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Dear Amplify,

I am writing to apply for your NYC Instructional Coach position. I have been working as a math teacher at an independent school in NYC, and I love using Desmos as a central part of my teaching. For a long time I have also been making my own Desmos graphs and activities and sharing them with the broader math-education community on social media. A sampling is here. Math can often seem forbiddingly abstract to students, but Desmos graphs can make it wonderfully tangible. Students can literally push and pull mathematical objects around, and poke them to see what happens.

Very often during my teaching I have shown students and colleagues how to use Desmos, and especially how to make the most of the opportunities available beyond its basic graphing functions, powerful and extremely useful though those functions are. One illustrative example is the following: a colleague of mine was having the students in her class make Desmos art, and she asked around in the math department how it might be possible for the children to draw ellipses whose principal axes are oriented obliquely, as opposed to the simpler case of them being stretched along either the x- or y-axes. A colleague started to explain to her how to apply a rotation matrix to an ellipse, but it quickly became apparent that this would be much too complicated for the students. I later showed her how to draw an ellipse at any angle simply using two draggable points A and B and the one-liner distance((x,y), A) + distance((x,y), B) = k. She was grateful, I felt happy that my countless hours happily playing with Desmos were proving useful to others, and, most importantly, many students in her class were able to make the cartoon eyes of their Desmos art animals look satisfyingly right.

I have also often used, and demonstrated the use of, Mathigon's Polypad tools, and I was very pleased to see their recent incorporation into the choice of Desmos activity screens. My 6th grade class especially enjoyed fraction bars and their ability to make musical rhythms. One example that I posted is here. It is hard to overstate how satisfying it is to show people how the topic of fractions, often forbiddingly dry, can transform in a way that makes perfect mathematical and musical sense into a fun and educational toy.

The question of how to improve math education is, of course, longstanding and urgent. I truly believe that Desmos has created the most powerful set of tools anywhere for achieving that. On the small scale of a single classroom, I have had the pleasure and opportunity of exploring this in my own teaching. This has given me direct experience of its great potential, and also of the some of the practical issues that can arise in a classroom setting. I live in NYC (on Roosevelt Island) and own a car (currently somewhat under-used!). I cannot think of a more enjoyable and worthwhile activity than sharing the joys and educational potential of Desmos with teachers and their students throughout the local community. It would be a thrilling opportunity, and an inspiring challenge.

Sincerely,

RDSRaizada

Rajeev D. S. Raizada, Ph.D.

Rajeev Raizada

High school math teacher in NYC, visual explainer, programmer

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Summary

I have been working as a high school math teacher in an independent school in NYC. Before switching to school teaching, I was a cognitive neuroscience faculty member in a university, teaching and carrying out research. I believe strongly that the traditional follow-the-textbook mode of math instruction completely fails to do justice to the subject. Moreover, it all too often results in students trying to follow memorised tricks and procedures, without any understanding of why they work.

For all those reasons and more, I am a huge fan of Desmos. I especially enjoy using it to make math games, exploiting features such as the ticker and its ability to trigger actions. A collection of some of my Desmos creations can be found here.

I enjoy sharing my Desmos creations with the broader community. Many math-related Wikipedia pages are not as clear as they could be, due to a lack of explanatory diagrams. Spurred by this, I have made and posted several Desmos-made figures and animations, e.g. an animated gif illustrating how to prove the Pythagorean theorem by area-preserving shearing, here, made from this Desmos graph. A collection of my Desmos-made Wikipedia contributions can be found here. I also post on social media, including on the Desmos subreddit and Twitter. A sampling of my Desmos-related tweets that have attracted some community attention can be found here.

Appointments

Math teacher, grades 6, 9, 10 & 11. St. Ann's School, Brooklyn	Sept.2022 - present
Upper school math teacher, The Birch Wathen Lenox School, NYC	Sept.2021 - Aug.2022
Assistant Professor, Dept. of Brain & Cog.Sci., Univ. of Rochester	2013 - 2021
Research Scientist, Dept. of Psychology, Cornell University	2011 - 2013
Research Scientist, Neukom Inst. for Comp. Science, Dartmouth College	2008 - 2011

Education & Training

Univ. of Washington, Seattle. Postdoc. Advisor: Patricia Kuhl	2003 - 2008
MGH-NMR Center, Charlestown. Postdoc. Advisor: Russell Poldrack	2000 - 2003
Boston Univ. Ph.D. in Cog. & Neural Systems. Advisor: Stephen Grossberg	1996 - 2000
Univ. of Birmingham, England. M.Sc. in Cognitive Science	1994 - 1995
Univ. of Oxford, England. B.A. in Mathematics & Philosophy	1991 - 1994

Teaching

School math classes

- Calculus
- Precalculus
- Algebra 2

• 6th Grade
• Mathematical problem-solving (Grades 6-8)

Desmos creations

A collection of some of my Desmos creations can be found here.

Interactive code tutorials

Interactive statistics tutorials, in Python and Matlab
• Webpage containing these tutorials is here.
• YouTube video illustrating the interactive programs in action is here.
• These tutorials have been used for teaching at U.Mass Boston, here.

Python and Matlab for fMRI, General Linear Model and pattern-based analysis
• Webpage with these tutorials is here.
• Used for teaching at the Univ. of Arizona, here and the Univ. of Gent, here.
• YouTube video of me presenting these tutorials to a class: here.

Matlab for neural networks
• Webpage containing these tutorials is here.
• Page includes tutorial code implementing and explaining the backpropagation algorithm, which is the core tool used for training deep neural networks.

Educational videos

I have recently experimented with making some short educational YouTube videos, in which I try to explain topics as simply and engagingly as possible.
• A mathematical pattern hidden in the American flag (explaining why the first n odd numbers sum to n^2), here.
• Why does a negative number times a negative number end up being positive? An intuitive explanation, here.
• Make better presentations, by controlling visual attention, here.

University classes taught

• Language and the brain
• Introduction to fMRI (functional magnetic resonance imaging)
• Cognitive Neuroscience

Selected publications

For a complete listing, please see my Google Scholar profile: https://scholar.google.com/citations?user=PJWjx8gAAAAJ

Anderson, A. J., Lalor, E., Lin, F., Binder, J.R., Fernandino, L., Humphries, C., Conant, L., Raizada, R.D.S., Grimm, S. and Wang, X. (2018) Multiple regions of a cortical network commonly encode the meaning of words in multiple grammatical positions of read sentences. *Cerebral Cortex*, 29(6), 2396-2411. PDF.

Zinszer, B.D., Anderson, A.J., Kang, O., Wheatley, T. and Raizada, R.D.S. (2016) Semantic structural alignment of neural representational spaces enables translation between English and Chinese words. *Journal of Cognitive Neuroscience*, 28, 1749-1759. PDF.

Mackey, A.P., Raizada, R.D.S. and Bunge, S.A. (2012) Environmental influences on prefrontal development. *In: Principles of frontal lobe function*

(2nd Edition), edited by Donald Stuss and Robert Knight. Oxford: Oxford University Press. PDF.

Raizada, R.D.S., Tsao, F.M., Liu, H.M., Holloway, I.D., Ansari, D. and Kuhl, P.K. (2010) Linking brain-wide multivoxel activation patterns to behaviour: examples from language and math. *NeuroImage*, 51, 462-471. PDF. Supplementary Material.

Raizada, R.D.S. and Kishiyama, M. (2010) Effects of socioeconomic status on brain development, and how Cognitive Neuroscience may contribute to leveling the playing field. *Frontiers in Human Neuroscience*. doi:10.3389/neuro.09.003.2010. PDF.

Grants and awards

Currently funded	NSF CAREER Award #1652127: "Testing models of semantic spaces in the brain." PI. $513k.	2017 - 2021
Previously funded	Google Faculty Award: "Good representations of meaning enable good inferences: Bridging between word2vec and analogical reasoning in the human brain." PI. $66k.	2015 - 2016
	NSF Award #1228261: "Measuring and modeling object similarity in the brain: combining conceptual and perceptual representations." PI. $480K.	2012 - 2015
	IARPA Award: "Knowledge representation in neural systems." Co-PI. $400K.	2014 - 2015
	NSF Award #1058753: "EAGER: Brain-mobile interfaces: Exploratory research into the development of networked NeuroPhones." Co-PI. $250K.	2010 - 2012
	NSF 0121950 Cognitive Neuroscience Pilot Grant. Co-PI. "Enhancing human cortical plasticity: Visual psychophysics and fMRI." $50K.	2001 - 2001

References

Available upon request