22	107	122	0	1
A8	30	17	130	125	0	1
A9	30	22	138	135	0	1
A10	26	20	126	103	0	1
A11	26	7	103	93	0	0
A12	25	0	117	121	0	0
A13	26	12	99	93	0	0
A14	25	13	87	100	0	0
A15	22	2	55	81	0	0
A16	23	0	111	113	0	0
A17	24	10.5	92	110	0	0
A18	25	0	117	121	0	0
A19	26	1.5	103	100	0	0

[1](Golubić 2014, PhD. p.121)

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A8	30	17	130	125	0	1
A9	30	22	138	135	0	1
A10	26	20	126	103	0	1
A11	26	7	103	93	0	0
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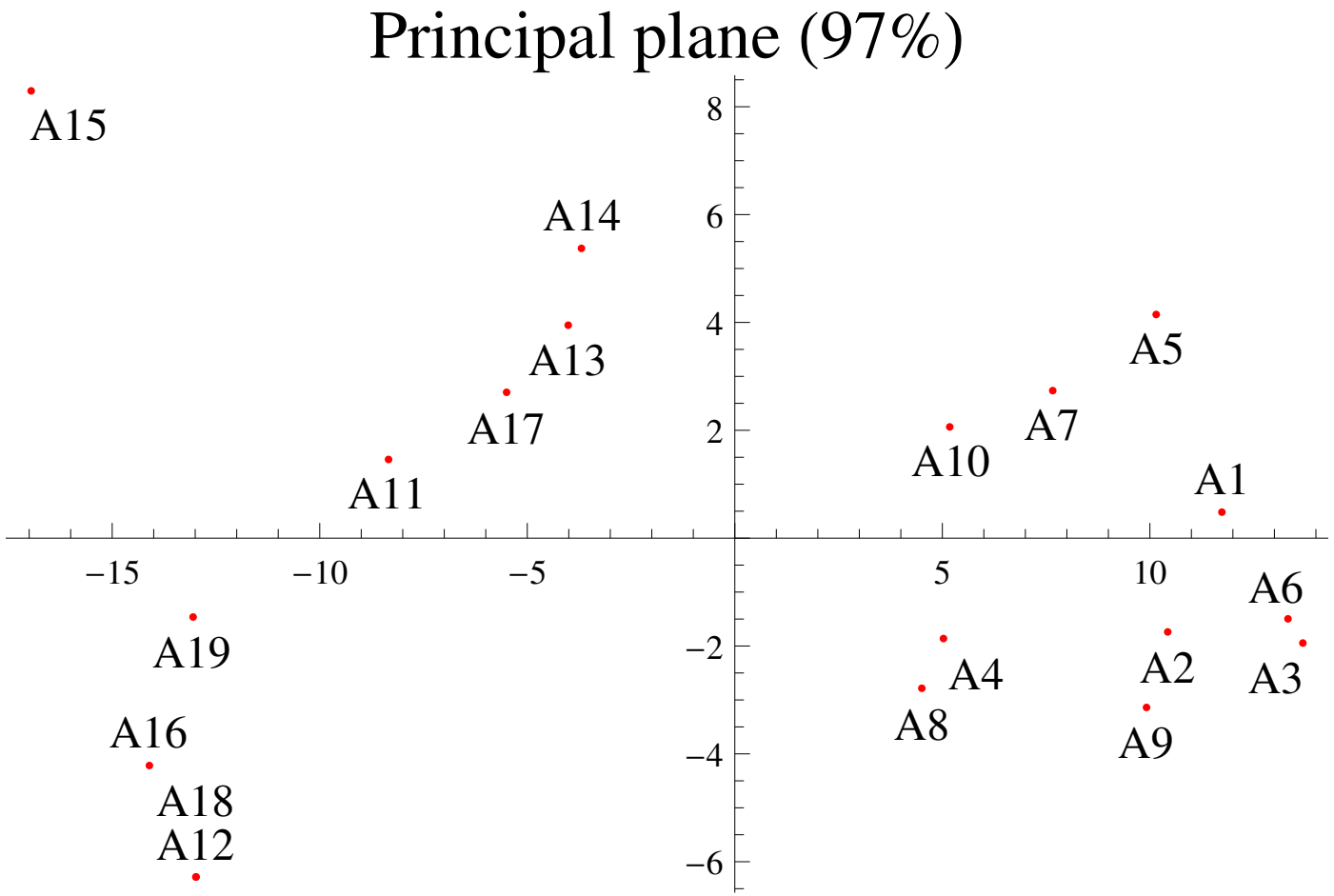
Resized data

	MSE	REY	IQprf	IQver
*A*1	30	25	27.20	23.20
*A*2	30	23	26	27.20
...	...	...	...	...
*A*18	25	0	23.40	24.20
*A*19	26	1.50	20.60	20

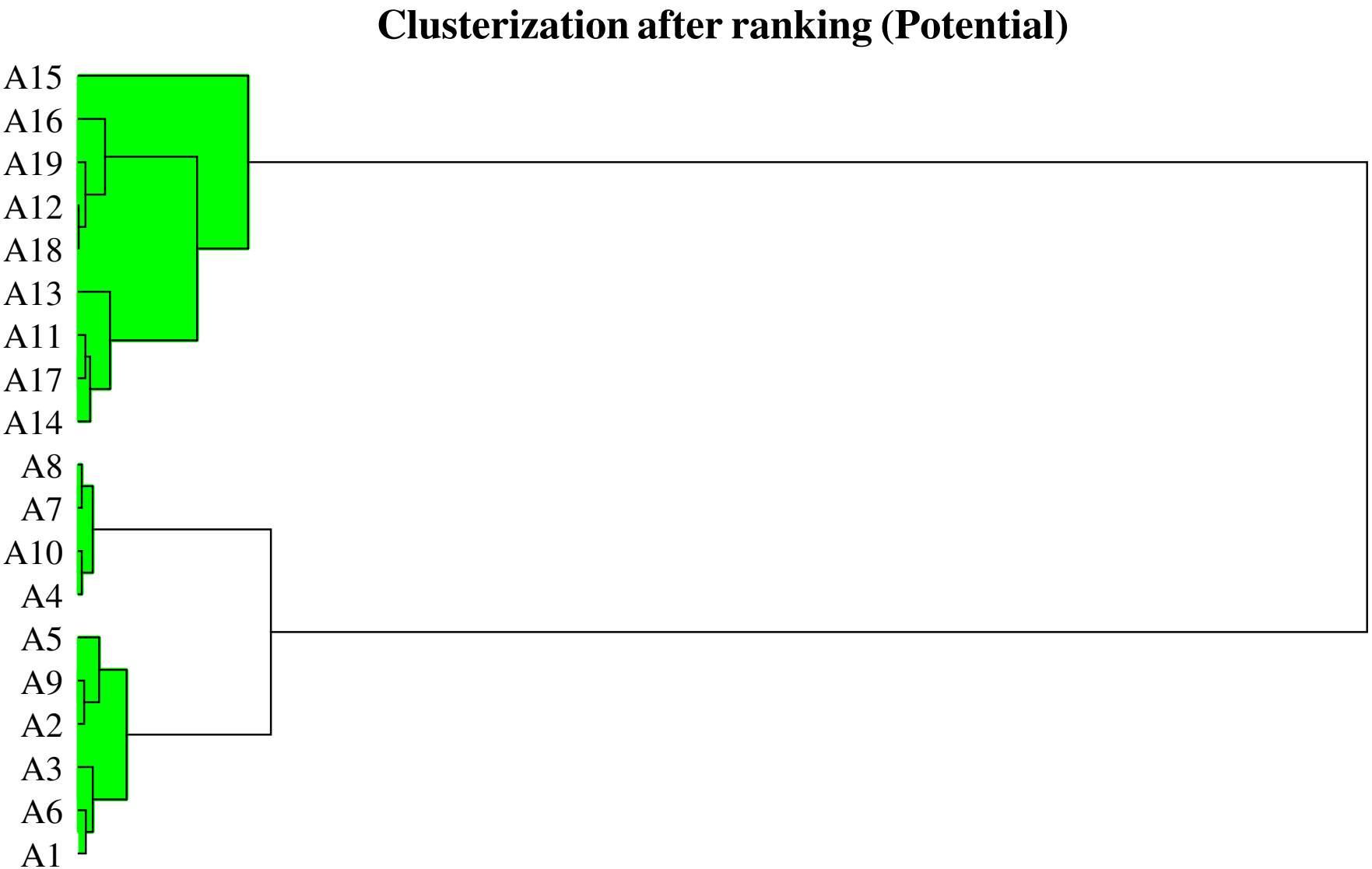
PCA



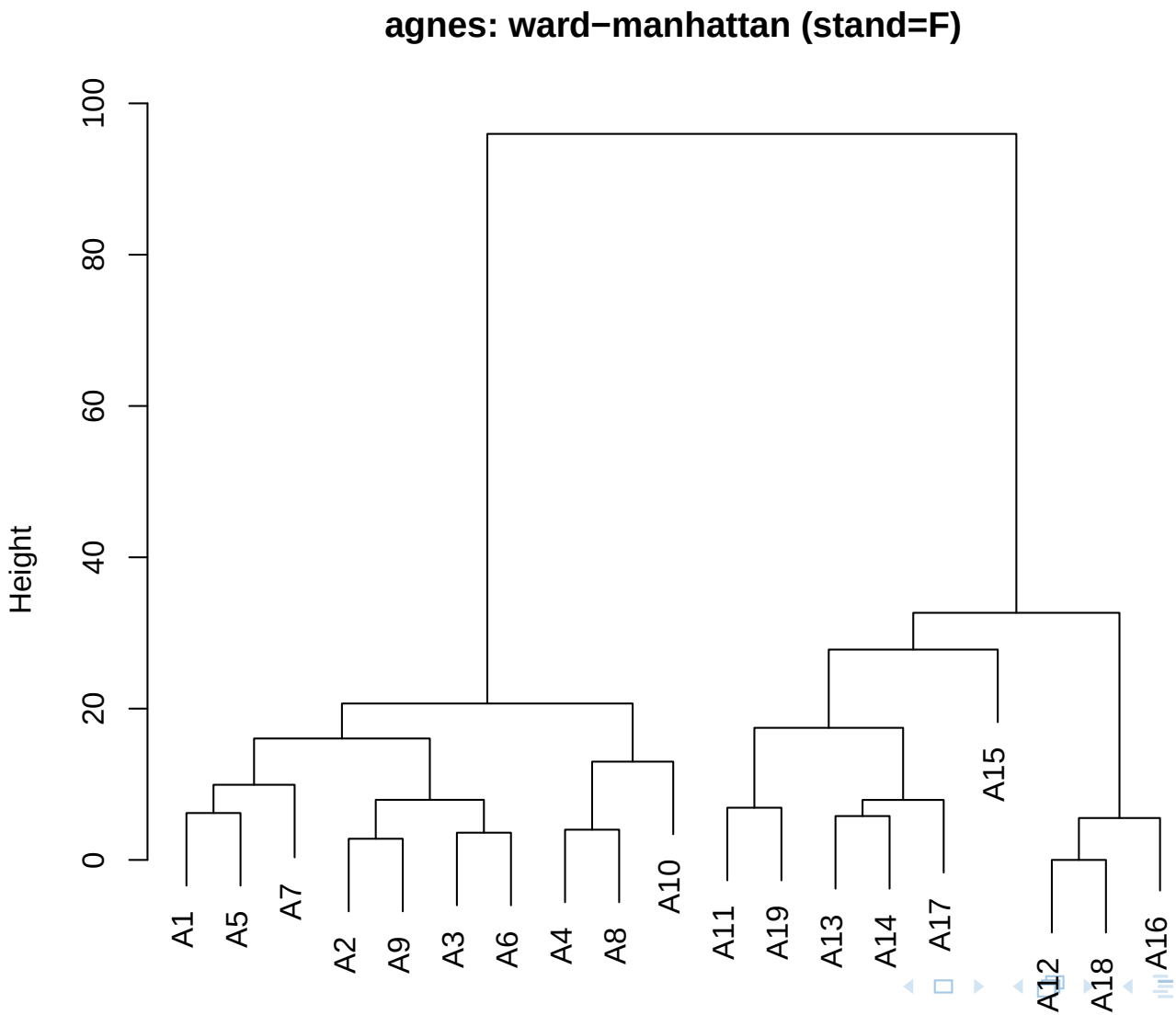
A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
C	2	2	2	5	5	2	5	5	2	5	1	4	1	1	3	4	1	4	4

Kmeans(k=5)

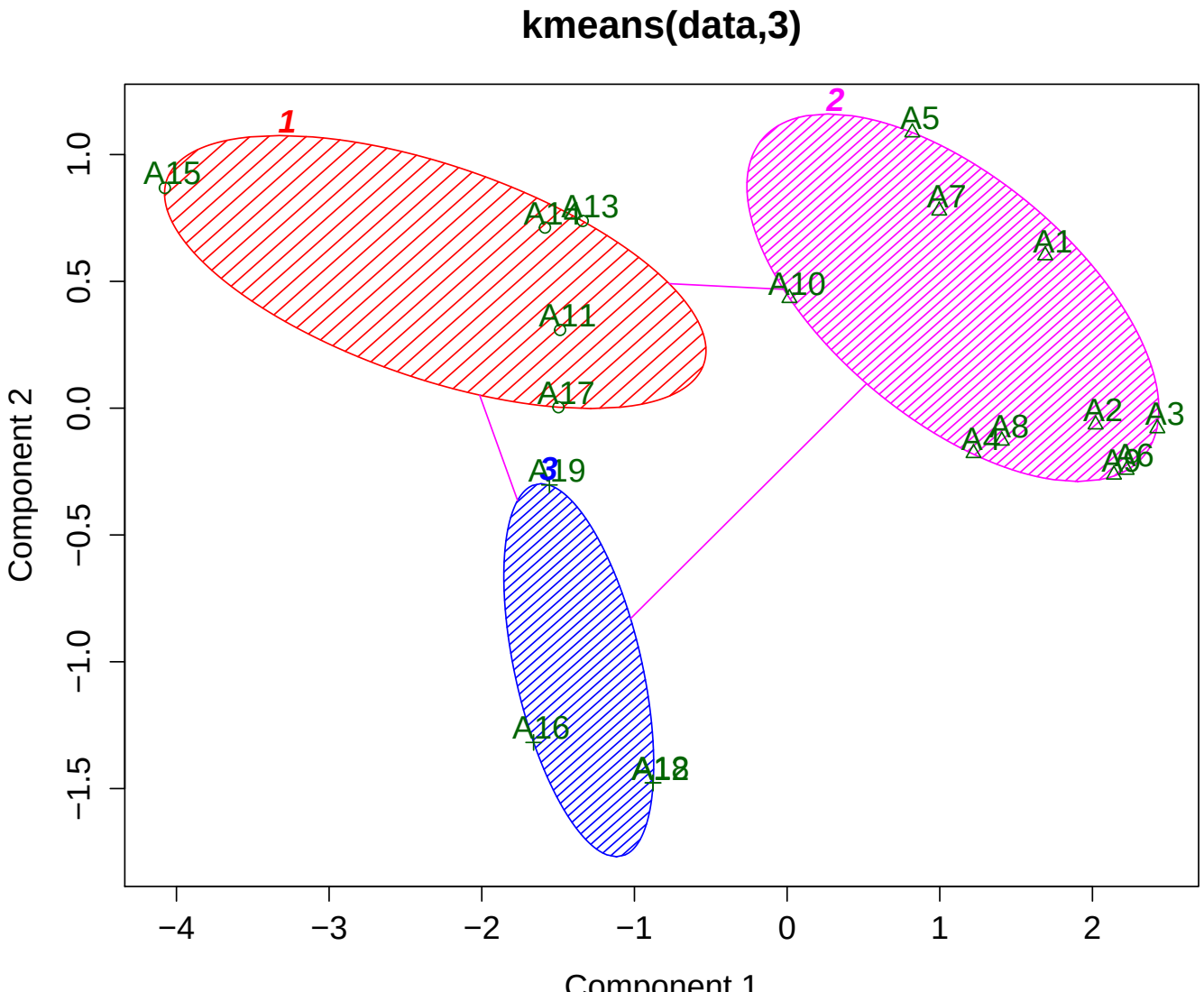
Clusterization — Potential Method (Čaklović 2012)



Clusterization — agnes(data,stand=F)



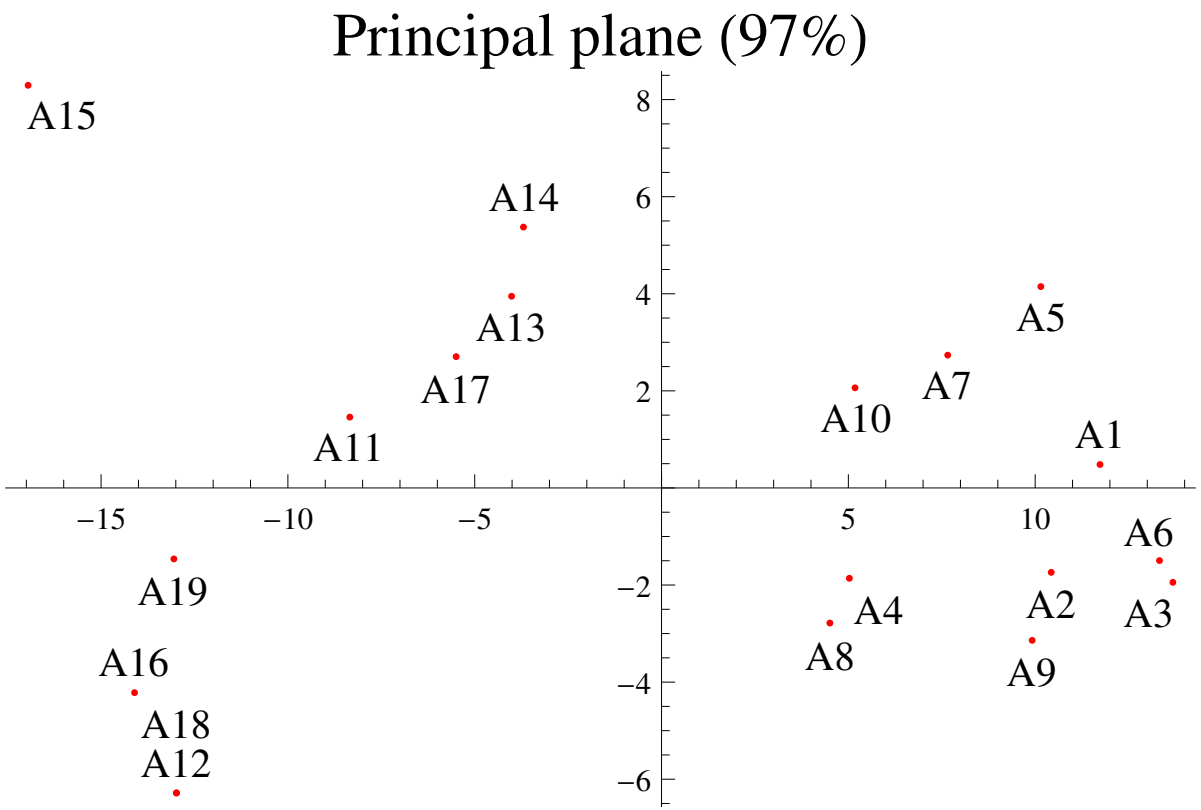
Clusterization — kmeans (k=3)



These two components explain 92.38 % of the point variability.

Clusterization (A1-A10) — brutal force

```
> max.dissimilarity.average$p = max.dissimilarity.center$p
 [1] 1 1 1 1 2 1 2 1 1 2
```



Correspondence analysis — categorization

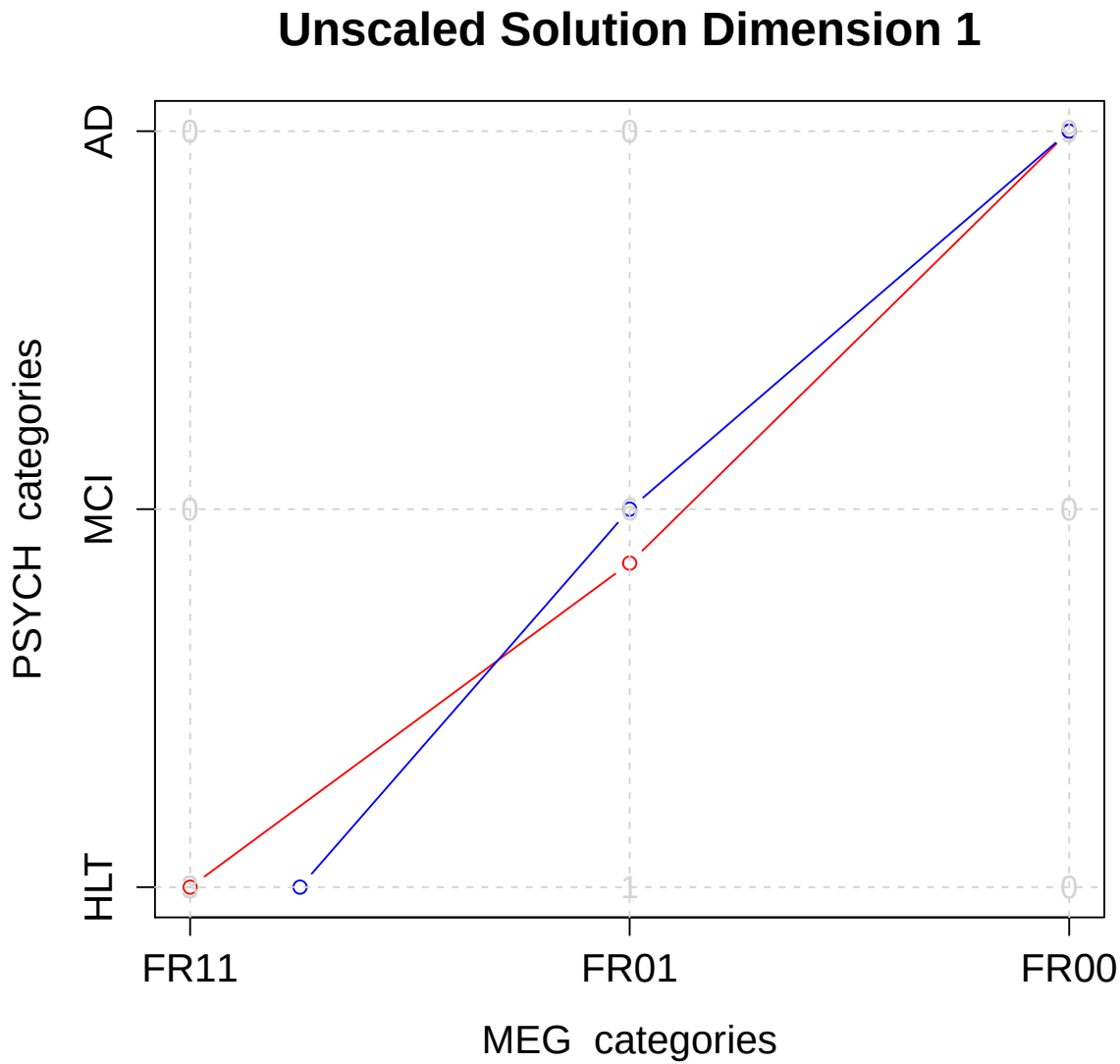
	MSE	REY	IQprf	IQver	psycat
A1	a	a	a	b	? H
A2	a	a	b	a	? H
A3	a	a	a	a	? H
A4	b	b	b	b	? MCI
A5	b	a	b	c	? MCI
A6	b	a	b	a	? MCI
...	...	...	...	...	...
A10	b	b	b	c	? MCI
A11	b	c	c	c	? AD
A12	c	c	b	b	? AD
...	...	...	...	...	...
A16	c	c	c	c	? AD
A17	c	c	c	c	? AD
A18	c	c	b	b	? AD
A19	b	c	c	c	? AD

Correspondence analysis

```
> cont.tab
          psy.cat          covariates
megstatus HLT MCI AD              F R
     FR11   3   0  0       FR11 1 1
     FR01   1   6  0       FR01 0 1
     FR00   0   0  9       FR00 0 0

> res$chisq.decomp
                 Chisq Proportion Cumulative Proportion
Component 1 19.00000  0.6086957                0.6086957
Component 2 12.21429  0.3913043                1.0000000
```

Anacor — output



What next?

MEG signals:

one head => 272 sensors

one sensor => main signal + two ref signals (partial derivatives)

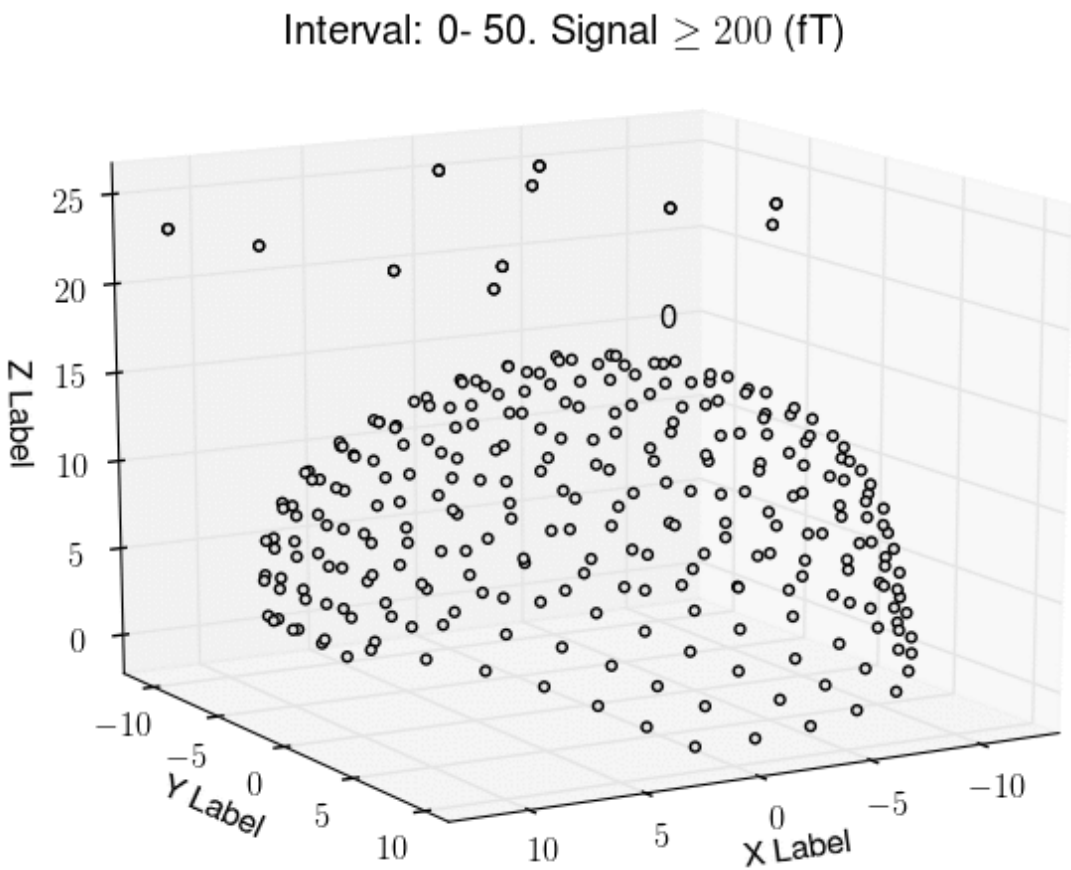
two signals => compared by priority $\rightarrow$ Preference Graph

one head => one Preference Graph

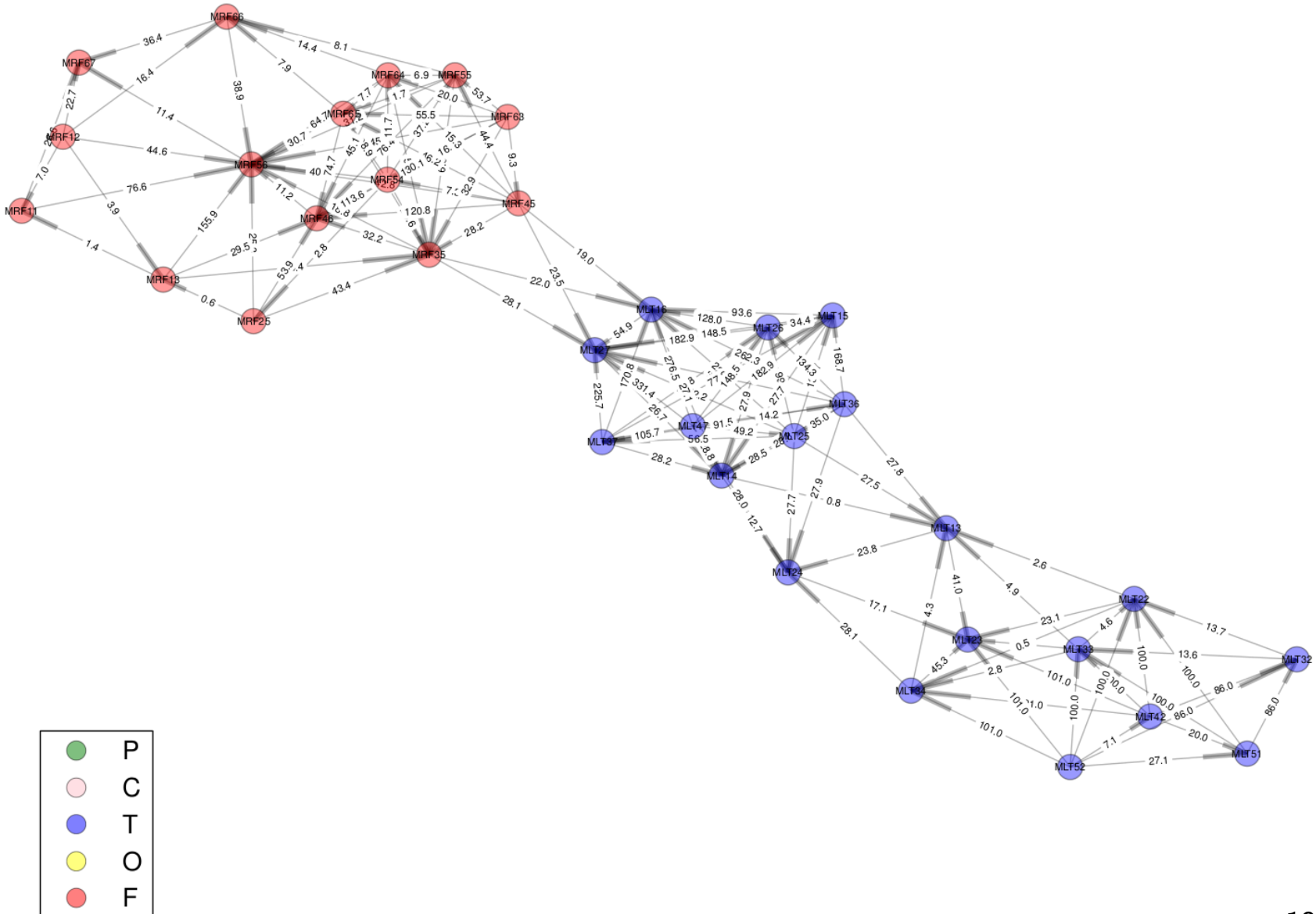
many heads => many Preference Graphs

graphs may be clusterized

One head — animation



One head preference graph



References

Čaklović, Lavoslav (2012), Measure of Inconsistency for the Potential Method., *in* V.Torra, Y.Narukawa, B.López & M.Villaret, eds, 'MDAI', Vol. 7647 of *Lecture Notes in Computer Science*, Springer, pp. 102–114.

Golubić, Sanja Josef (2014), Neurodynamics of Normal and Pathology-Changed Sensory Processing, PhD thesis, University of Zagreb.