VYTAUTAS MAGNUS UNIVERSITY

FACULTY OF INFORMATICS

DEPARTMENT OF APPLIED INFORMATICS

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LITHUANIAN PARLIAMENT LEGISLATIVE VOTING ANALYSIS AND VISUALIZATION

Master final thesis

Applied informatics study programme, state code 6211BX012

Study field Informatics

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(signature) (date)

Defended prof. dr. Daiva Vitkutė-Adžgauskienė _____ _____
(Dean of Faculty) (signature) (date)

Kaunas, 2019

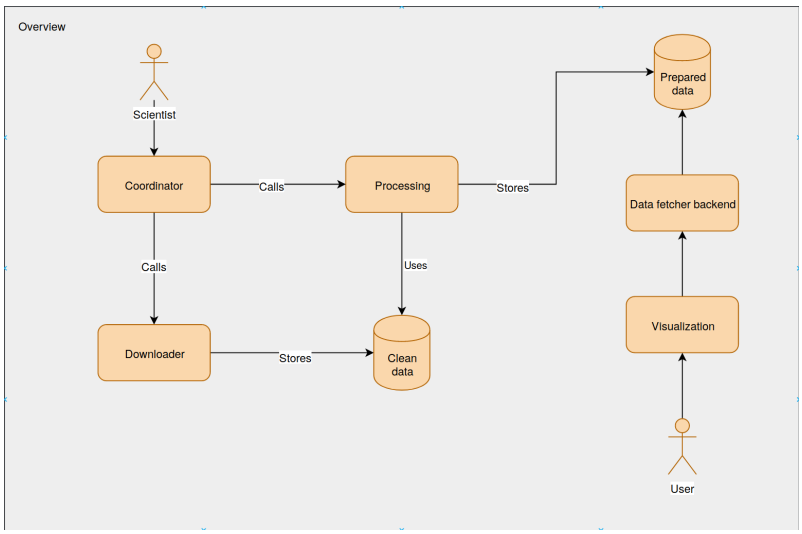
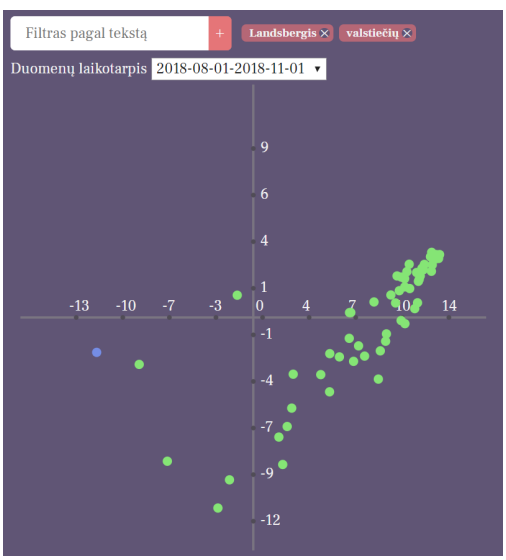
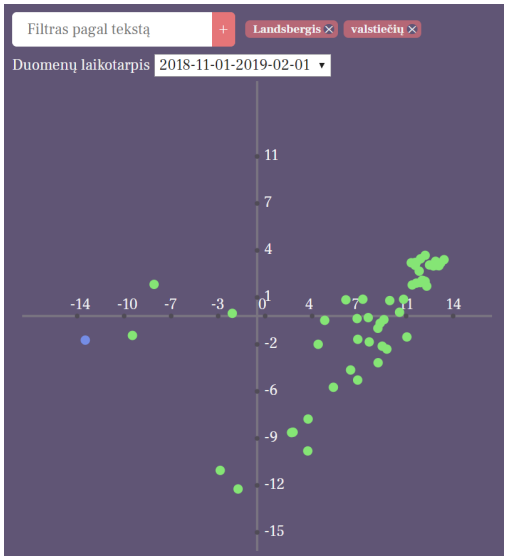


Figure 1. Data flow from database to *k-means*



(a) Data filter 1



(b) Data filter 2

Figure 4. Data filters

Table 11. Encoding of vote outcomes

Vote outcome	Encoding 1	Encoding 2	Encoding 3
For	2	1	2
Against	-2	-1	-2
Abstain	-1	0	-1
Did not vote	0	0	-1

Since factions are important part when viewing visualizations, they need to be consistent throughout graphs. Faction assigned colors can be viewed in figure

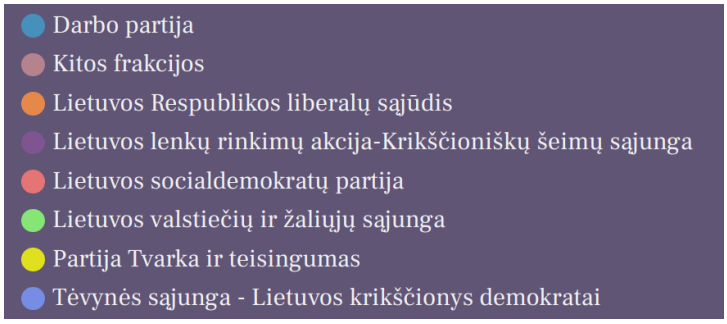
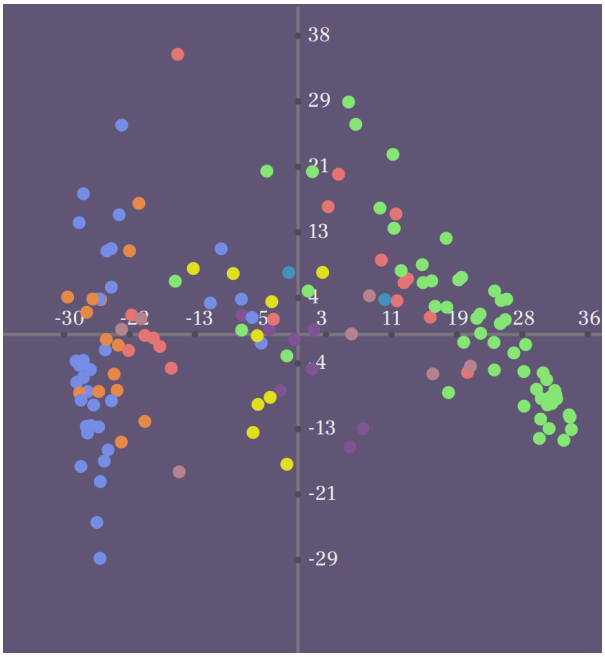
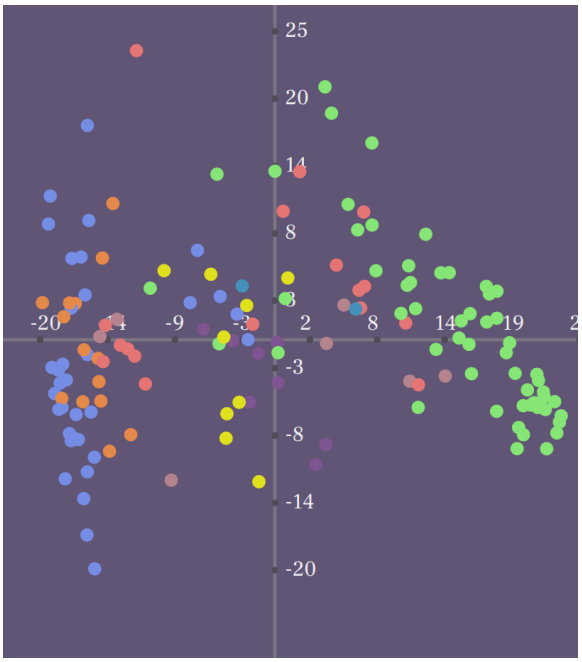


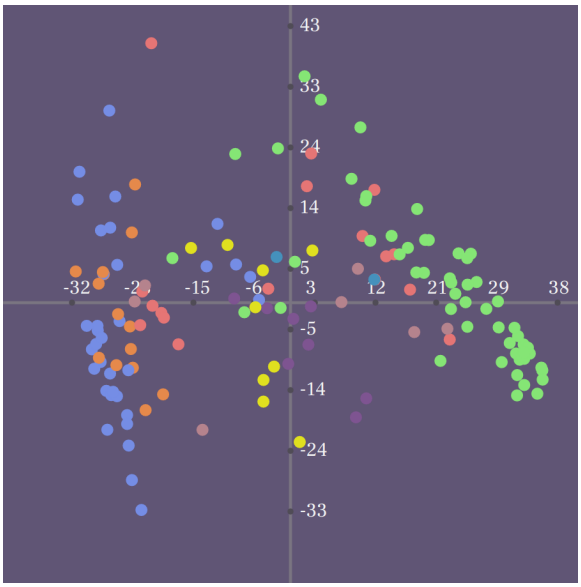
Figure 5. Colors assigned to factions in following visualizations



(a) encoding = E1

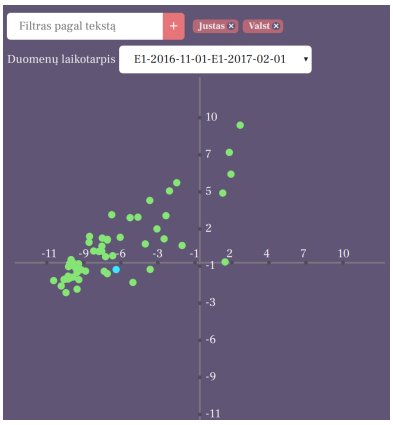


(b) encoding = E2

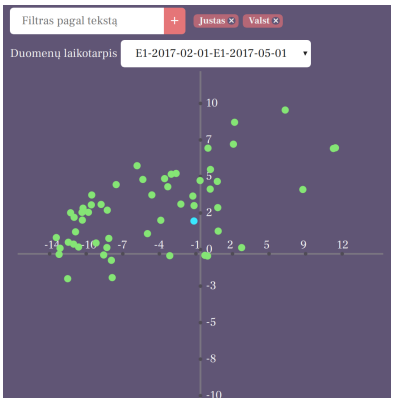


(c) encoding = E3

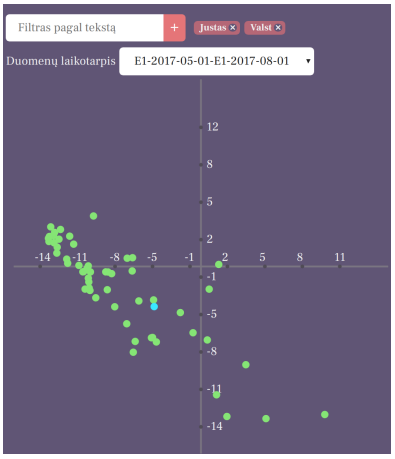
Figure 6. MDS on 2d scatter plot



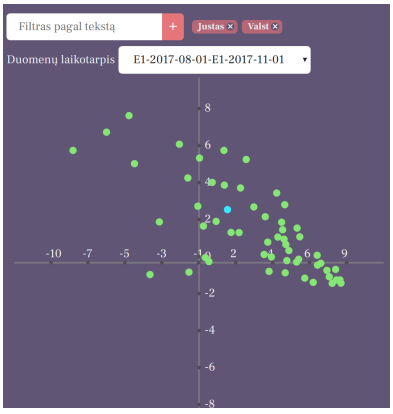
(a) 2016-11-01 — 2017-02-01



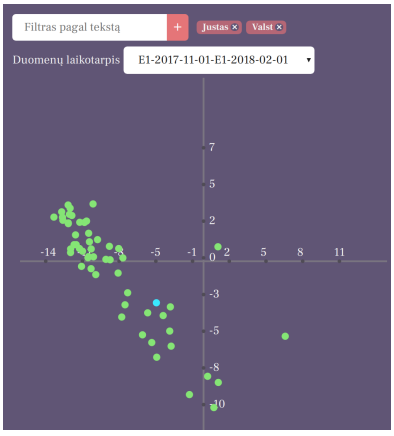
(b) 2017-02-01 — 2017-05-01



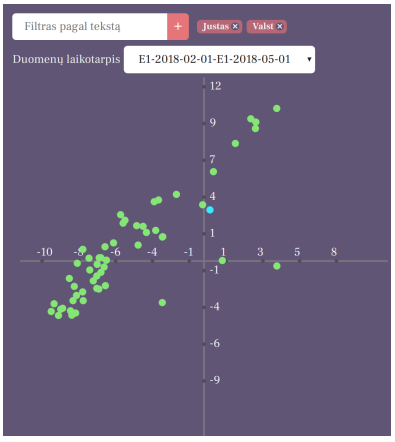
(c) 2017-05-01 — 2017-08-01



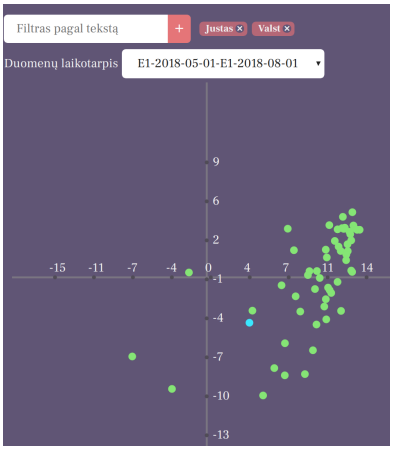
(d) 2017-08-01 — 2017-11-01



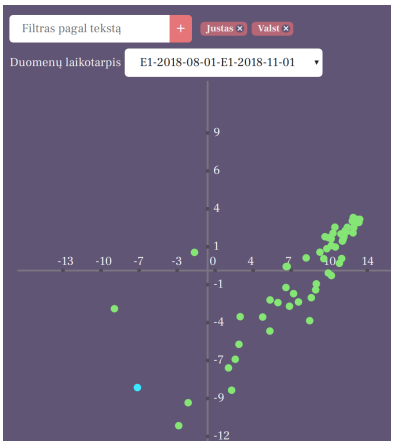
(e) 2017-11-01 — 2018-02-01



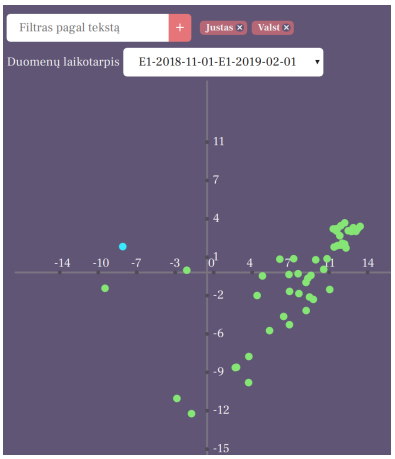
(f) 2018-02-01 — 2018-05-01



(g) 2018-05-01 — 2018-08-01

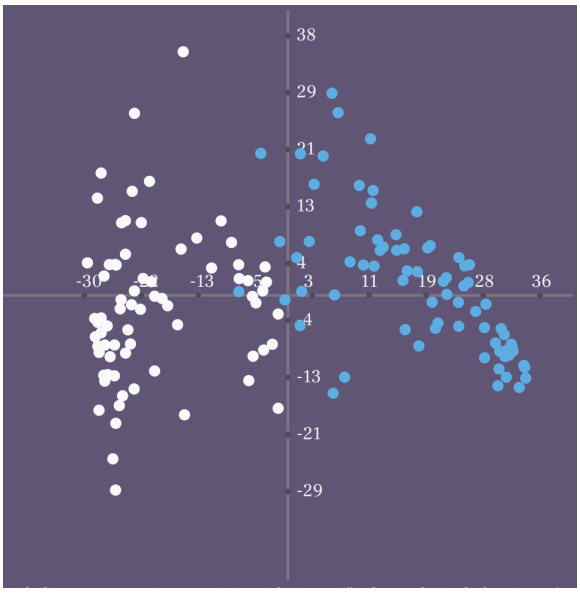


(h) 2018-08-01 — 2018-11-01

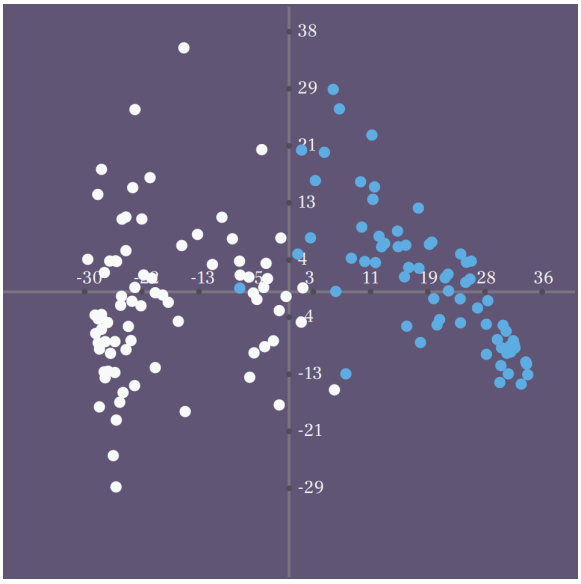


(i) 2018-11-01 — 2019-02-01

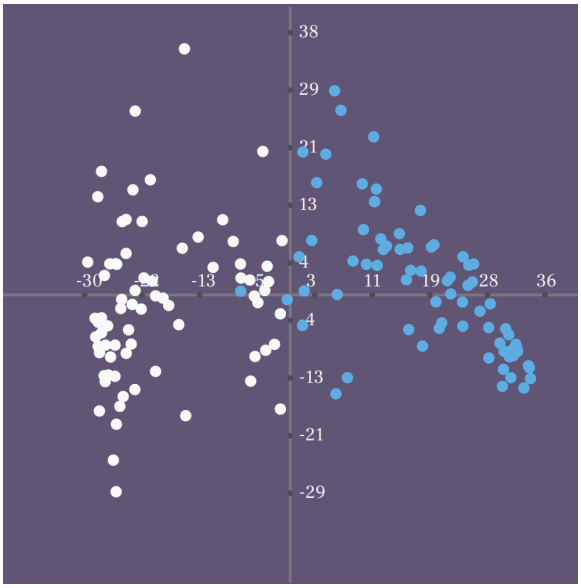
Figure 7. Changes in Justas Džiugelis voting patterns



(a) k=2, encoding = E1

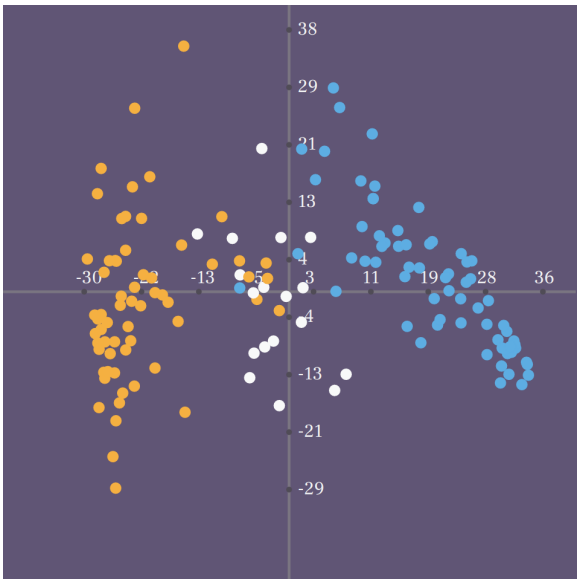


(b) k=2, encoding = E2

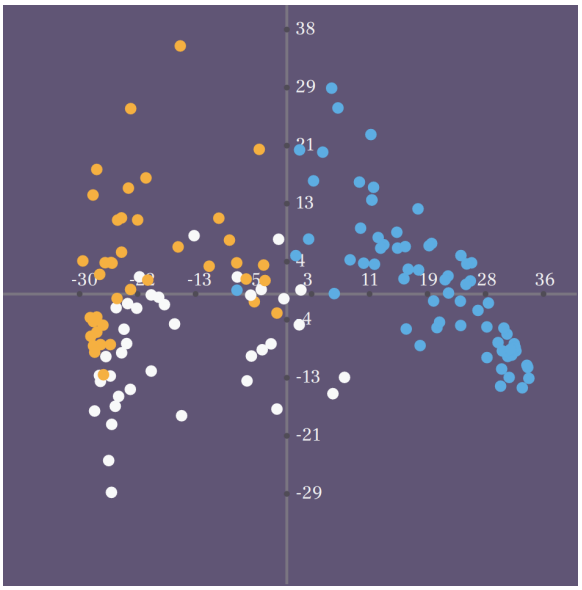


(c) k=2, encoding = E3

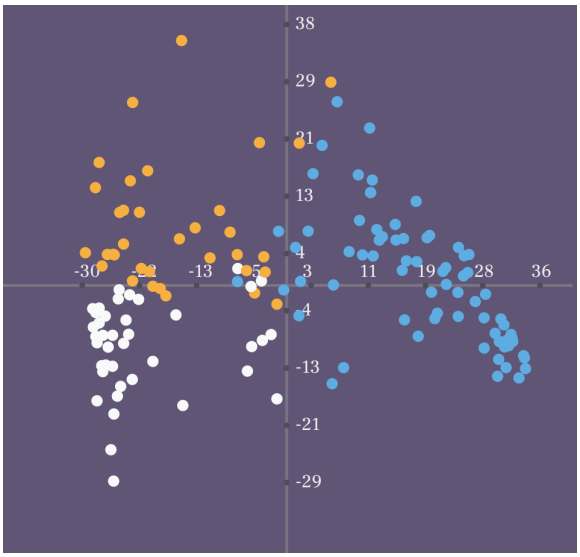
Figure 8. majority vs minority, *k-means* on MDS coordinates



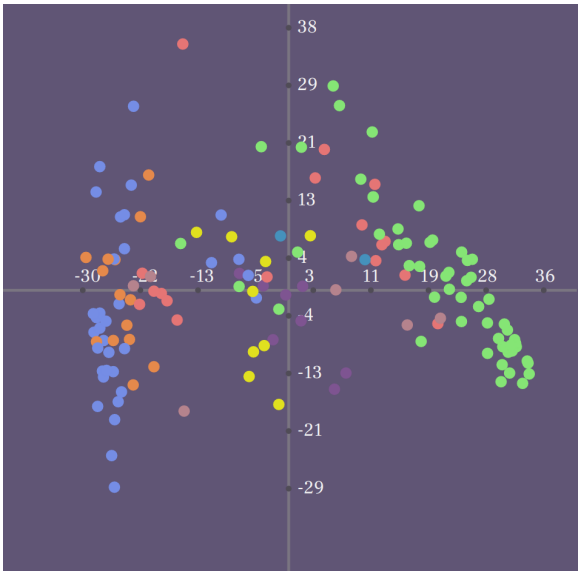
(a) k=3, encoding = E1



(b) k=3, encoding = E2



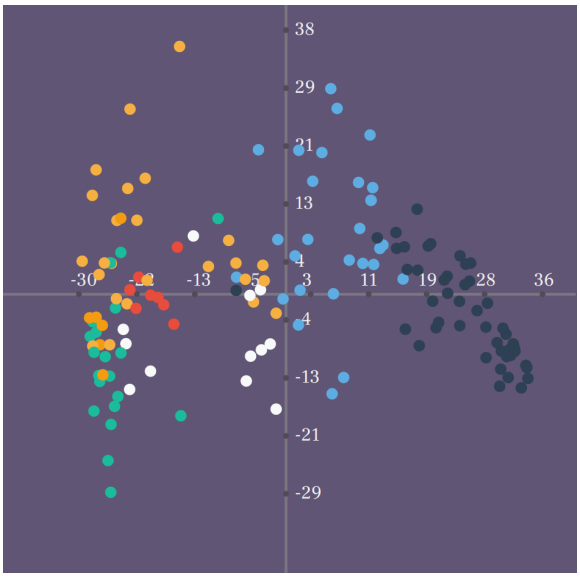
(c) k=3, encoding = E3



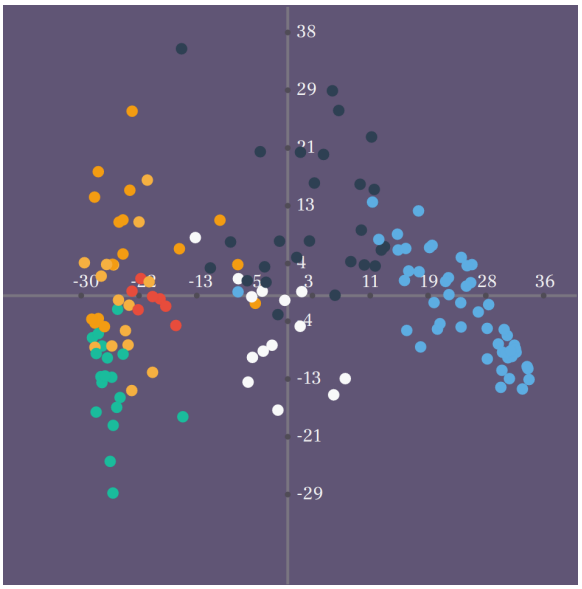
(d) Actual factions

Figure 9. majority vs minority, k=3, *k-means* on MDS coordinates

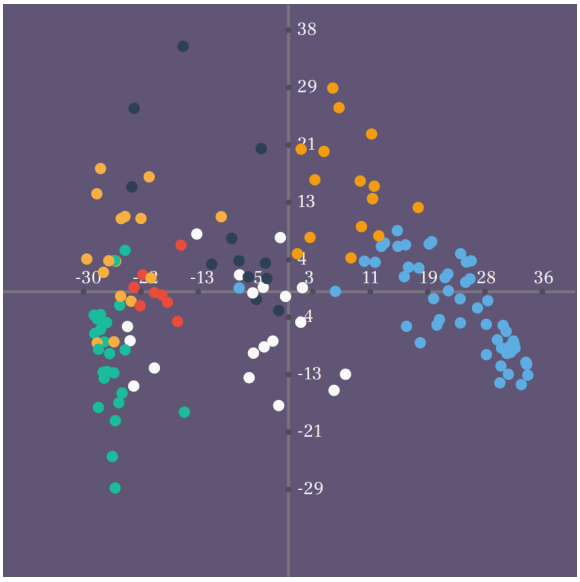
Looking at figures 9a,9b, 9c suggests that *k=3* is one cluster too much for *E2, E3* encodings as it doesn't show anything meaningful. 9a figure shows points which are more truthful, white points being people who are outsiders as predicted in hypothesis.



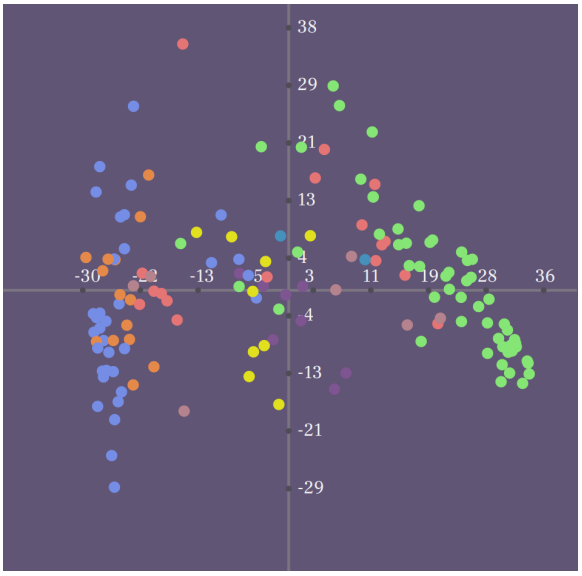
(a) k=7, encoding = E1



(b) k=7, encoding = E2



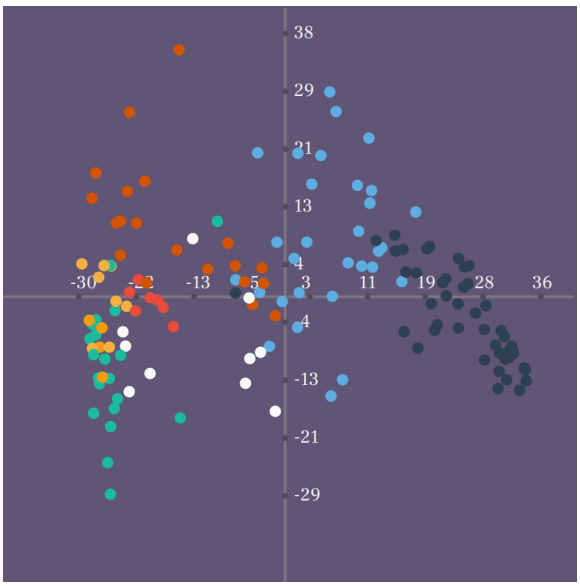
(c) k=7, encoding = E3



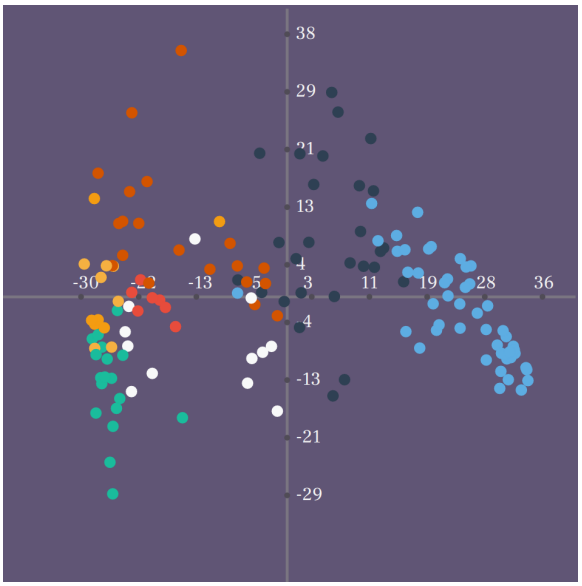
(d) Actual factions

Figure 10. different clusters of members, *k-means* on MDS coordinates

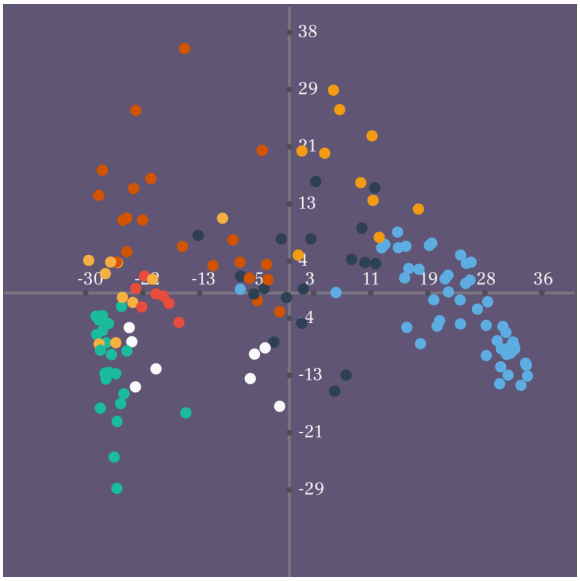
ideology, just a similar one. This finding suggests that some citizens might be betrayed.



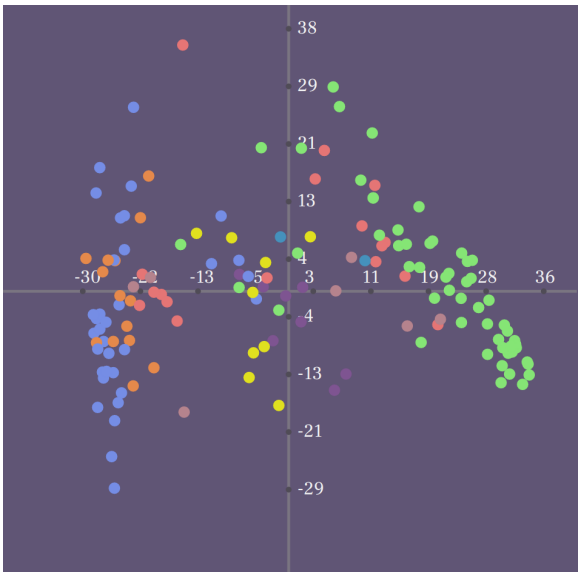
(a) k=8, encoding = E1



(b) k=8, encoding = E2



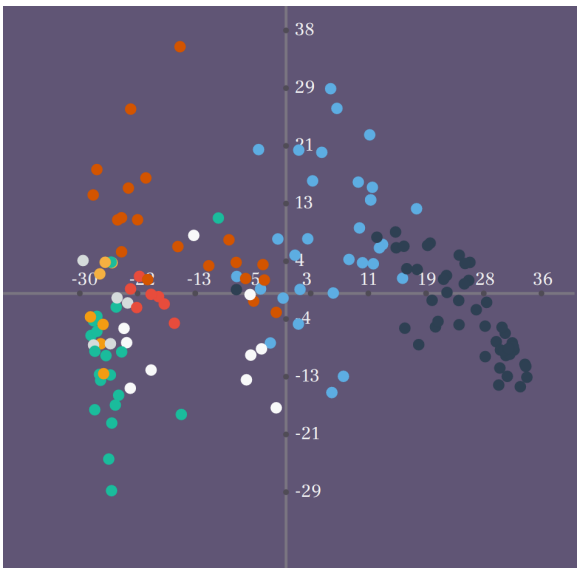
(c) k=8, encoding = E3



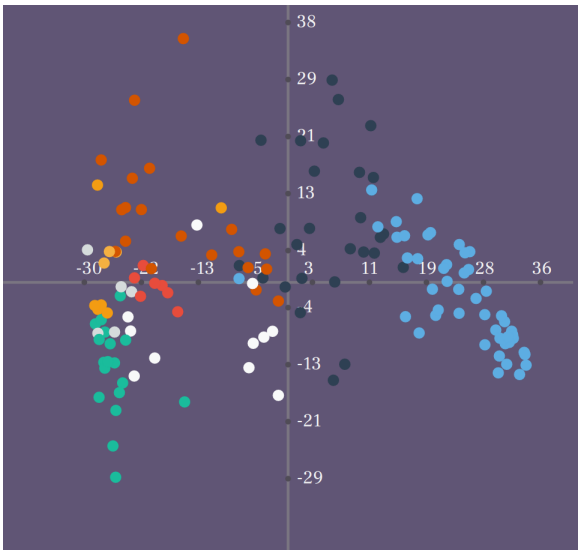
(d) Actual factions

Figure 11. different clusters of members, *k-means* on MDS coordinates

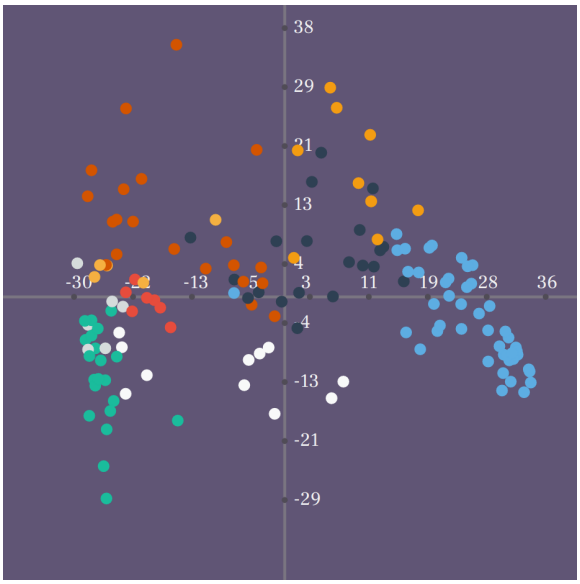
In figures 11a, 11b, 11c $k = 8$ parameter setting is tested. Graphs seem to suggest that minority is working together on some issues, but still vote differently on others. Difference from $k = 7$ can be seen with more outliers in the center.



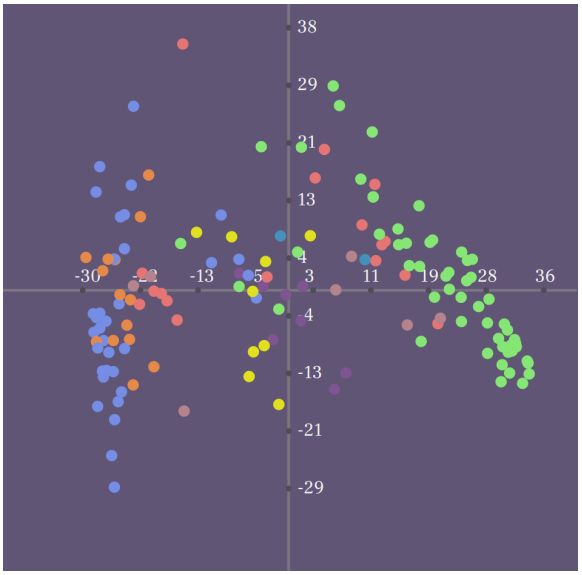
(a) k=9, encoding = E1



(b) k=9, encoding = E2



(c) k=9, encoding = E3



(d) Actual factions

Figure 12. different clusters of members, *k-means* on MDS coordinates

In figures 12a, 12b, 12c $k = 9$ parameter setting is tested. $E3$ encoding graph is accurate to split majority greens faction voting. It splits main cluster which votes together from outliers who take high position posts or left the faction. Same encoding splits some liberals from conservatives well, although voting patterns are similar on the plot.