A Causal Study on Understanding the Effects of Students' Study Motivation to Academic Performance

There exists a common belief that students with higher study motivations tend to perform better than students without passions on study. If a student is willing to study hard or pursue a higher education, he/she is more likely to get a good grade at school. This belief is corroborated by two K-12 teachers who were interviewed by us last year (Guo & Li, 2020); they spoke from their teaching experiences that student's motivation toward studying played a vital role in achieving their academic success. However, humans are biased, and it is likely that such a common belief is fallacious due to confirmation bias (e.g. teachers like hard working students, so they form false impressions that hardworking students perform better in study). Therefore, it is in demand to understand the causal link between student's motivations and their academic performance with quantitative methods.

In this project, we will investigate the correctness of this common belief to be casual by validating on a real dataset (Cortez & Silva, 2008) containing 649 samples collected from two Portuguese schools. We will also leverage a state-of-the-art causal inference library, DoWhy (Sharma & Kiciman), to model and evaluate causal assumptions conveniently. In specific, we will first identify confounders and create a causal model represented by directed acyclic graphs (DAGs). Next, we will leverage pre-implemented casual models by "DoWhy" to identify and estimate causes. In the end, we will evaluate the robustness of our results.

Our group is teamed by Hangzhi Guo and Lizhen Zhu. We will together research the causal models for our study. We will also analyze and evaluate the result. Hangzhi will primarily contribute to the paper writing, and Lizhen focuses on implementing causal models using "DoWhy". We will meet regularly with each other to discuss model implementations and paper writing.

Reference:

Cortez, P., & Silva, A. (2008). Using Data Mining to Predict Secondary School Student Performance. In A. Brito and J. Teixeira Eds., Proceedings of 5th FUture BUsiness TEChnology Conference (FUBUTEC 2008) pp. 5-12, ISBN 978-9077381-39-7.

Guo, H., & Li, N. (2020). Factors Impacting K-12 Teachers in Understanding Explanations of Machine Learning Model on Students' Performance. *http://acs.ist.psu.edu/ist521/example-projects/Fall2020/g8li_guo_HCI_Final_Paper%20F2020.pdf*

Sharma, A., & Kiciman, E. (2020). DoWhy: An End-to-End Library for Causal Inference. *arXiv preprint arXiv:2011.04216*.