

THE SUMTIMES

MARCH 2024

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Pictured above: Yutian He, 2nd year PhD student



GET INVOLVED



ASSOCIATION FOR WOMEN IN MATHEMATICS (AWM)

Hello everyone!

I hope you are doing well. The Student Chapter of the Association for Women in Mathematics (AWM) has been created! Our chapter aims to create a community that empowers minorities who have been marginalized due to their race and gender identities in the mathematical sciences. We wish to develop and grow our professional being. This will be accomplished by offering several workshops such as building a website, creating a compelling CV, and many others. Additionally, we will be advertising networking opportunities as they arise.

Our first workshop will be on creating a resume and cover letter and will be led by the Graduate Student Success Center. The event is on Monday, April 1st, from 11:30 am to 12:30 pm. Look out for emails and flyers for this workshop! All math graduate students are welcome to join! We hope to see all of you there!

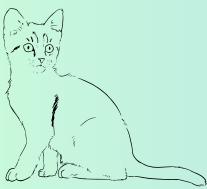
Kind regards,
Margarita Bustos Gonzalez
Chapter President of AWM

RUNNING FROM OUR PROBLEMS

Avoidance at it's Finest!

If you are interested in joining the math department's recreational running group, Running from our Problems, please reach out to Jessa at jessa-rhea@uiowa.edu to be added to the group chat! We organize math department group runs, run in the City Park parkrun 5k, and run in local races together. We are looking forward to welcoming new members and seeing y'all out on the trails!

Thanks,
Jessa



PETS PETS PETS



To avoid their owners being haunted for the next 30 years, the following pet images showed up in our inboxes and took over our hearts.



We relate to
George's dog Fred



Reese is Jessa and
Devon's cuddlebug



←
Delbar
helps
her
mom
Paria
with
laundry



↑ Marc's cats Lentil (l) and Bean (r) could not be →
more different, but they love each other.

Meet
Jose
David's
cat
Kiara!



←
Alex is
Liz's
very
sweet
good
boy



Here's Brooke's baby Baby! →



DATES TO NOTE



BIRTHDAYS

Nandita Nair	March 6
Alisson Serracin Morales	March 7
Kevin Del Real Ramos	March 10
Kitrick Fynaardt	March 24

COMPREHENSIVE EXAMS

Nicholas Cecil	March 19
Jose David Beltran Lizarazzo	April 2
Matthew Barber	April 16

All the best! We're rooting for you!



LIFE OUTSIDE MATH



Nandita was part of a dance team that performed at the Indian Harvest Festival in North Liberty



Yutian performed at the Lunar New Year Gala celebrations at the Englert



Elise and Natalie were there to support her!



Garrett and Elise at the Bollywood dance competition
Nachte Raho



Here's Casey at her cousin's wedding at the 'Top of the World' in Utah



Send us pictures of fun things you do during spring break!

-Nandita & Evelyn



MEET THE POSTDOC:

JOSHUA JORDAN

It's really nice to meet you. Could you give us a quick introduction about who you are? What do you do? What does pluriclosed mean?

Yeah, I can absolutely take a crack at it. I'm Josh Jordan. I'm a new postdoc here. Hao Fang is my supervisor. I do differential geometry and I graduated from University of California, Irvine with my PhD in geometric analysis, so I do differential geometry but sort of with a focus on partial differential equations methods. The specific kind of geometry I do is complex geometry. So the manifolds locally look like \mathbb{C}^n , instead of \mathbb{R}^n . And the transition functions are holomorphic instead of smooth.



The thing that's kind of interesting about them is that instead of just having a Riemannian metric, you can force your Riemannian metric to be like Hermitian. Generally speaking, when people study those things, they require them to have some integrability conditions. So Kähler manifolds are where these Hermitian metrics are what's called a closed two form.

Yeah, they're manifolds that are complex and symplectic and symplectic manifolds have a lot of topological restrictions. But these Kähler ones are where the Riemannian stuff is really nice and the symplectic stuff is nice – they meet in a nice way.

I don't do that. So there's been a lot of work done on Kähler manifolds, but the non-Kähler world is still pretty fuzzy, because a lot of the analysis is a lot more complicated. The equations don't simplify as nicely. The connections you have to work with, they're covariant derivatives, so they have torsion terms. So there's a whole bunch of identities that don't hold, things that don't commute. And generally, that stuff doesn't get studied a whole lot just because it's a little bit uglier. But my advisor at undergrad kind of came up with a partial differential equation that's related to some Einstein metrics on these things. And so lately, I've just been studying that equation. It's an interesting equation. It's a single elliptic partial differential equation, it's fully nonlinear, but it's not concave so there's a bunch of standard PDE techniques that you can't use. I'm going really deep into the rabbit hole really fast. Yeah, so that's the kind of stuff I spend all day with.

How do you like the postdoc life as opposed to the PhD life?

Oh boy. It's real different. I like teaching. When I first came to undergrad, I had wanted to be a high school math teacher. I enjoyed teaching, and so it's been nice to get to do some more of that. The research has also been really fun. I really appreciate that Dr. Fang gives me a lot of freedom to kind of choose my own directions and write things the way I want to write things, kind of approach a problem I want to approach.

Do you like the independence? Has it been hard to transition from being told what to do versus having to come up with it on your own?

Yes. I like the independence. I feel like my PhD advisor also gave me a lot of room to explore things. But the independence also comes with being the only person who's working on the exact thing you're working on. So, it's kind of like, I don't know. There's not classes you take with people anymore. I came from a tight-knit geometry cohort. There was a bunch of geometers studying pretty similar sorts of things. So, it's been an interesting adjustment to come to a department where a lot of the geometry-topology group definitely skews a little more heavily towards topology. It's been kind of cool looking a little bit more at the algebraic side of things.

Do you like it? You can say no.

I have started to like it more. Well, I mean, I was a Kähler geometer. Kähler geometry matches up with algebraic topology really nicely. And so one of the things that we did for a paper that we're working on right now was study some algebraic homological objects, okay? Which I was generally very nervous about, but it was actually really cool. Like, I felt like I understood it for the first time. I got a kick out of it.

That's awesome. So you said you'd been to UC Irvine; how do you like UC Irvine versus Iowa? How's that fit for you?

You can't ask me that when we're coming out of winter. I grew up in Ohio. I'm used to midwestern winters. But man, six years of not having a real winter was really nice. But actually, I've really liked it out here. Southern California is not walkable. But I really like this little walkable downtown area - there is stuff to do within walking distance. Yeah, Irvine was a little more like if you had a car and you didn't mind driving like two hours, you could do whatever you wanted. And out here there's like a little less but it's all within walking distance. So it's kind of better in my opinion.

Do you know if you want to stay at Iowa or are you looking at other places?

I'm gonna be here for at least two more years. My appointment - me and Lizzie's appointments actually - are both for three years because we're on the RTG grant. So I'll be here for at least two more years and then I gotta look for other postdocs, tenure track jobs. See what is out there.

Are there any courses that you'd be excited to teach while you're here or any seminars you'd want to possibly be a part of?

Yes, so I'm really excited. I heard I'm teaching undergrad differential equations in the fall. Differential equations was a class that was really important to me. I was a math and physics major in undergrad, so learning differential equations was the first time I was like, oh this actually means stuff, I can use this to do real stuff. So I'm excited for that.

What else? I think I should get an opportunity to teach a topics class sometime before too long. I think that would be really fun. You could really do a whole class on the Kalabi problem. It basically boils down to like one fully nonlinear elliptic PDE. But you need a bunch of complex geometry background to get there and some algebraic topology. And in my opinion, it's one of the more beautiful results of the last 40 years. I feel like teaching a class on that would be really cool. But really, I mean, just differential equations, calculus.

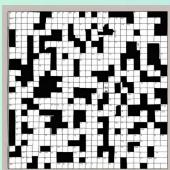
Do you have any advice for us grad students?

Oh my gosh. All right, first one. Join your union. I have my strike card. In 2022 we were on strike for six weeks. We got like 55 percent pay raises over two years. It's one of the cooler things I feel like I've ever been a part of and I know the labor laws out here are wack, but the stronger membership for a union, the stronger the union.

Start your applications early. If you're planning on going on to a postdoc, start them early and do a lot of editing. But also, having a story for the stuff you like to work on is super important. I feel like that's a lesson everybody learns by the time they graduate but I don't know that anybody ever really tells you. Have a story for the stuff you work on. What's the big picture for the projects you've done? Why is the kind of math that you do important?

Is there anything you want to ask the graduate student community?

Give me recommendations. What are good places to eat, things to do, etc.



P U Z Z L E T I M E

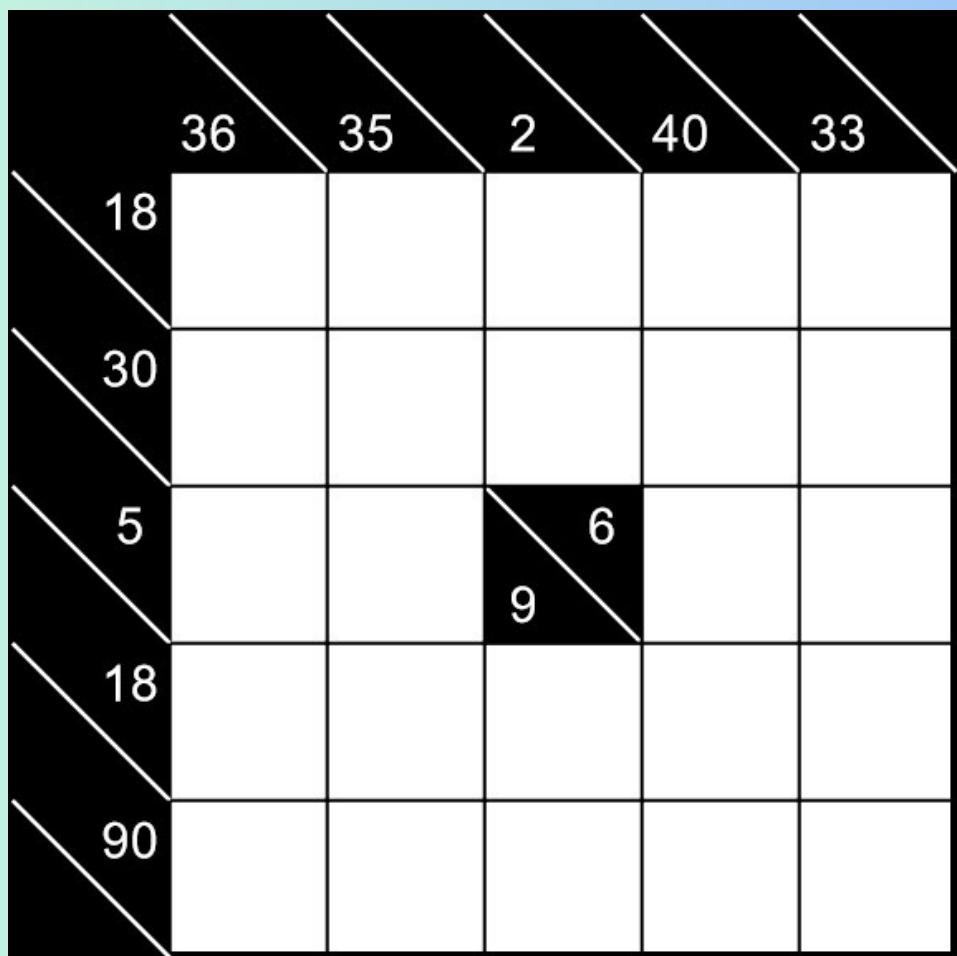


The following puzzle is a variation of Kakuro. Fill in the white spaces with letters that form Roman numerals, and that satisfy the following rules:

- Each row and column must be divisible into valid Roman numerals whose product is given in that row or column.
- No product can have repeated factors.
- Only the numerals I, V, and X are allowed.

For example, if a row of five squares multiplies to 18, a few possible solutions are IXIII (read as 9, 2, 1), IIXII (read as 1, 9 2) and VIIII (read as 6, 3). If a row of three squares multiplies to 10, XII (read as 10, 1, 1) is **not** a solution since it has a repeated factor. There is only one way to fill the entire puzzle correctly.

You may check your solutions with Cole Hengel!



MEET THE FIRST YEARS

Okay, so you guys are married. When did you guys meet?

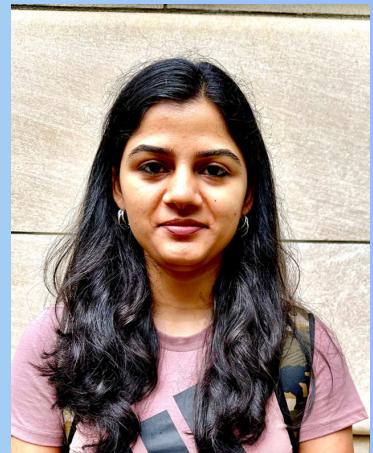
Sheetal: Okay, so we were both classmates during our undergraduate time. So we had been in school together for three years and then during our masters, we went to different institutions. But yeah, it's probably from that time on.

And when did you get married?

Sheetal: Oh 2019. So about four years back?

Mansimran: Pre COVID.

Sheetal: Yes, pre COVID.



Did you have a fancy Indian wedding?

Sheetal: Yeah, nice. Really fun.

Wow, amazing. So why did you decide to do a PhD? You told me that you took a gap in between undergrad and grad school?

Sheetal: Yeah, so we both worked for exactly five years before coming here and we are both actually assistant professors of instruction in Delhi University, right? And it's a requirement for us to do a PhD. Yeah. So that's why we're doing it.

Why did you decide to come to Iowa?

Mansimran: The program is really nice. I like the AMCS because I wanted to work in the field of optimization and you know, work with a professor from a business school. There are not many programs that offer such flexibility, that's why I chose AMCS rather than a pure math program.



Sheetal: It's rather surprising because I had applied to business schools as well as directly into programs of optimization and I got admissions from outstanding universities. But then this program is really good for both, and it lets you choose advisors from the whole school. That's why I am here.

You guys like optimization, right? How do you like the courses so far?

Sheetal: Oh, so right now, the courses that we have taken are the ones we need to pass the quals for. I'm personally looking forward to the optimization courses and related algebra ones, but I can't complain about the courses we're taking right now. They're fine, but also a lot of work.

UNIVERSITY OF IOWA MATHEMATICS DEPARTMENT NEWSLETTER

Other than that, I think it's okay. Mansimran feels the same. It's too much work sometimes. I got some time to get used to all this because I was here but he's just jumped into this right from a proper job.

Mansimran: We came in the spring semester, so we're taking courses that are a continuation of the previous semester's. So there are some topics which the professor just skip because they had taught it in the previous semester, but we need to catch up on that. There's a lot of catching up.

Sheetal: That sucks. But also, it's a real struggle to make friends as well, because everyone else is in their second semester and already have their own thing - they have their friend groups. Yeah, thank God that we at least are there for each other.

How do you like Iowa and like, Iowa City? You know, how's everything non-academic?

Mansimran: The vibe is nice. Yeah, the location of the university is great. The buildings, they're pretty.

Where do you guys stay?

Mansimran: We stay near Seville. There are a lot of cafes and its a vibrant town right now when I came it was very cold, but now it's fine.

Sheetal: The place is so much better than West Lafayette. Purdue is in the middle of nowhere. There's so much more cafes and places to chill in here than in Purdue.

Are you both planning to take quals in the summer?

Mansimran: Yup we're planning to take three quals.

Sheetal: Yeah hopefully we can prepare well in the summer and be done with it.

What do you do other than math?

Mansimran: I used to play cricket, I used to play professionally. I was part of the IPL (Indian Premiere League), but then I got an injury back in 2012, and so then I sat and studied because cricket was over, so that's when I started loving maths.

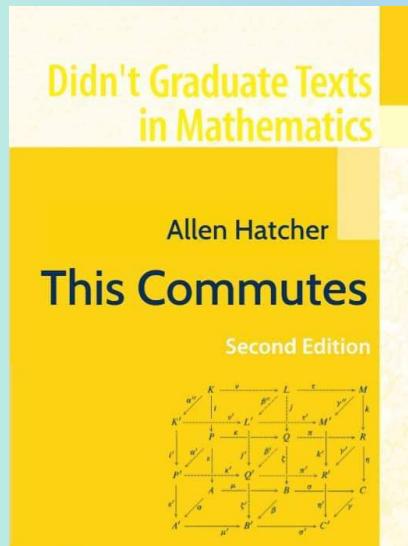
Sheetal: He had a really serious injury because I remember that once semester he took all his classes by standing in the back of the class because he couldn't sit. His injury was so severe that he could only either lie down completely or stand.

Most people would have given up on the semester at that point, so huge respect. There's a trend of NFL players and other sportspeople jumping into math after their sports career, so maybe we'll hear about you in the news someday. "Ex-IPL player becomes a mathematician." Thank you for talking to us!

Sheetal: Thank you so much!

Mansimran: Thanks!

AND NOW, THE MEMES



In this derivation we were rather cavalier about issues of "i" and questions of convergence. As Jens, the serious young student of field theory, objects, we try one more time.

B. Gaussian integrals

It has probably not escaped your notice that the only integral an average physicist can do is the Gaussian integral

$$\int [d\phi] e^{-\frac{\phi^2}{2X}} = \sqrt{\pi}, \quad [d\phi] = \frac{d\phi}{\sqrt{2\pi}}. \quad (3.5)$$

This is the Gaussian integral in one dimension. In more dimensions, Gaussian integrals make their appearance in a slightly

Not being chosen
is
being chosen.

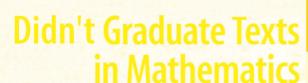
This wisdom was brought to you by $\binom{n}{k} = \binom{n}{n-k}$ -gang.



Thinking about
a topological
transformation



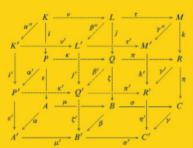
Writing the
function to
describe it



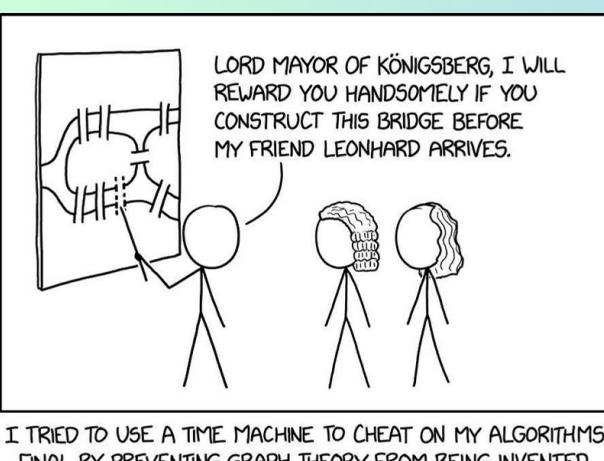
Introduction to That Thing

But only for people who already know it

Second Edition



Springer
somethingotherwhatever.com



I TRIED TO USE A TIME MACHINE TO CHEAT ON MY ALGORITHMS FINAL BY PREVENTING GRAPH THEORY FROM BEING INVENTED.

$\frac{df}{dx}$	f'	$\frac{\Delta f}{\Delta x}$
LAWFUL GOOD	NEUTRAL GOOD	CHAOTIC GOOD
$\frac{d}{dx} f(x)$	$f'(x)$	$f^{(1)}(x)$
LAWFUL NEUTRAL	TRUE NEUTRAL	CHAOTIC NEUTRAL
$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$	Df	\dot{f}
LAWFUL EVIL	NEUTRAL EVIL	CHAOTIC EVIL