Northwestern | THE GRADUATE SCHOOL

Application for Admission

App Type **New Student**   Submitted Date **12-10-2018**   App ID# **78541883**

Intended **Full-time**
Status   Entry **Fall 2019**   Prior TGS
                            Quarter   Applicant
                                                          (Program)

Last Name **Stern**   First **Samuel**   Middle **Walter**

Gender Pronouns (US only) **he/him/his**   Birthdate **03-06-1997**   Gender **Male**

Program **Computer Science: MS**   Secondary PhD
                                                    (MEAS Only)
Specialization/Area of Interest **Artificial Intelligence and Machine Learning**   MS Consideration
                                                    (MEAS Only)
Cluster

JD/PhD **No**   DPT/PhD **No**   Fee   US Vet/Active Forces **No**
                                                    Waiver

Ethnicity **White**   Hispanic **No**

Citizenship **UNITED STATES**   Visa

Citizenship Status **U.S. Citizen**

Country of Birth **UNITED STATES**   Green Card #

Current Address   Permanent Address
 204 N Pinckney St Apt 203   **764 Kensington Rd**

 Madison, WI, 53703   **Neenah, WI, 54956**
 UNITED STATES   **UNITED STATES**

Current Phone **[920]-851-7325**   Permanent Phone

Cell Phone   Preferred Phone **Current Phone Number**
                                         Number

Email Address **sterns697@gmail.com**

Previous Institution	From	To	Field of Study	Level	Degree	Date
University Of Wisconsin-Madison	**09-06-2015**	**05-15-2019**	**Computer Science and**		**US Bachelor of Science**	

Cumulative UG GPA	**3.33**

Cumulative UG GPA	3.33	UG Junior/Senior Year GPA	
Cumulative UG GPA - Unconverted		Max UG GPA Scale	**4.00**
Cumulative Grad GPA			
Cumulative Grad GPA - Unconverted		Max Grad GPA Scale	

Letters of Recommendation
1. **Paul Wilson**   **paul.wilson@wisc.edu**
2. **Elise Gold**   **elise.gold@wisc.edu**
3. **Wendy Crone**   **crone@engr.wisc.edu**
4.
5.

Are you interested in studying with specific faculty members? (List names below)

1.   First Name **Ken**   Last Name **Forbus**

2.   First Name **Ian**   Last Name **Horswill**

3.   First Name **Sara**   Last Name **Sood**

4.   First Name   Last Name

Please indicate the highest level of education completed by your parent(s) or guardian(s) (the one or two people most responsible for raising you)

First individual's highest level of education completed: **Graduate or professional degree**

If other, please explain:

Second individual's highest level of education completed: **Bachelor's degree or equivalent**

If other, please explain:

Language	Reading	Writing	Speaking

Self-Reported Test Scores

GRE Gen **06-19-2018** Verbal **163** **93** Quant **166** **90** A.W. **4.0** **59**

GRE Sub [ ] [ ] [ ] LSAT [ ] [ ] [ ]

TOEFL [ ] Ovr [ ] Read [ ] List [ ] Speak [ ] Writ [ ] IELTS [ ] Ovr [ ]

GMAT [ ] Tot [ ] [ ] Verb [ ] [ ] Quant [ ] [ ] A.W. [ ] [ ] I.R. [ ] [ ]

MCAT [ ] Bioscience [ ] [ ] Verbal [ ] [ ] Physical Science [ ] [ ]

Please list any honors you have been awarded
Dean't list [College of Engineering] 2015, 2016.

Have you applied for or been awarded an external fellowship?

Yes ○ No ⊗ If yes, please specify;

Please describe your plans for the future.
After completing my study, I plan to continue into industry. I am not yet completely certain of where I will go.

Other Universities Applied (in preferred rank order)

1. School Drop Down **University of Wisconsin-Madison**   5. School "other"

2. School Drop Down **University of Illinois-Urbana**   6. School "other"

3. School Drop Down **University of Minnesota-Twin Cities**   7. School "other"

4. School Drop Down   8. School "other" **Michigan Technological University**

Michigan State University

Academic misconduct? Yes ○ No ⊗   Convicted of crime? Yes ○ No ⊗

If answered yes, applicant is asked to upload explanation. If uploaded, explanation will be attached to end of application PDF.

From a young age, I have always been fascinated by computers and computer programming, captivated by the idea of turning simple abstract logic into tangible, powerful real-world results. I find myself drawn to complex systems, compelled to pick them apart and see for myself the simple pieces from which their properties emerge. This curiosity is the reason why I am now drawn to the fields of artificial intelligence and network security - these fields push the limits of modern computing, demanding intricate knowledge of many underlying systems and principles.

I am currently double-majoring in Computer Science and Engineering Physics, with a focus in Scientific Computing, and I am working under Prof. Paul Wilson with the Computational Nuclear Engineering Research Group (CNERG). My current projects are the modification of software developed by this group to add compatibility to Windows operating systems, as well as the development of a diagnostic technique for Monte Carlo Mesh Tally Amalgamation. I intend to publish a thesis paper on the latter project in May of 2019. In my time with the CNERG team, I have not only developed my programming skills beyond the normal rigor of my coursework, but I have also gained practical experience following professional workflow standards.

I want to continue my education and improve as a programmer so that I can continue moving forward to larger and harder problems. I want to put the skills I've gained as a researcher to the test, and develop them further. In time, I aspire to make great strides in my chosen fields.

        UW-MADISON STUDENT RECORD
 Stern,Samuel Walter
MATRICULATION DATE 09/02/15
INSTITUTION(S) ATTENDED:
Milwaukee School Of Engineering, Milwaukee, WI
Neenah High School, Neenah, WI
CEEB Advanced Placement Test, New York, NY
 CURRENT MAJOR: Engineering Physics BS
 CURRENT MAJOR: Computer Sciences BMAJ
10/02/15 --GER Communication Part A satisfied.
10/02/15 --GER Quantitative Reasoning Part A satisfied.

 08/24/15   TRANSFER COURSE CREDITS
ENGINEER X10   X   Electives   2.000
ENGINEER X10   X   Electives   2.000
ENGINEER X10   X   Electives   2.000
ENGINEER X10   X   Electives   2.000
                      TOTAL CREDITS   8.000

 08/24/15   TEST CREDITS
MATH   221 NIC r Calculus&Analytic Geom   5.000
MATH   222 NIC r Calculus&Analytic Geom   4.000
ENGLISH X04 EC a Electives   3.000
HISTORY 101 SEC   Amer Hist to Civil War   3.000
HISTORY 102 SEC   Amer Hist-Civil War-Pr   3.000
POLI SCI X20 SEC   Electives   3.000
ENGLISH X25 LEC a Electives   3.000
                      TOTAL CREDITS   24.000

        eBLCXG   CRS   GR   PTS
Fall 2015-2016 EP   2   EgrPhysics Undergrad
           SESSION A1: SEP 02 - DEC 15
CHEM   109 PEC r Advanced General Chemi   5.000   A 20.000
MATH   375 NAC   Multi-Var Calc & Linea H 5.000   A 20.000
SPANISH 203 IC   Third Semester Spanish   4.000 AB 14.000
 SUM: EARNED CR 14   GPA CR 14   GPA 3.857   14.000   54.000
12/24/15 Dean's Honor List

 12/25/15   TEST CREDITS
SPANISH 101 EC   First Semester Spanish   4.000
SPANISH 102 EC   Second Semester Spanis   4.000
                      TOTAL CREDITS   8.000

        eBLCXG   CRS   GR   PTS
Spring 2015-2016 EP   3   EgrPhysics Undergrad
           SESSION A1: JAN 19 - MAY 06
E M A   201 PIC   Statics   3.000   B 9.000
INTEREGR 160   Intro to Engineering D   3.000 AB 10.500
MATH   376 NAC   Topics-Multi-Var Calc& H 5.000   A 20.000
SPANISH 204 IC   Fourth Semester Spanis   4.000 AB 14.000
 SUM: EARNED CR 15   GPA CR 15   GPA 3.567   15.000   53.500
05/15/16 Dean's Honor List

        eBLCXG   CRS   GR   PTS
Summer 2016   EP   3   EgrPhysics Undergrad
           SESSION DDD: JUN 13 - JUL 10
E P D   275   X   Technical Presentation   2.000   A 8.000
           SESSION DHH: JUN 13 - AUG 07
PHYSICS 202 PIC   General Physics   5.000 BC 12.500
 SUM: EARNED CR 7   GPA CR 7   GPA 2.929   7.000   20.500

        eBLCXG   CRS   GR   PTS
Fall 2016-2017 EP   3   EgrPhysics Undergrad
           SESSION A1: SEP 06 - DEC 15
ANTHRO   104eSEC   Cult Anthro&Human Dive   3.000 AB 10.500
E P   271   Engr Problem Solving I   3.000   A 12.000
PHYSICS 205 PIC   Mod Physics for Engine   3.000   B 9.000
PHYSICS 311 PAC   Mechanics   3.000   B 9.000
STAT   224 NIC r Intro Stats for Engine   3.000   B 9.000
 SUM: EARNED CR 15   GPA CR 15   GPA 3.300   15.000   49.500
12/24/16 Dean's Honor List

        eBLCXG   CRS   GR   PTS
Spring 2016-2017 EP   4   EgrPhysics Undergrad
           SESSION A1: JAN 17 - MAY 04
COMP SCI 302 NIC r Introduction to Progra   3.000 AB 10.500
E C E   376   Electricl&Electronc Ci   3.000   A 12.000
E M A   303 PIC   Mechanics of Materials   3.000 BC 7.500

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MATH     321 NAC   Appl Mathematical Anal   H 3.000  BC  7.500
M E      361       Thermodynamics            3.000  BC  7.500
 SUM: EARNED CR 15   GPA CR 15   GPA  3.000   15.000     45.000

            eBLCXG                           CRS  GR    PTS
Summer 2017      EP   4   EgrPhysics Undergrad
            SESSION DHH: JUN 19 - AUG 13
COMP SCI 240 NICx  Intro to Discrete Math    3.000  AB 10.500
COMP SCI 367 NIC r Intro to Data Structur    3.000   B  9.000
 SUM: EARNED CR  6   GPA CR  6   GPA  3.250    6.000     19.500

            eBLCXG                           CRS  GR    PTS
Fall 2017-2018  EP   4   EgrPhysics Undergrad
            SESSION A1: SEP 06 - DEC 13
COMP SCI 252  ECx   Intro to Computer Engi    2.000  AB  7.000
COMP SCI 412 NIC    Intro to Numerical Met    3.000  AB 10.500
E P      468        Intro to Engineering R   H 1.000   A  4.000
E P D    397     b Technical Communicatio     3.000  AB 10.500
N E      305 PIC    Fundamentals-Nuclear E    3.000  AB 10.500
PHYSICS  322 PAC    Electromagnetic Fields    3.000  AB 10.500
 SUM: EARNED CR 15   GPA CR 15   GPA  3.533   15.000     53.000
12/24/17 Dean's Honor List

            eBLCXG                           CRS  GR    PTS
Spring 2017-2018 EP   4   EgrPhysics Undergrad
            SESSION A1: JAN 23 - MAY 04
COMP SCI 354 NICxr Machine Organizatn&Pro    3.000  BC  7.500
COMP SCI 513 NACx  Numerical Linear Algeb    3.000  BC  7.500
COMP SCI 559  IC   Computer Graphics         3.000  AB 10.500
E P      469        Research Proposal-Engr   H 1.000   B  3.000
M E      307    x  Mechanics of Materials    1.000   B  3.000
M E      363        Fluid Dynamics           3.000   B  9.000
 SUM: EARNED CR 14   GPA CR 14   GPA  2.893   14.000     40.500

            eBLCXG                           CRS  GR    PTS
Summer 2018      EP   4   EgrPhysics Undergrad
            SESSION DHH: JUN 18 - AUG 12
M E      364        Elementary Heat Transf    3.000  AB 10.500
 SUM: EARNED CR  3   GPA CR  3   GPA  3.500    3.000     10.500

            eBLCXG                           CRS  GR    PTS
Fall 2018-2019  EP   4   EgrPhysics Undergrad
            SESSION A1: SEP 05 - DEC 12
COMP SCI 577 NAC   Introduction to Algori    4.000 UNRPTD
E P      568        Research Pract-Engr Ph   H 3.000 UNRPTD
M S & E  351        Struct&Property Rels-S    3.000 UNRPTD
N E      427 PIC   Nuclear Instrumentatio    2.000 UNRPTD
 SUM: EARNED CR  0   GPA CR  0   GPA  0.000   12.000      0.000

            ADV STG CREDITS            40
            UGRAD CUM CREDITS          144
            UNDERGRAD CUM GPA CREDITS  104
            UGRAD CUM GRADE POINTS     346.0
            UNDERGRADUATE GPA            3.327


                    MEMORANDA


06/12/15 --Admitted with deficiency in foreign language.  Must
        clear deficiency prior to completion of 60 degree
        credits (including transfer credits) or may not
        continue.
        (ADM)
05/13/18 Action Pending Removal of Incomplete
09/05/18 Cleared of Previous Action
09/05/18 Grade changed in E P  469 (1184) from I to B
        work completed: 2018-08-29
                END OF RECORD
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Samuel W. Stern
204 N. Pinckney St., Apt. 203
Madison, Wisconsin 53703
(920) 851-7325
sterns697@gmail.com

PURPOSE: *I am seeking a research assistantship to accompany my graduate school curriculum. With a strong track record of academic and organizational accomplishments, I will be a strong addition to a graduate-level research team. My primary areas of interest include artificial intelligence and network security.*

EDUCATION

Completing senior year at the **University of Wisconsin-Madison, College of Engineering**

Double Major: **Engineering Physics** & **Computer Science** (Current GPA: 3.327, 144 credits completed)

ACADEMIC WORK EXPERIENCE

Research Assistant for Professor Paul Wilson (Madison, WI), 2017 - Present
Adapted software developed by the CNERG (Computational Nuclear Engineering Research Group) team for compatibility with Windows operating systems. CNERG focuses on the development of reliable software tools for the analysis of complex nuclear systems.

• Added functionality for easy, rapid install of CNERG software
• Optimized code package inclusion to minimize installation complexity
• Proficient with c++ and java programming languages. Familiar with git and professional workflow management technology
• Compatibility between systems allows team to easily develop software on multiple platforms
• Organized, documented, and solved lingering errors in the install process

UNDERGRADUATE THESIS

"An Investigation into Diagnostic Techniques of Mesh Amalgamation for Monte Carlo Methods"

• Analysis of Monte Carlo statistical error to isolate effects of fine mesh for radiation transport
• Modification of DAGMC (Direct Accelerated Geometry Monte Carlo) to allow naive mesh amalgamation as an error reduction technique.
• Development of a diagnostic statistic and a method for easily isolating this statistic

ACADEMIC RECOGNITION

• Frances Sawyer Hefti Scholarship 2015-16 & 2016-17
• Milk Source LLC Corporate Scholarship 2015-16, 2016-17, 2017-18, 2018-19
• Dorothy Marshall Scholarship (Freshman Achievement in College of Engineering) 2015-16
• Robert Radtke Scholarship (Neenah High School's Top Mathematics Award) 2015-16
• Morris Dalton Scholarship 2015-16
• University of Wisconsin-Madison Summer School Scholarship, 2018-19

ORGANIZATIONAL EXPERIENCE

Elected treasurer of a UW-Madison Cosplay & Design Guild, 2017-18
• Maintained on-time, accountable dues collection for 20-member volunteer-led student club.
• Utilized Web-based expense-tracking software to account for all income/expenses.
• Handled all business operations of the organization, including travel planning, lodging and expenses.
• Successfully trained and transitioned responsibilities to my successor upon completion of my tenure.

VOLUNTEER EXPERIENCE

Co-organized (with my brothers) a community fundraiser, which generated $2,500+ (revenues raised after expenses) for Neenah family facing childhood cancer treatment bills, 2013
• Responsibilities included site selection, volunteer coordination and community promotion
• By minimizing costs, we maximized the amount of money the family could put toward medical expenses.

ADDITIONAL WORK EXPERIENCE

Customer Service Representative (Food Service), UW-Madison Union South, 2017
• Sharpened strong multitasking skills, especially during lunch and dinner shifts.
• Excellent customer experience ensured by prioritization and promptness.
• Displayed strong teamwork skills, whether responsible for cash register or working in the kitchen..

Farm Hand / Tour Guide, Omro Dairy, Seasonal 2017
• Prepared the farm for Winnebago County Dairy Breakfast on the Farm by cleaning the grounds and painting buildings.
• Helped coordinate the flow of more than 4,000 visitors during event: answering questions, directing traffic and ensuring the safety of both guests and animals.

"Diversity" has, in recent years, drifted toward becoming a "buzz-word", touted about by anyone wishing to bear the appearance of an accepting culture. It's a word I've grown hesitant to trust, as too many people and organizations would rather hide behind the word than actually act on or even understand its meaning.

I have tried to live up to my ideals by putting them into practice. I spent several years (primarily 2012-14) as a volunteer on behalf of not-for-profit Goodwill Industries of North Central Wisconsin, one of the primary employers - and advocates - benefiting individuals who are differently abled or challenged in other ways. Goodwill NCW's Community & Diversity Programs include the LGBT Partnership, Restorative Justice, Circles of Support and Voices of Men (which - name aside - actually campaigns against all manner of violence toward women).

I was most personally involved in the Miracle League of the Fox Valley, which allowed severely impaired youths (physical, mental or otherwise) to participate in a full season of baseball. I was a "player buddy," mentoring and protecting a designated player in each game. I worked two seasons with this youth, deepening my appreciation of the challenges he and his family face on a daily basis. Something as simple as safe physical access to a baseball diamond is often taken for granted by the vast majority of Americans; but for someone confined to a wheelchair or battling mental illness, it can be a revelatory and liberating experience. I am proud of having been a small part of that.

I absolutely appreciate that Northwestern University wants individuals that will contribute to an environment where open-minded people feel free to exchange and explore new ideas and paradigms. I seek to be a part of that chorus. I hope that the administration, faculty and others walk that talk as well: Appreciation of all religions means a lot to me personally. Twice in my life, swastikas have twice been painted on my family's hometown synagogue, a sad reminder that the blight of antisemitism remains real and frightening in the 21st century. I want to study and contribute in an academic setting where I will feel safe and respected as well.

My father served as president of Congregation B'nai Israel when the second swastika incident took place. He carried the weight of that vandalism for a long time. It took a lot of the wind out of his sails. But there was a silver lining in this: One of the very first people to contact him personally to pledge unity and support was the president of the local Islamic Society. My dad grew up in a generation when Jews and Muslims didn't talk much; and when they did, they often didn't talk kindly. But they did talk on that day, and I think that conversation certainly changed some perspectives in my father. He may not invite the Imam over for Passover dinner, but he doesn't speak roughly of him anymore, either. The vandals tried to spread hate and fear, and - somehow - managed to accomplish just the opposite in the process.

I believe that the unfortunate reality is that hatred may never truly be extinguished from the world. But it's how we, people of good conscience, respond to those poisonous words and deeds that's either going to inspire or damage our own little corners of the world. Hatred itself may remain an ever-present threat, but it can be defeated every time it rears its ugly head, if good people are willing to stand up to it.

I believe I can contribute to the multicultural voice at Northwestern University, standing stalwart against racism, sexism, antisemitism, and every other form of hatred that presents itself.

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Recommendation Form

Applicant Name: **Samuel Stern**

Program: **Computer Science: MS**

Applicant Waived Rights*: **This applicant has waived the right to view their recommendation.**

Recommender Name: **Paul P.H. Wilson**

Organization Name: **University of Wisconsin - Madison**

Title: **Professor**

E-mail Address: **paul.wilson@wisc.edu**

Telephone Number: **6082630807**

Relationship to Applicant: **Research Mentor**

Certification (Date): **12-10-2018**

Paul P.H. Wilson
Grainger Professor of Nuclear Engineering
419 Engr Research Bldg   Phone:+1.608.263.0807
1500 Engineering Dr   Cell: +1.608.469.9615
Madison, WI 53706   paul.wilson@wisc.edu

December 10, 2018

Graduate Admissions Committee
Department of Computer Science
Northwestern University
Evanston, IL 60208

Dear Admissions Committee,

I am writing to offer my recommendation in support of Samuel "Sam" Stern's application to your MS program in Computer Science at Northwestern University. I first met Sam in my Engineering Problem Solving (EP271) course 2 years ago. I have gotten to know him better over the last year, since he joined my research group as an undergraduate researcher. My research group is engaged with software development for the simulation of complex nuclear energy systems. Sam's initial task was to modify an existing software tool to increase its portability across platforms, transitioning to a research project for his undergraduate thesis in the last few months.

Sam has been an industrious member of my group, and made steady progress on the software portability task. He worked very independently, overcoming various obstacles along the way with minimal assistance from others. This task involved building a runtime plugin, written by my group, for a licensed, commercial software package. Building the plugin was reasonably well supported in Linux, relying on a number of other packages, but was not well-supported in a Windows environment. Sam's task was to learn to build the software in Linux using a remote virtual machine, and then replicate the process in Windows with as few supporting packages as possible. In particular, Sam was asked to build the software without relying on BLAS/LAPACK libraries that are common for many scientific software packages. This task is nearly complete, with a final replacement of one linear algebra library with another. An important final step in this effort has been devising and implementing tests to ensure that the behavior is preserved across this change of library.

During the past summer, Sam identified a research project based on Monte Carlo radiation transport, the basis for much of my group's research. Specifically, Sam's goal is to assess the effectiveness of scoring results in different overlapping spatial regions in order to reduce statistical uncertainty in the results. This project required Sam to quickly pick up some of the statistical basis for scoring results in such simulations. He has most recently completed a detailed breakdown of the tasks required to complete this work, recognizing the ability to develop three independent components that allow him to make steady progress overall, even when he hits a road block in any single component.

Overall, Sam has demonstrated a strong balance of independence and seeking assistance, generally learning things on his own, but checking in at an appropriate frequency to ensure that he is getting it right. Both of his major tasks have carried him well beyond his prior experience and training and he has been able to learn what he needs to make progress. His

biggest weakness is related to his ability to estimate how busy he will be and therefore how long each step will take. This is a common weakness for beginning researchers, however.

In his work with me, Sam has had to learn C++ and Python, using a number of new-to-him open source libraries in each. He has demonstrated competency across the board in these specific skills.

In summary, I recommend Samuel Stern for an MS in Computer Science at Northwestern University.

Regards,

Paul P.H. Wilson

419 Engr Research Bldg	Paul P.H. Wilson	Phone: +1.608.263.0807
1500 Engineering Dr	Grainger Professor of Nuclear Engineering	Cell: +1.608.469.9615
Madison, WI 53706	Department of Engineering Physics	paul.wilson@wisc.edu

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Recommendation Form

Applicant Name: **Samuel Stern**

Program: **Computer Science: MS**

Applicant Waived Rights*: **This applicant has waived the right to view their recommendation.**

Recommender Name: **Elise Gold**

Organization Name: **University of Wisconsin - Madison**

Title: **Faculty Associate Emerita**

E-mail Address: **elise.gold@wisc.edu**

Telephone Number: **608-497-1197**

Relationship to Applicant: **Instructor**

Certification (Date): **12-11-2018**

Technical Communication Program
Mechanical Engineering Building Suite 2107
1513 Engineering Drive
Madison, WI 53706
(608) 262-2472 | tc.engr.wisc.edu

November 8, 2018

Dear Admission Committee Members:

I am happy to recommend Sam Stern to your graduate program in computer science. In the Fall of 2017, Sam was one of 44 students in my Technical Communication classes (EPD 397), where he earned an AB, a very good final course grade from an instructor who guards her A grades. I can attest specifically to his performance because each class section is limited to around 23 students. Overall, Sam, who is motivated, approached assignments with dedication; time and again, he made them opportunities not just for displaying his abilities but for learning something new and improving his communication skills, crucial to the success of any student pursuing a graduate degree and especially critical to someone pursuing a career in computer science. Besides demonstrating his love of learning, Sam has traits any faculty member would find admirable in a student, ones which would make him a strong candidate for any graduate-level program. He is intellectually curious, is diligent and responsible, learns quickly and shows initiative, has a number of higher level written and oral communication skills, and is a personable young man who works both well independently and with others.

Just briefly to provide some context, Technical Communication is a rather challenging course. This course requires that students work through multiple formal and informal assignments individually as they share their work with me and peers in drafts to receive and implement feedback. Many of the assignments revolve around taking a term project topic focused on solving an engineering or scientific problem from start to completion—from initial conception of two possible topics in a short memo with annotated bibliography of three selected credible sources on each topic, through some more sustained research to write a more developed formal proposal and present a less formal short proposal talk about one of the topics, and finally through fuller research to prepare an end-of-semester technical report and accompanying formal technical presentation. A unique feature of students' experience in this course, as opposed to those in their majors, is that the documents and the presentations they prepare related to their technical subject must be made accessible and meaningful to an audience who is both multidisciplinary (engineering students from other majors) and nontechnical (me).

Completing this term project successfully involved a great deal of independent work on Sam's part--planning, organizing, writing, and editing and revising various documents, the two most important being a project proposal and a technical report based on the research, and preparing and giving engaging presentations for that multidisciplinary and nontechnical audience as I already mentioned. Sam's approach to completing components of his term project—an analysis of the techniques used to predict and detect damaging disruptions in experimental plasma reactors—revealed he has the aptitude and attitude crucial for being a successful M.S. candidate. Regarding the first main project document, Sam put together a strong proposal for his project that convincingly conveyed to his readers the broader contexts that would make his topic meaningful to them and other stakeholders. He then clearly and concisely explained the techniques he planned to examine--fuzzy logic, neural networking, and classical machine learning disruption predictors--and identified their potential benefits and drawbacks, maintaining the objectivity critical to scientific investigation. He moved on to define his goals for the project, emphasizing the analytical and evaluative component of the research not only by identifying the specific criteria he would apply—comparing these methods' response speeds and accuracy and assessing their applicability and set-up times in new facilities--and his intention of drawing significant

conclusions about which technique is best for plasma disruption prevention in the ITER facility, but also by recognizing the limitations of his research. To enhance his credibility, he provided a good research plan, discussing important source information he had already discovered; he constructed a reasonable schedule for completing the work; and he described how his own motivation and background made him a qualified candidate to do the research.

Not only can Sam write a persuasive proposal, but he can also carry through and effectively report his research. With his mixed audience in mind, Sam began his report by providing, with clarity, the context for why such an audience should care about the subject—the continued increased need for global power bringing with it increasing pollution, a need that could be addressed with little pollution by nuclear fusion reactors if the problem of disruptions could be solved. Having established the subject's importance, he then turned to a background section to describe how the different methods work to predict disruptions, explaining how they worked technically and identifying their strengths and weaknesses. (In fact, he was ambitious enough to include not just the three different prediction techniques he originally planned on examining but a fourth one: Classification and Regression Tree [CART] systems.) Based on this foundation, he could then analyze and compare the four methods and applying his evaluation criteria: first, each method's prior usage and precedent to determine the reliability of both the method and the research surrounding it; second, the methods' accuracy and speed to determine how well each method could protect its reactor(s) once implemented. While the final report was solid and clearly written and structured, there are several significant ways Sam might have improved it, given its expanded scope: identifying some additional sources beside the nine credible scholarly ones he employed and using these sources more fully by providing more supportive detail from them would have given greater depth to his assessment of criteria, which led to his determinative recommendation to begin with a fuzzy logic (FL) system for "early" tests, while a machine-learning system is trained using the FL system's data. Despite these weaknesses, his final report represented the progress he made over the semester in examining a complex subject. It is his clarity of thought and interest in communicating research results to others along with persistence, determination, and tenacity that I believe he would bring to a graduate degree program in computer science and, as a masters level student, would improve the depth with which he conducts his analysis.

Besides demonstrating solid writing skills, Sam is thoughtful and savvy about addressing potential audiences in other communication situations as evidenced in both his three-minute proposal presentation, which focused on the problem and potential solutions he was examining and their implications for stakeholders, and his nine-minute technical presentation, a presentation all students are required to give about their report topics at the end of the semester. First, regarding presentation skills, distilling an in-depth report into its most significant points and presenting technical material in a clear and engaging manner are a big challenge, one that a graduate student who will then become a career professional needs to meet well—after all, he may be presenting not only to other students learning about the discipline, but to other colleagues who are experts in the field and to non-technical audiences whom he might have to address in the workplace. Sam has demonstrated the skills necessary to be an effective presenter of technical material, skills that he would undoubtedly continue to hone in a graduate program. Carefully preparing a well-structured presentation with an accompanying solid slideshow, Sam began with a hook to engage his audience, followed that with a clear overview, and provided sufficient, clear background information. This approach helped to prepare his audience to grasp what was most important--the main points of Sam's analysis and conclusions and recommendations, which he supported with some well-chosen source material to enhance his own credibility as a researcher.

Through self-motivation and his desire to learn, Sam thrives on independent work, whether preparing a report or a presentation, something essential for anyone in a graduate program, but those qualities also

happen to be nicely complemented by his ability to conduct himself well with others, something essential for a long-term career and collaborating with teams of colleagues. Sam regularly participated in class discussion, offering perceptive comments about writing strategies and sharing his thoughts about reading assignments. Furthermore, when asked to provide commentary in writing and face to face through peer review of others' writing throughout the semester, Sam consistently prepared substantive critiques with insightful suggestions for his peers and discussed those comments in a supportive manner in group workshops. That he worked well with others in the classroom suggests that he will do so in future teamwork in an advanced degree program as well as thereafter in anywhere effective collaboration is prized.

Sam has already shown that he can be successful in a rigorous academic program by double-majoring in Computer Science and Engineering Physics and in his work with CNERG (Computational Nuclear Engineering Research Group) relevant to the graduate degree he now wishes to pursue. Furthermore, because of his performance in my class, his communication skills, his initiative and diligence, his cooperative and personable nature, Sam Stern would, I believe, not only succeed in a M.S. program but also be a decided asset to it. I recommend him to you.

Sincerely,

Elise M. Gold, Ph.D.
Faculty Associate Emerita

elise.gold@wisc.edu

Northwestern │ THE GRADUATE SCHOOL

Recommendation Form

Applicant Name: **Samuel Stern**

Program: **Computer Science: MS**

Applicant Waived Rights*: **This applicant has waived the right to view their recommendation.**

Recommender Name: **Wendy Crone**

Organization Name: **University of Wisconsin - Madison**

Title: **Professor**

E-mail Address: **crone@engr.wisc.edu**

Telephone Number: **[608]262-8384**

Relationship to Applicant: **instructor in several classes**

Certification (Date): **12-11-2018**

November 8, 2018

RE: Sam Stern's Recommendation

To Whom It May Concern:

I am writing in support of Sam Stern's application to your graduate program. I believe he is a good candidate for this opportunity, demonstrated by both his performance in challenging coursework and accomplishments as an undergraduate researcher.

Sam is an undergraduate at UW-Madison in the Engineering Physics BS degree program who is also double majoring in Computer Science. I have known him for over two years, both as his instructor in our sequence of research courses that begins with *Introduction to Engineering Research*, a required course for our Engineering Physics undergraduate majors. In this course he completed skill building around topics such as literature searches, handling research data, ethical conduct in research, and technical communication. I teach this class in an interactive discussion format. Sam is a pleasure to have in the class and always engages in our discussions of case studies in a thoughtful and constructive manner.

Engineering Physics is a unique honors degree program in which students focus on a "capstone" research project (rather than a design project), that has all of the rigor associated with our College's "Honors in Undergraduate Research" designation. This degree gives the student strong fundamentals in applied math, physics and engineering, along with the opportunity to learn about emerging technology areas in coursework and an authentic research experience. In Sam's case he has chosen to focus on Scientific Computation.

Sam has had a long-standing interest in research. In the Individual Development Plan that he has been working on (via http://myidp.sciencecareers.org/), he identified two key areas of interest - "Building new devices or developing/refining techniques" and "Organizing things, creating systems in the workplace" - that fit well with his interest in pursuing graduate studies. He has undertaken a Senior Thesis research project with Prof. Paul Wilson in the Computational Nuclear Engineering Research Group on the topic of "Development of a Diagnostic Method for Monte Carlo Mesh Amalgamation" and is making progress on the project. I have also seen him making strides in his development as a researcher over the last several months. In particular, his presentation skills have improved and he has developed skills needed to work in a research team environment.

Sam's choices during his undergraduate program have shown his commitment to pursuing a research career. He is a good candidate for graduate studies given his motivation to conduct research. Please contact me if you would like to talk in more detail about Sam's qualifications.

Yours,

Wendy C. Crone
   Karen Thompson Medhi Professor of the College of Engineering
   President and Fellow of the Society for Experimental Mechanics
   Discovery Fellow in the Wisconsin Institute for Discovery
Department of Engineering Physics
University of Wisconsin-Madison