How Personality Influences Users' Needs for Recommendation Diversity?

香港浸會大學 HONG KONG BAPTIST UNIVERSITY

Li Chen[a] (lichen@comp.hkbu.edu.hk), Wen Wu[a,b], Liang He[b]

[a] Department of Computer Science, Hong Kong Baptist University, Hong Kong

[b] Department of Computer Science and Technology, East China Normal University, Shanghai, China

Motivation

Diversity-driven recommender system: users might be interested in exploring a larger range of items, instead of too similar ones.

Research question: *would users' personality have big impact on their preference over the N recommendations' diversity degree?*

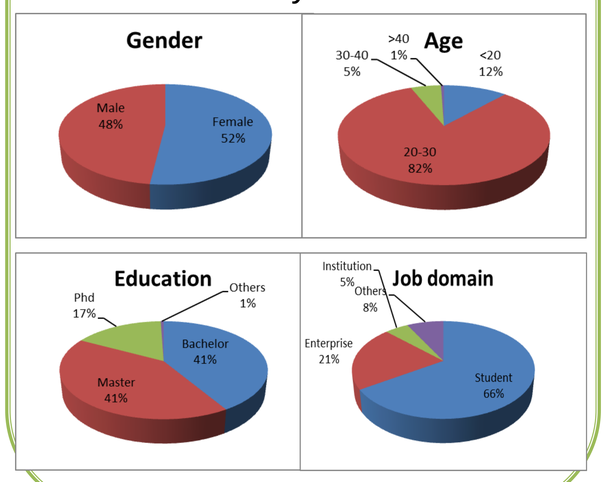
Personality

Influence

Needs for diversity in recommendations

Approach: User Survey

181 Chinese subjects took part in the online survey



Task 1: enter the demographic info and answer the personality quiz

Task 2: name ten movies that s/he recently watched and liked

Task 3: choose ten new movies that s/he is prepared to watch from Douban Movie (movie.douban.com)

Measure of Users' Personality: Big-Five Factor Model

Factor 1: *Openness* (O)
Sub-factors: Imagination (Q3); Artistic Interests (Q8); Liberalism (Q13); Adventurousness (Q18); Intellect (Q23).
Factor 2: *Conscientiousness*(C)
Sub-factors: Orderliness (Q5); Cautiousness (Q10); Self-discipline (Q15); Self-efficacy (Q20); Dutifulness (Q25).
Factor 3: *Extroversion* (E)
Sub-factors: Gregariousness (Q2); Cheerfulness (Q7); Assertiveness (Q12); Friendliness (Q17); Excitement-Seeking (Q22).
Factor 4: *Agreeableness* (A)
Sub-factors: Modesty (Q4); Altruism (Q9); Morality (Q14); Cooperation (Q19); Trust (Q24).
Factor 5: *Neuroticism* (N)
Sub-factors: Anxiety (Q1); Vulnerability (Q6); Depression (Q11); Anger (Q16); Self-Consciousness (Q21).

Trait	Description
Openness	Being curious, original, intellectual, creative, and open to new ideas.
Conscientiousness	Being organized, systematic, punctual, achievement-oriented, and dependable.
Extraversion	Being outgoing, talkative, sociable, and enjoying social situations.
Agreeableness	Being affable, tolerant, sensitive, trusting, kind, and warm.
Neuroticism	Being anxious, irritable, temperamental, and moody.

Measure of Diversity within *N* Items

For the attributes *actor* and *actress*

$$Div(actor) = \frac{2}{n(n-1)} \sum_{i=2}^{n} \sum_{j=1}^{i-1} (1 - Sim(i,j))$$

For *genre*, *director*, *country*, *release time*

$$Div(genre) = (1/(\frac{1}{m} \sum_{j=1}^{m} (2 * j - m - 1) * p(j) + \alpha)) * \frac{m}{n}$$

Overall diversity

$$OverDiv = \sum_{i=1}^{k} W_i * Div(attr_i)$$

Results

*Effect of personality factors on single attribute's diversity degree (*p<0.05 and **p<0.01)*

	Neuroticism (N)	*Extraversion (E)*	*Openness (O)*	*Agreeableness (A)*	*Conscientiousness (C)*
Div(genre)	-0.04	0.02	0.10	-0.04	-0.12
Div(director)	**0.17***	**-0.15***	0.07	-0.17	-0.16
Div(country)	0.06	-0.15	0.07	**-0.18***	**-0.15***
Div(time)	-0.08	-0.14	-0.07	-0.04	**0.15***
Div(actor)	0.09	-0.07	**0.20***	-0.10	-0.10

➔ the five personality factors are all somewhat significantly influential to users' diversity needs regarding single attribute of the movie

Effect of demographical factors on single attribute's diversity degree

	Age	*Gender*	*Education*
Div (genre)	**-0.18***	-0.13	-0.10
Div(director)	0.13	**0.24****	**-0.20****
Div(country)	-0.14	**0.23****	**-0.20****
Div(time)	-0.05	-0.12	0.06
Div(actor)	-0.01	0.10	-0.04

➔ users' demographic properties, including age, gender and education level, also produce certain effects

Correlation between users' personality/demographic factors and their selections' overall diversity

	OverDiv1	**OverDiv2**	**OverDiv3**	**OverDiv4**
Neuroticism	0.071	-0.017	0.016	0.113
Extraversion	-0.112	-0.035	-0.070	-0.135
Openness	0.057	0.065	0.069	0.086
Agreeableness	-0.137	-0.088	-0.112	**-0.177***
Conscientiousness	**-0.162***	**-0.148***	**-0.161***	**-0.192***
Age	**-0.237****	**-0.212****	**-0.214****	**-0.182***
Gender	-0.007	-0.066	-0.015	0.091
Education	**-0.152***	**-0.148***	**-0.159***	**-0.165***

OverDiv1: weight assignment {0.2, 0.2, 0.2, 0.2, 0.2}; OverDiv2: weight assignment {0.4, 0.1, 0.1, 0.2, 0.2}; OverDiv3:weight assignment {0.3, 0.1, 0.2, 0.2, 0.2}; OverDiv4: weight assignment {0.1, 0.1, 0.2, 0.3, 0.3} on the set of attributes {genre, director, country, release time, actor/actress}.

➔ no matter how the attributes' weights vary, the overall diversity is consistently significantly correlated with the personality factor ***conscientiousness***, and two demographical factors ***age*** and ***education level***

Next question: *how to develop the adaptive diversity strategy in recommender system, by meeting with individual user's spontaneous needs?*

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