



# Does ChatGPT Promote or Hinder Human Creativity? An Empirical Comparison of Human and ChatGPT Creativity

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## Introduction

- Large Language Models (LLMs) like ChatGPT may enhance creativity but also raise concerns about a “**homogenizing effect**” – reducing idea diversity across groups of people who use the same AI model.
- We explored this phenomenon by comparing creativity reflected in human-written and AI-generated college admission essays at both individual and aggregated levels.

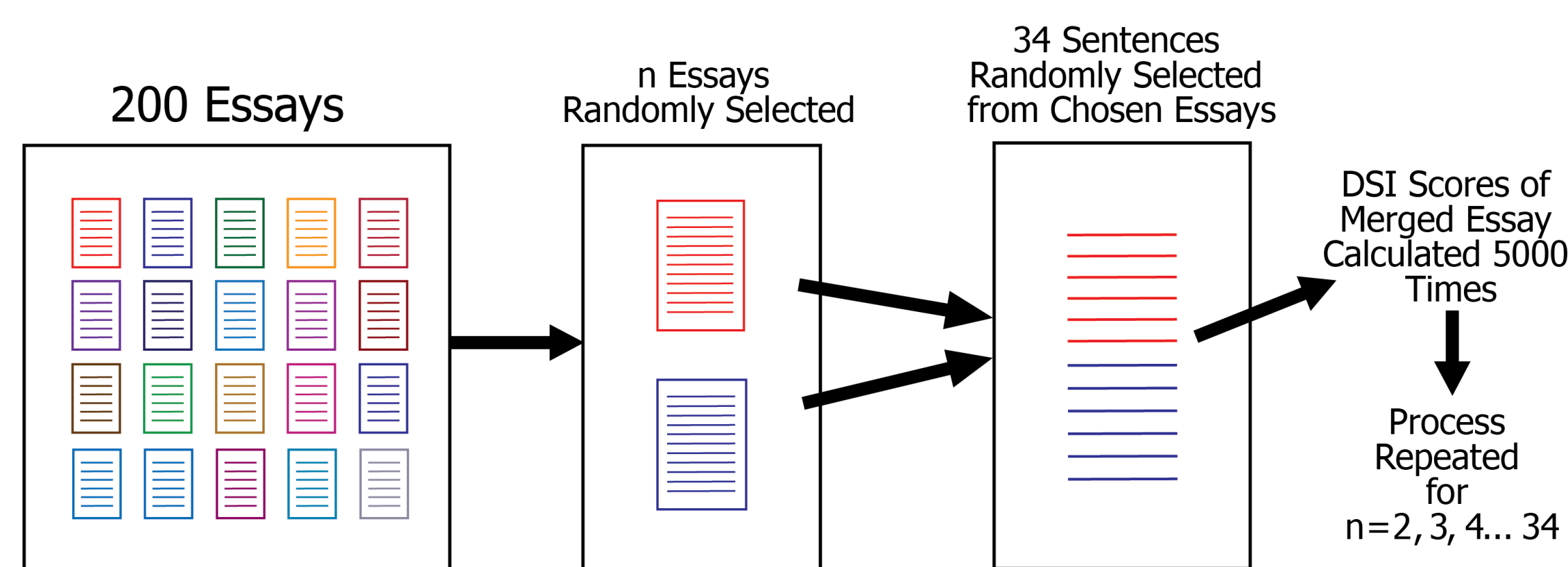
## Methods

### Data

- We analyzed 600 college admission essays: 200 generated by GPT-4 and 400 written by actual human applicants who applied to a private university from 2018 to 2022. The human-written essays were further divided into two groups: 200 from randomly selected general applicants and 200 from applicants with a diverse range of races and ethnicities.

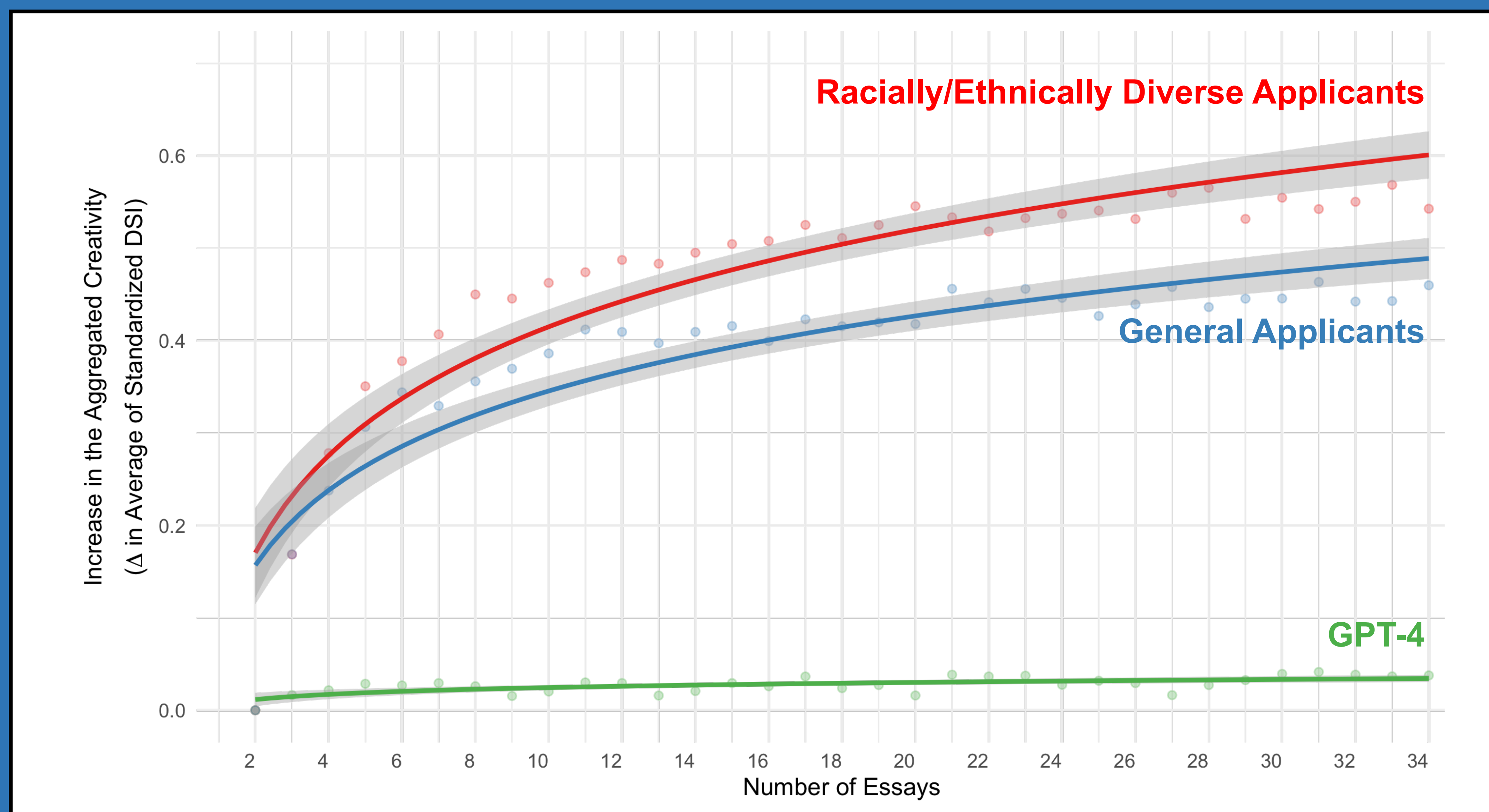
### Measures

- Individual Creativity.** We computationally assess the creativity level of each essay by measuring idea diversity utilizing a semantic distance approach – *Divergent Semantic Integration* (DSI).
- Aggregated Creativity.** We also assessed the aggregated creativity of multiple essays combined. We traced changes in aggregated creativity as we pooled together a progressively larger number of essays.



## Does ChatGPT homogenize the diversity of ideas?

# Each additional human essay adds a greater semantic diversity of ideas than each additional GPT-4 essay.



*Note.* The dependent variable was the average of standardized DSI scores ( $n = 99$ ). The interaction between authorship and the log-transformed number of essays was significant for the Diverse Group ( $p < .05$ ) and for GPT-4 ( $p < .001$ ), suggesting that the effect of the log-transformed number of essays on DSI scores varies depending on authorship (see Table 1 in the right panel).

## Results

### Individual Creativity

- Human-written essays were more semantically diverse than GPT-4-generated essays for general (Cohen's  $d = 0.44$ ,  $p < .001$ ) and racially diverse applicants (Cohen's  $d = 0.31$ ,  $p = .004$ ).
- There was no difference in semantic diversity between essays from the general applicants and the racially/ethnically diverse applicants (Cohen's  $d = 0.13$ ,  $p = .193$ ).

### Aggregated Creativity

- Each additional human essay adds a greater diversity of ideas than each additional GPT-4 essay does (see Table 1).
- Within the human-authored essays, the increase in semantic diversity was more pronounced for those from the racially/ethnically diverse group than for those from the general applicants' group.

**Table 1.** Regression Analysis Predicting Increases in the Average of Standardized DSI Scores.

	Model1	Model2
Authorship [Diverse Group]	0.083 ***	-0.011
Authorship [GPT-4]	-0.364 ***	-0.070 *
Log(Number of Essays)	0.092 ***	0.117 ***
Authorship [Diverse Group] × Log(Number of Essays)		0.035 **
Authorship [GPT-4] × Log(Number of Essays)		-0.109 ***
Observations	99	99
R <sup>2</sup> (Δ R <sup>2</sup> )	0.929	0.973 (0.044)

Note. \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ . We applied a logarithmic transformation to the number of essays to capture the non-linear and declining effect of the number of essays on changes in aggregated creativity.

## Discussion

- GPT-4 did not produce creative content that is comparable to that of individual humans.
- Moreover, the GPT-4 did not match the unique and diverse ideas generated by a collective of humans.
- These findings highlight the risk of a "homogenizing effect" on creativity through the repeated use of a specific LLM.
- Our findings indicate that an overreliance on AI models at the societal level could result in a diminished diversity of creative ideas.
- Conversely, promoting racial and ethnic diversity can enrich the diversity of ideas in creative outputs.



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