FORM D - IV A INSTRUCTION

The faculty member is encouraged to use a range of evidence demonstrating instructional accomplishment, which can be included in portfolios or compendia of relevant materials.

1. Undergraduate and Graduate Credit Instruction:

Record of instructional activities for at least the past six semesters. Include only actual participation in credit courses (on- or off-campus instruction) or virtual university on-line courses. In determining the "past six semesters," the faculty members may elect to exclude any semesters during which s/he was on leave; additional semesters may be included on an additional page. Fill in or, as appropriate, attach relevant print screen from CLIFMS*.

Semester and Year	Course Number	Credits (Number or Var)	Number of Sections Taught Lec	Rec	Lab	Number of Students	Number of Assistants**	Notes
Spring 2017	CMSE 820	3.0	1.0	0.0	0.0	28	0	Math. Found. of Data Sci. (3 students were Math exchange). Rating scale explanation for CMSE courses is included in the uploaded pdf SIRS document. 84 SCHs.
Spring 2016	CMSE 201	4.0	1.0	0.0	0.0	21	1	Intro. to Comp. Sci. (previously listed as NSC 204). Rating scale explanation for CMSE/NSC course is included in the uploaded pdf SIRS document. 84 SCHs.
Fall 2015	MTH 414	3.0	1.0	0.0	0.0	24	1	Linear Algebra II 72 SCHs.

All SIRS data will be uploaded as part of the pdf document located at the end of this packet.

SUMMARY OF SIRS DATA

Key:
SA - Strongly Agree is valued as 1.0
A - Agree is valued as 2.0
N - Neither Disagree Nor Agree is valued as 3.0
D - Disagree is valued as 4.0
SD - Strongly Disagree is valued as 5.0

Q1: The instructor was available and willing to help the student.
Q2: The instructor explained course material clearly.
Q3: The instructor was well prepared for classes and other related course activities.
Q4: The instructor organized the course well.
Q5: Rate the instructor on a scale of 4.0, 3.0, 2.0, 1.0, 0.0 (where 4.0. is the best rating)

*Consult departmental staff who are authorized to enter data on the web-based CLIFMS (Course Load, Instruction, Funding and Modeling System) system and can search for course sections and enrollments by faculty name, per semester.
**Many include graduate and undergraduate assistants, graders, and other support personnel.

FORM D - IV A INSTRUCTION

COURSE NUMBER: CMSE 820
SEMESTER: Spring 2017
ENROLLMENT: 28
NUMBER OF RESPONSES: 26

QUESTION:	Q1	Q2	Q3	Q4	Q5
AVERAGE:	1.7	1.82	1.99	2.13	1.8

COMPARATIVE DATA FOR ALL DEPARTMENTAL COURSES IN Spring 2017
Departmental data is not available.

COURSE NUMBER: CMSE 201
SEMESTER: Spring 2016
ENROLLMENT: 21
NUMBER OF RESPONSES: 19

QUESTION:	Q1	Q2	Q3	Q4	Q5
AVERAGE:	1.83	1.72	1.51	2.37	2.03

COMPARATIVE DATA FOR ALL DEPARTMENTAL COURSES IN Spring 2016
Departmental data is not available.

COURSE NUMBER: MTH 414
SEMESTER: Fall 2015
ENROLLMENT: 24
NUMBER OF RESPONSES: 14

QUESTION:	Q1	Q2	Q3	Q4	Q5
AVERAGE:	1.86	1.21	2.21	2.57	1.93

COMPARATIVE DATA FOR ALL DEPARTMENTAL COURSES IN Fall 2015
Departmental data is not available.

STUDENTS COMMENTS FROM REPRESENTATIVE COURSES (all comments are shown)

CMSE820 SS17

"The class was interesting and covered a lot of useful tools. Sometimes the topics covered in class were out of scope for the background of some students."

"The programming homework assignments were very helpful but I felt that the proofs did not help my understanding. I was very lost during lecture and felt I only really learned when I did the programming. The instructor was very willing to help and answer questions during office hours. I feel that this course was taught at a mathematical level that is difficult for someone without an advanced math background (like engineering or physics) to understand. I think more applications and an emphasis on the programming will help make the math foundations more clear, having to translate them to code. Also, it would help to get constant feedback on the homework since we only had about half of them graded."

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**Many include graduate and undergraduate assistants, graders, and other support personnel.

"The course helped in my basic understanding of Data Science and has induced interest in learning more advanced related topics. Since Data Science is a vast field, the topics covered in the course were excellent and adequate. However, would help in the future if extra classes are organized on topics out of the syllabus but are of interest to many students."

"This course presents lots of proof to us on detail. I think it's helpful to us, and should keep it. It might be better to involve more about machine learning in the class. Some classes are too theoretical. The teacher is really nice and always be ready for answering students questions. I benefit a lot. Also the teacher is enthusiastic in every class."

"This class helps me to not only know how to implement many data science-related methods in data analysis, but also gives me a deeper understanding about the details and underlying mechanisms. The math is very difficult for engineering students. Hope to add some basic instruction on math at the beginning."

"Great material in the course. Great instructor. Unfortunate planning of the course and HW's: the second half, the material seemed more difficult but less HW's were assigned. Class notes were copy of other notes, although it is OK since this was the 1st semester. Good theoretical/application HW's, although sometimes complicated/confusing. 100% would recommend the course and the professor."

"The instructor did a pretty good job on covering the material, which is quite extensive in my opinion. I believe one thing that could be improved is to have clearer connections between the presented topics, in order to understand the "big picture" more clearly. Overall, the content is dense and requires appropriate background from the students. Since CMSE has students with distinct backgrounds, it is a hard job to be the lecturer of this course, and I think he did a great job."

"Honestly, the course doesn't cover a lot of important math in data science. The instructor spent too much of time proof the lemma. Which I think it is not very important in this level of class. And the homework are vague and hard to understand. The overall difficulty is too high due to the style of the course. I think most of the students want to know how to use the math rather and proof it."

"This class helped me learn many things related to data science and I think it is really useful to my future research. It includes both application part and theoretical part. I enjoyed this course and I like the instructor of this course."

"I think the homework part is quite helpful as it is closely related to real data science issues. However, I hope next time, the instructor can give more detailed guide on the project. As a student whose research concentration is not on this area, the project is really confusing and time consuming for me. Since students from different background registered in this course. I hope the instructor can consider this situation and reduce the materials covered."

"1) I enjoyed the interesting and careful proofs. 2) I love your precise and strict math logic. The coding part is necessary of dealing with machine learning problems. 3) I won't be able to attend but I strongly hope that you'll offer data science II to continue on this topic. 4) Lecture notes are extremely helpful. 5) You're so kind during the office hour."

"The course is great, interesting, somehow difficult for me but like it. One they sometimes lost in the course content, so some general introduction would be better."

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"The course would have been considerably improved if homeworks were graded within a reasonable amount of time, and solutions were provided. I feel like there were incorrect assumptions concerning the material background of many students, specifically in regards to knowledge of real analysis, which as far as I know, was not a pre-req. There was also too much homework. The lecture notes were extremely helpful and well done."

"I liked the bite sized homeworks rather than large homework set. There was a lot of homework and I think the instructor would agree since he had difficulty giving feedback on the homeworks in a reasonable amount of time. Maybe I would recommend a TA to help with the grading. Great course overall!"

"I liked the format of assignments within the class notes. Also, the class notes were helpful. Students would benefit from a more clear outline of mathematical background needed for this course in the course description and/or syllabus."

"1) How to apply the knowledge to realize and link knowledge of different aspects to get new ideas. 2) Less details. 3) A very good course and I've learned a lot. This makes me more interested in computer science."

"1) Too few related to data, especially real data problems and general techniques. 2) Check some widely used methods and teach those. 3) Many thing didn't cover but should be covered. e.g. SVM, KNN, decision tree, Neuval Network, logistic regression, confusion matrix..."

"Some of the math theories helped me to understand the materials better. It goes the introduction. The PCA, Graph Theory and Manifold theory are extremely useful. 2) Sometimes the instructor spend too much time on writing in blackboard. Since we can have the notes later, I don't think it necessary. Besides we spend too much time on proof while some of them may not be necessary. 3) Generally, I like the content in this course. It helped me know more about data science."

"I) I think the instructor's lecture notes are very clear and he's very patient to answer any questions. Of course, his mathematics background helped me understand a lot about the course. II) I think if there will be homework solution posted online it will better."

"Lectures were rather dull. More concrete suggestions for final project topics would be helpful for students not actively engaged in data science research. Instructor provided lecture notes were very helpful."

"The most usefull aspect of the course was hands-on homeworks--the ones that included coding. It was helpfull that we covered the theory in class and partially through homeworks."

"I. The homework questions were very helpful for learning, as well as office hours. II. I think choice of topics was very good --> Earlier in the course, it would have been good to make the connection to how broadly ??? can be used for pattern discovery. It only became clear to me at least in final one-third of course. III. Overall, this is an excellent class in terms of subject and delivery."

"I) The typed up lecture notes and coding exercises were helpful for me to understand the applications of this course. I would have liked to have more coding homeworks and not as many proofs. Quicker feedback on the homework would have been helpful."

"A better primer is needed for students without a math background. Also, find ways to get more student participation in class."

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[redacted]

"Give more instruction or help to students who seem to be behind in class or unfamiliar with the class topics. Additional pre-class assignments or office hours would be appreciated."

"Try to make this course more systemic in future. I can hardly link knowledge in one system tree."

"Go over Python a bit more at beginning in order for people to understand it better. Overall a great class!"

"I did enjoy the class very much. Although most students, if not all, had a lot of prior programming knowledge. I was not in the same situation which made this class very difficult at the pace it was taught."

"Make the homework assignments a bit easier. At least half of the assignments were too difficult to get running correctly when putting 6-8 hours in. Also, the last homework was built off a previous one which a lot of people didn't get working correctly."

"Generally, a very interesting course, but it would be better if Professor can organize or summarize each case student after group discussion."

"This course started out very simple and easy to understand. However, I found the homework assignments quickly became overwhelming and hard to complete. Luckily the instructor was very helpful but it still felt like too much."

"The instructor was good but the course had some issues. The homework assignments were much more difficult than anything covered in class, and I couldn't finish several despite trying 100%."

"I enjoyed the more challenging homework assignments with longer deadlines more."

"One of the best classes I have taken at MSU. I recommend having a schedule of all assignment due dates at the beginning of the semester next year."

"Although my competence improved from completed required homework assignments, I felt that I needed more time than allowed to submit a complete & working assignment."

"Very well organized and enjoyable course. The focus on applications of programming was especially good. I will be taking the next course in the fall."

"I felt that several homeworks were above the skill level of the current time in class. I would hope it is lessened some in the future."

"For the course, I think it would've been helpful if we would've had 5-10 min @ start of class to discuss the current HW w/our peers at table & call TA or Prof over to help answer ?s before we moved on to the lesson of the day."

"No comments, class was fun."

"I enjoyed the class a lot and very much appreciated the style of lectures and the openness of class discussions."

"The course was overall extremely interesting. It touches on a wide range of modeling techniques and they are explained very well. I came into the course with a strong Python background so I cannot speak much

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to that but it seemed at times that aspect of the course went too quickly. In the future I would encourage every more class-wide discussions as those were always very fruitful."

2. Non-Credit Instruction:

List other instructional activities including non-credit courses/certificate programs, licensure programs, conferences, seminars, workshops, etc. Include non-credit instruction that involves international comparative, or global content delivered either to domestic or international groups, either here or aboard.

Non-Credit Courses/Certificate Programs

I organized a weekly review session during the summer 2017 semester to help graduate students to prepare for the CMSE qualifying exam in "Mathematical Foundations of Data Science."

Workshops

On September 9, 2016, I was a panel member for a workshop on "Getting Grants," organized by the College of Natural Science, MSU.

On September 5, 2015, I was a panel member for a workshop on "How to look for an academic job," organized by the Department of Mathematics, MSU.

Seminars (Domestic)

On September 13-14, 2016, I gave a two part tutorial on "Wavelet Theory" to the participants in the long program on "Understanding Many Particle Systems with Machine Learning," held at the Institute for Pure and Applied Mathematics (IPAM) on the campus of UCLA.

Seminars (International)

On June 6, 2017, I gave a talk at Shanghai Jiao Tong University promoting the CMSE Ph.D. program.

On June 5, 2017, I gave a talk at Fudan University promoting the CMSE Ph.D. program.

3. Academic Advising:

a. Faculty member's activity in the area of academic advising. The statement may include commentary on supplementary materials such as recruitment activities, international student advising, evidence of peer recognition, and evidence of student recognition.

† Represents entries after last action.

Undergraduate:

Graduate:

Ph.D. Students

1. † [redacted]. **(Currently active)**
   Expected Graduation Date: **05-31-2022**
   [redacted] is a 1st year PhD student in CMSE; I am currently his mentor, but he has not officially selected an advisor yet..
2. † [redacted]. **(Currently active)**
   Expected Graduation Date: **05-31-2021**
   I co-advise [redacted] with [redacted] ([redacted] is the primary advisor).
3. † [redacted]. **(Currently active)**
   Expected Graduation Date: **05-31-2021**
4. † [redacted]. **(Currently active)**
   Expected Graduation Date: **05-31-2021**

Graduate/Professional:

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[redacted]

FORM D - IV A INSTRUCTION

1. † [redacted]. **(Currently active)**
   I co-advise [redacted] with [redacted] (I am the primary advisor).
2. † [redacted] **(Currently active)**
3. † [redacted]
   I advised [redacted] during Spring and Summer 2017. He is now a postdoc at Brown University..

Other:

I meet with all of the above students and postdocs at least once per week for one hour, and often quite a lot more. On weeks that I can, I like to sit and work with each of them for at least one extended period (2-4 hours). Now that I have a larger group, I have also formed subgroups within my group, so that the postdocs can help the graduate students, and informally mentor them. In particular, [redacted] form a subgroup, while [redacted] form another. I am still working [redacted] into this structure, but anticipate that he will pair up with [redacted], who will arrive in CMSE on January 1, 2018 as a postdoc.

I encourage my students and postdocs to attend conferences, even if they are not giving talks. For example, [redacted] attended two workshops last year, a week long one at IPAM (UCLA) on machine learning and many body phyiscs, and a two day one on machine learning at the University of Illinois, Chicago. [redacted] attended several conferences. [redacted] is organizing a workshop.

In the summer 2017 semester, [redacted] took an independent study course (CMSE 891) with me on the topic of “Linear Algebra II.”

Graduate committees

I am serving or have served on 6 graduate committees for students other than my own. I am on three graduate committees for my own students (one is for [redacted], who I co-advise); one of my students, [redacted], has just started at MSU and has not formed his guidance committee yet.

b. Candidate's undergraduate advisees (if applicable to individual under review):

	Freshman	Sophomore	Junior	Senior
Number of current undergraduate advisees	0	0	0	0
Number of Honors Students (all years)	0	0	0	0

c. Candidate's graduate/graduate-professional advisees (limit to principal advisor or committee chairpersonship status):

	Masters	Doctoral	Professional
Number of students currently enrolled or active	0	4	2
Number of graduate committees during the reporting period	0	4	
Degrees awarded during the reporting period	0	0	
Degrees awarded during career	0	0	

*Consult departmental staff who are authorized to enter data on the web-based CLIFMS (Course Load, Instruction, Funding and Modeling System) system and can search for course sections and enrollments by faculty name, per semester.
**Many include graduate and undergraduate assistants, graders, and other support personnel.

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FORM D - IV A INSTRUCTION

Number of Masters degree students as chairperson of advisory committee or as thesis/dissertation advisor

	Course Option	Project Option	Thesis Option
Number of students currently enrolled or active	0	0	0
Number of M.S. committees during the reporting period			0
Degrees awarded during the reporting period	0	0	0
Degrees awarded during career	0	0	0

4. List of Instructional Works:

List publications, presentations, papers, grants received (refer to Form D-IVE), and other works that are primarily on support of or emananting from instructional activity.)

5. Other Evidence of Instructional Activity:

Cite other evidence of instructional productivity such as works/grants in progress or under review (refer to Form D-IVE). Address instructional goals and approaches; innovative methods or curricular development; significant effects of instruction; and curatorial and patient care activities, etc. Include evidence of instructional awards and peer recognition (within and outside the university).

*Consult departmental staff who are authorized to enter data on the web-based CLIFMS (Course Load, Instruction, Funding and Modeling System) system and can search for course sections and enrollments by faculty name, per semester.

**Many include graduate and undergraduate assistants, graders, and other support personnel.

FORM D - IV B RESEARCH AND CREATIVE ACTIVITIES

1. List of Research/Creative Works:

Attach a separate list of publications, presentations, papers, and other works that are primarily in support of or emanating from Research and Creative Activities. Indicate how the primary or lead author of a multi-authored work can be identified. The list should provide dates and, in particular, accurately indicate activity from the reporting period. Items to be indentified:

1) Books
2) Book chapters
3) Bulletins or monographs
4) Reviewed archival journal publications
5) Other journal publications
   a) Non-reviewed publications
   b) Manuscripts accepted for publications
6) Reviewed conference proceedings
   a) Full publication review
   b) Abstract reviewed
7) Non-reviewed conference proceedings
   a) Invited papers/presentations
   b) Submitted papers/presentations
8) Technical reports
9) Reviews
10) Patents
11) Federally registered copyrighted software
12) Other creative works such as report, bulletins, and documented software packages (both unregistered protected and public domain)

The list should be in chronological order by category with the most recent work listed first. Place an asterisk (*) in the left margin on the first line of those entries, which were invited. Place a dagger (†) in the left margin on the first line of those entries completed since the previous action. Indicate the following co-authors with the following: students or post-doctoral students with a superscript (1), candidate's thesis adviser with a superscript (2), lead author(s) with a superscript (3). Scholarly works pertaining to teaching and public service should be included in this section; place a double dagger (‡) in the left margin on the first line of these entries.

Reviewed archival journal publications

[redacted] [1] "Computing minimal interpolants in C1,1(Rd)," *Revista Matematica Iberoamericana,* Vol. 33, No. 1, pp. 29-66, (2017)

2. † [redacted] "Wavelet scattering regression of quantum chemical energies," *Multiscale Modeling and Simulation,* Vol. 15, No. 2, pp. 827-863, (2017)

3. [redacted] "Diffusion maps for changing data," *Applied and Computational Harmonic Analysis*, Vol. 36, No. 1, pp. 79-107, (2014)

4. [redacted] "A general theorem of existence of quasi absolutely minimal Lipschitz extensions," *Mathematische Annalen,* Vol. 359, No. 3-4, pp. 595-628, (2014)

5. [redacted] "Bi-stochastic kernels via asymmetric affinity functions," *Applied and Computational Harmonic Analysis,* Vol. 35, No. 1, pp. 177-180, (2013)

6. [redacted] "The number of harmonic frames of prime order," *Linear Algebra and Its Applications,* Vol. 432, No. 5, pp. 1105-1125, (2010)

7. [redacted] "The refinability of step functions," *Proceedings of the American Mathematical Society*, Vol. 136, No. 3, pp. 899-908, (2008)

Other journal publications: Manuscripts accepted for publication

1. † [redacted] "Time-coupled diffusion maps," *Applied and Computational Harmonic Analysis,* (2017)

Reviewed conference proceedings: Full publication review

1. † [redacted], Mallat Stephane "Solid Harmonic Wavelet Scattering," *31st Conference on Neural Information Processing Systems (NIPS 2017),* (2017)

2. † [redacted] "A Diffusion-based Condensation Process for Multiscale Analysis of Single Cell Data," *ICML Workshop Computational Biology,* (2016)

3. [redacted] "Sparse endmember extraction and demixing," *Proceedings of the IEEE 2012 International Geoscience and Remote Sensing Symposium,* (2012)

4. [redacted] "Frame based kernel methods for automatic classification in hyperspectral data," *Proceedings of the IEEE 2009 International Geoscience and Remote Sensing Symposium,* (2009)

Reviewed conference proceedings: Abstract reviewed

1. [redacted] "Wavelet packets for multi and hyperspectral imagery," *Proceedings of IS&T/SPIE Electronic Imaging 2010, Wavelet Applications in Industrial Processing VII,* (2010)

Technical reports

1. † [redacted]. , Sauceda H. "IPAM Program on Machine Learning & Many-Particle Systems - Recent Progress and Open Problems," Organization: Institute for Pure and Applied Mathematics, How published: On the website of IPAM, (2017)

2. † [redacted] "PHATE: A Dimensionality Reduction Method for Visualizing Trajectory Structures in High-Dimensional Biological Data," How published: bioRxiv preprint, (2017)

3. † [redacted] "Frames for subspaces of Cn," How published: arXiv:1410.5206, (2007)

4. [redacted] "Quantum Energy Regression using Scattering Transforms," How published: arXiv:1502.02077, (2015)

5. [redacted] "Algorithms for computing the optimal Lipschitz constant of interpolants with Lipschitz derivative," How published: arXiv:1307.3292, (2013)

Reviews

1. [redacted] "Distinguished lecture series: Assaf Naor on the Lipschitz extension problem," How published: Fields Notes (quarterly magazine of the Fields Institute), (2013)

Other creative works

1. † [redacted] "C-1-1-Interpolation," How published: https://github.com/matthew-hirn/C-1-1-Interpolation, (2016)

2. † [redacted] "ScatNet-QM-2D," How published: https://github.com/matthew-hirn/ScatNet-QM-2D, (2016)

FORM D - IV B RESEARCH AND CREATIVE ACTIVITIES

Publication Highlights:

Provide an annotated list of **up to five** most significant scholarly works. (Place a dagger (†) in the left margin on the first line of those entries that were completed since the previous action.) The annotation should very briefly describe the work and its special significance.

Author ordering

Authors are listed in alphabetical order and are equal contributors (per the convention in Mathematics) unless the lead author is marked with a superscript (3)

1. †[redacted] (1) "Computing minimal interpolants in C1,1(Rd) ," *Revista Matematica Iberoamericana,* Vol. 33, No. 1, pp. 29-66, (2017)

First practical and optimal smooth interpolation algorithm (in the Whitney sense) in arbitrary dimension.

2. †[redacted] "Wavelet scattering regression of quantum chemical energies ," *Multiscale Modeling and Simulation,* Vol. 15, No. 2, pp. 827-863, (2017)

First multiscale machine learning regression framework for quantum molecular energies that encodes all fundamental physical laws of the system.

3. [redacted] "Diffusion maps for changing data ," *Applied and Computational Harmonic Analysis,* Vol. 36, No. 1, pp. 79-107, (2014)

One of the first papers to extend manifold learning to non-stationary dynamic data.

4.[redacted] "A general theorem of existence of quasi absolutely minimal Lipschitz extensions ," *Mathematische Annalen,* Vol. 359, No. 3-4, pp. 595-628, (2014)

One of the only papers to extend (partial results) the theory of absolutely minimal Lipschitz extension beyond scalar valued functions.

5. †[redacted] "PHATE: A Dimensionality Reduction Method for Visualizing Trajectory Structures in High-Dimensional Biological Data ," How published: bioRxiv preprint, (2017)

First paper to extend diffusion geometric methods to high dimensional progression data (such as metric trees, intersecting trajectories) that does not rely on extrinsic ordering (like time) or user-supervsion. State of the art results on high-throughput biological data. Being prepared for submission to Science.

2. Quantity of Research/Creative Works Produced:

For each of the categories listed in question one above, list the number of research and creative works produced.

	1	2	3	4	5a	5b	6a	6b	7a	7b	8	9	10	11	12
During the reporting period	0	0	0	2	0	1	2	0	0	0	3	0	0	0	2
During career	0	0	0	7	0	1	4	1	0	0	5	1	0	0	2

[redacted]

FORM D - IV B RESEARCH AND CREATIVE ACTIVITIES

3. Number of Grants Received:

(primarily in support of research and creative activities; refer to Form D-IVE):

During the reporting period:	3	During career:	3

4. Other Evidence of Research/Creative Activity:

Cite other evidence of research and creative productivity such as: seminars, colloquia, invited papers; works/grants in progress or under review (refer to formD-IVE); patents; formation of research-related partnerships with organizations, industries, or communities; curatorial and patient care activities, etc. Include evidence of peer recognition (within and outside the university).

Seminars, Colloquia, Invited Papers

During the reporting period I have given 10 invited lectures at international conferences, including an opening day talk for the IPAM long program on "Understanding Many Particle Systems with Machine Learning" and an invited talk at the 2016 American Physical Society March Meeting. I also declined at least 4 additional talks at international conferences, due to an overabundance of traveling commitments. For my career I have given 20 invited talks at international conferences, and 2 contributed talks at international conferences.

During the reporting period I have given 6 seminar talks. For my career, I have given 26 seminar talks, including 4 colloquium talks.

I have presented my research 3 separate times at DARPA, in various formats.

Works in progress or under review

I am currently working on 1 article to be submitted to a journal, which is nearly finished. I am also currently working on 4 other projects, for which notes/manuscripts exist, but which I would not classify as nearly finished.

Peer recognition

I received the Alfred P. Sloan Fellowship in 2016.

I received the DARPA Young Faculty Award in 2016.

I received a single-PI grant from National Science Foundation in 2016.

I was named a Kavli Fellow in 2017. As part of this distinction, I was invited by the National Academy Sciences to participate in 1st Japanese-American-German Frontiers of Science symposium in 2017.

During the Fall 2016 semester, I was a Senior Fellow at the Institute for Pure and Applied Mathematics (IPAM), on the campus of UCLA, for the long program on "Understanding Many Particle Systems with Machine Learning."

COLLEGE OF **NATURAL SCIENCE**

Funded Grants Only

Title	Principal Investigator	Co-Principal Investigators	Awarding Agency	Effective Dates	Total Amount Awarded Including Indirect Costs	Total Amount Awarded to Candidate Including Indirect Costs	Indirect Cost Rate	Nature of Candidate's Participation (if not P.I.)
Provable Machine Learning Algorithms for Scientific Computation	[redacted]	n/a	Sloan Foundation	9/15/16 – 9/14/18	$55,000	$55,000.00	0%	Sole PI
Three dimensional deep wavelet scattering for quantum energy interpolation	[redacted]	n/a	NSF	9/1/16 – 8/31/19	$191,775	$191,775	55%	Sole PI
Deep Wavelet Scattering for Quantum Many Body Physics	[redacted]	n/a	DARPA	9/15/16 – 9/14/18	$494,786	$494,786	55%	Sole PI

From the *CNS P&T Guidelines* revised November 21, 2013:
*A list of all the candidate's funded grants (using the *CNS Funded Grants Only* worksheet) including the following in order: title, principal investigator, all co-principal investigators (unless prohibitively many), awarding agency, effective dates, total amount awarded, *total amount awarded to the candidate*, whether these amounts include indirect costs or not, and *the nature of the candidate's participation in the grant if not P.I.*

FORM D - IV C SERVICE WITHIN THE ACADEMIC AND BROADER COMMUNITY

1. Service within the Academic Organizations:

a. Service to Scholarly and Professional Organizations:

List significant committee/administrative responsibilities in support of scholarly and professional organizations (at the local, state, national, and international levels) including: elected and appointed offices held; committee memberships and memberships on review or accreditation teams; reports written and submitted; grants received in support of the organization (refer to form D-IVE); editorial positions, review boards and ad hoc review requests; and programs and conferences planned and coordinated, coordinated or served on panel or chaired a session. Include evidence of contributions (e.g. evaluations by affected groups or peers).

Membership on Conference Steering and Scientific Committees

In 2015, I co-organized (with two others) the "8th Whitney Problems Workshop," held at CIRM in France. This was a weeklong international conference, with approximately 25-30 talks and numerous participants.

Journal Paper and Textbook Review Duties

During the review period, I have reviewed articles for 2 different journals, while in my career I have reviewed articles for 9 different journals. These journals span mathematics (Applied and Computational Harmonic Analysis, Linear Algebra and Its Applications, Proceedings of the American Mathematical Society, SIAM Journal on Applied Dynamical Systems), computer science (Neural Computation), electrical engineering (IEEE Signal Processing Letters, IEEE Transactions on Information Theory, Signal Processing), and materials science (NPJ Computational Materials).

Review Panels (NSF, NIH, or other)

I have reviewed grant proposals for the DOE in 2017.

I served on a joint NSF/NIH review panel in 2016.

Chaired Sessions

In 2016, I organized a mini-session (4 talks, half a day) on "Kernel Learning and Harmonic Analysis" for the Culminating Workshop of the IPAM long program on "Understanding Many Particle Systems with Machine Learning."

b. Service within the University:

List significant committee/administrative responsibilities and contributions within the University. Include service that advances the University's equal opportunity/affirmative action commitment. Committee service includes: appointed and elected university, college, and department ad hoc or standing committees, grievance panels, councils, task forces, boards, or graduate committees. Administrative responsibilities include: the direction/coordination of programs or offices; admissions; participation in special studies or projects; collection development, care and use; grants received in support ot the institution (refer to Form D-IVE), etc. Describe roles in any major reports issued, policy changes recommended and implemented, and administrative units restructured. Include evidence of contributions (e.g., evaluations by peers and affected groups).

Department-Level Committees

2017-2018: Chair of the CMSE undergraduate studies committee

2017-2018: Member of the CMSE long term steering committee

2017-2018: Member of the CMSE/CSE hiring committee in deep learning

2016-2017: Member of the CMSE/ChEMS hiring committee in computational materials science

College-Level Committees

2017-2018: CMSE representative at CNS undergraduate chairs meetings

2017-2018: CMSE representative at Engineering undergraduate chairs meetings

University-Level Committees

2017-2018: Member of the University hiring committee for CANVAS.

2. Service within the Broader Community:

As a representative of the University, list significant contributions to local, national, or international communities that have not been listed elsewhere. This can include (but is not restricted to) outreach, MSU Extension, Professional and Clinical Programs, International Studies and Programs, and Urban Affairs Programs. Appropriate contributions or activities may include technical assistance, consulting arrangements, and information sharing; targeted publications and presentations; assistance with building of external capacity or assessment; cultural and civic programs; and efforts to build international competence (e.g., acquisition of language skills). Describe affected groups and evidence of contributions (e.g., evaluations by affected groups; development of innovative approaches, strategies, technologies, systems of delivery; patient care; awards). List evidence, such as grants (refer to Form D-IVE), of activity that is primarily in support of or emanating from service within the broader community.

FORM D - IV D ADDITIONAL REPORTING

1. Evidence of Other Scholarship:

Cite evidence of "other" scholarship as specified on p.2 in the "summary rating" table (i.e., functions outside of instruction, research and creative activity, and service within the academic and broader community). Address the scholarship, significance, impact, and attention to context of these accomplishments.

2. Integration across Multiple Mission Functions:

Discuss ways that your work demonstrates the integration of scholarship across the mission functions of the university - instruction, research and creative activities, and service within the academic and broader community.

3. Other Awards/Evidence:

Cite other distinctive awards, accomplishments of sabbatical or other leaves, professional development activties, and any other evidence not covered in the preceding pages. (If the reporting period differs from the usual period, then justify and support that period here).

FORM D - IV E GRANT PROPOSALS

List grant proposals submitted during reporting period relating to teaching, research and creative activities, or service within the academic and broader community. Include grants is support of outreach, international, urban, and extension activities.*

Name of Granting Agency (Grantor:) / Focus of Grant (Focus:)	Start/ Submit Date	$ Amount Requested	Status			$ Amount Assigned to Faculty Candidate (if Applicable)	Principal/Co-Investigators
			Pending	$ Amt Funded	Not Funded		
Research/Creative Activity							
Grantor: ALFRED P. SLOAN FOUNDATION **Focus:** Provable Machine Learning Algorithms for Scientific Computation	09-15-2016/ 09-14-2018	$55,000		$55,000		$55,000 (100%)	[redacted]
Grantor: DEFENSE ADVANCED RESEARCH PROJECTS AGENC **Focus:** Deep Wavelet Scattering for Quantum Many Body Physics	09-15-2016/ 09-14-2018	$994,370		$494,786		$336,638 (68%)	[redacted]
Grantor: National Science Foundation **Focus:** Three dimensional deep wavelet scattering for quantum energy interpolation	09-01-2016/ 08-31-2019	$209,634		$191,775		$134,242 (69%)	[redacted]
Grantor: David & Lucile Packard Foundation **Focus:** Mathematical Foundations of Multiscale Machine Learning for Scientific Computation	04-20-2017	$875,000		$0	X	$0	[redacted]
Grantor: National Science Foundation **Focus:** BIGDATA: F: Collaborative Research: Multiscale invariants for Big Data exploration with application to medical data analysis	03-22-2017	$553,999		$0	X	$0	[redacted]
Grantor: National Science Foundation **Focus:** NRT: Training Tomorrow's Workforce in Data-Enabled Science and Engineering	03-20-2017	$2,999,962		$0	X	$0	[redacted]

*Anyone with MSU Net username and password can log onto the web-based Information Reference database, maintained by the Office of Contract and Grant Administration, to search for records of proposals and grant awards by principal investigator. Printouts may be attached to this page.

[redacted]

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Name of Granting Agency (Grantor:) / Focus of Grant (Focus:)	Start/ Submit Date	$ Amount Requested	Status			$ Amount Assigned to Faculty Candidate (if Applicable)	Principal/Co-Investigators
			Pending	$ Amt Funded	Not Funded		
Grantor: YALE UNIVERSITY, NATL INST OF HEALTH - NIH/PHS **Focus:** Diffusion-based Data Reprsentations, Denoising and Synthetic Generation of Multisource Data to Reveal Progression and Gene Interaction	03-02-2017	$348,750		$0	X	$0	[redacted]
Grantor: YALE UNIVERSITY, NATL INST OF HEALTH - NIH/PHS **Focus:** Diffusion-based Methods for Revealing Progressions, Multi-scale Clusters and Gene Interactions in Noisy Single Cell Data	06-01-2016	$347,665		$0	X	$0	[redacted]
Grantor: National Science Foundation **Focus:** Tracking the Evolution of High Resolution Sentiment and Latent Issue Positions Using Unstructured Text in the Era of Big Data	02-29-2016	$1,245,585		$0	X	$0	[redacted]
Grantor: National Science Foundation **Focus:** NRT-DESE: Training Tomorrow's Workforce in Data-Enabled Science and Engineering	02-08-2016	$2,999,965		$0	X	$0	[redacted]
Grantor: National Science Foundation **Focus:** BIGDATA: Collaborative Research: F: IA: Learning intrinsic invariants for medical Big Data exploration	02-08-2016	$318,867		$0	X	$0	[redacted]
Grantor: National Science Foundation **Focus:** Innovative Representations and Predictive Algorithms For Epilepsy Time Series Data	10-29-2015	$1,112,346		$0	X	$0	[redacted]

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Name of Granting Agency (Grantor:) / Focus of Grant (Focus:)	Start/ Submit Date	$ Amount Requested	Status			$ Amount Assigned to Faculty Candidate (if Applicable)	Principal/Co-Investigators
			Pending	$ Amt Funded	Not Funded		
Grantor: NATL INST OF HEALTH - NIH/PHS **Focus:** Hierarchical clustering and temporal predictive framework for neuroscience data: epileptic seizure as a testbed	10-21-2015	$1,102,093		$0	X	$0	[redacted]

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