



Goodsell Gazette

Carleton College

Northfield, MN 55057

The newsletter for the Carleton mathematics and statistics community

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Summer Research in Applied and Computational Math at Carleton

Summer is just around the corner... Okay not really, but you might be thinking about your summer plans already! I'm here to help with that. I'm looking for a team of three students to work on applied and computational math problems this summer. Here are some details:

When: June 17 - August 23 (10 weeks)

Where: Carleton campus

What: Full-time, paid research position in applied/computational math

I will offer one or possibly two projects, and I am interested in math AND/OR stats interested people for these projects.

The main research topic will be something called "semantic geometric reconstruction". Let's say you have information (i.e., data) about an object's shape from different perspectives, and you want to fuse it all together into a single 3d representation of that object. That fusion is geometric reconstruction. If you stir in extra generic knowledge about the makeup of the object or objects (it's a tree, or it's a building), it becomes semantic geometric reconstruction. In this project we'll use tools from computational geometry, machine learning, and numerical optimization to develop and test strategies for semantic geometric reconstruction. This will be done in partnership with a local computer vision company that has lots of amazing 3d data and tricky geometric problems to solve. Prerequisites are not rigid, but I suggest some programming experience, intro statistics (or beyond), and some math coursework past linear algebra. I may offer another project that is less data focused, depending on student interest and background. If you have questions, or would like to apply to join the summer research group, send Rob Thompson (rthompson@carleton.edu) an email!

Job & Internship Opportunities

Oracle Corporate Scholars Program

The Oracle Corporate Scholars Program will provide extended learning experiences at Oracle headquarters during the summer of 2019. The program includes scholarship support for African American college students who are currently pursuing a major in Computer Science, Mathematics, or a related subject. Candidates must have attended a high school in the U.S., be a U.S. citizen or permanent resident, be an African

American college student, and be a sophomore or junior at the time of application. Successful candidates will be offered internships during the summer of 2019 and subsequent scholarship awards for academic year 2019-2020. To be considered, candidates must submit the online application for the Program, complete with a letter of recommendation, a one-page personal statement of career interest, a resume, and a current transcript. All application materials must be received by March 15. For more information and to apply, visit: <https://scholarships.unconf.org/Program/Details/202d445c-509a-48ea-b2d1-6ecf83c898d0>.

BEAM Counselor/Teaching Assistant

This summer, change the lives of talented middle school students from underserved backgrounds. Bridge to Enter Advanced Mathematics (BEAM), a project of the Art of Problem Solving Initiative, Inc., is seeking undergraduate students or recent graduates to be counselors and teaching assistants for a summer program that gives everyone a chance to excel in mathematics. During summer 2019, we will run residential programs at college campuses in upstate New York and Southern California, and day programs in New York City and Los Angeles. At both programs, you'll create a vibrant social experience for kids who are discovering for the first time that there are other people who like doing mathematics; you'll also be a TA for classes on topics such as number theory, combinatorics, problem solving, and computer science. At our residential program, counselors will also live with the students in the campus dorms. Be a role model and guide for students who are just beginning to set their educational path! Counselors must be strong mathematically, be reliable, and take initiative. They should be charismatic and able to help the kids have fun. Apply by the end of February for full consideration. For more information, visit: <https://www.beammath.org/counselor-info/>.

Vassar College, TEU

The Teaching Experiences for Undergraduates (TEU) program is a six week immersive summer experience in secondary mathematics education at Brown University in Providence, RI, funded by the National Science Foundation. TEU participants earn a generous stipend, take a 60-hour course in mathematics pedagogy, and apply what they're learning to teaching urban high school students under the supervision of a master teacher-mentor. TEU provides a rich summer experience for undergraduates from 61 partner liberal arts institutions who are interested in secondary STEM teaching careers. For more information and to apply, visit: <https://teu.vassar.edu/>. The application deadline is February 28th.

Problems of the Fortnight

To be acknowledged in the next *Gazette*, solutions to these problems should reach me by noon on Tuesday, March 5.

1. Here's a sequence you may never have seen before:

$$7, 19, 26, 37, 56, \dots$$

(as you "no doubt" guessed immediately, the next term is 61). This sequence consists of the positive integers that can be written as differences of two positive *cubes* of integers, specifically:

$$7 = 2^3 - 1^3, 19 = 3^3 - 2^3, 26 = 3^3 - 1^3, 37 = 4^3 - 3^3, 56 = 4^3 - 2^3, 61 = 5^3 - 4^3, \dots$$

Now for the problem: Given a positive integer n , is it always possible to multiply n by a perfect square so that the new number (say k^2n) will occur in the sequence? If so, show why; if not, give an example of a positive integer n for which this is impossible.

2. One of the recent snowstorms created problems at the Wohascum Skating Club, which has an outdoor rink. It stopped snowing just an hour before a scheduled event, the rink was under four inches of snow, and the town snowplow (which usually clears the rink after making its rounds

square so that the new number (say $k + n$) will occur in the sequence: if so, show why, if not, give an example of a positive integer n for which this is impossible.

2. One of the recent snowstorms created problems at the Wohascum Skating Club, which has an outdoor rink. It stopped snowing just an hour before a scheduled event, the rink was under four inches of snow, and the town snowplow (which usually clears the rink after making its rounds elsewhere) was still off clearing the local streets. Fortunately, a dozen volunteers were found, and soon the light, fluffy snow was flying off the rink as each person threw each shovelful to the nearest point along the perimeter. Given that the rink is an 80 by 30 foot rectangle, what was the average distance that the snow was being thrown, as the entire rink was cleared?

As for the problems posed February 8, correct solutions to both came in from "Auplume", and the second problem was also solved by John Snyder in Oconomowoc. What's up, student solvers? Here's hoping for more from you ...

- Mark Krusemeyer



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