A computational approach to creativity: *Fostering success and equity in college admissions*

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Introduction

- Creativity is the ability to generate novel and useful ideas.
- Creativity can play a crucial role in college admissions as it can predict future academic success while being less biased by sociodemographic factors.
- Despite these possibilities, little empirical research has been done on the role of creativity in college admissions due to challenges in getting human creativity evaluations.
- To this end, we developed the computational metric of creativity and tested its potential benefits to foster success and equity in college admissions.

Hypothesis

- ❖ Compared to SAT…
  - Can **creativity** add additional predictive value in predicting future academic success in college?
  - Is **creativity** less biased by race/ethnicity?
  - Is **creativity** considered in college admissions?

Methods

- ❖ **Data**
  - 42,085 College Admissions Essays
    - From all applicants who applied to Georgetown
    - Between 2018 and 2022 (before ChatGPT)
    - Before the advent of ChatGPT
- ❖ **Computational Creativity Metric**
  - Three computational measures were combined to compute the computational creativity metric.
  - **Fine-tuned Large Language Models**
    - GPT-3.5-turbo / Llama-2-7b
    - Fine-tuned the model to predict the creativity of admissions essays
    - ranging from 0 (low creative) to 1 (high creative)
    - Fine-tuning data:
      - 370 human-rated essays
      - 22 creativity experts
      - Each essay was rated by 3 experts
      - Dataset split
        - Training/validation: 259 essays (70%)
        - Test: 111 essays (30%)
  - **Divergent Semantic Integration (DSI)**
    - The extent to which the meanings of the words in an essay are similar or different to each other.
    - Example
      - A **teacher** calls a **student** (Low DSI).
      - A **teacher** calls a **walrus** (High DSI).

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*Can **creativity** promote **success** and **equity** in college admissions?*

Computationally Measured Creativity Can Predict Future Academic Success at College and Is Less Biased by Race and Ethnicity.

Table 1. *Regression Analysis Predicting Future Cumulative GPAs*

	Model 1	Model 2
Predictors	β	β
Creativity	0.34 ***	0.12 ***
SAT		0.44 ***
URM		-0.09 ***
N =	4,034	3,966
R²	0.114	0.307

Note. *** p < .001. All variables were standardized. URM = The Under-Represented Minority: Black /African American, Hispanic, American Indian = 1, 0 otherwise

Table 2. *Regression Analysis Predicting the URM Status*

	Model 1	Model 2
Predictors	b	b
Creativity	-0.07 ***	-0.01 ***
SAT		-0.15 ***
N =	42,085	39,621
R²	0.029	0.139

Note. *** p < .001. All predictors were standardized. The Linear Probability Model (LPM) was used for interpretability. The Logistic regression yielded generally consistent results.

Table 3. *Regression Analysis Predicting Admission Outcomes*

	Model 1	Model 2
Predictors	b	b
Creativity	0.07 ***	0.03 ***
SAT		0.13 ***
is URM		0.13 ***
N =	42,085	39,621
R²	0.028	0.100

Note. *** p < .001. All predictors were standardized. The Linear Probability Model (LPM) was used for interpretability. The Logistic regression yielded generally consistent results. URM = The Under-Represented Minority: Black/African American, Hispanic, American Indian = 1, 0 otherwise

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Standardized Test Scores

- ❖ **Standardized Test Scores**
  - SAT
  - ACT scores were converted to SAT as the majority of applicants submitted SAT scores.
- ❖ **Dependent Variables**
  1. Cumulative GPAs
  2. Race/ethnicity
     The Under-Represented Minority (the **URM**) Black/African/Hispanic/American Indian = 1, 0 otherwise
  3. Admission Outcome;
     Accepted = 1; rejected = 0

Results

- ❖ **Computational Creativity Metric Validation**
- In the test dataset, we found a strong correlation between computational creativity metric and human experts' ratings ($r = 0.85$, p < .001)

Figure 1. *The Relationship Between Computational Creativity Metric and Human Ratings*
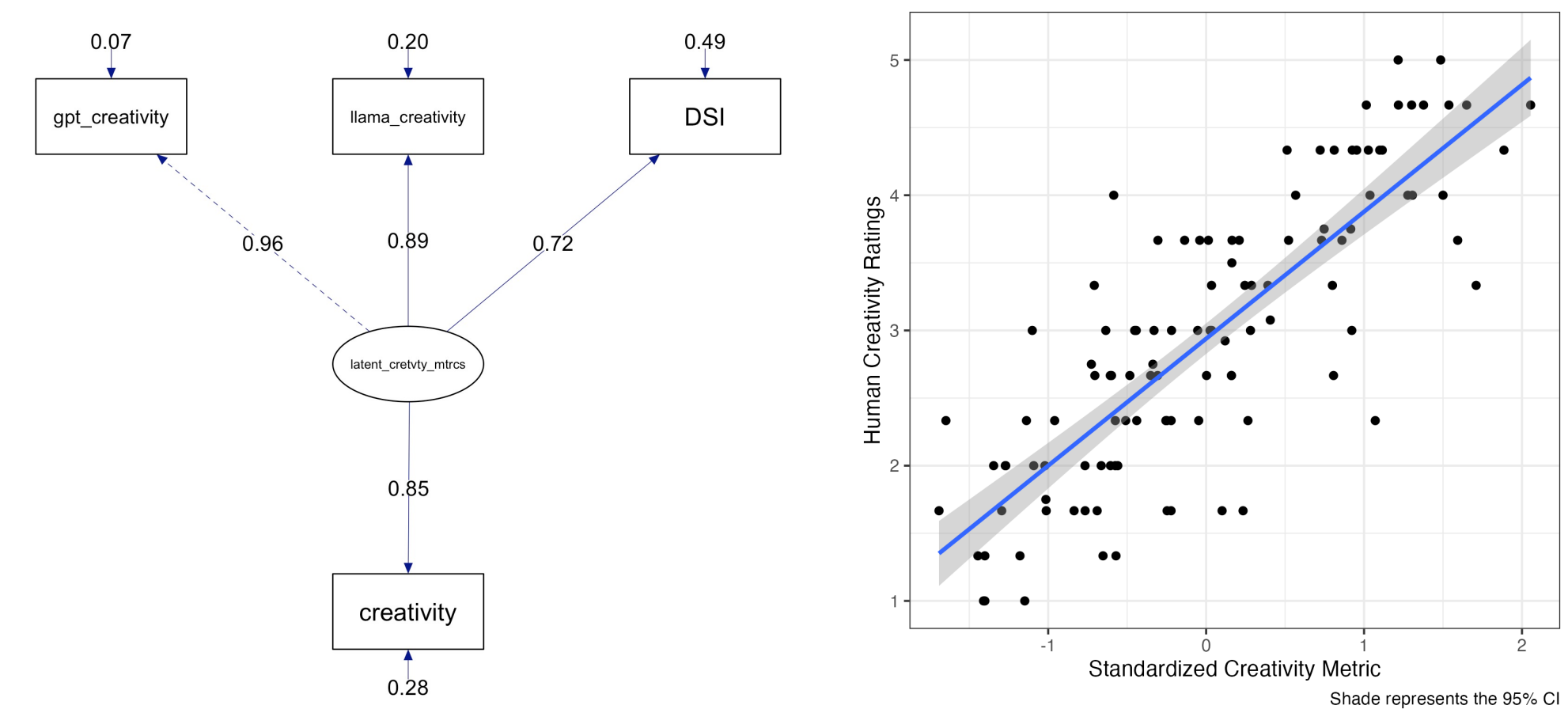
- ❖ **Future Academic Success**
  - Creativity positively predicted future cumulative GPAs at college after controlling for SAT and the URM status (see Table 1).
- ❖ **Race and Ethnicity**
  - Each 1 SD increase in SAT scores was associated with a 15% lower chance of being a URM, compared to just a 1% decrease for creativity. (see Table 2).
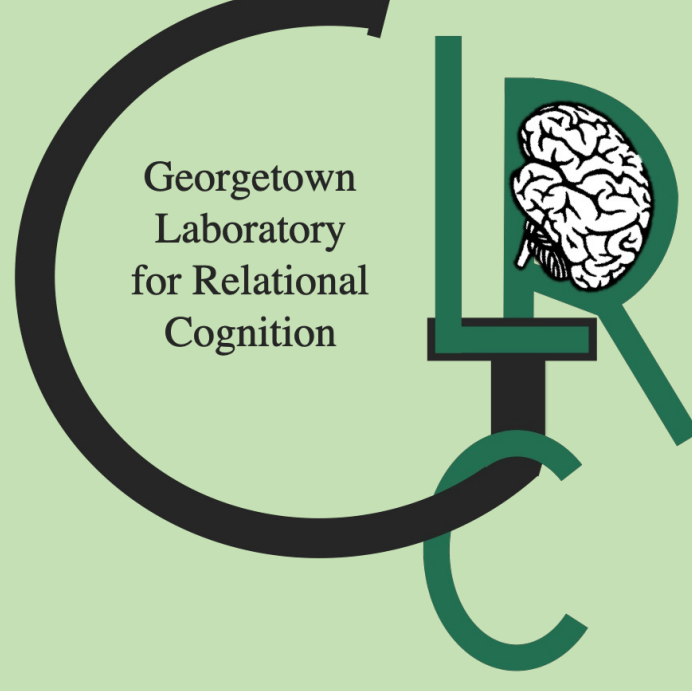- ❖ **Admission Outcomes**
  - Each 1 SD increase in SAT scores was associated with a 13% higher chance of being accepted, compared to just a 3% increase for creativity. (see Table 3).

Conclusion

- Creativity is an important predictor of college success.
- Creativity is less associated with race/ethnicity than SAT. This finding is particularly important considering the recent US Supreme Court decision on Affirmative Action saying that colleges should stop considering race/ethnicity in their admissions.
- Yet, creativity may not have been adequately considered in college admissions.
- Overall, our findings highlight that incorporating creativity into college admissions can contribute to promoting students' success and diversity while reducing disparity in higher education.