Machine Learning and Big-Data Analytics Identify Well-being Predictors to Students' Academic Achievements Globally

Zizhong (David) Xiao & Chong Ho (Alex) Yu

- Azusa Pacific University, Department of Psychology -

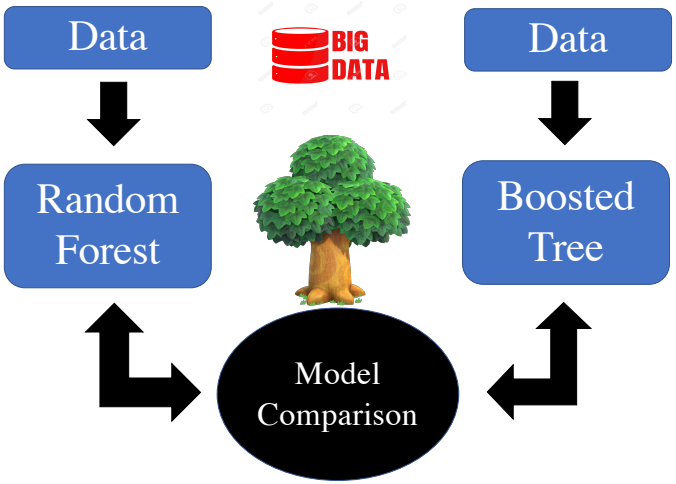
INTRODUCTION

- Well-being is related to academic achievement (e.g., Korhonen, Linnanmäki, & Aunio, 2014).
- However, past research mostly relied on **traditional statistics** (i.e., correlation, ANOVA, linear regression) on **limited samples**
- To address these gaps, we will test this relationship again using big-data analytics with a world-wide database.

METHOD

- Data downloaded from https://www.oecd.org/pisa/data/2018database/
- Only 9 countries completed the well-being section of the PISA report
  - (1) U.A.E., (2) Bulgaria, (3) Spain, (4) Georgia, (5) Hong Kong, (6) Ireland, (7) Mexico, (8) Panama, and (9) Serbia.
- Set up the ind. variable (all PISA well-being factors) and dep. variables (math and science scores) using **plausible values**
- Analytics performed in JMP

Big Data Analytics



RESULTS

Model Comparison RASE (Root Average Squared Error – Prediction Error)	
-Bagging-	-Boosting-
Math: **98.99**	Math: **101.45**
Science: **95.98**	Science: **98.38**

***Note:** RASE is the same as Root Mean Squared Error (RMSE) except that RMSE adjusts for *degrees of freedom* but RASE does not.

SOCIAL & PEER ENGAGEMENT

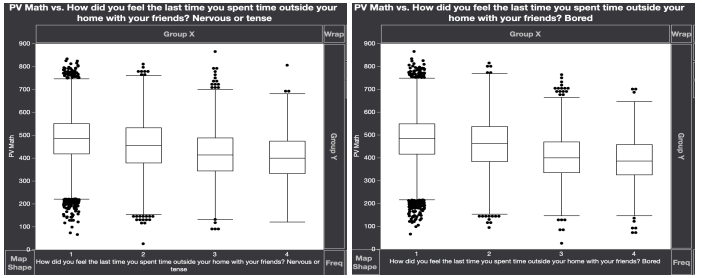
- How did you feel the last time you spent outside your home with friends. Bored? Nervous? Tense?
- Now think of the last time you had a break between classes at school. How did you feel? Nervous? Tense? Lonely?

ACADEMIC ACHIEVEMENT

- **Math Scores**
- **Science Scores**

RESULTS (cont.)

*Median Smoothing displays a **CLEAR** trend*



DISCUSSION

- **Social engagement** plays a crucial role in **academic achievement**.
- Median smoothing supports this finding
  - **Higher peer engagement -> higher academic achievement among** math and science scores
- *Bagging* and *Boosting* models do not have much distinction -> either works
  - Policy maker vs. Statistician?
- Only 9 countries completed the 2018 PISA well-being, thus cannot be attributed to ALL cultures.
- Future study can study well-being **COMBINED** with other PISA variables

For further questions, please contact Zizhong (David) Xiao at zizhongxiao17@apu.edu and visit his website at: https://zxiao003.wixsite.com/mysite