Points & Angles

Newsletter of the Metropolitan Mathematics Club of Chicago
Volume XLVIII No. 5 Feb./Mar. 2019

Technology That Thinks WITH Students, Not FOR Students

March Speaker Eli Luberoff

From I-90 & South-bound I-294: Exit at I-190 West to O'Hare; Exit onto North Mannheim Rd.; Take Mannheim Rd. North 2.25 miles.

From Northbound I-294: Exit at West Touhy Ave.; Take Touhy Ave. to Mannheim Rd.; Turn right on Mannheim Rd.

Public Transit: Take the CTA Blue Line to the Rosemont Bus Terminal; Take Pace Bus #223 to Touhy Ave. & Lee Rd.; Walk East on Touhy to Mannheim Rd.

Friday, March 1, 2019
Doors Open/Social Hour: 5:45 PM
Dinner & Talk: 7:00 PM

Fountain Blue Banquet & Convention Center
2300 Mannheim Rd., Des Plaines
847-298-3636
$43 for Members, $49 for Nonmembers

Reserve by noon, Monday, Feb. 25
Online at www.mmcchicago.org
or by phone at 847-486-4291

Eli Luberoff is the creator and CEO of Desmos, the free online graphing calculator and educational tool. He began his programming life on his TI-83 graphing calculator in elementary school, culminating with a working version of Monopoly (which was destroyed when he removed the backup battery accidentally). He began working on the software that would become Desmos.com during a year-long hiatus from Yale University in 2007, returning to graduate summa cum laude with degrees in mathematics and physics in 2009. In 2011, Eli was also selected by *Bloomberg Businessweek* as one of the top 25 entrepreneurs under 25.

For as long as Eli Luberoff can remember, he's been an informal tutor, helping friends and family with homework. Back in his hometown of Amherst, Massachusetts, he remembers occasionally doing his brother's math homework in elementary school in return for a ride to KFC. His motivation (aside from food) has always been a love for teaching. He started tutoring professionally in high school and has been a volunteer/peer/professional tutor ever since. Desmos was born out of Luberoff's own experiences as a math tutor, when he noticed that his younger students were still using the same calculator he had used in school a decade prior. "It blew my mind—because everywhere else, they're walking around with supercomputers in their pockets, but in this, they're still using the same thing," he says.

Eli has said, "Technology wears two faces. With one, it amplifies student thinking and creativity, helping them create and understand like they haven't before. With the other, it thinks and creates FOR the student, dazzling or grading them without inspiring or educating them. We'll look at easy and free technology – including handheld calculators, Sketchpad, and Desmos – that thinks WITH you and your students, not FOR them."

In the spirit of full disclosure, several of us have been trying to coordinate a talk by Eli Luberoff at MMC. He has always been open to the idea, but he is so busy that getting it on the calendar quite proved tricky. We are glad that MMC

Eli Luberoff's Dinner Talk (cont.)

and Eli could finally sync. Don't miss this opportunity or the workshops Eli will be running the following morning. All information is on the MMC website.

The March 1 dinner meeting is back at Fountain Blue, and the Saturday morning workshops will be held at Glenbrook South High School in Glenview. For the workshops, you must preregister, seats are limited, and slots will fill on a first come-first served basis.

Points from the Interior

Wholeheartedly Learning to Be a Better Mathematics Teacher

by Mary Wiltjer

I love the theatre. I go often, as do quite a few MMC members. It is a common chat during the social hour to say who has seen the latest at Steppenwolf or Court or a storefront Chicago theatre. Actually, I attend a lot of theatre with my MMC friends. Research shows that during a live performance in the theatre, audience members' heartbeats sync as a performance goes on. Likewise, I think a great class can have a similar intensity. Actually, I bet that even medium-good classes have an innate sense of community, even if it isn't completely biological. However, in many ways, teaching and learning is just production and theatre. I wholeheartedly believe that is why learning in a classroom, with a living, breathing teacher and students, should never be replaced by online or technology-driven formats. The possibilities of this direction in education was brought to life by Matt Moran at the last MMC dinner talk. I'm worried. Technology is cheaper, and the decision makers seem to care more about cost than about craft and kids.

On the other hand, I had the pleasure of being a learner in a classroom setting at the MMC Conference of Workshops. I don't believe there is a better way for teachers to grow professionally than in workshops targeting their needs and wishes, where being active learners (as their students are) is the norm. If you tell me about an idea, I may be able to work it into my teaching, but if you have me do an activity, it will be obvious how I would (or wouldn't) want to use it in my class with almost a sense of muscle memory steering it to success. The "doing" stimulates so much thought. Brain studies show activity opens up far more learning channels, so it is best for learners from either side of the teacher's desk. The MMC conference has held a special place in my heart, since the first one I attended at Homewood-Flossmoor High School with Gene McCormack. (We knew we had taken a wrong turn on our way there when a big sign welcomed us to Indiana.) I just don't think you can find a better event (especially if you factor in cost) for improving your teaching. I was sad to see that the number of registrants was down this year. All professional conferences have dramatically declining enrollment, but I just think the MMC Conference of Workshops is too wonderful to suffer a similar fate. Schools have moved toward a great deal of in-house professional development, but this decision can become so insular that it actually thwarts growth. As educators, we must regularly remind the decision makers what is best for kids and for us. With no voice of opposition, why should they do any differently or better?

In the spirit that workshops can provide some of the richest learning experiences for classroom teachers, I have gotten all of our out-of-town dinner meeting speakers to run workshops on the Saturdays following their program presentations. Gail Burrill led a fabulous workshop back in November. Annie Fetter will be doing one in May. I'm giddy with excitement for our next speaker, Eli Luberoff, because he is running two different workshops on the morning of Saturday, March 2. (See our websites for details.) Being a tech guy (he created and still leads Desmos), you may think he is what I fear in steering education out of classroom settings. In contrast, Eli has stated on numerous occasions that he feels classroom learning is best and that Desmos is an aid to that. His dinner meeting presentation, "Technology that Thinks WITH Students, Not FOR Students," appears to reinforce positive pedagogy. It will be a weekend full of wonderful learning experiences for math teachers. There is no better way to learn (especially if you factor in cost) than an MMC workshop. I cannot encourage you enough to attend everything you possibly can and to share this information with others. I know we will all leave enriched and singing a similar tune that mathematics education is ever-evolving and improving as long as we are ever-evolving and improving. Maybe we should all wear heart monitors to see if the communal learning events, like a great play, have us all beating in rhythm.

January Dinner Meeting Talk – Matthew Moran

by Serg Cvetkovic

In our fast-paced and rapidly-evolving (although some would say devolving) society, it is no secret that many jobs have become obsolete. According to a recent survey conducted by the Pew Research Center, 50% or more American adults think that jobs such as fast food worker, insurance claims processor, software engineer, and legal clerk will be replaced by robots or computers in their lifetimes. Sharing this data with the audience was how Matt kicked off his talk, *The Robots are Coming for Your Teaching Job: Educational Ramifications in the Machine Learning Age.*

Something interesting about this data, noted by Matt, is that only 30% of Americans feel that their own job or profession is at risk of being lost to automation in comparison to other jobs or professions (i.e. "It will happen to them, but not to me."). Additionally, 64% of Americans think that one profession that will not be lost to a machine anytime soon is that of a teacher. Hold on a second! If this is the case, why is Pearson advertising job openings for data scientists with experience in Artificial Intelligence or for software developers to create programs that actually evaluate student writing? I thought grading papers was a primary responsibility of the teacher?!?! Hmmm…Oh wait, while we're at it, let's introduce "NAO," a dancing robot that speaks 20 languages and walks around the room, interacting with students and teaching them math and physics, brought to you by Aldebaran Robotics. Upon viewing the promotional video for NAO and thinking (and I am sure that I was not the only one) that it was something out of a science fiction film, Matt assured us that this robot is very real and that it was developed for such purposes as being a teaching assistant, translating content between languages, and working with students that have autism or emotional disabilities. Don't we as educators always complain about the lack of assistive learning software or opportunities to differentiate our instruction to meet the diverse needs of our students? Should we, as educators, not be applauding the arrival of this robot? "Good or bad," Matt declared, "There is money and research being poured into these efforts, and there is an incentive for people to build such systems to simplify input to help build better systems."

Asking "How are these systems built?" provided Matt with a segue to begin talking about the role that mathematics plays in getting a machine to be able to learn. Let us begin with placing a piece of uncooked spaghetti on a scatterplot to find a best-fit line, a lesson that many of us experienced in our middle-school introduction to statistics and data analysis. As a data scientist, Matt takes that piece of spaghetti disguised as an algorithm and teaches computers to learn, which they exhibit by increasing their ability and consistency in predicting outcomes upon being fed large amounts of data. It sounds a lot like teaching a young child to read, right? It is not mere coincidence that the concept of a "neural network" is based on neurons in the human brain taking sensory inputs (like we take in sights, sounds, tastes, and smells) and clustering and classifying this information in order to generate an output (e.g. "The smell tells me that it's gasoline" or "The sound tells me that it must be a dog barking."). However, since machines are not capable of independent thought, they must be programmed to classify how we want. Matt shared an example of how this process works by asking, "Can a machine correctly classify handwritten digits?" He then continued to explain that if we took 70,000 images (i.e. a BIG data set), each being a 784-dimensional vector ranging from 0- to 255-pixel values, along with the sigmoid function $\sigma(z) = \frac{1}{1+e^{-z}}$, it is possible to develop a program to indicate if the input is a 7 (if the output yields a 1) or not a 7 (if the output yields a 0). It is actually a bit more complicated, as we have to account for mean-squared error (i.e. how close a fitted line is to data points), a loss function (i.e. how well our predictions model the data trend), and other things. The bottom line is that if we input handwritten digits into a machine and the digits fit the compromised model of vectors, pixels, etc., the machine can actually correctly classify the data that it is given. Of course, there are situations in which the machine is completely wrong. Going back to identifying handwritten digits, the machine could not correctly classify a 7 with a line through it, an 8 that was written in a heavily smudged form, or a 3 that did not have well-defined arches. In comes splitting our data into two sets, a training set and a testing set. As Matt showed the audience, after ample training of running the data through a neural network, a machine was able to identify handwritten digits with 98% accuracy.

Many of us are familiar with the horrors associated with artificial intelligence as depicted in fiction. There is HAL-9000, SkyNet, WOPR, Robbie, and many other examples of "AI gone awry." "Do we really want a machine operating at 98% accuracy to sort our mail at the post office?" (Moran, 2019). However, for many duties performed by humans, there is the incentive for people building these systems to simplify input to help make better models, and there is always the excuse to apply some pretty cool math (e.g. regression models, Bayes' theorem) in making these better models (i.e. the humanoid robot reading emotions).

MMC Scholarship for High School Seniors

The Metropolitan Mathematics Club of Chicago is offering a $2,000 scholarship for a high school senior who will pursue a career in the teaching of mathematics. In addition, up to two Filliman Scholarships may be awarded for the same amount (funded by a gift from the Filliman estate). The selected students, their parents, and their sponsoring teachers will be invited to MMC's May 10 dinner meeting, at which time the scholarship recipients will be honored.

A selection committee of MMC members, appointed by the board of directors, will determine the scholarship awards. To be eligible, an applicant must be sponsored by a member of MMC, submit the application, have an official transcript sent, request a letter of recommendation from a mathematics teacher, and respond to the prompts in point E below, such that all of the materials are received by March 8, 2019. The committee will evaluate applications and will make a recommendation to the board of directors as to the awarding of the scholarship.

The guidelines used for selection shall be:

A. Demonstration of overall academic scholarship with an inclusion of at least eight semesters of college preparatory mathematics. (A minimum cumulative grade point average of 3.0, where A = 4.)

B. A statement of the intention to pursue a career in mathematics teaching.

C. Indication of participation in extra-curricular activities, especially those that may have a positive influence on a teaching career.

D. A letter of recommendation from a math teacher who is familiar with the applicant's academic performance and his or her potential as a mathematics teacher. The teacher must be an MMC member.

E. A short response from the candidate (1-2 paragraphs) to each of the following prompts:

   a. What qualities do you possess that will help you in a teaching career?

   b. Describe a teacher who has had an impact on your education.

   c. Was there a time when you struggled with a concept in a math (or other) class? What did you do?

   d. What was your favorite math class? Why?

   e. Describe your favorite math problem. What makes it so great?

   f. What excites you about mathematics?

   g. Why do you want to teach mathematics? *This response may be longer than the others, if necessary.*

In addition to the application form, applicants must also send:

1. A letter of recommendation from a mathematics teacher, p*referably not sent through the applicant.**
2. A current transcript for seven semesters of high school.*
3. Responses to the prompts in point E above.

**Letters of recommendation and transcripts may be sent by separate mail.*

USACAS 2019

Extending Math Education with CAS and Other Technology Tools
Attend the ELEVENTH INTERNATIONAL Expanded Technology Conference
Organized by MEECAS (Mathematics Educators Exploring Computer Algebra Systems)

WHERE: Highland Park High School, Highland Park, IL
WHEN: Saturday, June 15, 2019 8:15 AM - 3:30 PM
Sunday, June 16, 2019 8:00 AM - 1:00 PM

Opening Dinner: Friday, June 14, 2019 hosted by MMC at the Renaissance Chicago North Shore Hotel
Up to date information will be posted at usacas.org.

Registration: **$85 for USACAS 11 (before May 9, 2019; $100 on or after May 9, 2019)**
$95 for USACAS 11 AND the MMC Friday night dinner
(before May 9, 2019; $110 on or after May 9, 2019)
$55 for MMC Friday night dinner (before May 9, 2019; $65 on or after May 9, 2019)
**Fee includes continental breakfast, a box lunch, and snacks*

Optional Saturday evening dinner and Architectural Boat Tour--transportation included: $55

NEW! Graduate Credit will be available through Central Michigan University.
Any questions can be directed to Ilene Hamilton at ihamilton2341@gmail.com.

Gratitude for Conference of Workshops

By Nicolette Norris and Rose Sterr, 2019 Conference Co-Chairs

The MMC Conference of Workshops held on Saturday, January 26, was a success. Over 400 participants were on hand, attending 90 workshops given by fantastic speakers, sharing activities and ideas that participants can use in their classrooms.

A huge thank you goes out to our site coordinator Rosa McCullagh, as well as the University of Chicago Laboratory Schools and their staff, who made everything run like clockwork. Not only did they provide the beautiful facilities, but they also provided food service, technology, directions, and all the other little things that went on behind the scenes during the previous months.

Thanks also to all our MMC volunteers who put together folders, as well as came early and stayed late to make sure everything was in the right place for the workshops and was cleaned up afterward.

We certainly know that teachers have enough on their plates, but fortunately, about 85 decided they could do even more and generously gave of their time and expertise by running workshops for the conference. The concept of teachers sharing and helping other teachers is why the MMC conference has been such a success. The idea that teaching doesn't end at our own classroom doors is crucial to bettering Chicagoland's mathematics education. We owe all of our speakers special thanks for their efforts. Also, some big thanks go out to the afternoon post-session speakers who gave 10-minute talks that stretched our thinking and inspired us to take action. Thank you, David, Ben, Candice, Annie, Doug, Esther, and Scott!

Soon you'll be hearing about the MMC Conference of Workshops 2020, so start planning now! If you presented this year, think about a workshop you would want to run next year. If you attended, plan to attend next year, but also consider presenting--everyone has those great ideas that they can share. We have a wonderful resource in Chicagoland with our spectacular mathematics community, and it would be great to see even more people willing to share their ideas in 2020.

Metropolitan Mathematics Club of Chicago
100 YEARS
1913-2013

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MMC Board of Directors—Candidate Biographies

President:

Serg Cvetkovic: Serg currently serves as MMC's community relations liaison. He has taught mathematics in the Chicago Public Schools for 15 years, with the last 8 being at Kelly High School on the southwest side, where he also coaches the school's math team. A strong supporter of access and equity in mathematics education, Serg is diligently working to increase exposure of more advanced mathematics topics to students from marginalized communities. He has had considerable success with this endeavor as a teacher in Math Circles of Chicago. In his spare time, Serg enjoys bicycling, reading comic books and science-fiction novels, and training to hopefully one day become a crossword puzzle champion.

Board:

Steve Starr: Steve is a retired CPS mathematics teacher and math department chair who taught at Lake View High School in Chicago for 20 years, sustaining a successful AP Calculus program where minority and low-income students were motivated to take advanced mathematics. At Lake View, he also developed and taught a three-week unit called "What's Fair?" which introduced students to some of the mathematics involved with social issues relating to fairness and allocation of resources. In this unit, students explored fair division, voting and gerrymandering, game theory, and mathematical modeling of fair income. Before teaching mathematics, he worked in shops as a woodworker, a machinist and industrial model maker, and a toy developer. Since retiring, he continues his passion for mathematics, staying involved with MMC, MC2, and other area math organizations, sharing ideas at workshops, supervising student teachers, tutoring, and teaching.

Aimee Hart: Aimee has been teaching mathematics for 21 years. She began her career at Josephinum Academy, a small Catholic girls' school in Chicago and taught at Marymount International School in Rome and Walter Payton College Prep before settling at New Trier High School 13 years ago. She currently teaches geometry, BC Calculus, and Intro to Computer Science. In the past, she coached the math team at both Payton and New Trier but more recently switched to coaching her children's basketball teams.

Liam Keigher: Liam has been teaching at Larkin High School in Elgin since 1995 and has been the head math coach since 2000. He especially enjoys doing math in addition to teaching it. Liam has served on a number of district curriculum committees in math and computer science. He is Larkin's sponsor for Mu Alpha Theta, hosting an annual middle school math contest. He has been a member of Larkin's technology committee since 1996 and has served at various times as the chair or co-chair. He is on the board of the North Suburban Math League and has been its written topics committee chair since 2008. He assists with the Chicago Area All-Star Math team that competes in the American Regions Math League. Liam would like to see more offerings for people to study math collaboratively in a non-classroom environment, like a consortium, at their own pace. He loves what MMC brings to the study of mathematics and believes in always learning and becoming better at one's craft. MMC seems like the perfect opportunity to realize these dreams. Besides, the dinners are fantastic!

Candidate Biographies (cont.)

Mary Wiltjer: Mary has been teaching for over 25 years, with the last 11 at Glenbrook South High School. On the MMC Board she has had many roles, including President, Membership Coordinator, and Conference Co-Chair. In her time with MMC, Mary is most proud of the additional, high-quality professional development opportunities she has brought to members at very affordable prices, such as the Saturday and summer workshops and the MMC conference post-session speakers.

Nicolette Norris: Nicolette is currently teaching at Chicago Vocational High School. She has been with the Chicago Public Schools for 17 years and has been teaching for 23 years. Nicolette presented at the 2005 MMC Conference of Workshops. She then joined MMC in 2006. She has served on the board for the past 4 years. Nicolette is one of the co-chairs for the MMC Conference of Workshops.

Rose Sterr: Rose currently teaches at Benet Academy and has been teaching math at various levels for over 30 years. She has been a member of MMC for about 10 years but remembers attending her first MMC dinner years ago at the Como Inn! For the past 2 years, she has co-chaired the MMC Conference of Workshops and continues to marvel at the talent we have in the Chicagoland area. She feels events such as this have been so valuable to her teaching, and she would be honored to continue representing this wonderful organization.

Is your membership current? Check your mailing label to see when your membership expires. You can renew by mail with the form below or renew in person at the next dinner meeting.

MMC Membership and Change of Address Form

Mail completed form and check to:

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7339 W. Ibsen St.
Chicago, IL

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☐2 years ($65) ☐1st yr teacher*, 1 yr ($22)
☐3 years ($90) ☐retired, 1 yr ($28)

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SCHOLARSHIP FUND $

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TOTAL AMOUNT OF CHECK $

Make check payable to *MMC*

Upcoming Events

Fri., Mar. 1	Eli Luberoff	**Technology that Thinks WITH Students, Not FOR Students**
Sat., Mar. 2	Eli Luberoff	**Workshop**
Fri., May 10	Annie Fetter	**Sense-Making, Ideas, Curiosity, and Learning**
Sat., May 11	Annie Fetter	**Workshop**
Fri., June 14	Tom Dick	**Cubics, Conics, CAS, and a Curious Connection Called "The Most Marvelous Theorem in Mathematics!"**
Sat.-Sun., June 15-16		**USACAS Conference, Highland Park**
Wed.-Sat., April 1-4, 2020		**NCTM Centennial Annual Meeting: Celebrating 100 Years—Looking Back and Moving Forward, Chicago**

Send upcoming event items to sburnett_308@yahoo.com no later than the date of the MMC dinner meeting preceding the issue in which the item should appear. All items are subject to editing.

Your membership renewal date appears in the upper right corner of the label

MMC
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Chicago, IL 60631