

## Pioneer Research Program Evaluation Form

### Scholar Information

<b>Scholar's Full Name:</b>	Weitao Ke
<b>Scholar's Research Concentration</b>	Explorations in Algorithmic Game Theory
<b>Title of Scholar's Research Paper</b>	Emergent Communication under Different Agent Populations: Investigating the Impact of Role Alteration on Language Generalizability

### Grading and Academic Oversight Section

**Program grade conferred by professor: A+**

*\*Full grading rubric approved by Pioneer Academics and Oberlin College*

**The Pioneer Research Program's college accreditation and academic oversight are conducted collaboratively with Oberlin College:**

<b>Listing on Common Application:</b>	"Summer Program, Credit Awarded Directly by Oberlin College"
<b>Course Title on Coalition Application:</b>	"099" "Pioneer Research Course"
<b>College Course ID on UC Application:</b>	"INST 099" "Pioneer Research Course"

### Comprehensive Evaluation Section

<b>Evaluator Name &amp; Full Title:</b>	Shaddin Dughmi, Associate Professor
<b>College/University &amp; Department:</b>	Computer Science, University of Southern California
<b>Full Educational Background of Evaluator:</b>	B.S., Computer Science, Cornell University, 2004. Ph.D., Computer Science, Stanford University, 2011.

**Please briefly explain the nature and requirements of the research paper and your interaction with the scholar:**

The goal of the research paper is to explore an existing or novel thread of research pertaining to algorithmic game theory. This exploration can take multiple forms, depending on the interests of the scholar and the nature of the research direction at hand. One form is a survey of prior work in that area, followed by proposing novel research questions that emanate from the prior work. Another form involves more original research, where the scholar identifies an unexplored or under-explored set of research questions, briefly surveys the related prior work, then embarks on answering those questions through original work. The research work can involve formal mathematical reasoning, computational experiments, or a combination thereof.

Weitao's research paper explores language formation from a game-theoretic perspective, via computational experiments. The approach, as in much of the prior work, is to model language evolution through a repeated game played by a population, where at each round a sender and receiver face a communication challenge where the sender must describe an image and the receiver must distinguish that image from a number of alternatives. Both players "win" if the communication is effective, otherwise they "lose". Within this framework, Weitao considers novel questions pertaining to "role alteration" between speaking and listening: How does role alteration affect the effectiveness of the evolved language and the speed at which it evolves, and how this is influenced by population dynamics (who can talk with whom) over time.

Weitao constructed a quite elaborate experimental setup which I found very impressive. He proficiently used machine learning models to model the agents, and devised a series of experiments to answer some very interesting and novel questions. In particular, his results are quite impressive and insightful: he found that role alteration does not much matter if the population is static, but "improves" the evolved language in dynamic settings where separate populations "merge" over time. Overall, I was extremely impressed with Weitao's research aptitude and resulting paper. He was able to devour a body of research, distill some innovative and well-thought-out questions, and proficiently implement a quite elaborate experimental setup to test his hypotheses.

**Please rate the scholar in the following areas:**

	Excellent	Good	Average	Below Average	Poor
Ability to form original ideas and concepts	X				
Ability to communicate thoughts in an effective and articulate manner	X				
Ability to synthesize and organize information from disparate sources	X				
Level of scholar's curiosity, aptitude, and industriousness	X				

**Based on the scholar's performance through Pioneer, how would you rate this scholar's potential for undergraduate-level academic work at a top college/university, relative to other undergraduate students whose academic work you have mentored?**

One of the best I have encountered, top 5% <u>X</u>	Excellent, top 10% ____
Very Good, top 25% ____	Good, top 50% ____
Below Average ____	

**Describe some of the scholar's strengths:**

Weitao is very driven, passionate, and full of energy. He functions as a fairly independent researcher already. He is remarkably mathematically and analytically mature, and compares favorably with strong research-minded undergraduates. He is also very well-read on topics that interest him, and has an ability to really wrap his head around the background research and come up with innovative questions.

**Describe some areas in which the scholar can improve:**

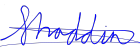
Can get fixated on technical details sometimes, at the expense of thinking abstractly and in a modular fashion about the problem. I have full confidence that this will be remedied with time and experience, however.

**While the second half of the research work was one-to-one with the professor, the first half involved a small research cohort of 3-6 scholars. Describe the contribution that the scholar made to the research group discussion and learning:**

Weitao was very active during the group discussions. He asked great questions, and was always prepared. He was by far the most engaged of the cohort. I was extremely impressed with Weitao's intellectual maturity, drive, and ability to ask insightful and challenging questions!

**Would you recommend this scholar to a college admissions officer at a top college or university? Why or why not?**

Absolutely. Weitao has my absolute highest recommendation for admission to the very best colleges. I anticipate great things for him in the future.

<b>Evaluator's Signature:</b>	
<b>Evaluator's Printed Name:</b>	Shaddin Dughmi
<b>Date of Evaluation:</b>	9/26/2023
<b>Evaluator's email &amp; phone:</b>	<a href="mailto:shaddin@gmail.com">shaddin@gmail.com</a> , (650)387-9265

Pioneer Academics affirms that the scholar whose research paper is attached has followed Pioneer Academics' protocols for developing original research and that their paper has met Pioneer Academics' standards for authenticity. The grading and evaluation have met the standards collaboratively defined by Pioneer Academics and Oberlin College & Conservatory. If there are any questions regarding the work's academic integrity, please contact us at [academic.integrity@pioneeracademics.com](mailto:academic.integrity@pioneeracademics.com) or by calling (855) 572-8863. We will conduct an immediate review and respond to your questions promptly.