

# Why does this keep happening?

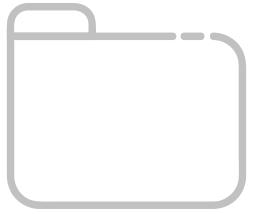
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Machine Learning on U.S. Police Shootings

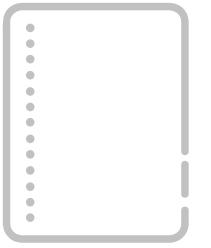


# Where we're going

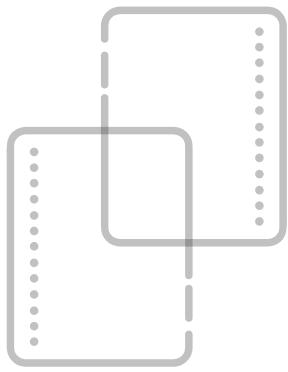
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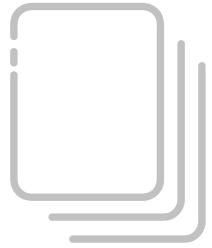
**Overview**



**Results**



**Recommendations**



**Methodology**

# Data

- The data ranges from January 2, 2015 to May 4, 2021.
- 6268 thousand people killed by U.S. police departments.
- All U.S. states
- Indication of whether body cameras were used, threat level, age, race, whether there were signs of mental illness, and how the victim was armed.

id	name	date	manner_of_death	armed	age	gender	race
3	Tim Elliot	2015-01-02	shot	gun	53	M	A
4	Lewis Lee Lembke	2015-01-02	shot	gun	47	M	W
5	John Paul Quintero	2015-01-03	shot and Tasered	unarmed	23	M	H
8	Matthew Hoffman	2015-01-04	shot	toy weapon	32	M	W
9	Michael Rodriguez	2015-01-04	shot	nail gun	39	M	H
11	Kenneth Joe Brown	2015-01-04	shot	gun	18	M	W
13	Kenneth Arnold Buck	2015-01-05	shot	gun	22	M	H
15	Brock Nichols	2015-01-06	shot	gun	35	M	W
16	Autumn Steele	2015-01-06	shot	unarmed	34	F	W
17	Leslie Sapp III	2015-01-06	shot	toy weapon	47	M	B
19	Patrick Wetter	2015-01-06	shot and Tasered	knife	25	M	W

# **Results**

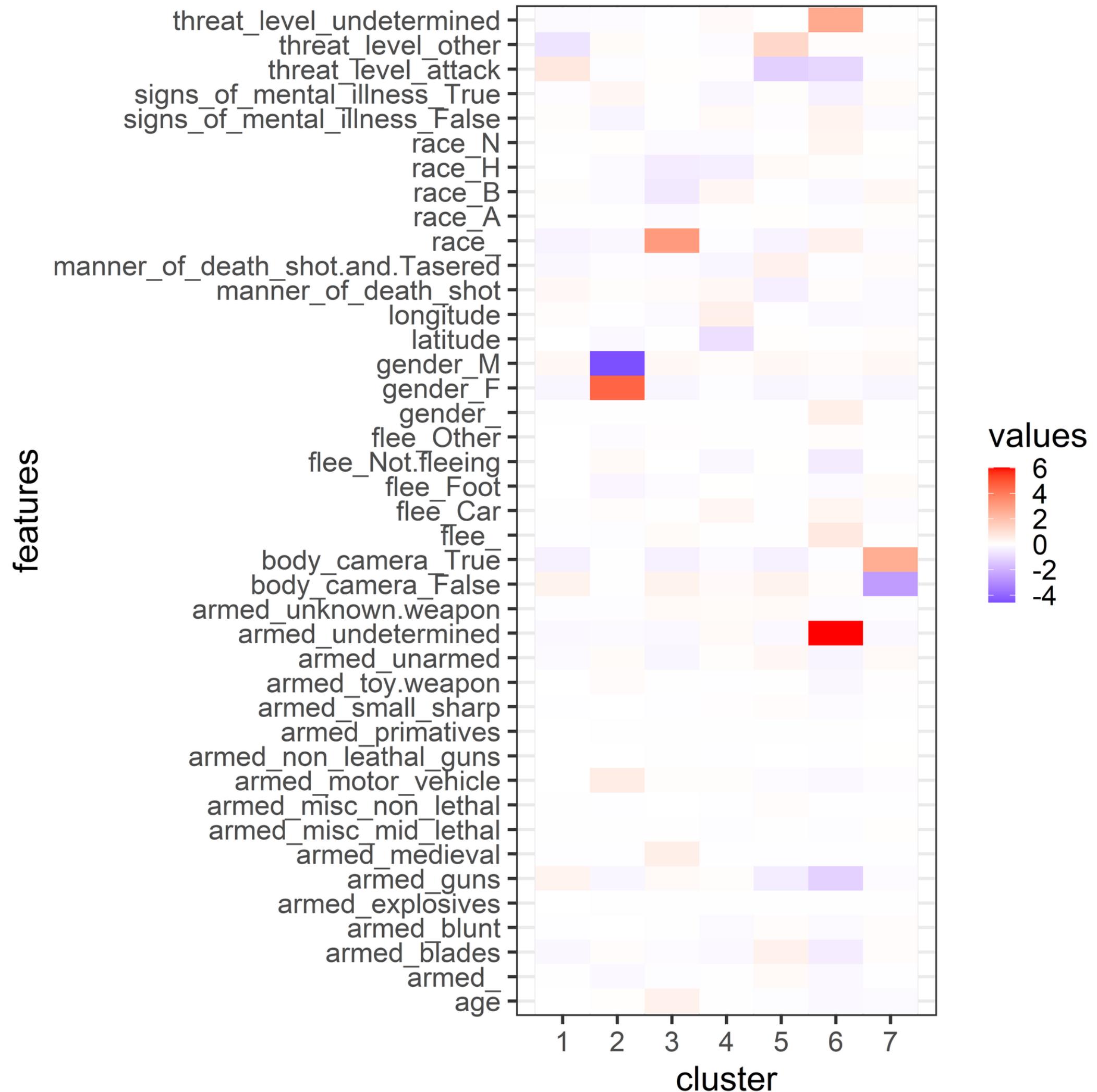
# Heat 1

## Women are more threatening in vehicles

Cluster 2 shows women are more threatening in armed motor vehicles.

Cluster 7 is dedicated entirely to body cameras being turned on and used during the altercation.

Cluster 6 shows armed undetermined, who are feeling with an undetermined threat level.



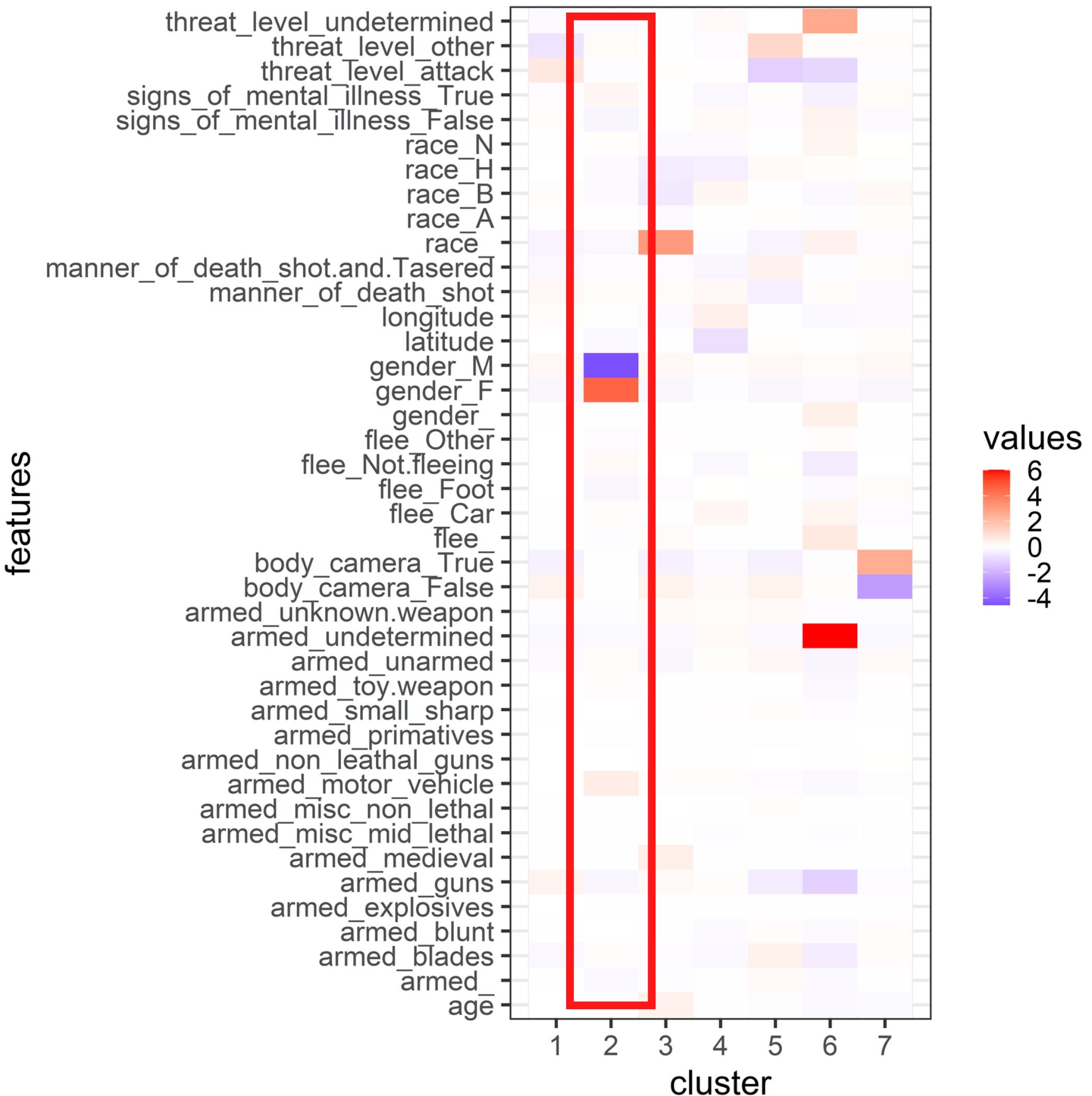
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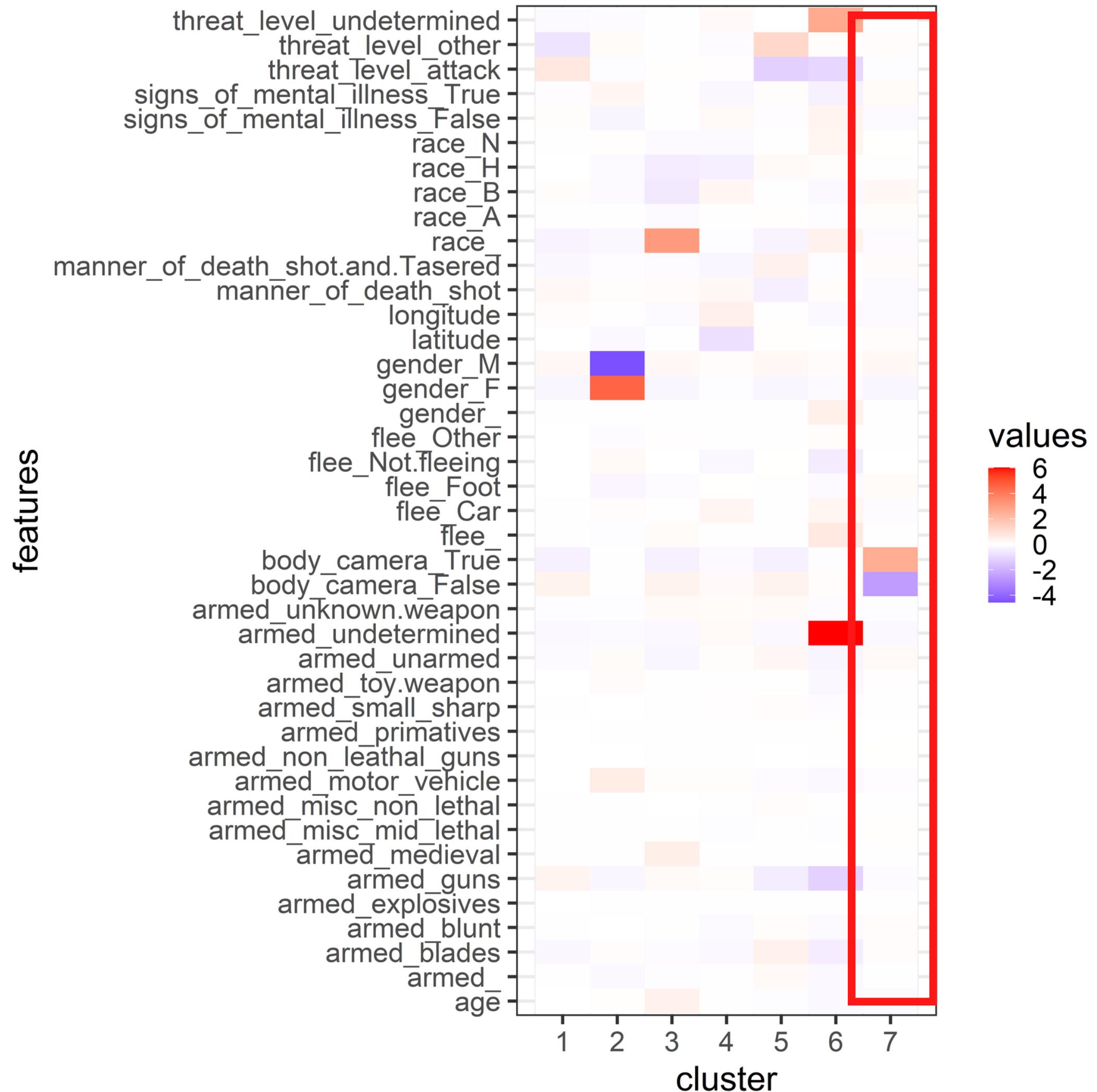
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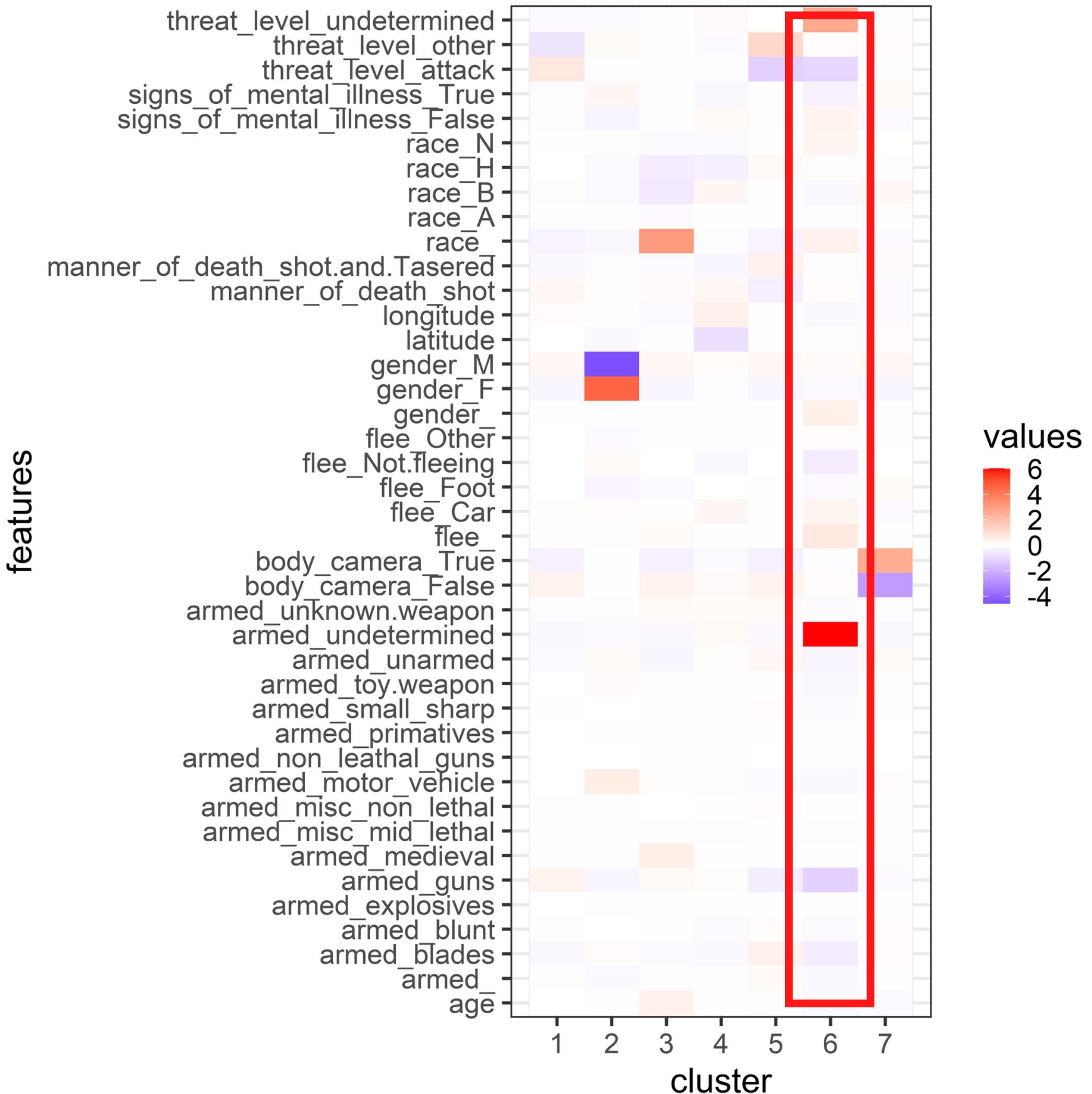
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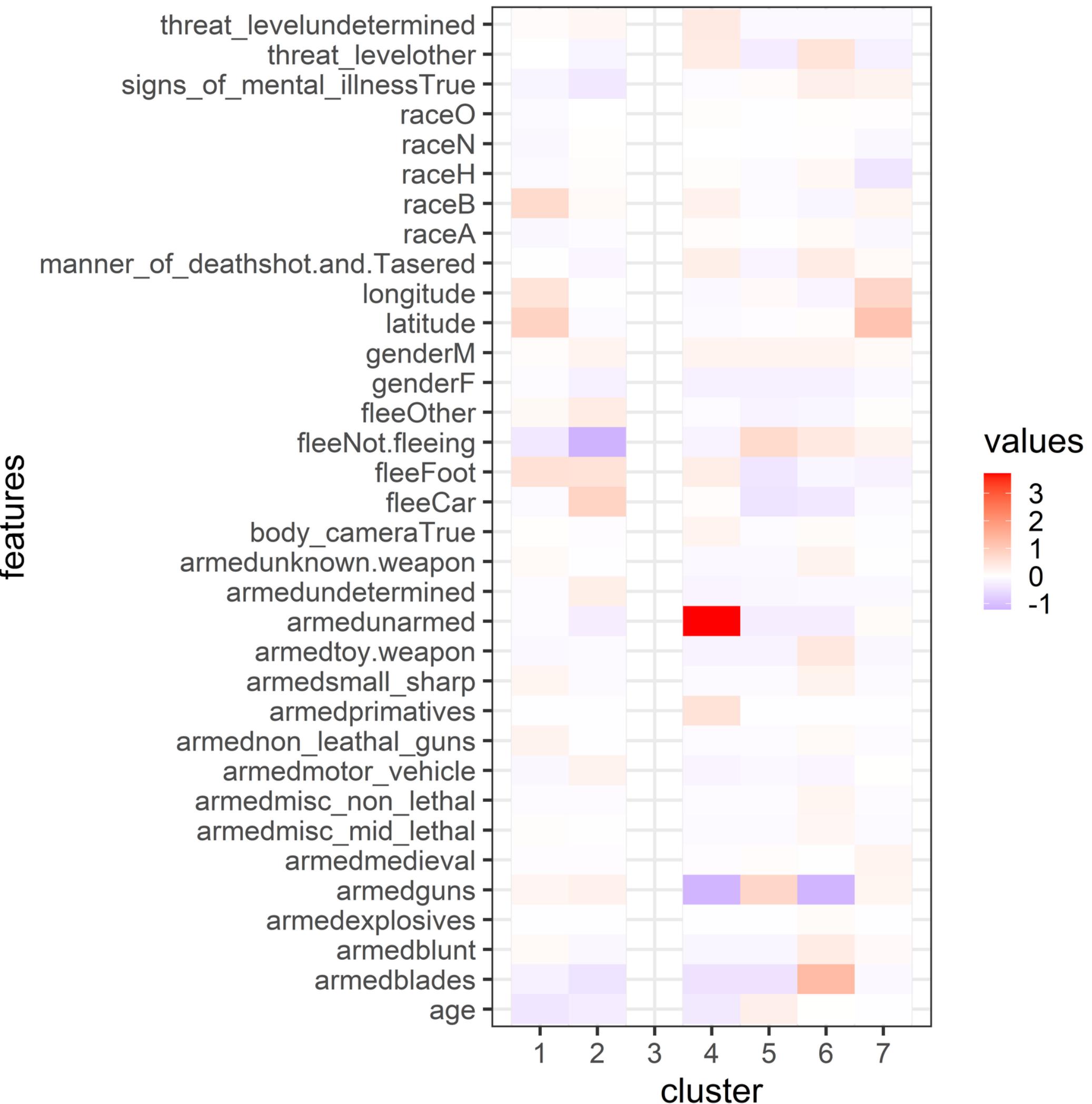
# Heat 2

# Fleeing, Age, and Weapons

Cluster 2 indicates that the younger a person is the more likely they are to flee.

Cluster 6 shows that those who show signs of mental illness are likely to be armed with blades or blunt objects.

Cluster 1 shows young African Americans who flee around a certain latitude and longitude.



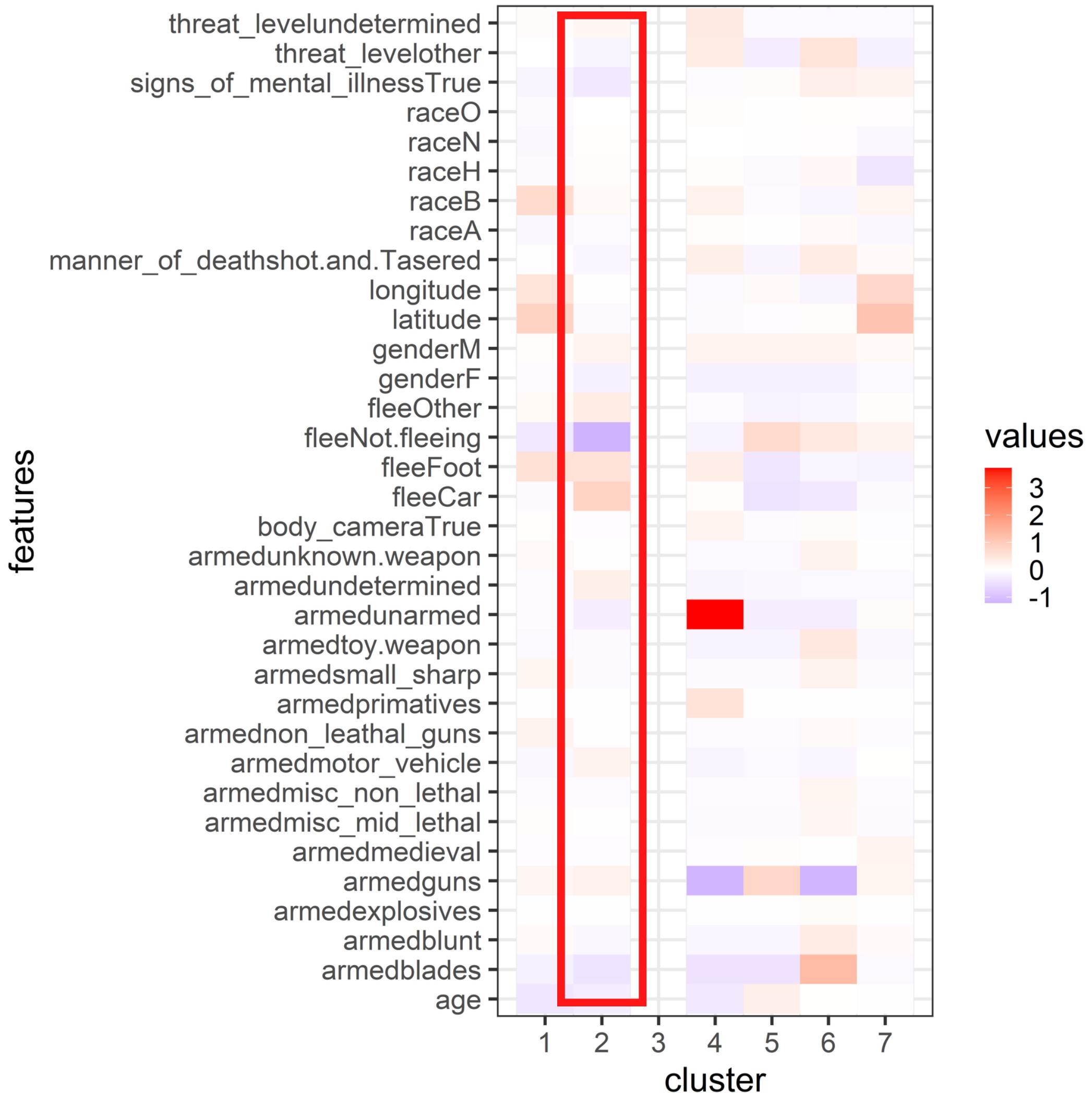
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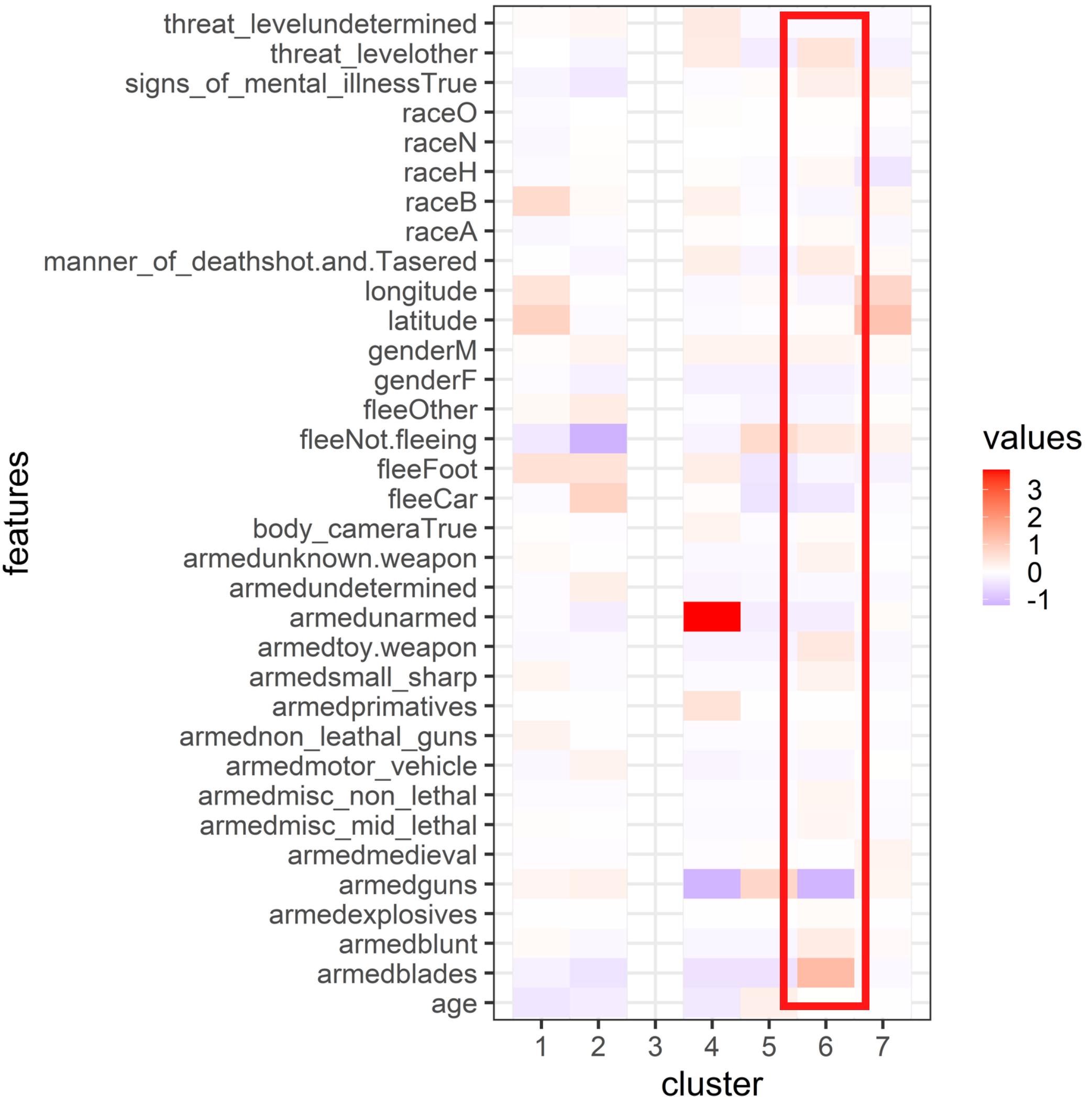
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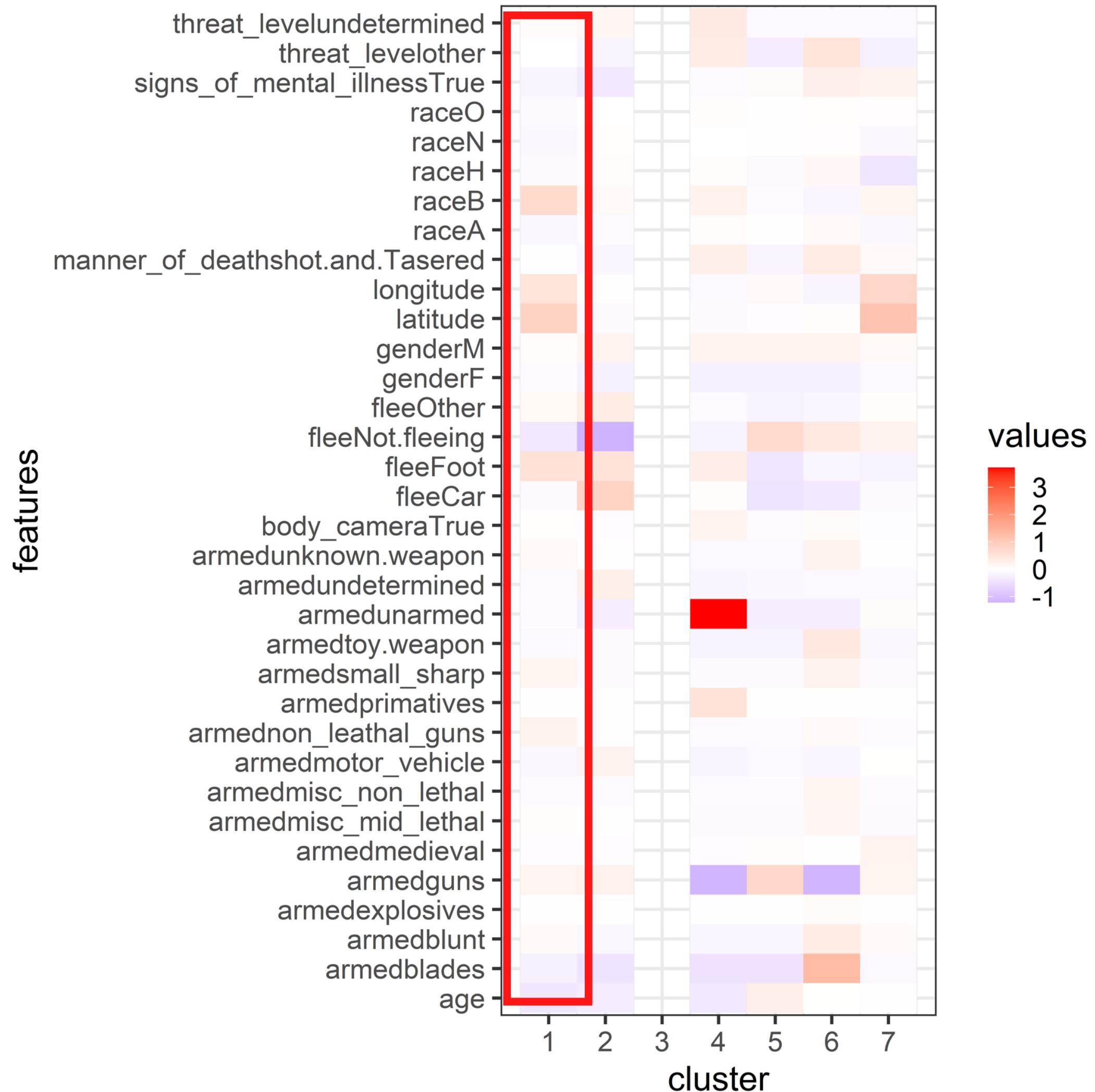
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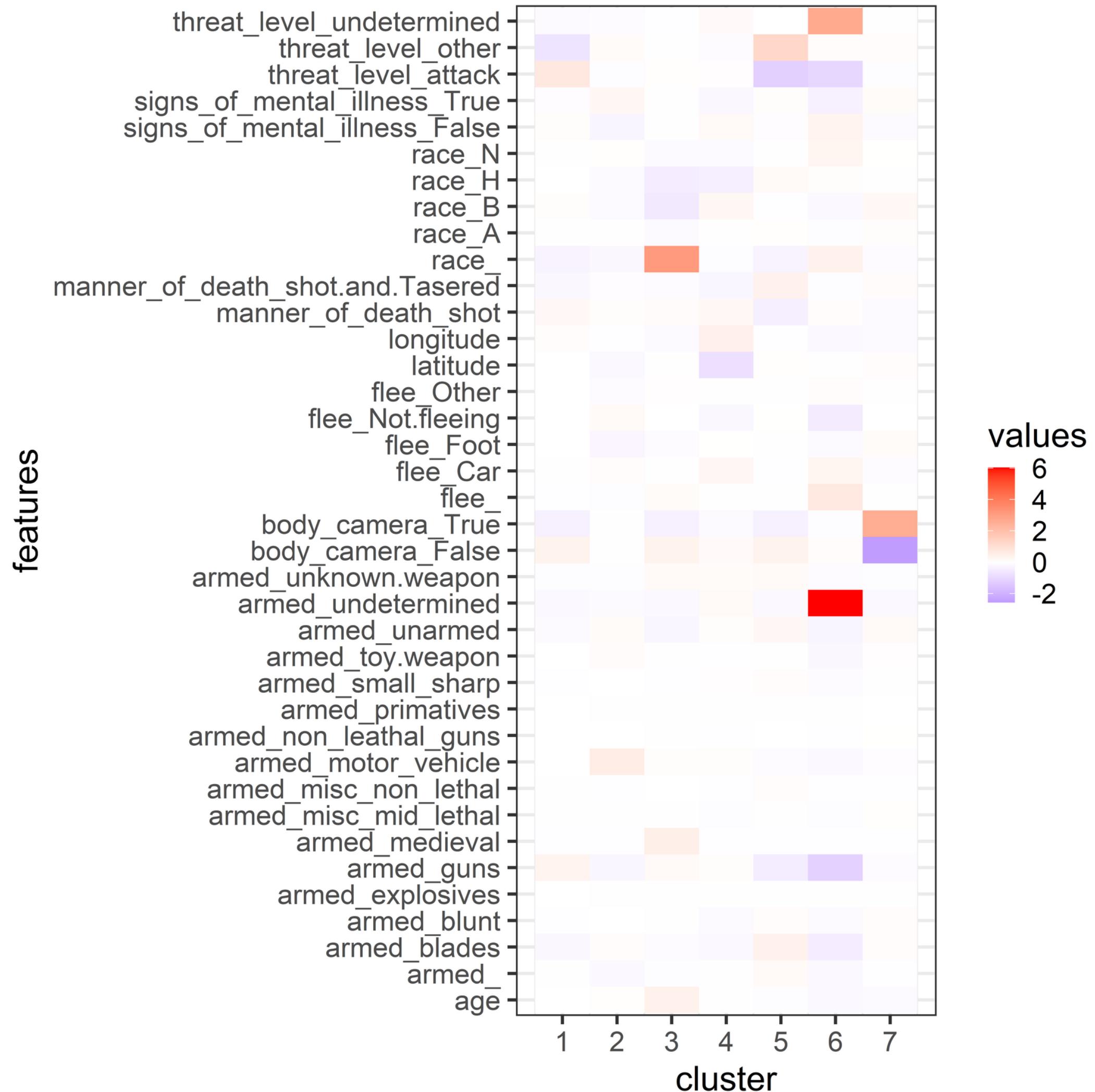
# Heat 3

## Threat Level & Crossbows

Cluster 6 shows armed undetermined victims who flee have an undetermined threat level.

Cluster 3 shows older victims armed with medieval weapons with body cameras not being used.

Cluster 5 shows victims armed with blades, with no body camera, who were shot and tasered with a other level of threat level.



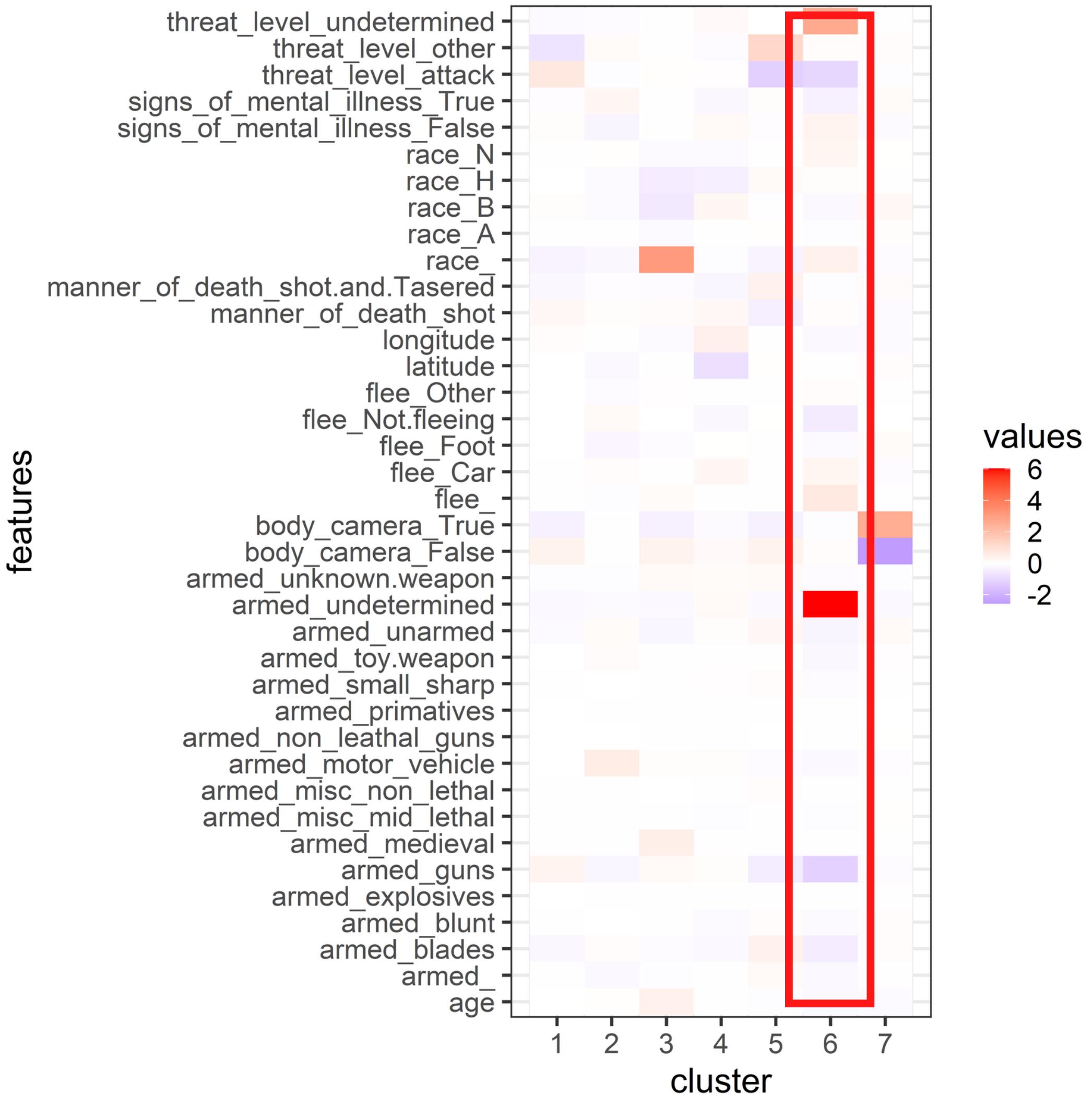
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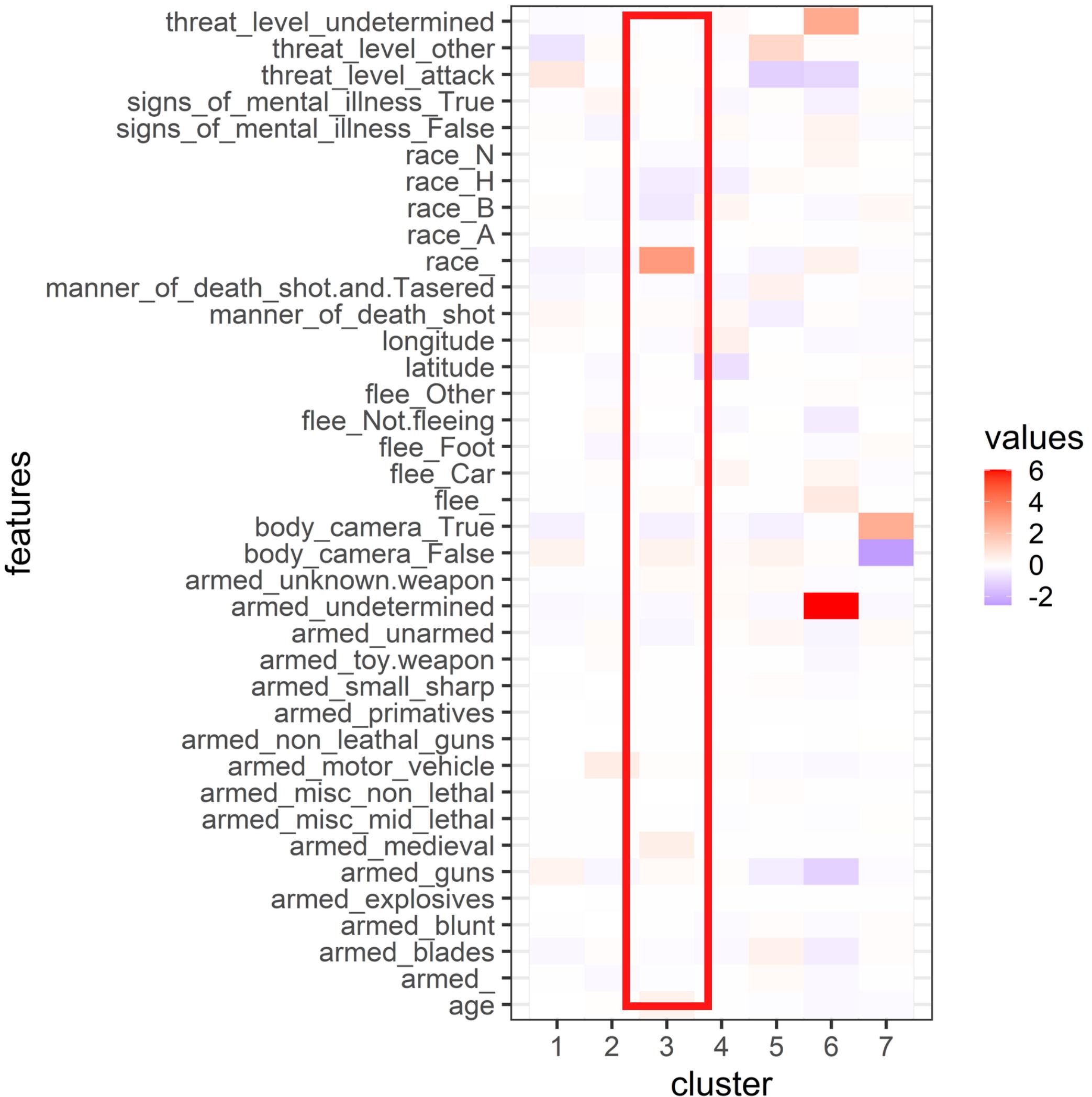
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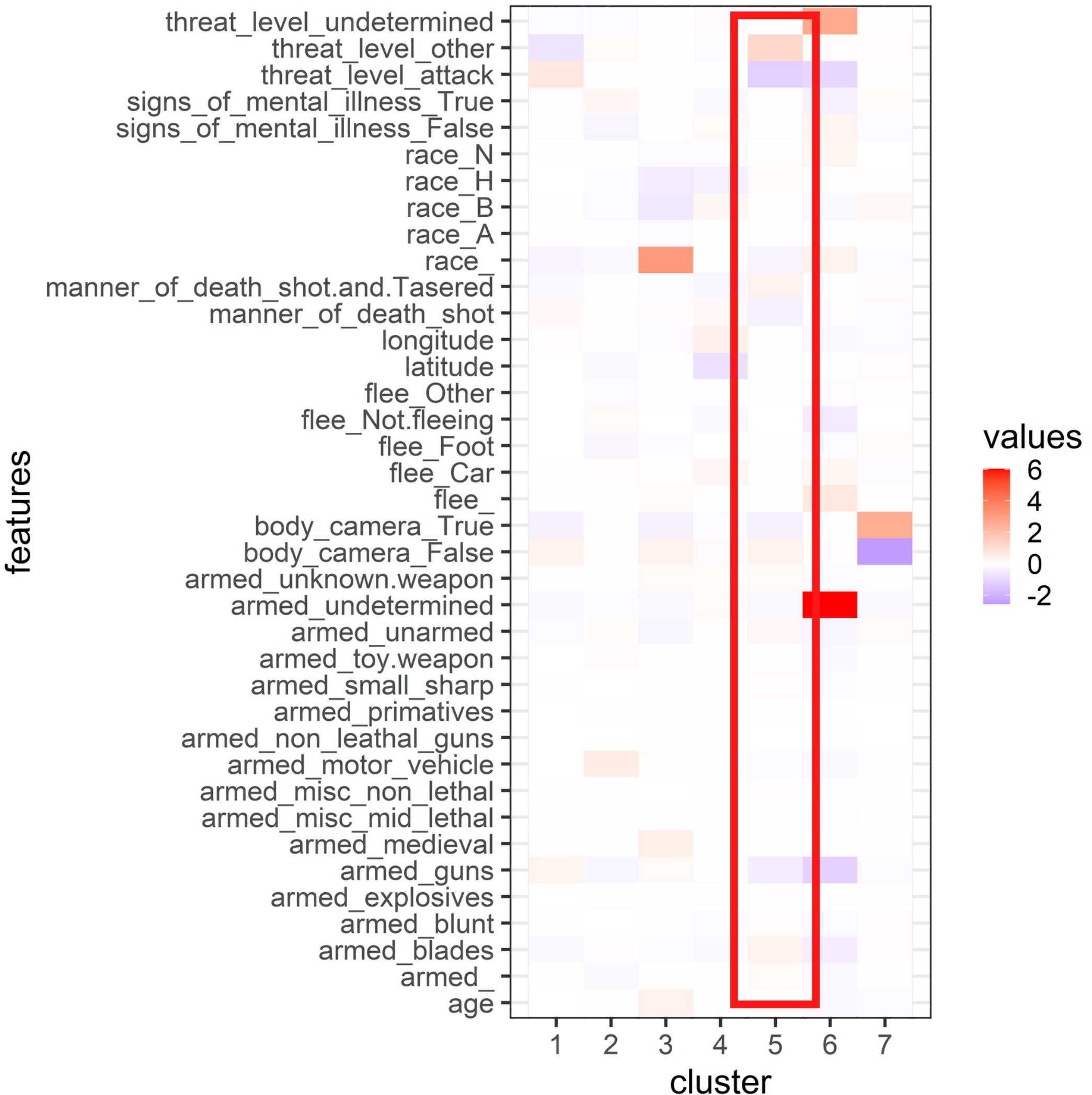
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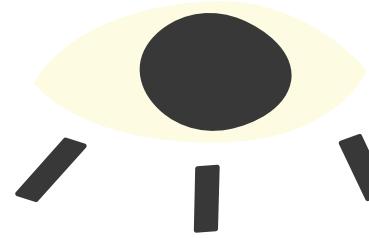
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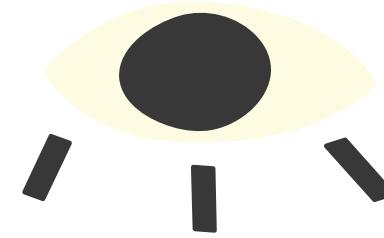
# Recommendations

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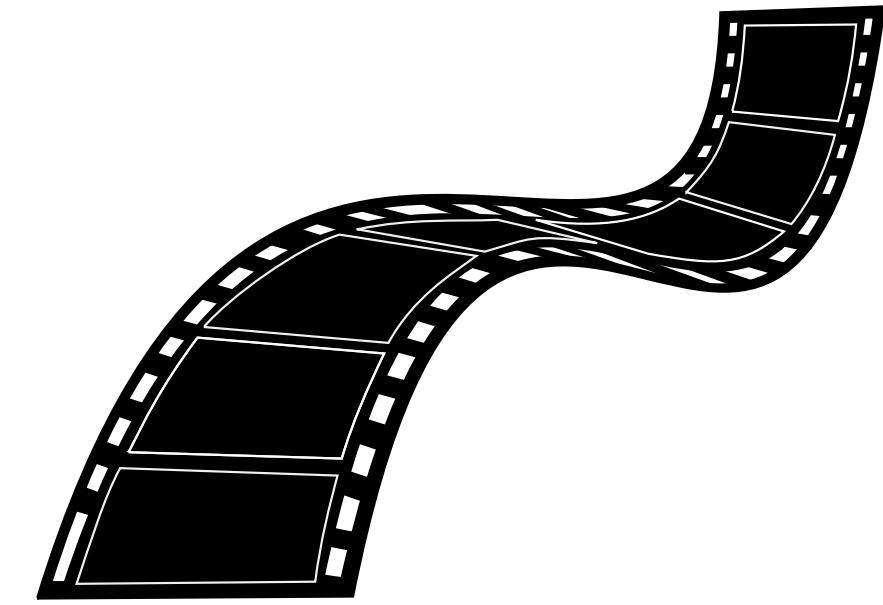
## Transparency

Suspects should be straightforward whether they are armed or not, and take measures to unarm themselves quickly.



## Reduce Threats

Suspects should disarm themselves and not flee in order to scale down the situation.



## Body Cameras

Body cameras can reduce confusion about police and use of justified force. With a video recording, everyone can be held accountable.

# **Methodology**

**There were some  
interesting things that  
came up...**

```
> summary(fatal.police.shootings.data$armed)
```

		air conditioner		air pistol
	208		1	1
Airsoft pistol	3	ax		barstool
		24		1
baseball bat	20	baseball bat and bottle	baseball bat and fireplace	poker
			1	1
baseball bat and knife	1	baton		bayonet
			6	1
BB gun	11	BB gun and vehicle		bean-bag gun
			1	1
beer bottle	3	binoculars		blunt object
			1	5
bottle	1	bow and arrow		box cutter
			1	13
brick	2	car, knife and mace		carjack
			1	1
chain	3	chain saw		chainsaw
			2	1
chair	4	claimed to be armed		contractor's level
			1	1
cordless drill	1	crossbow		crowbar
			9	5
fireworks	1	flagpole		flashlight
			1	2
garden tool	2	glass shard		grenade
			4	1
gun	3598	gun and car		gun and knife
			11	20
gun and machete		gun and sword		gun and vehicle

```
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```

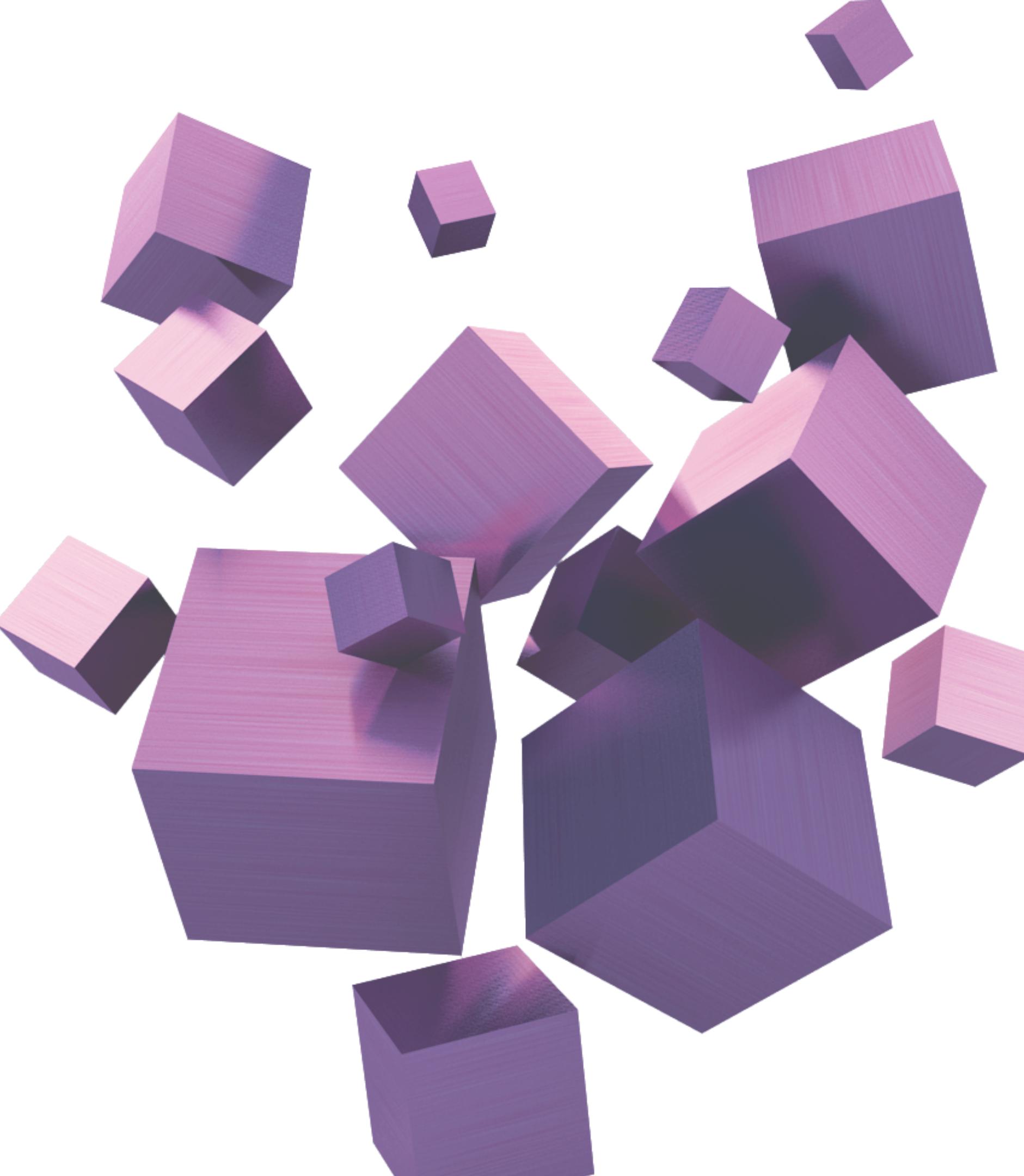
208	air conditioner	1	air pistol	1
Airsoft pistol	ax		barstool	1
3	24			
baseball bat	baseball bat and bottle	baseball bat and fireplace	poker	1
20	1			
baseball bat and knife	baton		bayonet	1
1	6			
BB gun	BB gun and vehicle		bean-bag gun	1
11	1			
beer bottle	binoculars	blunt object	5	
3	1			
bottle	bow and arrow	box cutter	13	
1	1			
brick	car, knife and mace	carjack	1	
2	1			
chain	chain saw	chainsaw	1	
3	2			
chair	claimed to be armed	contractor's level	1	
4	1			
cordless drill	crossbow	crowbar	5	
1	9			
fireworks	flagpole	flashlight	2	
1	1			
garden tool	glass shard	grenade	1	
2	4			
gun	gun and car	gun and knife	20	
3598	11			
gun and machete	gun and sword	gun and vehicle		

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3	24			
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1	1			
brick	car, knife and mace	carjack	1	
2	1			
chain	chain saw	chainsaw	1	
3	2			
chair	claimed to be armed	contractor's level	1	
4	1			
cordless drill	crossbow	crowbar	5	
1	9			
fireworks	flagpole	flashlight	2	
1	1			
garden tool	glass shard	grenade	1	
2	4			
gun	gun and car	gun and knife	20	
3598	11			
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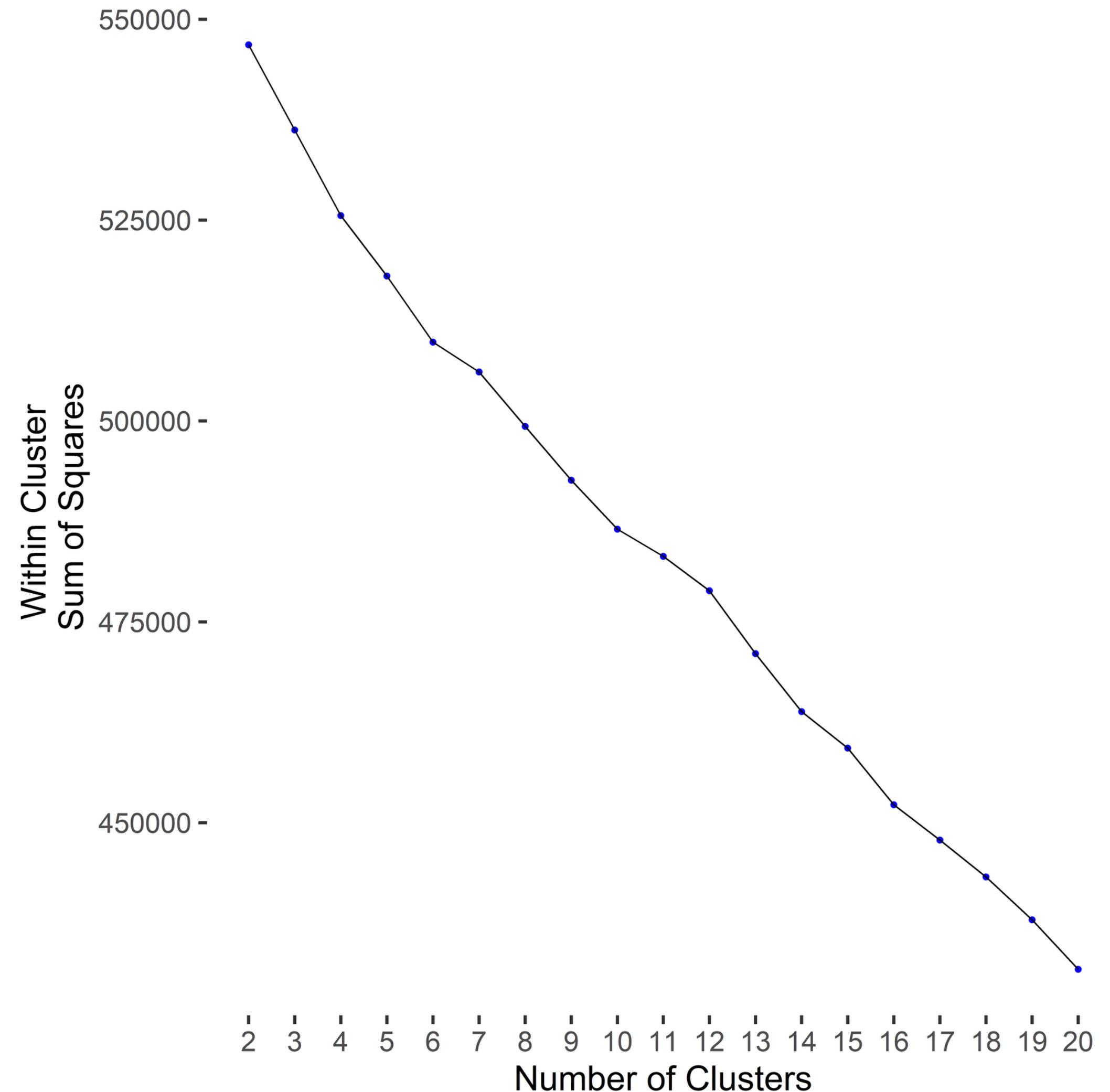
air conditioner	1	air pistol	1
ax	24	barstool	1
baseball bat	20	baseball bat and fireplace poker	1
baseball bat and knife	1	baton	6
BB gun	11	BB gun and vehicle	1
beer bottle	3	binoculars	1
bottle	1	bow and arrow	1
brick	2	car, knife and mace	1
chain	3	chain saw	2
chair	4	claimed to be armed	1
cordless drill	1	crossbow	9
fireworks	1	flagpole	1
garden tool	2	glass shard	4
gun	3598	gun and car	11
gun and machete		gun and sword	
		gun and vehicle	20
		grenade	1
		crowbar	5
		contractor's level	1
		chainsaw	1
		flashlight	2



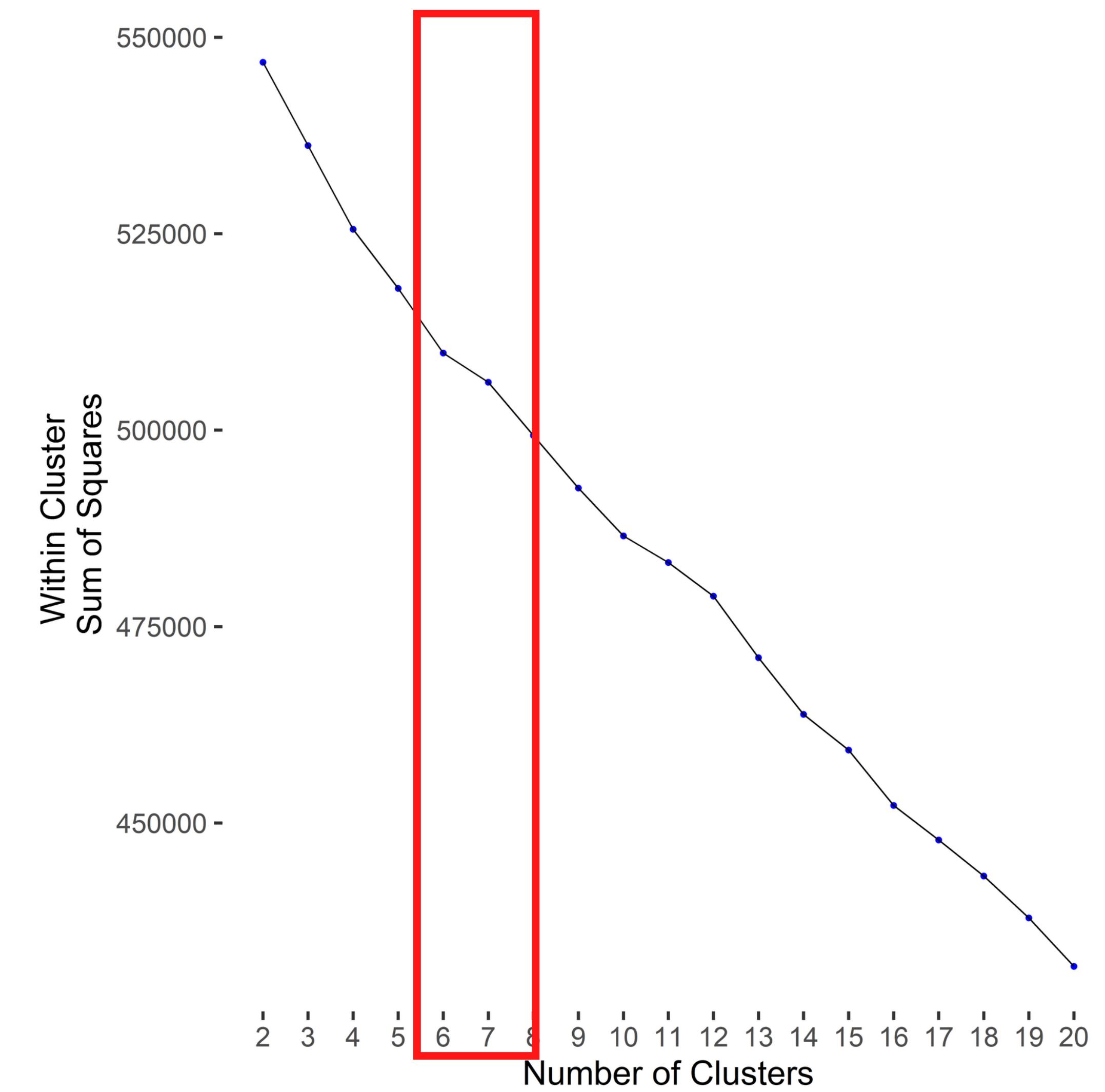
**My brain is a  
big cluster of  
stuff.**

Alexa Chung

# Number of Clusters

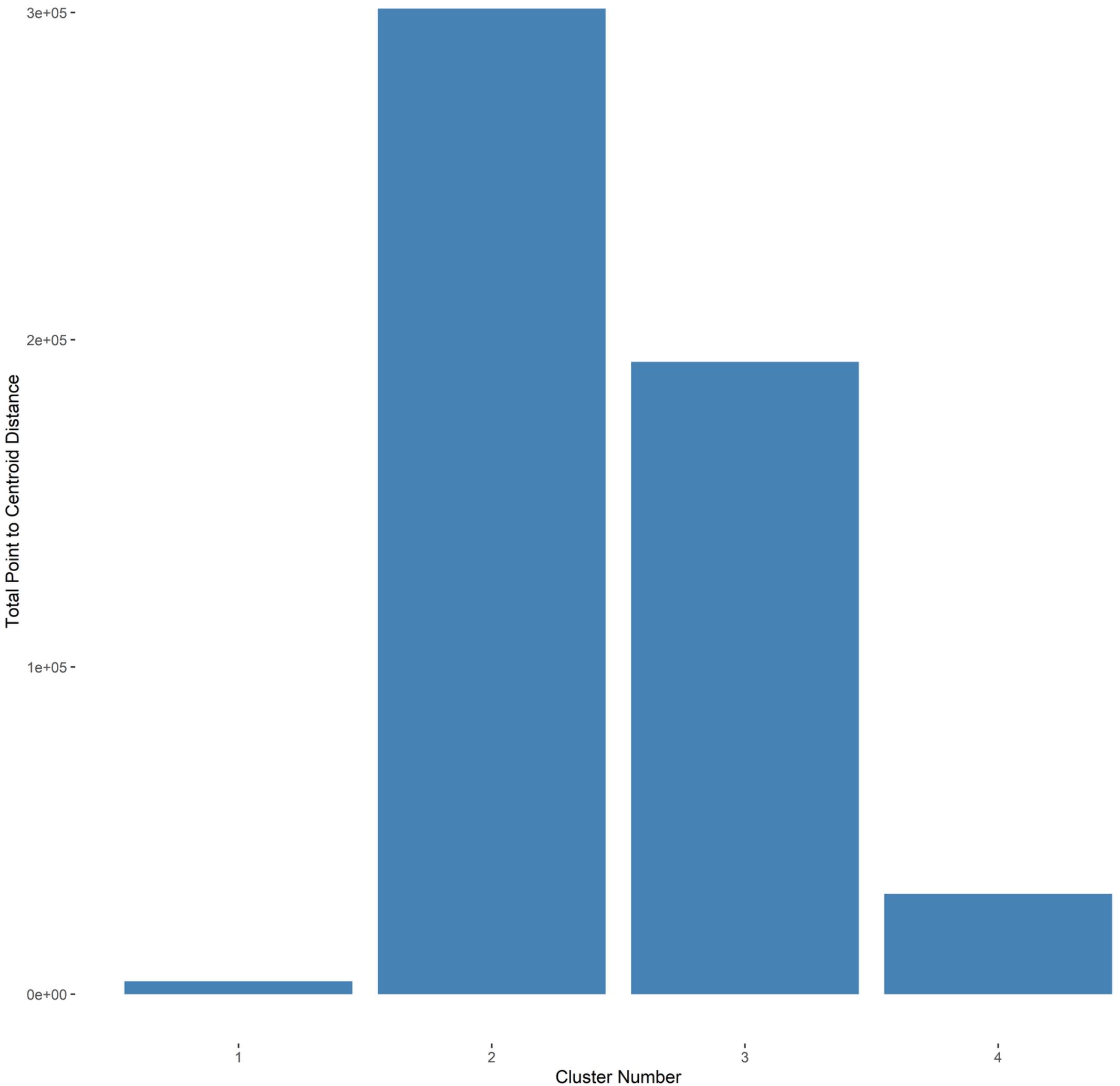


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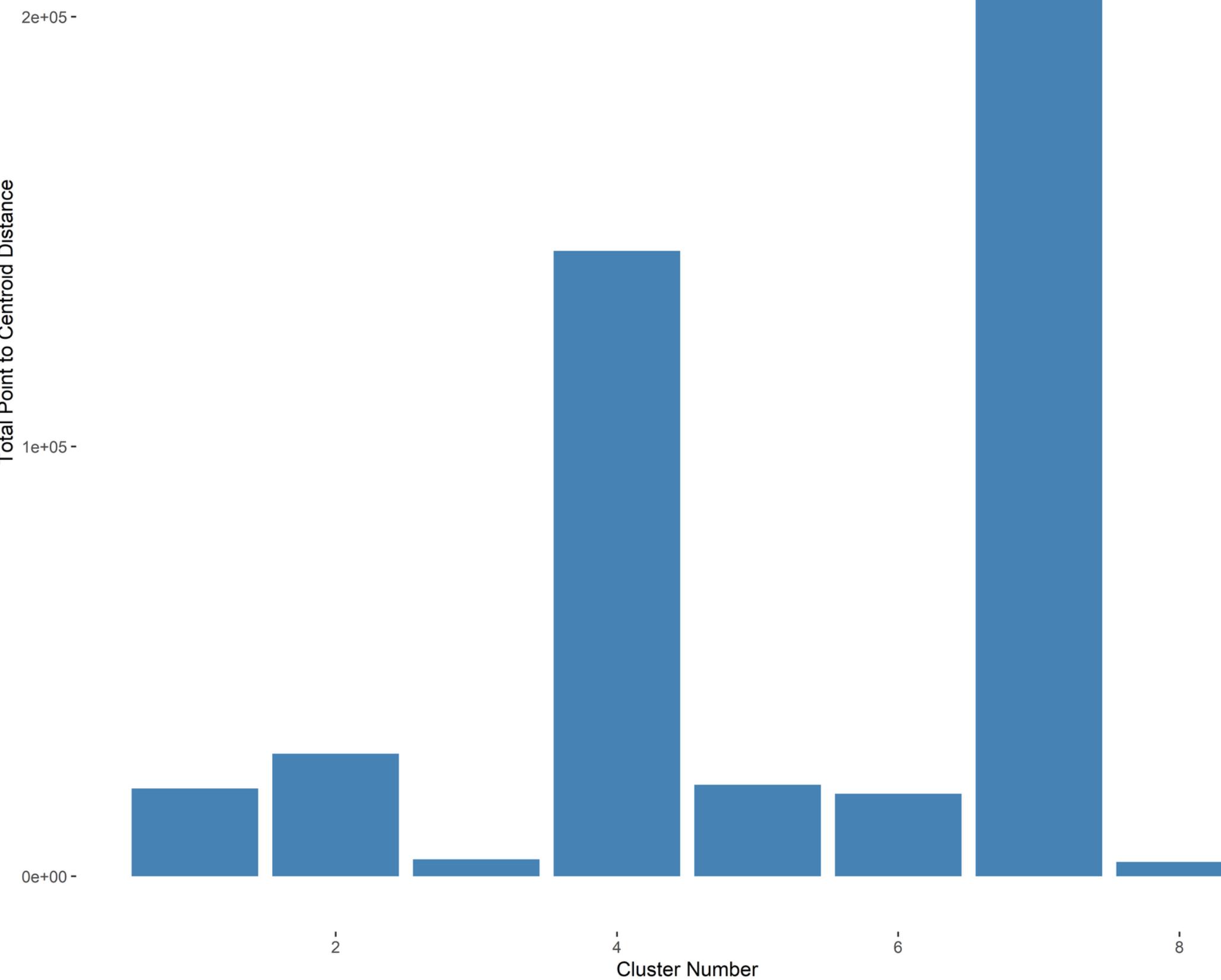
# Cluster Magnitude

$K = 4$

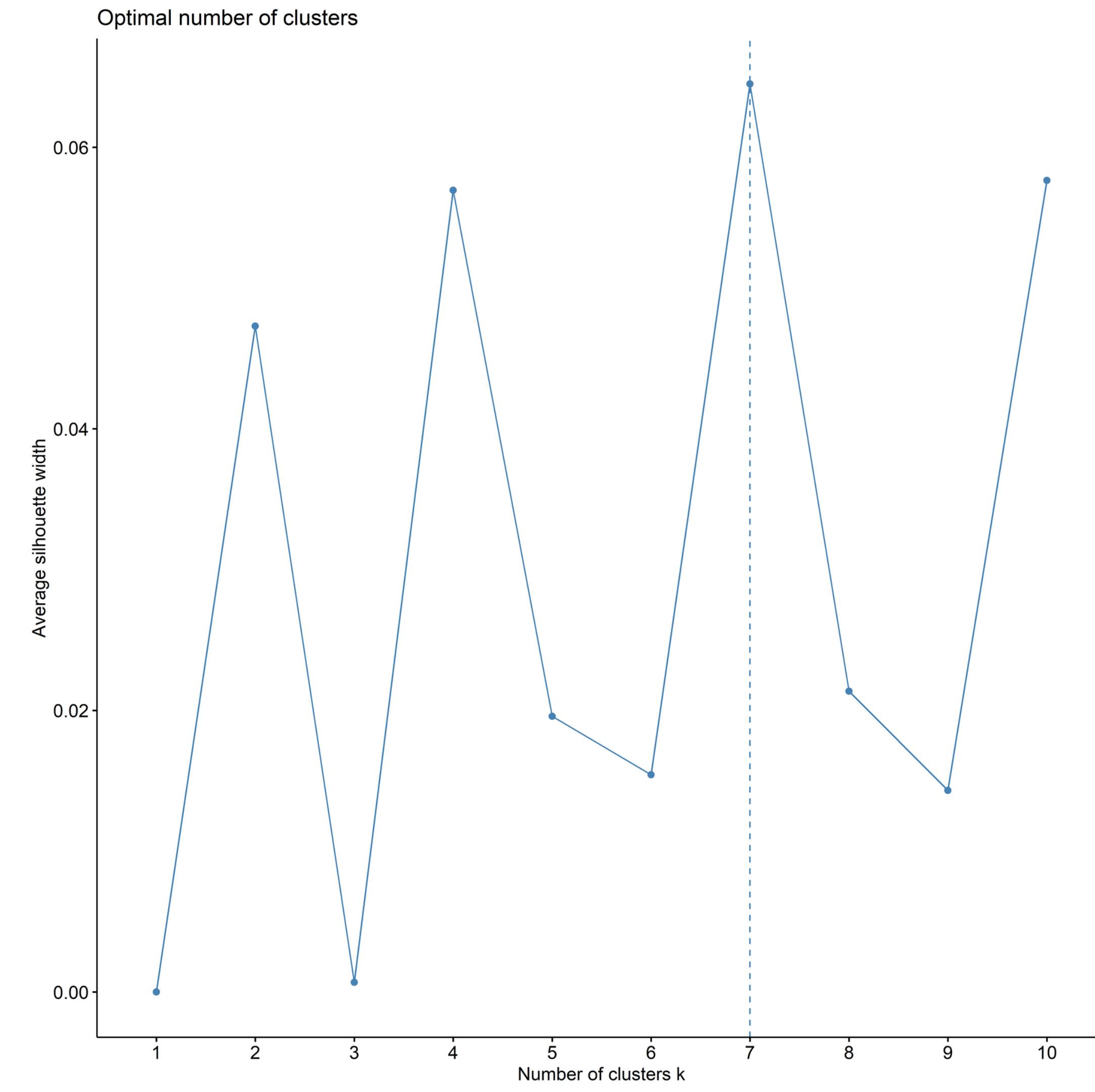


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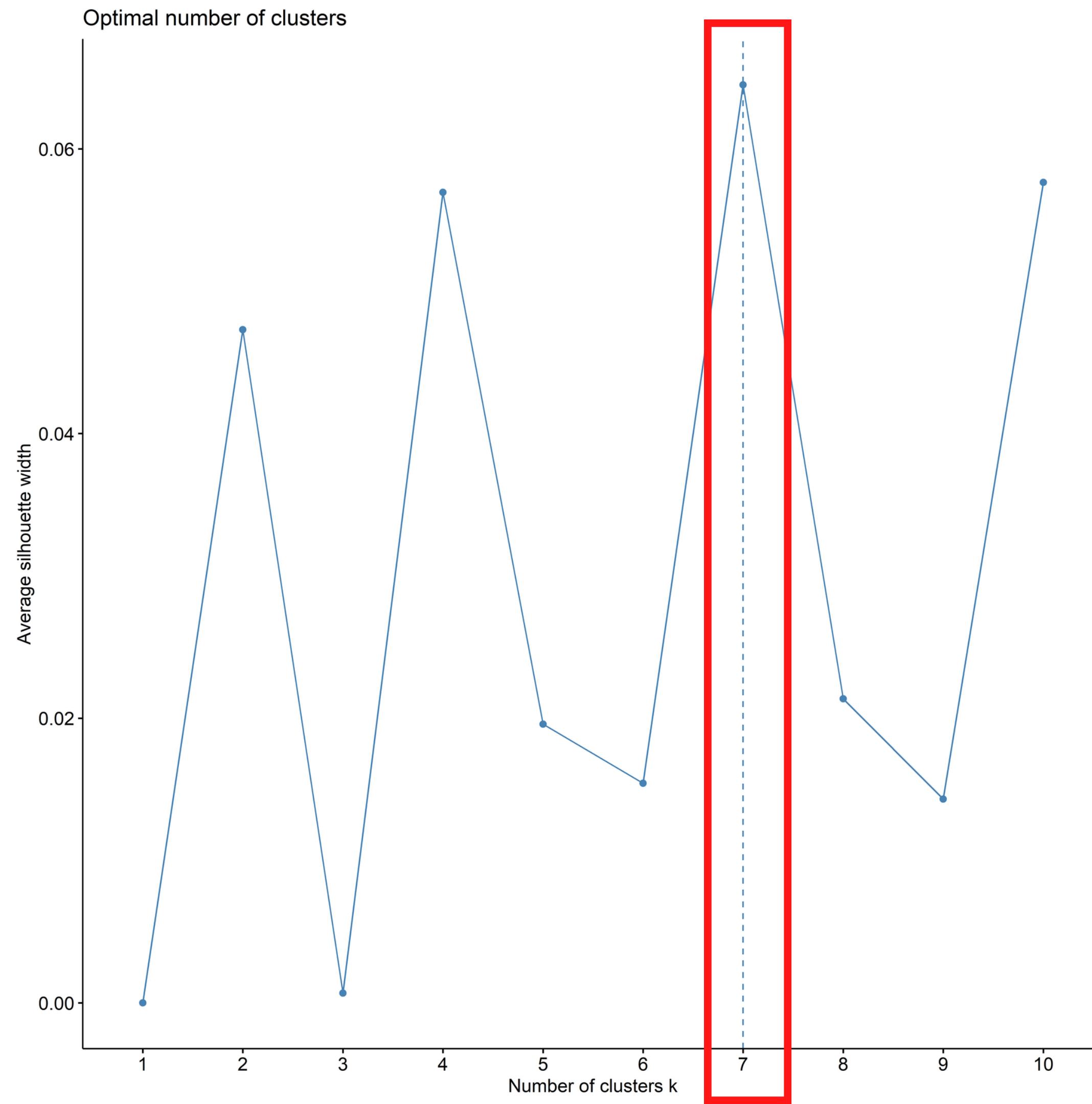
$K = 8$



# Selecting Appropriate Number of Clusters

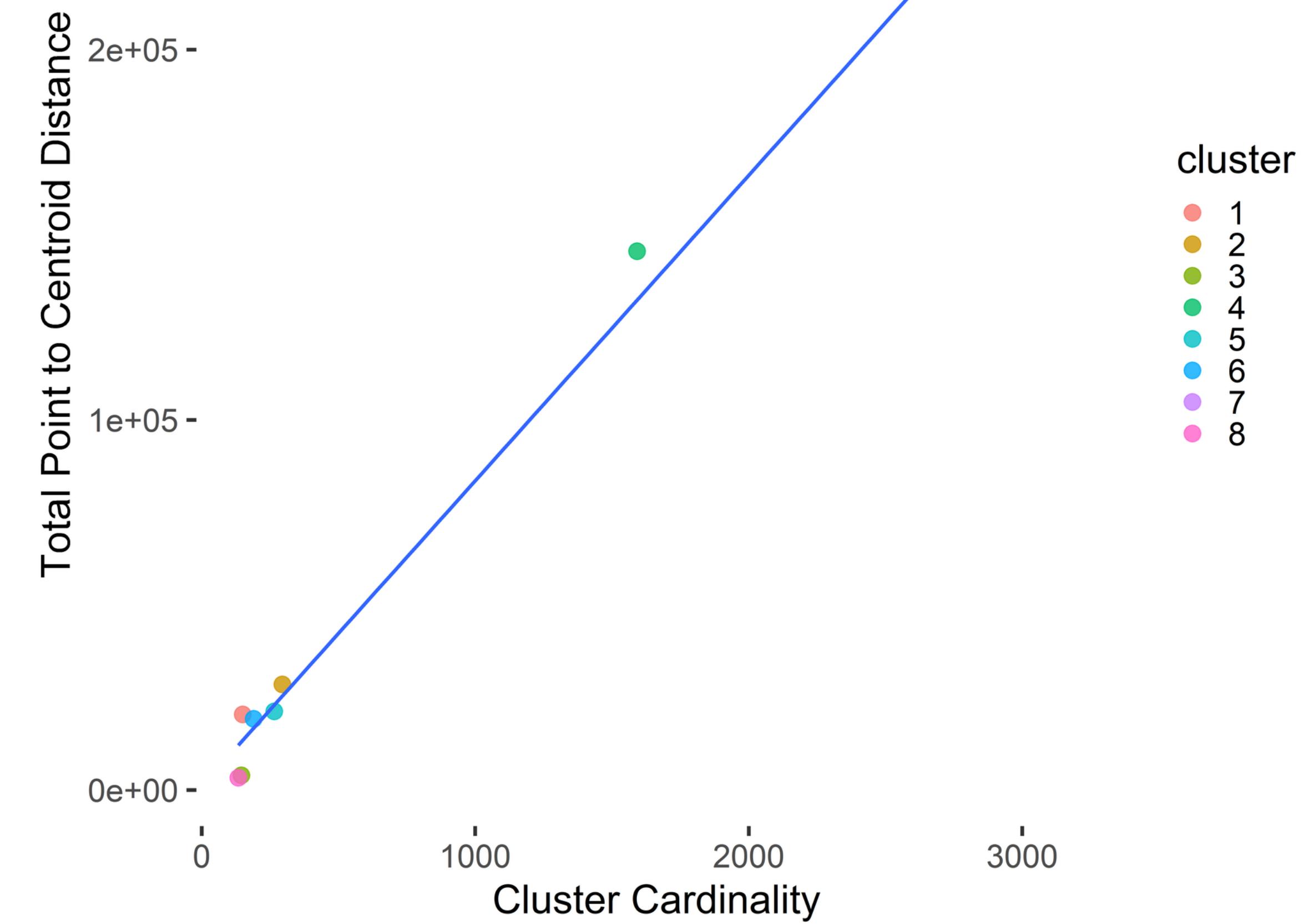


# Selecting Optimal Number of Clusters



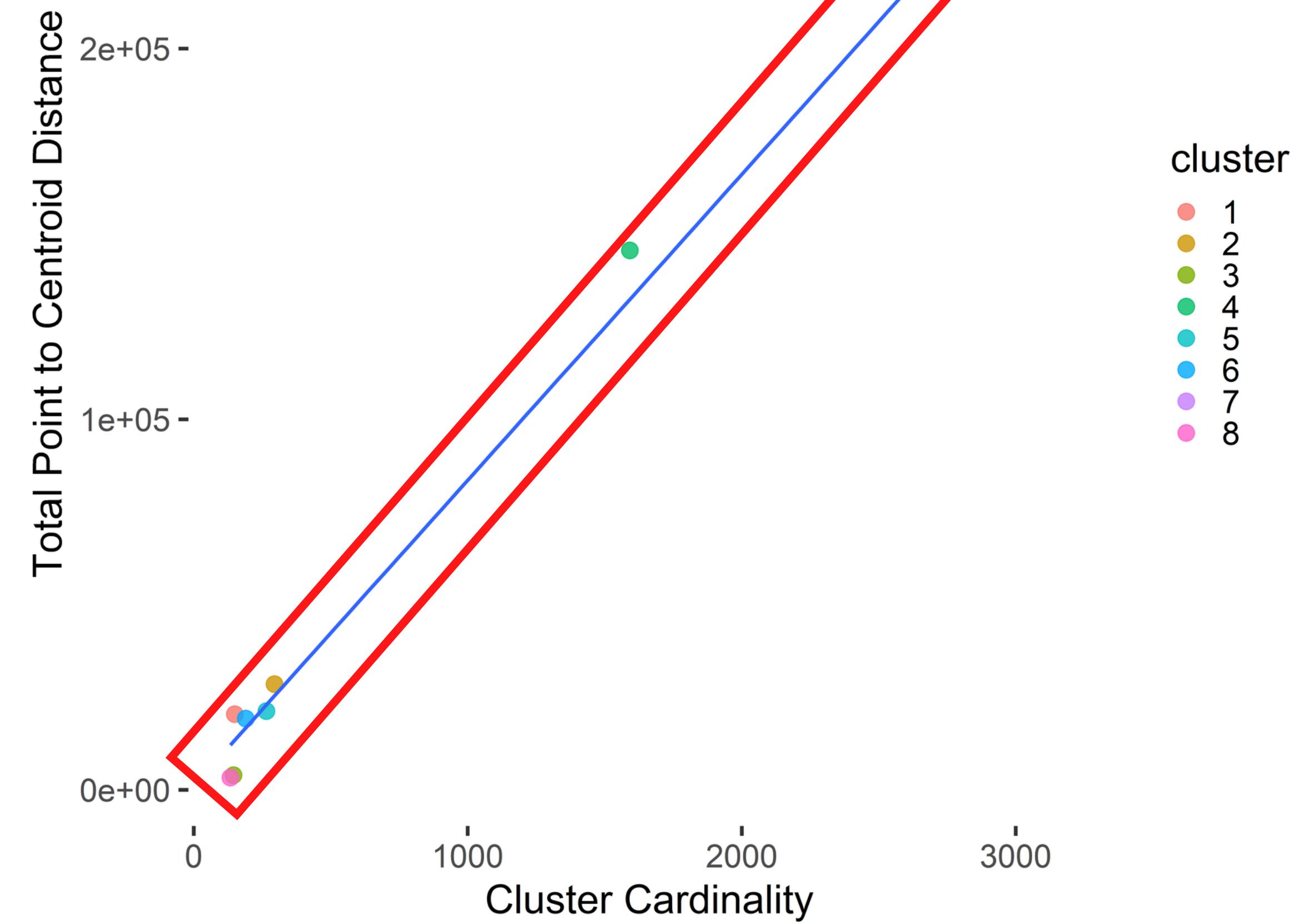
# Cluster Magnitude and Cardinality

**K = 8**



# Cluster Magnitude and Cardinality

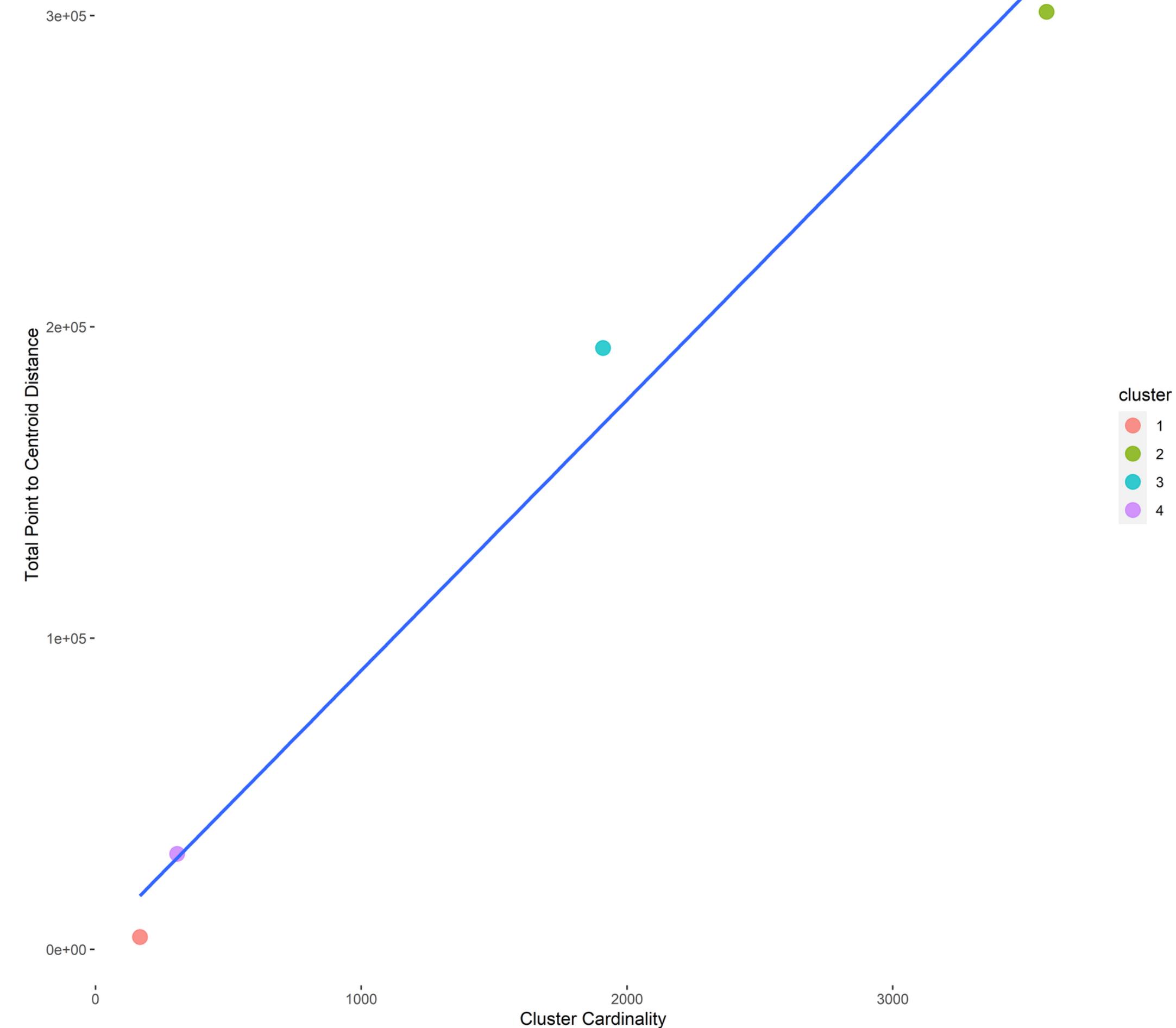
**K = 8**



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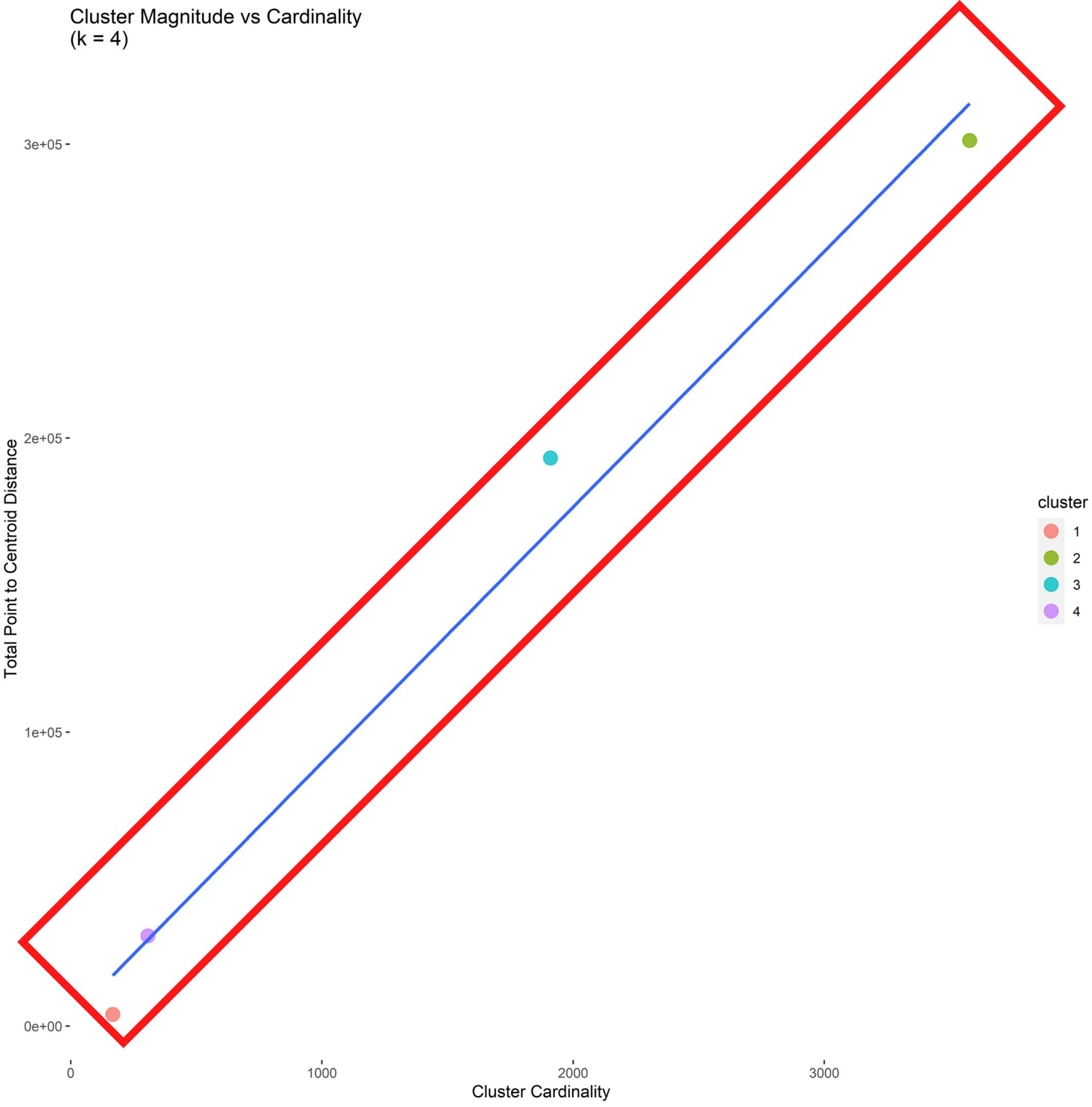
**K = 4**

Cluster Magnitude vs Cardinality  
(k = 4)



# Cluster Magnitude and Cardinality

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# **Thank You!**

# Questions?

# References

- American Psychological Association. (n.d.). What works to reduce police brutality. Monitor on Psychology. <https://www.apa.org/monitor/2020/10/cover-police-brutality>.
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