

## Pioneer Research Program Evaluation Form

### Student information:

**Scholar Name:** Vishnu Sampathkumar

**Scholar's Research Concentration at Pioneer:** Introduction to Combinatorics and Graph Theory

**Title of Scholar's Research Paper:** Chromatic Number in Preferential Growth Models

### 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:</b>	Dr. Carl Yerger	<b>Full Title:</b>	Associate Professor and Chair Mathematics and
<b>College/University:</b>	Davidson College	<b>Department:</b>	Computer Science
<b>Full Educational Background of Evaluator:</b>	Ph.D., Algorithms, Combinatorics and Optimization, Georgia Tech Certificate of Advanced Study, University of Cambridge, UK B.S., Harvey Mudd College		

**Please briefly explain the nature and requirements of the research paper and your interaction with the scholar:** I met with Vishnu in five 90-minute group sessions and five 60-minute individual research meetings via zoom. Vishnu was asked to write a research paper that in some way extends and goes beyond the material presented in group meetings. We also communicated through the Schoology platform (learning management system) between meetings if any questions came up. Vishnu was interested in network theory, a setting where graph theory is applied to models that may appear in real-world networks.

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 student's performance through Pioneer, how would you rate this student's potential for undergraduate level academic work at a top college/university?

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:** Vishnu had one of the most original Pioneer research papers I have seen during the eight years I have been a Pioneer instructor. He ran a number of experiments to get estimates for the chromatic number of several graph models, including the Barabasi-Albert attachment graph. This model has been used to describe many real-world networks. In particular these experiments confirmed theoretical bounds in a recent paper (from 2020!) in *Discrete Applied Mathematics*. These types of theoretical questions are just being considered, and if Vishnu had more time, he might be able to make progress that could lead to a publication. I believe Vishnu's project is what the future of mathematical papers will be like – a mix of theoretical and computational results leading to outcomes that could not be accomplished without either type of result playing a role.

Vishnu's writing was very strong. He used the LaTeX typesetting language and created many diagrams. Vishnu's written English is extremely strong. He also programmed these models in Python, which was impressive.

**Describe some areas in which the scholar can improve:** I really had to encourage Vishnu to write his results down on paper during the research process. He really wanted to explore as many new ideas as possible and was truly excited about his work. Ultimately, the research paper turned out very well, but it was not easy to see this at the beginning of our time together.

**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:** Vishnu was a very active class participator, asking good questions when he was confused. I appreciated his enthusiasm and desire to make connections to other fields, particularly computer science and neuroscience. Vishnu struggled a little on the homework assignments between each session, particularly those involving mathematical proofs, but I think he grew greatly through Pioneer and is now a much more mature writer and thinker.

**Would you recommend this scholar to a college admissions officer at a top college or university? Why or why not?** Vishnu would be an extremely strong contributor at a top undergraduate mathematics or computer science program. He would be able to jump right into both majors. Vishnu would also be able to join a faculty member's research team and excel essentially as soon as he sets foot on campus. He already has developed some mathematical maturity and can read research papers independently. Vishnu would also be a leader in supporting departmental activities and would bring enthusiasm to all of his courses. I give him my strongest possible recommendation.

Evaluator name (signed):



Evaluator name (printed): Carl Yerger

Date: 10-12-2021

Evaluator contact details (email and phone): [cayerger@davidson.edu](mailto:cayerger@davidson.edu), 1-704-894-2904

Pioneer Academics affirms that the student 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.