論文題目　　　Applications of Machine Learning in Exploratory Approaches to Cultural Psychology

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<div align="center">学位論文の要約</div>

Chapter 1 (Introduction): Cross-cultural research in psychology has traditionally followed top-down, theory-driven approaches. This presents a bias towards Western, Educated, Industrialized, Rich, and Democratic (WEIRD) cultures, leaving a gap in the literature with many understudied populations. A data-driven exploratory approach using machine learning presents a quick and efficient method to address this problem. This thesis adopted such methods for bottom-up cultural comparisons in research areas with few prior research, the formation and derivation of novel theories of cultural difference, resolution of competing hypotheses, and efficient examination of related constructs. Specific machine learning techniques used were cross validation, Gradient Boosted Decision Trees, and Lasso regressions. The techniques presented here may be of interest to psychologists, as they offer means of model interpretation. These methods have measures to increase robustness and generalizability (such as through cross-validation), that are part of the machine learning process. This means that exploratory findings are more likely to be validated and replicated in follow-up studies. This allows us to make additional inferences on the strength and nature of relationships within the data, which aids in the conceptualization of novel theories and hypotheses. Such approaches may be highly beneficial to psychologists, and the following chapters provide demonstrations of how these methods can be used to great effect.

Chapter 2: Machine learning is increasingly used in socio-cultural psychological research, most often to identify strong relationships for a target outcome variable in an exploratory, hypothesis-blind manner. We propose that for cultural comparisons, by using cultural membership as the outcome, we can examine the magnitude of cultural differentiation and gain interpretative insight into how cultures differ. This is particularly useful for studying differences between underrepresented populations in the literature, such as within East-Asia differences. Here, we demonstrate this procedure by fitting machine learning models on Chinese, Japanese and South Korean respondents from the World Values Survey (N = 5943), and show that sizeable differences exist between these cultures (high accuracy), particularly on dimensions of power and benevolence: Chinese respondents were likely to value these dimensions more than Japanese and Korean respondents. Using these novel findings, we conducted a Study 2 to extend and test this as novel hypothesis in a separate dataset. Specifically, we examined questionnaire items from the International Social Survey Programme (ISSP) Social Networks and Social Resources (ISSP Research Group, 2019), as well as Social Inequality (ISSP Research Group, 2017) datasets, that were related to themes of power and benevolence. Overall, similar results, and boundary conditions were found. In sum, it can be concluded that such methods are able to complement existing theory-driven research in cultural psychology, and may be especially useful in studying underrepresented populations.

Chapter 3: Past research has shown that preferences for products and artifacts vary across cultures. This can be in consumption, such as the choosing of story and pictures consistent with culturally determined affect values (Tsai et al., 2007). Music is one such cultural product, and has an advantage of being a standardized way to measure cultural affordances without low-level confounds (such as differences in translation or language structures) that plague other comparisons of text-based cultural products. Furthermore, due to the recent growth of the field of music information retrieval (Dixon, Gómez, & Volk, 2018), and the prevalence of music streaming technology, huge repositories of music consumption and feature databases are available to researchers. Using a data-driven approach, we develop a theory on how danceability in music, as a cultural product, represents shared societal values by indicating collective tendencies towards anger experiences. Using Spotify API, Study 1 explored N=1.3 million songs by machine learning (gbm), and found that danceability (RVI=0.14) was higher in US than Japan, accounting for accurate classifications of song origin (US/Japan, AUC=0.83). Study 2 (N=800) showed Western Top-50 songs had higher danceability that East Asian Top-50 songs (t=7.5, p<.001). We the decided to focus on danceability features in music. Danceability measures the rhythmic salience of a song. These tend to be universally perceived as high-arousal and associated with dance activities (Savage et al., 2015; Mehr et al., 2019). Danceability in music was hypothesized to indicate the extent to which high arousal emotions (both positive and negative) were valued or experienced in various cultures. The following studies were conducted to test this hypothesis. Study 3 examined emotion terms of English lyrics from a subset of Study 2 (N=343) and found that danceability mediated culture and anger sentiment in song lyrics (B=0.03**). Study 4, a cross-culture survey (N=268), showed dance-related music listening (t=-4.5, p<.001) and high-arousal music preferences (t=-2.8, p=.006) were rated higher in US than Singapore. Study 5 analyzed songs from 60 countries (N=3000) and found frequency of negative emotion (anger) experiences positively predicted danceability of Top-50 songs across cultures. Study 6 examined individual preferences in music playlist creation across 13 countries, and found that, similar to Study 5, participant-rated preference for danceable music was predicted by country-level Spotify danceability scores and frequency of negative emotion (anger) experiences. These support our data-driven theory that danceability differs between cultures according to anger affordances.

Chapter 4: A machine-learning classifier was trained on sentiment information of two samples of Tweets with the keyword of "happiness," from Singapore and New York. On one hand, it can be hypothesized that happiness-related Tweets in New York should be more positive than happiness-related Tweets from Singapore, due to greater affordance for positive emotions in Western cultural contexts. On the other hand, happiness-related Tweets from Singapore should be more positive that that of New York, due to collectivistic face or concern for reputation and portrayal of one's public image on social media. Results showed that positively valenced words, which we argue relate to the concept of happiness, showed stronger influences on the classifier than negative words, and revealed that Singaporean Tweets were more positive than New York Tweets.

Chapter 5: It has been suggested that social withdrawal (NEET/hikikomori behavior) occurs as a result of an individual's difficulty to adapt to social norms and pressures within given cultures (marginalization), and is present in collectivistic cultures with high social pressures and expectations. Since most of the NEET-Hikikomori studies have been conducted in Japan, we examine its applicability in Singapore with the NEET/Hikikomori Risk scale. Data was collected from Singaporean university students, revealed strong convergent validity. To better understand its social and psychological context, an exploratory analysis was conducted to find associations with perceived deficits in social relationships, self-esteem and competence, as well as personality, anxiety, depression, and cultural self-construal. Consistent with previous findings in Japan, the evidence supports the risks of NEET/Hikikomori tendencies in Singapore as concurrent with cultural marginalization, perceived social rejection and low views of self.

Chapter 6 (General Discussion): In sum, machine learning proved useful in uncovering novel and useful findings in all of the separate research projects. In general, when applied to hypothesis generation, they afforded interpretative insight that spurred the creation of a novel hypothesis. In all the follow-up studies conducted, confirmations and replications of the hypotheses were generally observed. While these applications were focused in theory generation specifically for areas where few previous studies existed in the field of cultural psychology, these are by no means exhaustive, and machine may learning affords tremendous potential for furthering our understanding of human behavior in other subfields and disciplines.