University at Buffalo
State University of New York

Department of Computer Science and Engineering

Dec. 6, 2015

Graduate Admissions Committee
Re: applicant Chen Xu

Dear Graduate Admissions Committee:

I am happy to provide a reference for Mr. Chen Xu. I have known him since his arrival at UB in August 2014, first in my class "CSE596: Intro Theory of Computation" (which was required for PhD study), next in my Spring 2015 advanced graduate course "CSE696: Computational Complexity," and in informal weekly contact (not a registered independent study) this term. He is completing a Master's thesis with original research under my colleague Jinhui Xu. His applications reflect a desire to re-locate geographically.

Chen earned a B+ in CSE696, behind my two currently supported students with A and A- and another with A. This followed a B in CSE596; it was not far from B+ and 13th in the class of 32. He was adamant about taking 696 despite the grade in 596 and since I had seen bright spots I encouraged it. The difference from the others in CSE696 was simply scores on homeworks and my take-home final. I was slow to pick up on his creativity because the ideas he expressed last spring were quixotic—the kind that imply collapses of the polynomial hierarchy or $\mathsf{BPP} = \mathsf{ZPP}$. I regarded them as his effort to absorb the course material by pounding on it rather than quiet osmosis, and focused more on improving his technical command.

I saw him a couple more times in early summer, but it was really after we started meeting again in September that I saw a big step up in both creativity and command. He first brought to my attention some matrix problems involving Krylov space methods, which I tried to connect to topics I've been discussing with Joel Ouaknine of Oxford in connection with Skolem's Problem. Then I learned about his work on sparse-matrix methods and trying to classify a new case of a much-studied problem into RP (for the record, RP is between BPP and ZPP). Originally he was tilting after the whole problem, which being hard for approximating maximum-satisfiability is not going to fall without doing a Samson, but now he understands the contours of the edifice and is pressing against a side wall where recently developed machinery might be creatively configured to move it. His idea is good—looking for sparse solutions to under-specified linear systems and then finding ways to sample approximations to them effectively. Most recently he has invented a way I haven't seen of "blurring" instances of (3)CNF-satisfiability by conjoining a formula with its images under flipping subsets of its variables, which has led at least to some lively discussions involving my other students. He hasn't discussed his factoring ideas with me. I could say I'd like to get him interested in computational experimentation as a vehicle of theory along lines I've tried with Gröbner-based scientific packages, but he is certainly doing similar things with linear algebra systems.

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I don't know if he is asking for financial support; he has said the lack of it as a Master's student hasn't been a factor with him. His English is a little hard to understand but it helps that he is effusive rather than quiet. His writing is crisp—he prefers neatly penned handwritten pages to LaTeX scribe notes—and literate with occasional grammar glitches. He is certainly earnest—and similar to someone who struggled to a B in my CSE596 class but now has a tenure-track position in warmer climes. The neatest thing is that out of the blue he paid his way to fly out and attend last week's workshop on "Computational Complexity of Low-Polynomial Time Problems" at the Simons Institute at Berkeley. He seemed to get a lot out of it including conversing with some senior people about his sparse linear subspace problem. He is much more of a hacker than a formalist, which might explain my highly formal teaching approach not playing to his best advantage. I'll be sorry to see him leave since I appreciate what he's up to and since our theory group has recovered the level of élan it had before Alan Selman retired two years ago. Viewing his work experience too, I believe he has a lot going for him that will respond well to good opportunities, and I can recommend him highly. I will be happy to answer any other questions you may have.

Yours sincerely

Dr. Kenneth W. Regan