College of Sciences
Department of Mathematics

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NC STATE UNIVERSITY

January 21, 2020
Search Committee
School of Mathematics
University of Minnesota
127 Vincent Hall
Minneapolis, MN 55455

Dear Search Committee,

I am applying for the MathCEP postdoctoral position in the School of Mathematics. I am a Graduate Student at North Carolina State University with my dissertation defense scheduled and an expected graduation date May 2021.

My dissertation work is in the field of differential geometry under Irina Kogan. My work focuses on the extent to which differential signatures can be used to differentiate submanifolds of a given space under certain transformation groups. We developed a method for constructing families of non-degenerate, non-congruent planer curves with identical signature groups, and gave conditions for which the signature uniquely determines a planar curve under actions of the Special Euclidean Group.

Future work will include examining how signatures from different group actions can be used in tandem along with other invariants to differentiate non-congruent curves. Additionally, methods for implementing the efficient calculation of numerical approximations of signatures by formulating joint invariants for transformation groups which have yet to be found explicitly.

At North Carolina State University I have been instructor of record for three courses including one flipped course. I have experience as an instructor for Calculus 2 and as a recitation leader for Calculus 1 and 3. Additionally I developed and taught a three-week summer course titled “Paradoxes and Infinities” for grades 7-10 while working with the Johns Hopkins Center for Talented Youth (CTY) program.

Teaching the flipped course has given me insight into how students are actively engaging with the material. This provided opportunity for them to not only receive direct and immediate feedback, but also practice communicating mathematical ideas to their peers. Seeing the benefits of this style, I provide ample space in my traditional lectures for students to work with the material during class time where I can gauge understanding and provide feedback that might normally not be given to them until test

time. Additionally, my summer with Johns Hopkins CTY has given me experience working with middle and high school students in a non-traditional classroom and I would like to continue to develop programs for students of this age group where they can interact with exciting topics in math that are not part of a normal curriculum.

While a graduate student at NC State I was also a committee member of the Graduate Instructor Support and Tools (GIST) program and helped organize resources and set up workshops for graduate students who are interested in improving their teaching. I would like to bring that experience to the University of Minnesota to help increase the quality of the graduate instructors.

I am interested in preparing myself further for a position as a teaching professor at a research university, or liberal arts college that emphasizes teaching. Primarily I want to develop the skills necessary to supervise undergraduate research projects and look to further my experience in developing interesting courses for students across the K-12 grades and college math and non-math majors. Additionally, I am interested in working with Peter Olver, who was part of the group that defined and contributed the initial work on differential signatures, in starting a research program that could be accessible to undergraduates.

I look forward to hearing from you soon. Thank you.

Sincerely,

Eric Geiger