Personality Recognition on Real Persona Chat Corpus

Internship Final Presentation (July-September)

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Research Background

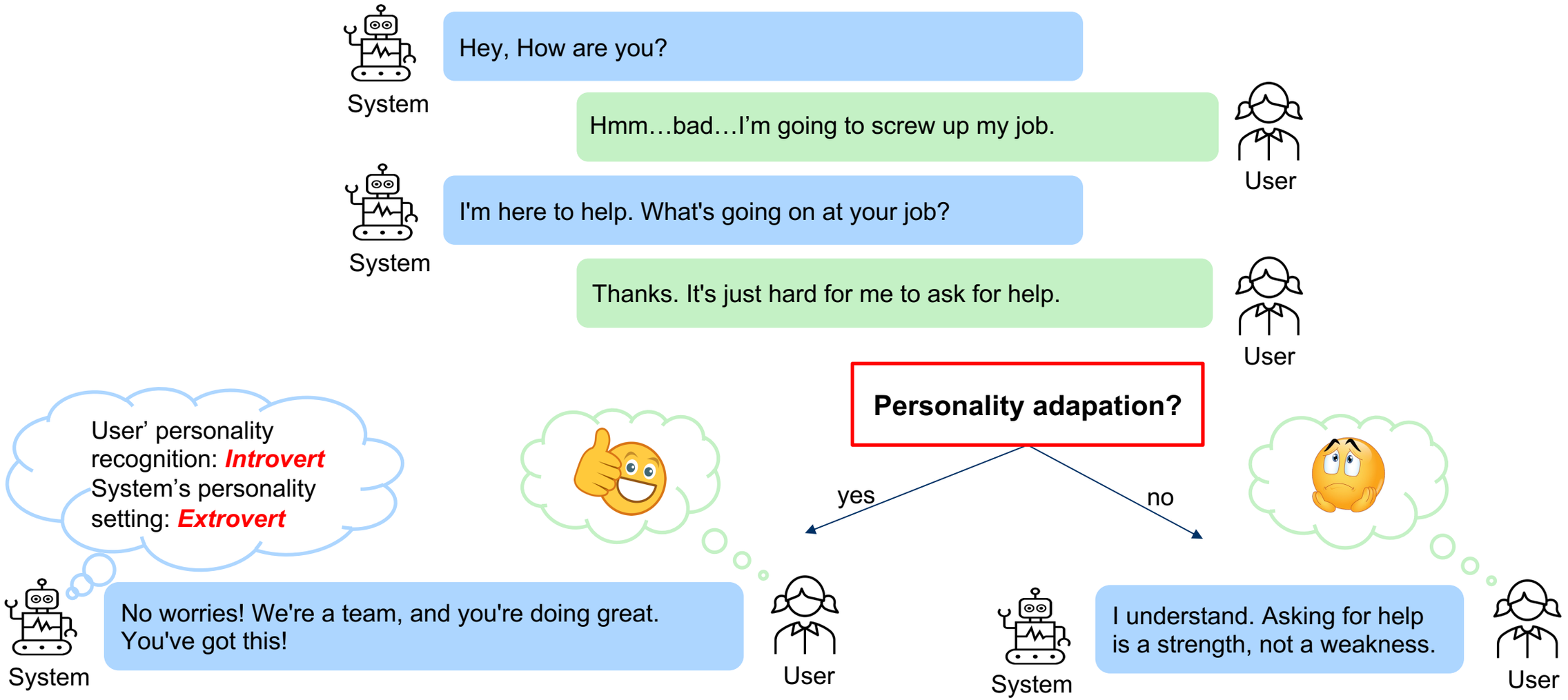
What's the personality?

The personality traits encompass enduring patterns of human ***thoughts***, ***feelings***, and ***behaviors***, which make each different from one another.

Fig: https://www.verywellmind.com/what-is-personality-2795416

Research Background

Why personality recognition in coversation?



Research Background

What are the types of personality?

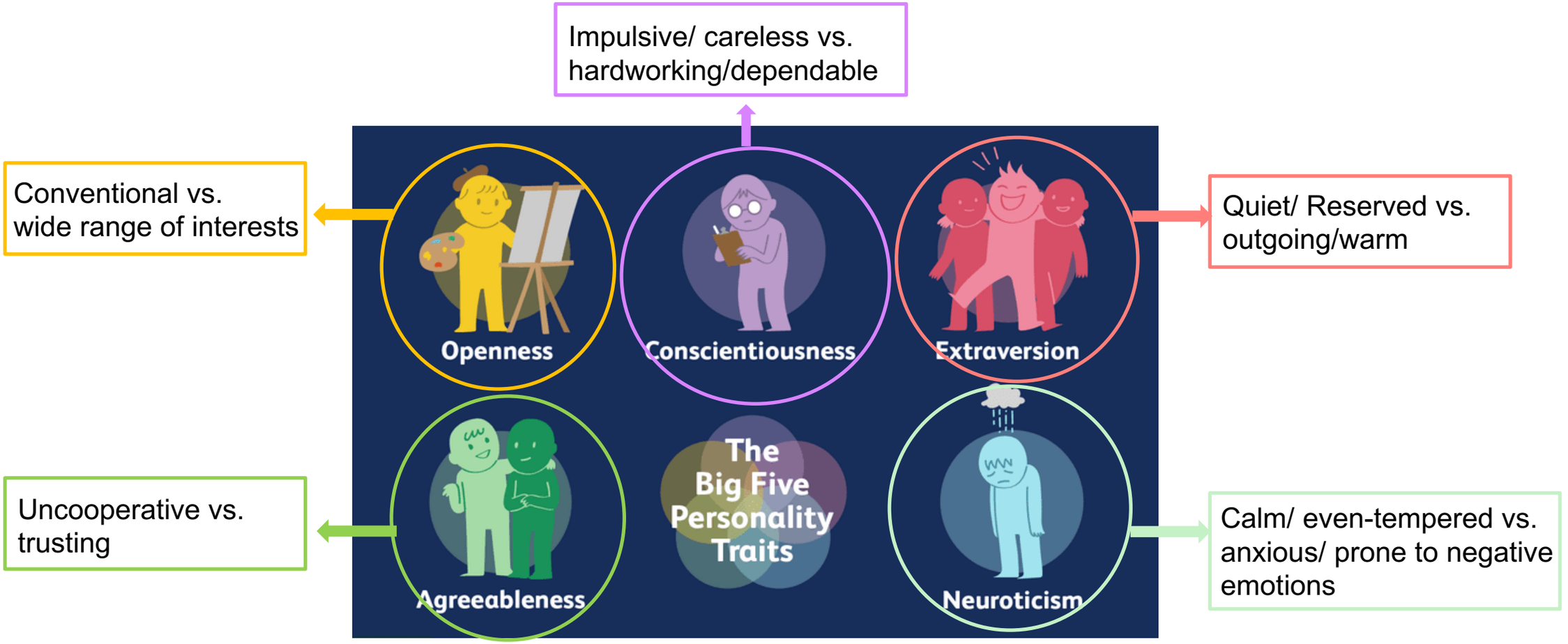


Fig: https://www.verywellmind.com/what-is-personality-2795416

Research Background

How does personality be expressed in conversation?

Expression of personality is decided by person's **inherent personality traits (monologue)** and influenced by the interlocutor (dialogue).

A: 絵日記が一番つらかった！(the picture diary was ***the most challenging***!)

B: 毎日書かなきゃいけないという。(you had to write it every day.)

A: そうそう。それを溜め込んでしまうと、悲惨でした。(Yeah, that's right. It was ***miserable*** when I let it pile up.)

B: 数日前のことですら覚えてないですもんね。(you can't even remember what happened a few days ago)

A: 毎日、朝ごはんに何を食べたとか、そういうことしか書かなかった気がします。(I think I only wrote about what I had for breakfast every day.)

B: 朝ご飯を書いていたんですね、かわいらしい。(You wrote about breakfast, how cute.)

A: いやいや、ちゃんと毎日書くべきでした！(***No no***, I should have been writing every day properly!)

Neuroticism score:
A 6.67
B 4.42

Neuroticism:
Easily upset/sad, nervous, ***pessimistic***, neurotic

Research Background

How does personality be expressed in conversation?

Expression of personality is decided by person's inherent personality traits (monologue) and **influenced by the interlocutor (dialogue)**.

A: 我が家は今晩はアジの南蛮漬けでした！(We had marinated horse mackerel for dinner tonight!)

B: わあ、それ大好きです！夏って感じしますね。(Wow, I ***love*** that! It feels like summer.)

A: 今日は小アジを使ったので、丸揚げにしましたよ！ (Today, I used small horse mackerel, so I fried them whole!

B: 良いですね、カルシウム満点！ (***That's great***, full of calcium!)

A: 骨まで食べれるのがいいですよねー。(Yes, it's nice to be able to eat the bones too!)

B: 羨ましいー。ご近所さんだったら、おすそ分けを奪いに行くのにー！ (I'm ***envious***! If you were my neighbor, I'd come over for a taste!)

Neuroticism score:
A 3.92
B 6.67

Neuroticism:
Easily upset/sad, nervous, pessimistic, neurotic

Experiments

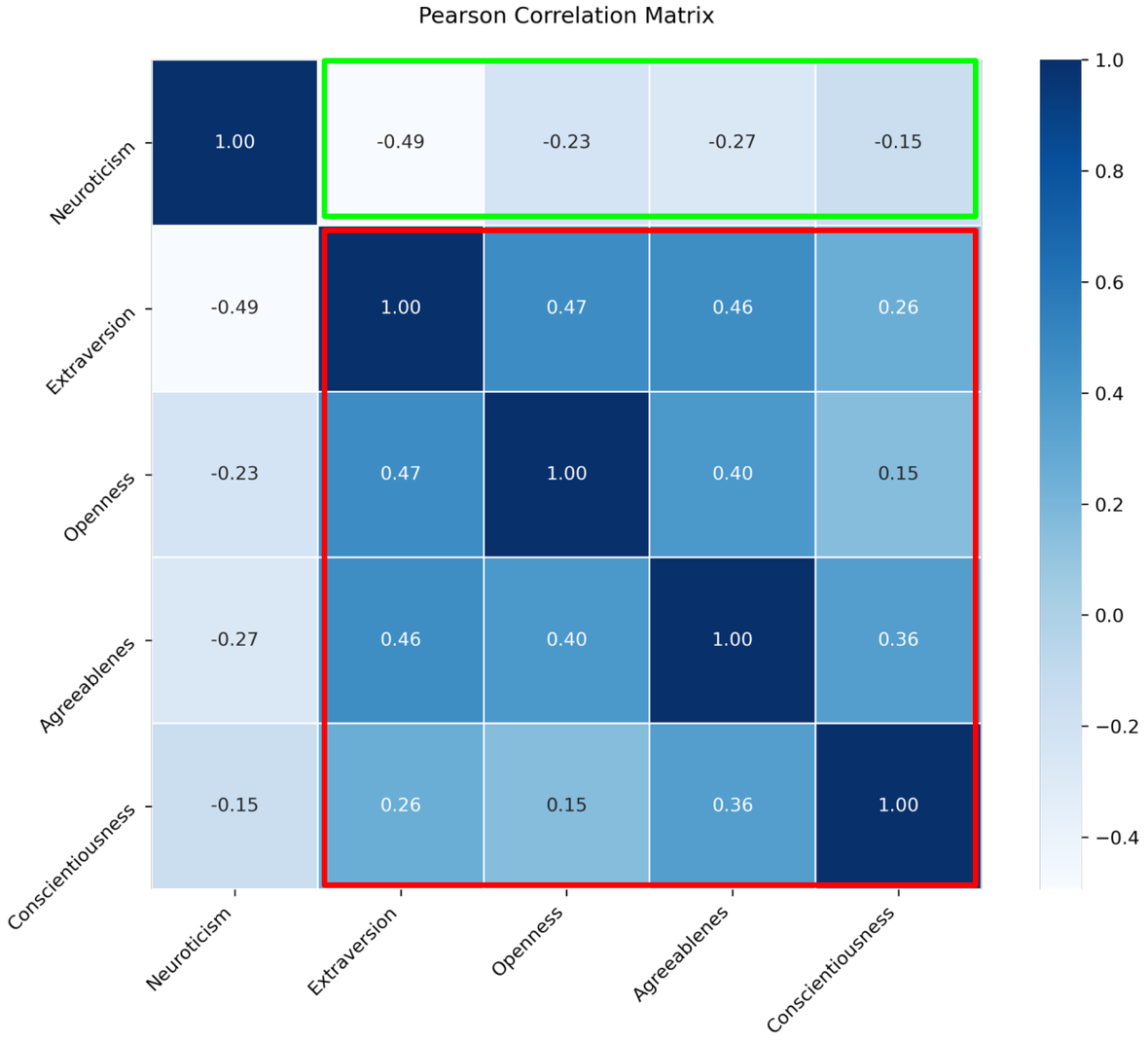
Corpus: RealPersonaChat

No. of dialogues	14,000
Dialogue length	28-49 utts. (Avg. 30.09)
No. of utterances	421,203
Utterance length	1-124 chars. (Avg. 22.92)
No. of participants (personas)	232
Language	Japanese
Personality traits	Neuroticism, Extraversion, Openness, Agreeableness, Conscientiousness (scale of 1-7)

Yamashita2023b et al. RealPersonaChat: A Realistic Persona Chat Corpus with Interlocutors' Own Personalities. Proceedings of the 37th Pacific Asia Conference on Language, Information and Computation. 2023.

Experiments

Big-5 Correlation



For all the correlation sets, *p-value*<0.05

- ❑ Neuroticism and the other four personalities show negative relations.
- ❑ Extraversion, Openness, Agreeableness, and Conscientiousness, each two sets show positive relation.

Experiments on Monologue

Experiments on big-5 classification

Threshold of low/high personality traits

Average of the train label, fine-tuning on rinna/Japanese-roberta-base.

	train (0:1)	valid (0:1)	test (0:1)	Acc. (test)	BA (test)
Neuroticism (4.29)	11605/10795	1220/1580	1555/1245	69.07	68.77
Extraversion (4.56)	11625/10775	1274/1526	1655/1145	66.71	67.85
Openness (4.53)	10135/12265	1050/1750	1750/1050	68.36	70.29
Agreeableness (4.87)	10525/11875	1120/ 1680	1545/1255	60.11	61.81
Conscientiousness (4.21)	11410/10990	1520/1280	1525/1275	64.14	64.09
Average				**65.68**	**66.56**

Experiments on big-5 classification

Threshold of low/high personality traits

Median of the train label, fine-tuning on rinna/Japanese-roberta-base.

	train (0:1)	valid (0:1)	test (0:1)	Acc. (test)	BA (test)
Neuroticism (4.25)	11195/11205	1115/1685	1545/1255	67.61	68.83
Extraversion (4.5)	10695/11705	1199/1601	1520/1280	64.61	64.50
Openness (4.75)	11110/11290	1105/1695	1810/990	74.57	72.78
Agreeableness (5.0)	11155/11245	1165/1635	1685/1115	67.18	65.59
Conscientiousness (4.17)	10775/11625	1379/1421	1365/1435	68.82	68.72
Average				**68.56**	**68.08**

Experiments on big-5 classification

Single vs multi-tasks

- ➢ Single-task: separately training five personality tasks.
- ➢ Multi-task: jointly training five personality tasks.

	Single-task		Multi-task	
	Acc.	BAcc.	Acc.	BAcc.
Neuroticism (4.25)	67.61	68.83	76.11	74.99
Extraversion (4.5)	64.61	64.50	75.68	76.73
Openness (4.75)	74.57	72.78	78.29	80.21
Agreeableness (5.0)	67.18	65.59	72.68	73.16
Conscientiousness (4.17)	68.82	68.72	73.79	73.52
Average	**68.56**	**68.08**	**75.31**	**75.72**

Experiments on big-5 classification

Results on different pre-trained models

	Acc.		BAcc.	
Models	Lr=1e-5	Lr=2e-5	Lr=1e-5	Lr=2e-5
rinna/roberta-base	-	75.31	-	75.72
microsoft/mdeberta-v3-base	74.25	43.39	74.83	0.5
xlm-roberta-base	75.19	42.89	75.21	0.5
xlm-roberta-large	78.16	-	78.17	-
studio-ousia/luke-japanese-base	**80.18**	-	79.60	-
studio-ousia/luke-japanese-large	79.98	-	**79.76**	-
nlp-waseda/roberta-base-japanese	47.44	-	49.98	-
nlp-waseda/roberta-large-japanese	76.37	-	77.01	-

Experiments on big-5 regression

Jointly train five tasks:
Normalize the label to (0,1)
last_hidden_size (768)-->512 (relu)-->256 (relu)-->128 (relu)-->1

	rinna/ roberta-base		
	MSE	Pearsonr (p-value)	Spearmanr (p-value)
Neuroticism (4.25)	.0034	.3056 (.2498)	.3383 (.1999)
Extraversion (4.5)	.0298	.1335 (.6222)	.2197 (.4137)
Openness (4.75)	.0152	.1966 (.4656)	.3051 (.2506)
Agreeableness (5.0)	.0065	.1244 (.6461)	.2197 (.4137)
Conscientiousness (4.17)	.0048	**.4867 (.0559)**	**.5125 (.0424)**

Experiments on big-5 regression

Jointly train five tasks:
Normalize the label to (0,1)
last_hidden_size (768)-->512 (relu)-->256 (relu)-->128 (relu)-->1

	studio-ousia/luke-japanese-base		
	MSE	Pearsonr (p-value)	Spearmanr (p-value)
Neuroticism (4.25)	.0060	-.0539 (.8428)	.0208 (.9389)
Extraversion (4.5)	.0260	.1434 (.5962)	.1708 (.5270)
Openness (4.75)	.0216	.3789 (.1478)	.4027 (.1220)
Agreeableness (5.0)	.0079	.3571 (.1745)	**.4698 (.0663)**
Conscientiousness (4.17)	.0047	**.6814 (.0037)**	**.8024 (.0002)**

Experiments on Dialogue

Proposed Methods

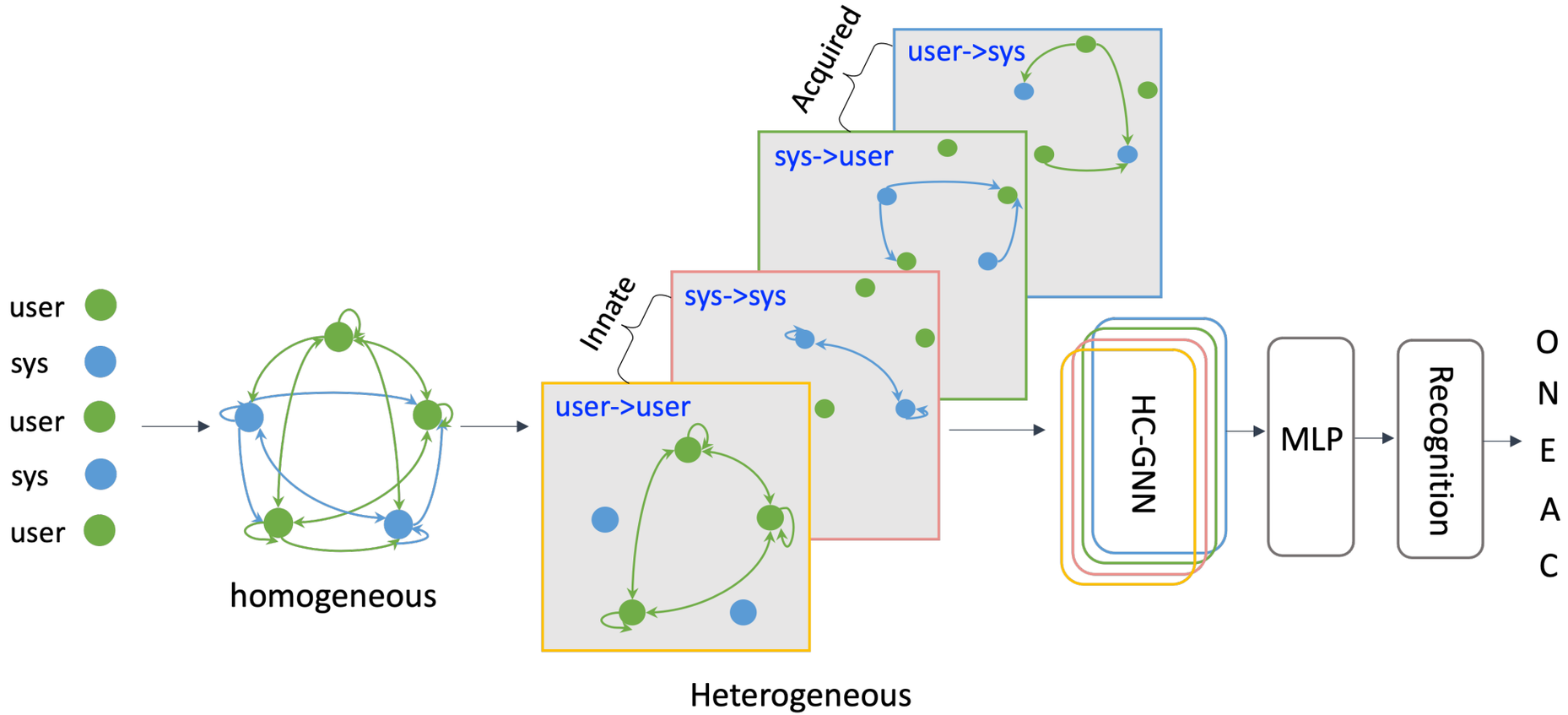


Fig. Personality Recognition by Heterogeneous Conversation Modeling Using Graph Representation. HC-GNN includes GATv2 and GCN layers.

Experiments on big-5 classification

Results on dialogue

	Acc.	BAcc.
Temporal (luke-japanese-base)	**66.91**	**66.49**
Spatial (luke-japanese-base)	57.67	57.11
Spatial (HC-GNN) (1 relation)	**67.34**	**66.18**
Spatial (HC-GNN) (2 relations)	67.66	66.88
Spatial (HC-GNN) (4 relations)	**73.63**	**72.83**

Modules in HC-GNN

	Acc.	BAcc.
Spatial (GCN) ［Kipf, T. N., & Welling, M. (2016)］	62.30	61.38
Spatial (GATv2, head=2) ［Brody et al. 2021］	66.75	66.61
Spatial (HC-GNN) (Ours)	73.63	72.83

Experiments on big-5 classification

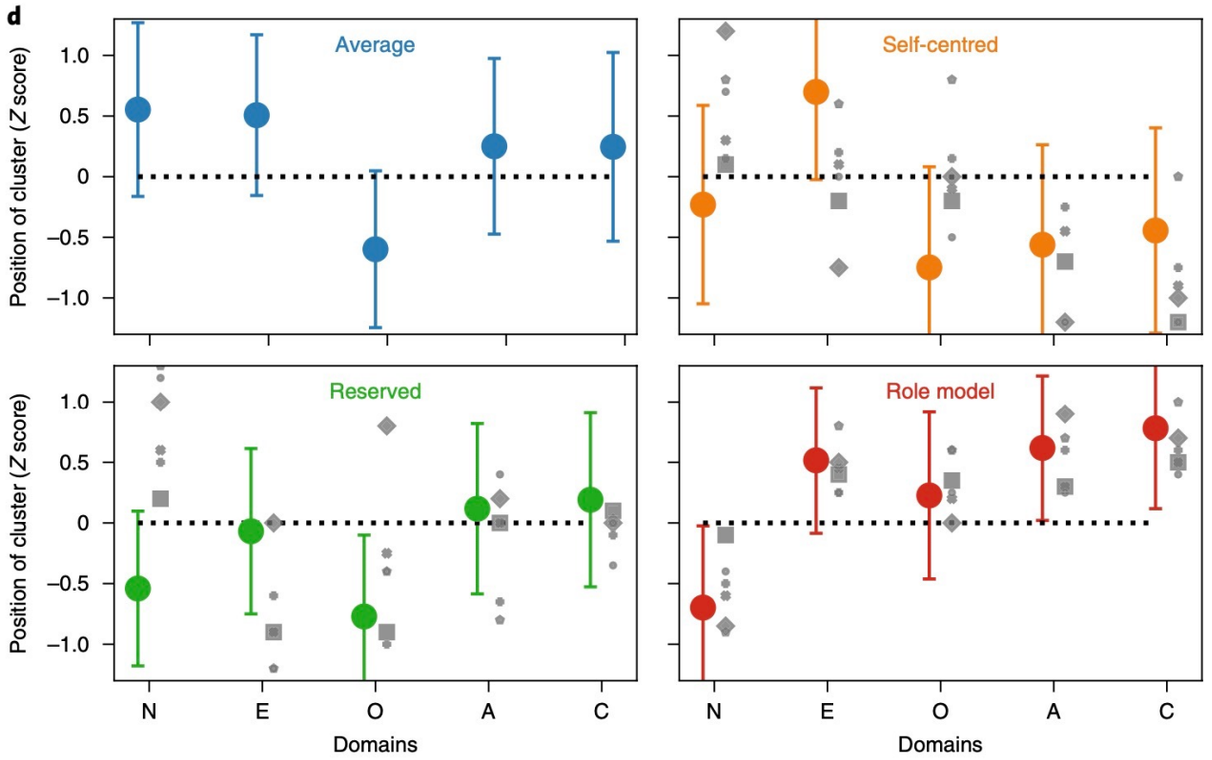
Results on monologue+dialogue

	Acc.	BAcc.
Monologue (temporal)	80.18	79.60
Dialogue (spatial, HC-GNN)	73.63	72.83
Monologue (temporal)+ Dialogue (spatial, HC-GNN)	78.13	77.65

Experiments on Character Classification

Character = a combination of big-five personality traits.
How to define?

- Martin et al. (2018) clustered person's personality into ***"Role model"***, ***"Reserverd"***, ***"Self-centered"***, ***"Average"*** based on the score on big five traits.



Martin, et al. "A robust data-driven approach identifies four personality types across four large data sets." *Nature human behaviour* 2.10 (2018): 735-742.

Experiments on Character Classification

Character = a combination of big-five personality traits.
How to define?

- Yamamoto et al. (2023) clustered person's personality into ***"Role model"***, ***"Reserverd"***, ***"Self-centered"***, ***"Introvert"*** based on the score on big five traits.

Table 2 Character and personality classes

Class name	User personality	System Character	Big Five traits				
			Em	Ex	Op	Ag	Co
Role model	○	○	Low	High	High	High	High
Reserved	○	○	Low	Low	Low	High	High
Self-centered	○		High	High	High	Low	Low
Introvert	○	○	High	Low	Low	Low	Low
Neutral (Baseline)		○	Middle	Middle	Middle	Middle	Middle

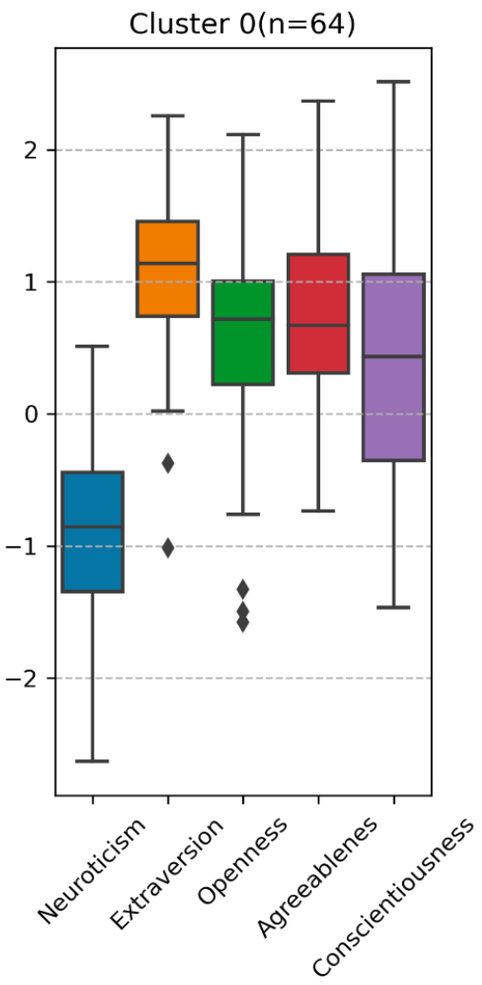
Source: Yamamoto *et al.* (2023)

Yamamoto, et al."Character adaptation of spoken dialogue systems based on user personalities" IWSDS 2023

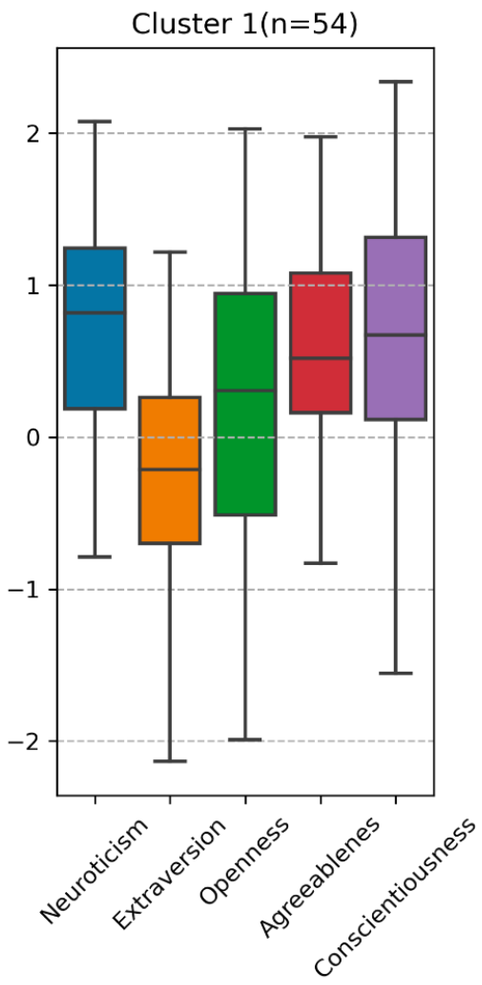
Experiments on Character Classification

- Data preprocessing: Normalized the big5 scores using the mean and standard deviation of each score.
- Clustering: K-means++, 4 classes.

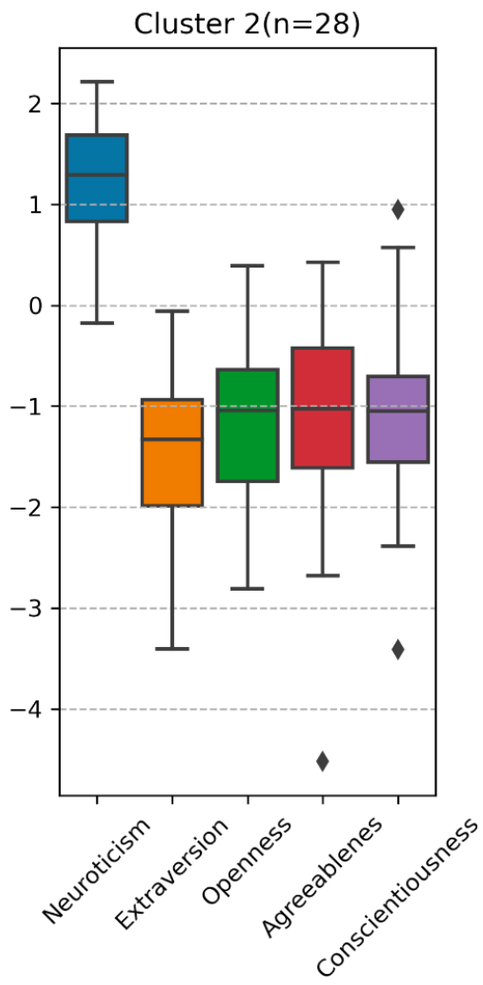
Role model



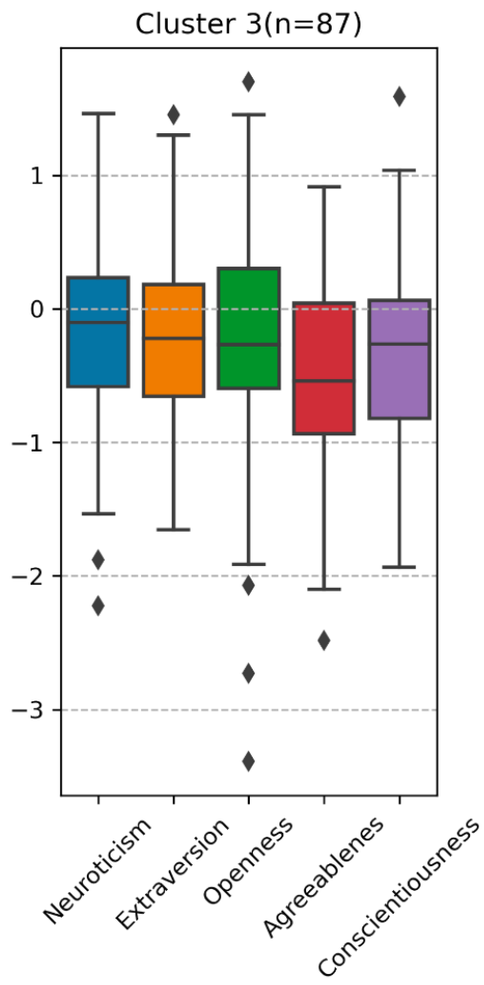
other



Introvert

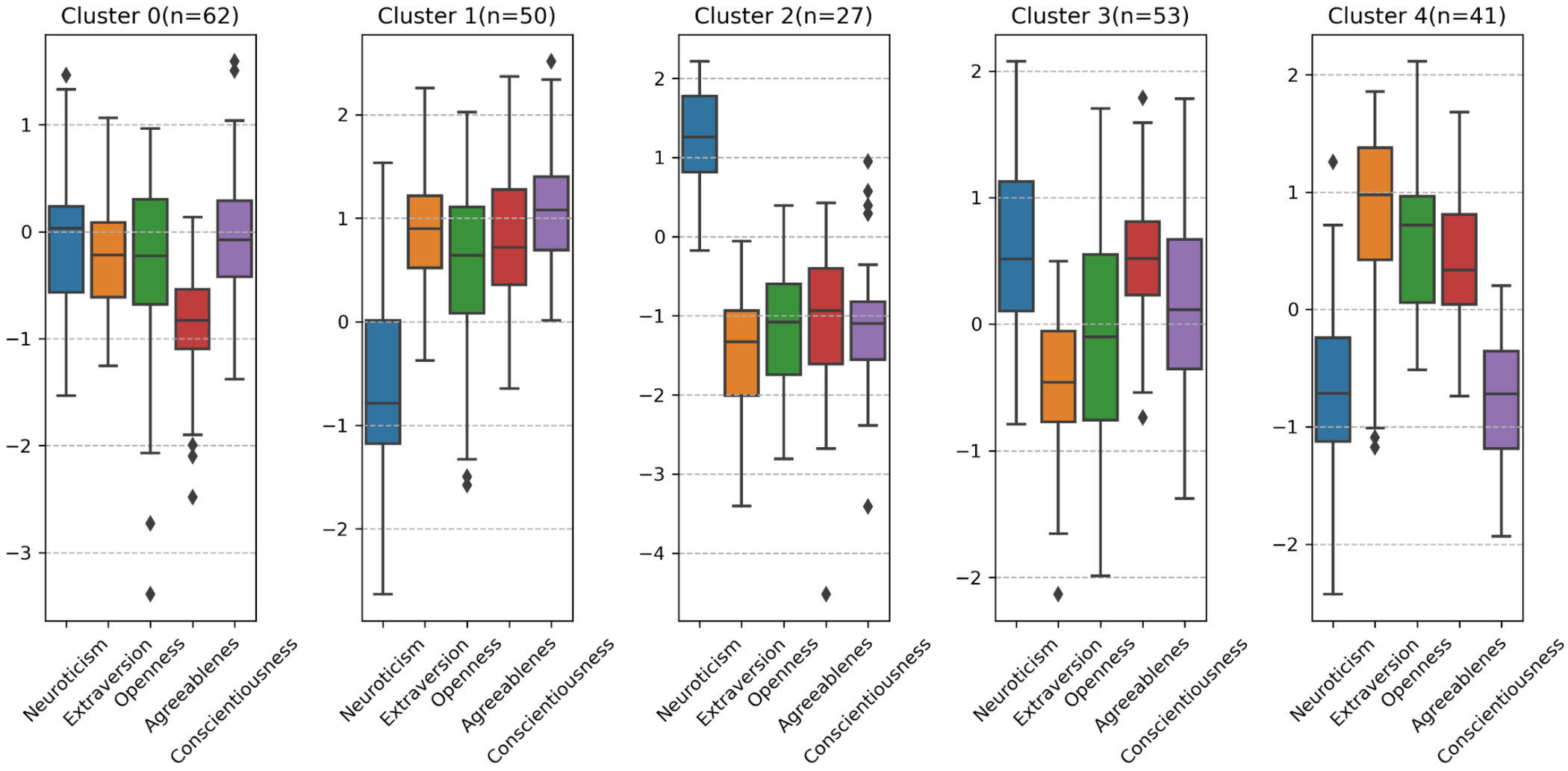


Self-centered



Experiments on Character Classification

- Data preprocessing: Normalized the big5 scores using the mean and standard deviation of each score.
- Clustering: K-means++, 5 classes.



Experiments on Character Classification

Methods		4-classes		5-classes	
		Acc.	BAcc.	Acc.	BAcc.
rinna/roberta-base	Temporal	65.11	62.23	60.50	58.36
	Spatial	58.05	56.18	56.92	55.34
	Temporal+Spatial	-	-	-	-
studio-ousia/luke-japanese-base	Temporal	63.18	62.87	62.36	59.45
	Spatial	56.53	57.28	51.44	48.07

Conclusions

1. Big Five personality traits exhibit correlations with each other, which makes them effective for coarse-grained low/high classification tasks. Although this may not hold true for fine-grained regression task.

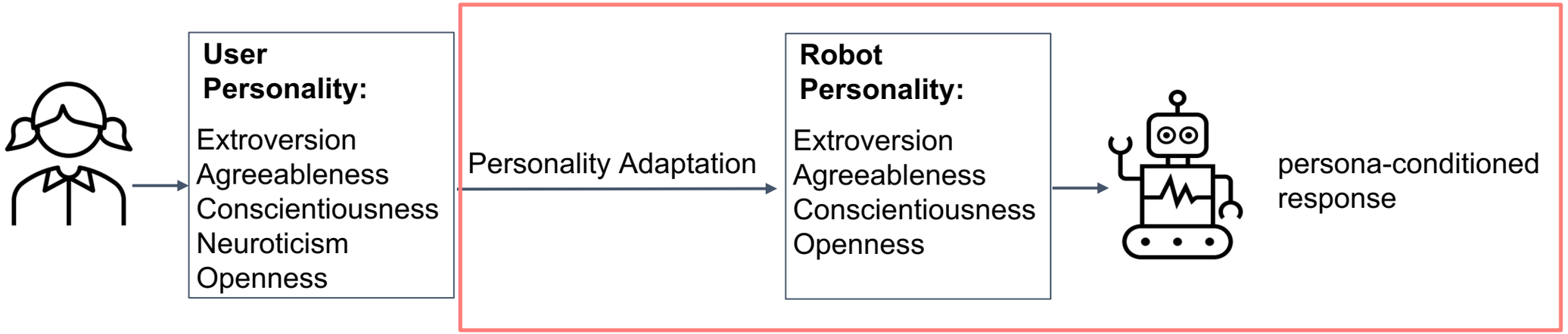
2. For personality recognition, *monologues carry more weight than dialogues*. This means that the context provided by an interlocutor has a limited influence on a person's personality.

3. In the context of personality recognition during dialogues, our *proposed HC-GNN (spatial-based)* method *outperforms the temporal-based* approach.

4. Classifying a user's character remains a challenging task, and there is a need to explore precise methods for clustering the Big Five personality traits into distinct character classes.

Future Work

1. Better method to fuse spatial and temporal features.
2. Testing HC-GNN on monologue.
3. Personality adaptable system, specific to user's personality and needs (empathy, sympathy etc.)



rinna

Thanks for your attention!

Q&A