Annual Report

Institute of Computing and Cybersystems

Timothy Havens, Ph.D., Center Director

FY22: July 1, 2021 - June 30, 2022

Prepared for the Michigan Tech Office of the Vice President for Research

October 1, 2022

1. Mission Statement: The ICC promotes collaborative, cross-disciplinary research and learning experiences in the areas of computing education, biocomputing and digital health, cyber-physical systems, cybersecurity, data sciences, human-centered computing, and scalable architectures and systems, for the benefit of Michigan Tech and society at large.

The ICC creates and supports an arena in which faculty and students work collaboratively across organizational boundaries in an environment that mirrors contemporary technological innovation. The ICC's 82 members—in seven research centers—represent more than 25 academic disciplines at Michigan Tech. Member scientists are collaborating to conduct impactful research, make valuable contributions in the field of computing, and solve problems of critical national importance.

a. Objectives

- Bring faculty and students together to discover innovative new knowledge in the field of computing
- Foster interdisciplinary collaborations and enable faculty to develop multidisciplinary proposals and conduct impactful research which otherwise would not be possible
- Create a platform for broad sets of national and international collaborations to make valuable contributions to the field

b. Core Values. The work of the ICC embodies in particular Goal 3 of the University's strategic plan, "Research, scholarship, entrepreneurship, innovation, and creative work that promotes a sustainable, just, and prosperous world." Further, President Rick Koubek's "Tech Forward" vision, which aims to position Michigan Tech as an internationally recognized academic thought leader in the Fourth Industrial Revolution, is fully embraced by the ICC and its membership. In fact, the 2014 proposal to create the ICC articulates as its vision the need to prepare for and respond to such a revolution.

c. Scholarship and Service. ICC members are leaders among their research and academic peers, on and off campus. In FY22, ICC members collectively attended dozens of national and international academic meetings and conferences; published hundreds of journal articles (158 publications from January 1-August 3, 2022), conference papers, book chapters, and books; presented numerous papers, talks, and seminars; and provided prodigious professional service of many kinds to both Michigan Tech and also professional and scientific societies and organizations of all kinds. In addition, FY22 saw students of ICC members attending multiple conferences and workshops and several were presented with conference awards for their efforts.

d. Organization and Leadership. The ICC comprises seven research centers, each pursuing research in a broad computing discipline. A director provides Institute leadership, an associate director provides support focused on development of large grant proposals, an assistant director provides research development support, and center directors lead the Centers.

e. Governance Structure
The ICC director oversees the activities of seven research centers. Each research center is led by a center director.

f. Membership Criteria
Researchers pursuing computing- and cybersystems-related research may join the ICC and the research groups(s) of their choice by contacting the ICC director, assistant director, or an associate director.

g. ICC Membership
The ICC's 82 members represent over 25 Michigan Tech departments and academic disciplines.

2. FY22 Activities & Highlights

a. New Awards Highlights

i. New Grants and Contracts:

1. Kelly Steelman was awarded a 2-year NSF grant to study a sociotechnical approach to empower digital citizens.
2. Leo Ureel, Laura Brown, Jon Sticklen, and Michelle Jarvie-Eggart were awarded a 3-year NSF grant to support student learning and enhance programming competencies.
3. Soner Onder received a 4-year NSF grant along with Florida State University for collaborative research on vectorized instruction space.
4. Xiaoyong (Brian) Yuan and Lan Zhang were awarded a 3-year NSF grant to research artificial intelligence and associated theory, architecture, and algorithms.
5. Xinyu Lei received a CRII award from NSF to research secure machine learning and encrypted databases in the cloud.

ii. ICC Achievement Awards:

1. Sidike Paheding: For achievements in research in out-of-this-world deep learning and cybersecurity
2. Kelly Steelman: For achievements in collaborative, interdisciplinary research, and mentorship and support of junior faculty

3. Brian Yuan: For achievements in research in heterogeneous architectures for collaborative machine learning

iii. University Awards:
   1. Briana Bettin was awarded the 2022 Distinguished Teaching Award
   2. Jeff Wall received a Provost's Award for Sustained Teaching Excellence
   3. Samatha Smith and Briana Bettin were featured in the Dean's Teaching Showcase
   4. Jingfeng Jiang (BE, BDH) and Kevin Sunderland were awarded the Bhakta Rath Award for 2022

iv. Research Awards:
   1. Briana Bettin (CS/CLS, HCC/CompEd) won best paper at Innovation and Technology in Computer Science Education (ITiCSE) 2022 Conference. Linda Ott (CS) and Julia Hiebel are co-authors.
   2. Hoda Hatoum's (BE, MEEM, BDH) students have been awarded the following:
      a. PhD students Brennan Vogl and Alireza Asadbeygi were awarded the Blue Cross Blue Shield of Michigan Foundation student awards ($3,000 each)
      b. Brennan Vogl was awarded the DeVlieg Foundation Fellowship and the HRI Fall Fellowship
      c. Alireza Asadbeygi was shortlisted as a finalist for 2022 ASME-BED/SB3C Student Paper Competition PhD-level at the SB3C 2022 conference

b. Governance Structure: The ICC director oversees the activities of seven research centers. Each research center is led by a center director.

c. Membership and Members: To become a member of the ICC, an inquiry is sent to the Director, Associate Director, or Assistant Director by an interested faculty member. An appropriate center is selected, and the new member meets with the center director and/or the institute director to discuss research goals. A welcome email is sent which includes information on how to access support documents and services and the new member is added to our email list, our Canvas ICC 101 course, and a new faculty member lecture is scheduled. The ICC gained five new members in FY22.

d. **Member Support and Involvement:** The ICC hosts multiple events and meetings for members throughout the year. We host quarterly virtual meetings/chats in which we outline accomplishments, awards, and the state of the institute and allow members time to discuss how the institute can help further their research goals and best provide support. We also host quarterly "Coffee Hours" as unstructured social time in which members can meet and network with each other (and other invited institutes). In FY22, the ICC co-hosted the inaugural Computing[MTU] Showcase to highlight the importance and breadth of computing and data science at MTU. At the Showcase, we awarded three ICC Achievement Awards to Xiaoyong (Brian) Yuan, Sidike Paheding, and Kelly Steelman. Nominations came from the ICC centers, and a panel of previous awardees voted for recipients for 2022. The winners were announced in a ceremony prior to an evening panel session at the Rozsa. In addition, we hold a Faculty Lecture Series in which we pair new ICC members with faculty members who have been with the institute for several years. This allows faculty to showcase and discuss their research interests, encourages networking, and provides a spark for collaboration on research and proposals. In addition, in FY22 we developed a new RFP/Proposal calendar for faculty members, increased the material related to proposals and MTU boilerplate in our Canvas ICC 101 Course, and increased our presence on our website and social media channels.

e. We have increased the amount of proposal support we offer in the ICC by hiring an Assistant Director for Research Development in FY22. This has allowed us an additional resource to review proposals, provide editing support and technical writing capabilities, and to increase our outreach and presence at MTU and beyond. Proposal scouting and organizing RFP opportunities into a calendar has also helped link faculty members to new opportunities. Our Distinguished Speaker Lecture Series continued and expanded in FY22, and we brought several potential research collaborators to campus and hosted virtual sessions as well. In addition, our Computing[MTU] Showcase was a new opportunity for networking and collaboration for faculty members at MTU and beyond.

f. Current center/institute member list: Appendix A: ICC Membership List

3. Budget Overview

a. Provide a summary of FY budget:

Net ICR 17.5% IRAD (Emerging Tier 1)	FY23	FY24	FY25	FY26	FY27	FY28	Total
Awards	$144,911.73	$84,202.65	$34,318.55	$13,244.88	$0.00	$0.00	$276,677.80
Anticipated	$2,502.33	$2,502.33	$0.00	$0.00	$0.00	$0.00	$5,004.65
Pending	$9,662.10	$20,497.75	$16,095.28	$13,378.58	$9,464.88	$3,812.03	$72,910.60

Net ICR, FY23	**$828,067.00**
Net ICR 17.5% IRAD (Emerging Tier 1)	**$144,911.73**
Staff (Salary + F&A)	$41,330.00
Rapid Seedling Grants	$20,000.00
Remainder after standard expenses	**$83,581.73**
Allotted for Centers' discretionary funds: student travel funds, travel funds, seed grants*	$64,477.33
Allotted for ICC Director discretionary funds: student travel funds, travel funds, seed grants, speakers	$19,104.39

*Note that centers' budgets are determined after cost-share commitments.

b. Describe how center/institute IRAD was used to enhance member capacity to compete for external sponsored awards:

ICC IRAD was used to provide members with needed equipment to enhance the ability to perform experiments, to support students performing research with faculty members, to provide matching grants to support preliminary research, and to provide honorariums for visiting speakers/scholars. In addition, IRAD funds support in part our communications director and our assistant director for research development who work closely with faculty to ensure they are supported in their research efforts.

c. List proposals submitted through the center/institute during the past FY:

Please see Appendix B

d. Budget projection chart from ASPIRE database: Please see Appendix C

4. Future Plans and Goals

a. What are your strategic goals for the next year and for the next five years?

The ICC seeks to be a leading research institute at Michigan Tech by FY27. This includes continuing to support the prominence and growth of the College of Computing and interdisciplinary computing researchers at Michigan Tech. The ICC also seeks to provide top-notch research services for faculty and students across campus.

The strategic plan of the ICC includes continuing to seek opportunities to develop the research services and capabilities of the ICC staff. These services and capabilities are an invaluable resource to member faculty and students. Furthermore, building these services also enables to attract a productive membership of research-active faculty: i.e., researchers that can utilize services and capabilities to grow their own research program.

In the near term, the ICC is searching for two new hires:

- Research Coordinator - This position will be supervised by the Assistant Director for Research Development (Amanda Stump) and will be the first full-time hire on her research services team. The duties of this position will depend on the person hired, but it is anticipated that the coordinator will assist Ms. Stump with proposal development, budget preparation, ICC event planning and execution, and day-to-day ICC activities.
- Research Scientist - This position will be a full-time PhD-level research professional. The initial salary and startup is supported by a gift from Kanwal Rehki. It is anticipated that this person will both assist ICC members with their externally funded research, and also lead their own research projects as a PI.

In the next five years, the ICC will continue to look for opportunities to build the staff, with possible hires including additional research services personnel, research engineers / software developers, and research scientists.

In addition to these hiring goals, the ICC will continue to support visiting lectures / scientists, new faculty seminar series, and the Computing[MTU] Showcase.

b. Describe financial and membership goals directly related to enhancing member external sponsored awards. Provide metrics if appropriate.

The ICC seeks to be a “Top-3” research institute at Michigan Tech in terms of research funding: expenditures and new awards. By FY27, the ICC seeks to have:

- $6 million in expenditures per year
- $10 million in awards per year
- One multi-university center award (>$10 million in budget)

To enable this growth, the ICC seeks to hire, at a minimum:

- 3 research services / support personnel
- 2 research scientists hires

    - Including one endowed research scientist position to attract a high-profile computing researcher
- 2 research engineers / software developers

In FY23, the ICC and GLRC are collaborating on a >$100,000 Rapid Research Seedling Fund, providing up to $10,000 per semester for promising research seed proposals.

c. Describe any space or facility needs/goals for center/institute and members:

This year, Dr. Dukka KC and other ICC member faculty were awarded an NSF MRI grant to fund investments in high-performance computing. Providing necessary computing for our members will continue to be a priority for the ICC into the near future. The ICC also seeks to invest in opportunities related to Industry 4.0: automation, data science, robotics, and mechatronics.

Due to collaborations between the GLRC and ICC, there is also the opportunity to invest in research at the nexus of freshwater sciences, marine autonomy, and computing (see $100,000 Rapid Research Seedling Grants).

d. How much of a financial gap do you have regarding meeting those goals?

The fund-raising goals of the ICC over the next five years include:

- $500,000 to provide startup funds for personnel hires over the next five years
- >$1 million to endow and provide startup costs for an endowed research scientist position

e. What strategies will you use to fill this gap?

The ICC has been successful in engaging with “computing” alumni at Michigan Tech to procure donations for strategic investment. The Director will continue to work with key alumni to procure investments in growth.

5. Challenges and Barriers

a. Describe any center/institute challenges or barriers and any help we can provide to overcome them:

One of the main challenges we face with the ICC remains how to best utilize space to accommodate research labs, support cross-disciplinary collaborations, and encourage collaboration with GLRC members in our new joint institute.

Appendix A: ICC Membership List

Institute of Computing and Cybersystems Member List			
An, Hongyu	hongyua@mtu.edu	Cyber-Physical Systems & Human-Centered Computing & Scalable Architecture and Systems	Assistant Professor, Electrical and Computer Engineering Affiliated Assistant Professor, Computer Science Affiliated Assistant Professor, Biomedical Engineering
Arney, Todd	toarney@mtu.edu	Data Sciences	Associate Teaching Professor, Applied Computing
Bae, Jun Yun	bae@mtu.edu	Cyber-Physical Systems	Assistant Professor, Mechanical Engineering-Engineering Mechanics Assistant Professor, Applied Computing
Bettin, Briana	bcbettin@mtu.edu	Human-Centered Computing & Computing Education	Assistant Professor, Computer Science Assistant Professor, Cognitive and Learning Sciences
Bigham, Sajjad	sbigham@mtu.edu	Cyber-Physical Systems	Associate Professor, Mechanical Engineering-Engineering Mechanics Lou and Herbert Wacker Professorship in Mechanical Engineering
Bos, Jeremy	jpbos@mtu.edu	Data Sciences	Associate Professor, Electrical and Computer Engineering
Brown, Laura	lebrown@mtu.edu	Data Sciences & Computing Education	Associate Professor, Computer Science
Buche, Mari	mwbuche@mtu.edu	Data Sciences	Associate Dean, College of Business Professor of Management Information Systems, College of Business Affiliated Professor, Data Science

Cai, Yu*	cai@mtu.edu	Computing Education (Center Director) & Cybersecurity	Professor, Applied Computing Affiliated Professor, Computational Science and Engineering
Chatterjee, Snehamoy	schatte1@mtu.edu	Data Sciences	Associate Professor, Geological and Mining Engineering and Sciences Witte Family Endowed Faculty Fellow in Mining Engineering
Chen, Bo	bchen@mtu.edu	Cybersecurity & Cyber-Physical Systems	Associate Professor, Computer Science
Chen, Bo	bochen@mtu.edu	Cyber-Physical Systems	Professor, Mechanical Engineering-Engineering Mechanics Professor, Electrical and Computer Engineering
Chen, Tan	tanchen@mtu.edu	Data Sciences	Assistant Professor, Electrical and Computer Engineering
Costa, Flavio Bezerra	fbcosta@mtu.edu	Cyber-Physical Systems	Assistant Professor, Electrical and Computer Engineering
Dai, Jun	judai@mtu.edu	Data Sciences	Assistant Professor of Accounting, College of Business
Dukka KC	dbkc@mtu.edu	Biocomputing and Digital Health & Data Sciences	Associate Dean for Research, College of Computing; Associate Professor, Computer Science; Associate Director, ICC
Dyerson, Ana	adyerson@mtu.edu	Cyber-Physical Systems	Assistant Professor, Mechanical Engineering-Engineering Mechanics
Ebnenasir, Ali	aebnenas@mtu.edu	Scalable Architectures and Systems	Associate Professor, Computer Science
Eiris, Ricardo	reiris@mtu.edu	Human-Centered Computing	Assistant Professor, Construction Management Faculty, Civil and Environmental Engineering Faculty, College of Business

Fuhrmann, Dan	fuhrmann@mtu.edu	Scalable Architectures and Systems	Dave House Professor of Computing Chair, Department of Applied Computing Affiliated Professor, Electrical and Computer Engineering
Ghosh, Susanta	susantag@mtu.edu	Data Sciences & Biocomputing and Digital Health	Assistant Professor, Mechanical Engineering-Engineering Mechanics
Giusarma, Elena	egiusarm@mtu.edu	Data Sciences	Assistant Professor, Physics
Goldsmith, Steven	sygoldsm@mtu.edu	Cybersecurity & Data Sciences	Research Professor, Mechanical Engineering—Engineering Mechanics Instructor, Mechanical Engineering-Engineering Mechanics Affiliated Research Professor, Computer Science
Gowtham	g@mtu.edu	Data Sciences & Biocomputing and Digital Health	Director of Research Computing, Information Technology Adjunct Assistant Professor, Physics Research Associate Professor, Electrical and Computer Engineering
Han, Sang Yoon	sjhan@mtu.edu	Biocomputing and Digital Health & Data Sciences	Assistant Professor, Biomedical Engineering Affiliate Assistant Professor in Mechanical Engineering - Engineering Mechanics
Hatoum, Hoda	hhatoum@mtu.edu	Biocomputing and Digital Health	Assistant Professor, Biomedical Engineering Affiliated Assistant Professor, Mechanical Engineering-Engineering Mechanics
Hatti, Nagesh	nhatti@mtu.edu	Data Sciences	Professor of Practice, Electrical and Computer Engineering
Havens, Timothy*	thavens@mtu.edu	Data Sciences (Center Director)	Director, Great Lakes Research Center Director, Institute of Computing

			and Cybersystems William and Gloria Jackson Professor
Hembroff, Guy*	hembroff@mtu.edu	Cybersecurity (Center Director)	Affiliated Associate Professor, Data Science Associate Professor, Applied Computing
Hristova, Stefka	shristova@mtu.edu	Data Sciences	Associate Professor of Digital Media, Humanities
Hungwe, Kedmon	khungwe@mtu.edu	Computing Education	Professor, Cognitive and Learning Sciences
Jarvie-Eggart, Michelle	mejarvie@mtu.edu	Computing Education	Assistant Professor, Engineering Fundamentals
Jeremy Bos	jpbos@mtu.edu	Data Sciences	Electrical and Computer Engineering
Jiang, Jingfeng*	jjiang1@mtu.edu	Biocomputing and Digital Health (Center Director)	Professor, Biomedical Engineering
Kuhl, Scott	kuhl@mtu.edu	Human-Centered Computing	Associate Professor, Computer Science Affiliated Associate Professor, Cognitive and Learning Sciences
Lei, Xinyu	xinyulei@mtu.edu	Cybersecurity	Assistant Professor, Computer Science
Liu, Zhen	zhenl@mtu.edu	Cyber-Physical Systems	Associate Professor, Civil, Environmental, and Geospatial Engineering Affiliated Associate Professor, Geological and Mining Engineering and Sciences
Mayo, Jean	jmayo@mtu.edu	Cybersecurity & Computing Education	Professor, Computer Science
Mueller, Shane	shanem@mtu.edu	Human-Centered Computing	Professor of Psychology, Cognitive and Learning Sciences
Neckrich, Yakov	yakov@mtu.edu	Scalable Architectures and Systems	Associate Professor, Computer Science
Nguyen, Vinh	vinhn@mtu.edu	Data Sciences	Assistant Professor, Mechanical Engineering-Engineering Mechanics
Oliveria, Aurenice	oliveira@mtu.edu	Computing Education	Associate Professor, Electrical

			and Computer Engineering
Onder, Nilufer	nilufer@mtu.edu	Data Sciences & Computing Education	Associate Professor, Computer Science Associate Chair, Computer Science
Onder, Soner*	soner@mtu.edu	Scalable Architectures and Systems (Center Director)	Professor, Computer Science Affiliated Professor, Electrical and Computer Engineering
Ong, Benjamin	ongbw@mtu.edu	Data Sciences	Associate Professor, Mathematical Sciences
Oommen, Thomas	toommen@mtu.edu	Data Sciences	Professor, Geological and Mining Engineering and Sciences Affiliated Associate Professor, Civil and Environmental Engineering
Paheding, Sidike	spahedin@mtu.edu	Data Sciences	Assistant Professor, Applied Computing Affiliated Assistant Professor, Computer Science Affiliated Faculty, Computational Science & Engineering; ICC Center for Data Sciences
Pastel, Robert	pastel@mtu.edu	Human-Centered Computing	Associate Professor, Computer Science Affiliated Associate Professor, Cognitive and Learning Sciences
Pinar, Anthony	apinar@mtu.edu	Data Sciences	Associate Teaching Professor, Electrical and Computer Engineering
Rawashdeh, Nathir	narawash@mtu.edu	Data Sciences	Assistant Professor, Dept. of Applied Computing Affiliated Assistant Professor, Dept. of Electrical and Computer Engineering
Roggemann, Michael	mroggema@mtu.edu	Data Sciences	Professor Emeritus, Electrical and Computer Engineering
Rouleau, Mark	mdroulea@mtu.edu	Data Sciences	Associate Professor, Social Sciences
Schulz, Timothy	schulz@mtu.edu	Data Sciences	University Professor, Electrical and Computer Engineering

Semouchkina, Elena	esemouch@mtu.edu	Cyber-Physical Systems	Professor, Electrical and Computer Engineering Affiliated Professor, Physics
Sergeyev, Alex	avsergue@mtu.edu	Data Sciences	Professor, Applied Computing
Sha, Qiuying	gsha@mtu.edu	Biocomputing and Digital Health	Professor, Mathematical Sciences
Singh, Tripti	triptis@mtu.edu	Cybersecurity	Assistant Professor of Management Information Systems (MIS), College of Business
Smith, Samantha	slsmith1@mtu.edu	Human-Centered Computing	Assistant Professor, Cognitive and Learning Sciences
Steelman, Kelly	steelman@mtu.edu	Human-Centered Computing	Department Chair and Associate Professor, Cognitive and Learning Sciences Affiliated Associate Professor, Mechanical Engineering-Engineering Mechanics Affiliated Associate Professor, Computer Science
Sticklen, Jon	sticklen@mtu.edu	Computing Education	Associate Professor, Engineering Fundamentals Affiliated Associate Professor, Cognitive and Learning Sciences
Tan, Sarah	yinyint@mtu.edu	Computing Education	Research Assistant Professor, Engineering Fundamentals Affiliated Research Assistant Professor, Cognitive and Learning Sciences
Ten, Chee-Wooi*	ten@mtu.edu	Cyber-Physical Systems (Center Director)	Professor, Electrical and Computer Engineering Affiliated Professor, Applied Computing
Trewartha, Kevin	kmtrewar@mtu.edu	Human-Centered Computing	Associate Professor, Cognitive and Learning Sciences Associate Professor, Kinesiology and Integrative Physiology
Ureel, Leo	ureel@mtu.edu	Computing Education	Assistant Professor, Computer Science Assistant Professor, Cognitive and Learning Sciences

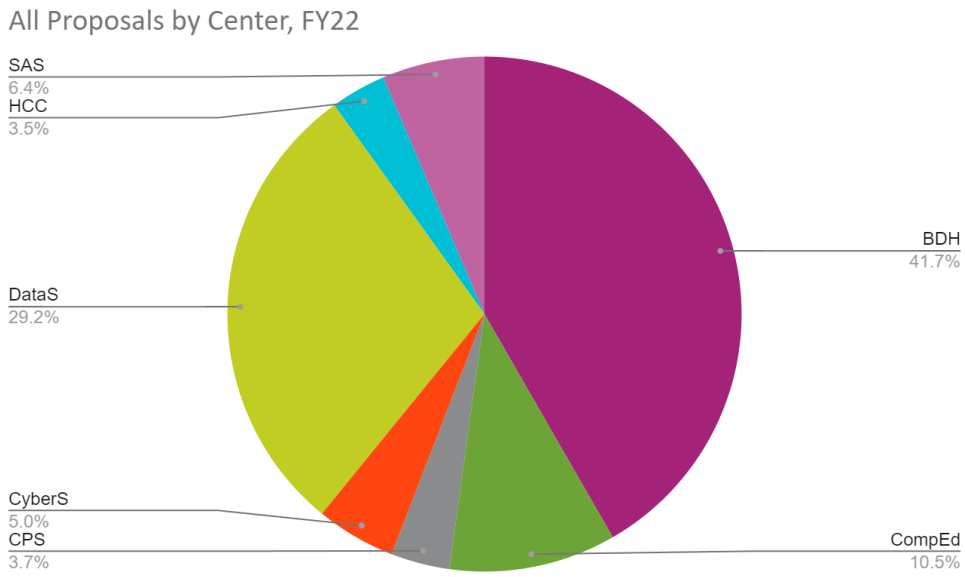
Veinott, Elizabeth*	eveinott@mtu.edu	Human-Centered Computing (Center Director)	Associate Professor, Cognitive and Learning Sciences Affiliated Associate Professor, Computer Science
Vertanen, Keith	vertanen@mtu.edu	Human-Centered Computing	Dabe House Associate Professor, Computer Science
Wall, Jeffrey	jdwall@mtu.edu	Cybersecurity & Computing Education	Associate Professor of Management Information Systems, College of Business
Wallace, Charles	wallace@mtu.edu	Computing Education & Human-Centered Computing	Associate Professor, Computer Science Associate Dean for Curriculum & Instruction, College of Computing Affiliated Associate Professor, Cognitive and Learning Sciences
Wang, Kaichen	kaicheny@mtu.edu	Cyber-Physical Systems	Assistant Professor Electrical and Computer Engineering
Wang, Zequn	zequnw@mtu.edu	Data Sciences	Assistant Professor, Mechanical Engineering-Engineering Mechanics
Wang, Zhaohui	zhaohuiw@mtu.edu	Cyber-Physical Systems	Associate Professor, Electrical and Computer Engineering
Wang, Zhenlin	zlwang@mtu.edu	Scalable Architectures and Systems	Professor, Computer Science
Wei, Hairong	Hairong@mtu.edu	Data Sciences	Professor, School of Forest Resources and Environmental Sciences
Xu, Zhengfu	zhengfux@mtu.edu	Biocomputing and Digital Health	Professor, Mathematical Sciences
Yu, Chunxiu (Tracy)	chunxiyu@mtu.edu	Biocomputing and Digital Health	Assistant Professor, Biomedical Engineering Affiliated Assistant Professor, Biological Sciences
Yuan, Xiaoyong (Brian)	xyyuan@mtu.edu	Cybersecurity & Data Sciences	Assistant Professor, Applied Computing Assistant Professor, Computer Science

Yue, Jianhui	jyue@mtu.edu	Scalable Architectures and Systems & Biocomputing and Digital Health	Assistant Professor, Computer Science
Zhang, Kui	kuiz@mtu.edu	Biocomputing and Digital Health	Dave House Endowed Professor, Mathematical Sciences
Zhang, Kuilin	klzhang@mtu.edu	Cyber-Physical Systems	Associate Professor, Civil, Environmental, and Geospatial Engineering Affiliated Associate Professor, Computer Science
Zhang, Lan	lanzhang@mtu.edu	Cyber-Physical Systems	Assistant Professor, Electrical and Computer Engineering Affiliated Assistant Professor, Computer Science
Zhang, Wenbin	wenbinz@mtu.edu	Data Sciences	Assistant Professor, Computer Science
Zhou, Weihua	mhzhou@mtu.edu	Biocomputing and Digital Health & Data Sciences	Assistant Professor, Health Informatics, Applied Computing Affiliated Assistant Professor, Biomedical Engineering

Appendix B: proposals submitted through ICC, FY22

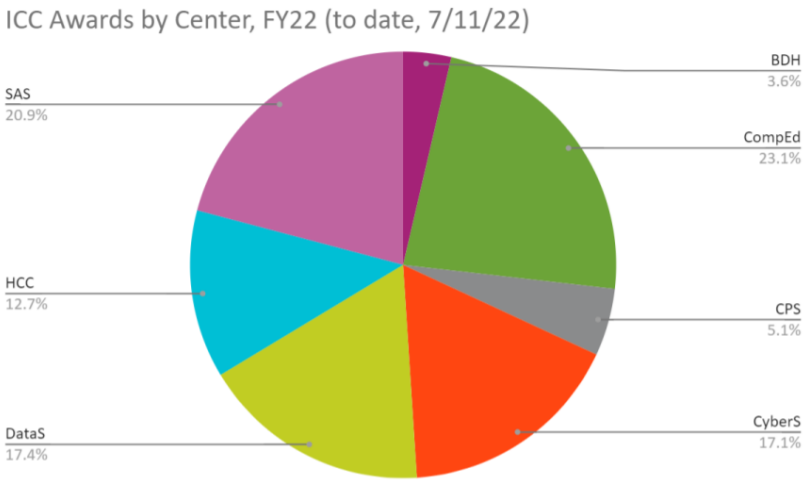
FY22 ICC Proposal Totals (without cost share)		
Type	Number	Amount
New	18	$2,749,862.00
Supplement	6	$587,081.00
Transfer	1	$104,623.00
Amendment	5	$272,644.00
Modification	6	$377,133.00

Total Awards FY22	**36**	**$4,091,343.00**
Proposals submitted in FY22 and awarded in FY23 as of Sept 1, 2022	**3**	**$1,316,610.00**
Declined	48	$20,233,044.00
Pending	4	$580,304.00
Closed	1	$4,914.00
Total Proposals, FY22	**91**	**$26,221,301.00**



a. Proposals Awarded, FY22

All Awards by Center, FY22 (New, Extensions, Continuations, etc)



FY22	
BDH	$149,120.00
CompEd	$947,100.00
CPS	$209,017.00
CyberS	$698,232.00
DataS	$711,965.00
HCC	$521,382.00
SAS	$854,527.00
Total	$4,091,343.00

PI	Sponsor	Proposal Title	Award Type	Duration	Amount (without cost share)
Quarter 1, FY22 (July-September)					
H. Wei (DataS)	Kansas State University (KSU)	ECA-PGR: Under the Hood: The Genetic Components of Maize Transformation	Modification	1 year	$79,765.00
K. Trewartha (HCC)	US Dept. of Health & Human Services (USDHHS)	Motor Learning as a Sensitive Behavioral Marker of Mild Cognitive Impairment and Early Alzheimer's Disease	Supplement	1 year	$98,240.00
S. Onder (SAS)	National Science Foundation (NSF)	SHF: Medium: Collaborative Research: Statically Controlled Asynchronous Lane Execution (SCALE)	Supplement	2 year	$157,345.00

J. Qiu (CPS)	NSF	CRII: SHF: GPU-accelerated FSM computations with advanced speculation	Amendment	1 year	$15,600.00
S. Onder (SAS)	NSF	SHF: Medium: Collaborative Research: Statically Controlled Asynchronous Lane Execution (SCALE)	Supplement	2 year	$331,496.00
T. Havens (DataS)	Signature Research, Inc.	Information Theory Approaches for Machine Learning Algorithm Performance Assessment with Limited Testing Data	New	1 year	$49,998.00
Y. Cai (CompEd/ CyberS)	United States Department of Defense (DOD)	GenCyber Student Camp through Doing + Gaming + Case Study + Teaching	Modification	2 year	$148,708.00
Y. Cai (CompEd/ CyberS)	DOD	GenCyber Student Camp in the Age of Artificial Intelligence	Modification	2 year	$148,660.00
X. Yuan (CyberS/ DataS)	NSF	Collaborative Research: SHF: Medium: A Heterogeneous Architecture for Collaborative Machine Learning	New	3 year	$200,148.00
S. Chatterjee (DataS)	USDHHS	Mine Health and Safety Big Data Analysis and Text Mining by Machine Learning Algorithms	New	2 year	$288,343.00
K. Steelman (HCC)	NSF	EAGER: SAI: Illuminated Devices: A Sociotechnical Approach to Empowering Digital Citizens and Strengthening Digital Literacy	New	2 year	$299,617.00
S. Paheding (DataS)	NSF	Collaborative Research: FW-HTF-P: IntelEUI: Artificial Intelligence and Extended Reality to Enhance Workforce Productivity for the Energy and Utilities Industry	New	1 year	$69,711.00
J. Mayo (CompEd/ HCC)	N/A	N/A	New	4 month	$50,000.00
				Total Awards (without cost share), Q1	**$1,937,631.00**
Q2, FY 22 (October-December)					
S. Paheding (DataS)	MTU REF	REF-CY22-RS: M2DeepPhosSite: MultiModal Deep Learning-based Approaches for Protein Phosphorylation Site Prediction	New	1 year	$24,000.00
C. Ten (CPS)	Arizona State University	Power Systems Transformation Summer School	New	1 year	$34,050.00

	(ASU)/Alfred P. Sloan Foundation				
				Total Awards (without cost share), Q2	**$69,939.00**
Q3, FY 22 (January-March)					
L. Ureel (CompEd)	NSF	Rich Immediate Critique of Antipatterns (RICA) in Novice Programmer Code: Broadening Adoption Supporting Student Learning and Enhancing Programming Competencies	New	3 year	$599,732.00
X. Lei (CyberS)	NSF	CRII: SaTC: Enabling Secure Machine Learning Queries over Encrypted Database in Cloud Computing	New	2 year	$174,855.00
S. Onder (SAS)	NSF/Florida State	NSF-ICC-FoMR: Collaborative Research	New/ Subcontract	1 year	$18,382.00
Dukka KC (BDH/DataS)	NSF	III: Medium: Collaborative Research: Multi-Level Computational Approaches to Protein Function Prediction	Transfer	1 year	$104,623.00
H. Wei (DataS)	KSU	No-cost extension: EPA-PGRL Under the Hood: The Genetic Components of Maize Transformation	Modification	1 year	$0.00
W. Zhou (BDH)	Tulane University/ National Institutes of Health (NIH)	Trans-omics integration of multi-omics studies for male osteoporosis	Amendment	1 year	$24,497.00
Havens (DataS)	DOD	NPT-03/04: Localization, tracking, and classification of on-ice and underwater noise sources using machine learning	Amendment	1 year	$0.00
				Total Awards (without cost share), Q3	**$922,089.00**
Q4, FY 22 (April-June)					
J. Jiang (BDH)	Spectrum Health Foundation	Machine-learning based detection of heart defects in neonatal patients	New	1 year	$20,000.00
J. Bos (DataS)	DOD	Imaging Theory and Mitigation in Extreme Turbulence-induced Anisoplanatism	Modification	3 month	$0.00
K. Vertanen (HCC)	NSF	CAREER: Technology Assisted Conversations	Amendment	1 year	$123,525.00
S. Onder (SAS)	NSF	Collaborative Research: SHF: Medium: Vectorized Instruction Space	New	4 year	$331,704.00
B. Yuan	Oak Ridge Associated	POWE Privacy Preserving Machine Learning at the Edge	New	1 year	$5,000.00

(CyberS/ DataS)	Universities (ORAU)				
B. Yuan (CyberS/ DataS)	NSF	Collaborative Research: SHF: Small: Artificial Intelligence of Things (AIoT): Theory, Architecture, and Algorithms	New	3 year	$409,355.00
L. Zhang (CPS)	NSF	CRII:CNS: IoT-aware Federated On-Device Intelligence	New	1 year	$174,967.00
B. Yuan (CyberS/ DataS)	NSF	Collaborative Research: SHF: Medium: Heterogeneous Architecture for Collaborative Machine Learning	Amendment	3 year	$109,022.00
				Total Awards (without cost share), Q4	**$1,216,005.00**
				Total Awards (without cost share), FY22	**$4,091,343.00**
				Grants Submitted in FY22 and Awarded in FY23	
Y. Neckrich (SAS)	NSF	AF: Small: Fundamental Geometric Data Structures	New	3 year	$594,059.00
Dukka KC (BDH/DataS)	NSF	MRI: Acquisition of a GPU-accelerated cluster for research, training and outreach	New	2 year	$432,075.00
T. Havens (DataS)	SOSSEC, Inc./US Army Corps of Engineers-ERDC	Do not share	Continuation	2 year	$290,476.00
				Total Grants Submitted in FY22 and Awarded in FY23	**$1,316,610.00**

b. Pending Proposals

PI	Sponsor	Proposal Title	Award Type	Duration	Amount (without cost share)
		Q3, FY 22 (January-March)			
S. Chatterjee (DataS)	Syracuse University/NSF	FW-HTF-P: The Future of Automated Mining: Identifying opportunities and impediments to mining automation	New	1 year	$16,684.00
S. Ghosh (DataS/BDH)	University California Los Angeles (UCLA)/ Department of Energy (DOE)	Prediction and Tuning of Spin Selectivity Properties of Chiral Nanomaterials via an integrated Machine Learning - First Principles Approach	New	3 year	$321,941.00

C. Ten (CPS)	Iowa State University/DOE	CYDERMS: Center for Cybersecurity & Resiliency of DERs and Microgrids-integrated Distribution Systems	New	2 year	$105,000.00
L. Brown (CompEd/ DataS)	Thermo Analytics/NSF	Physics-Informed Machine Learning Software for Battery Lifetime Modeling	New	1 year	$136,679.00
				Total Pending Proposals (without cost share), FY22	**$580,304.00**

c. Declined Proposals

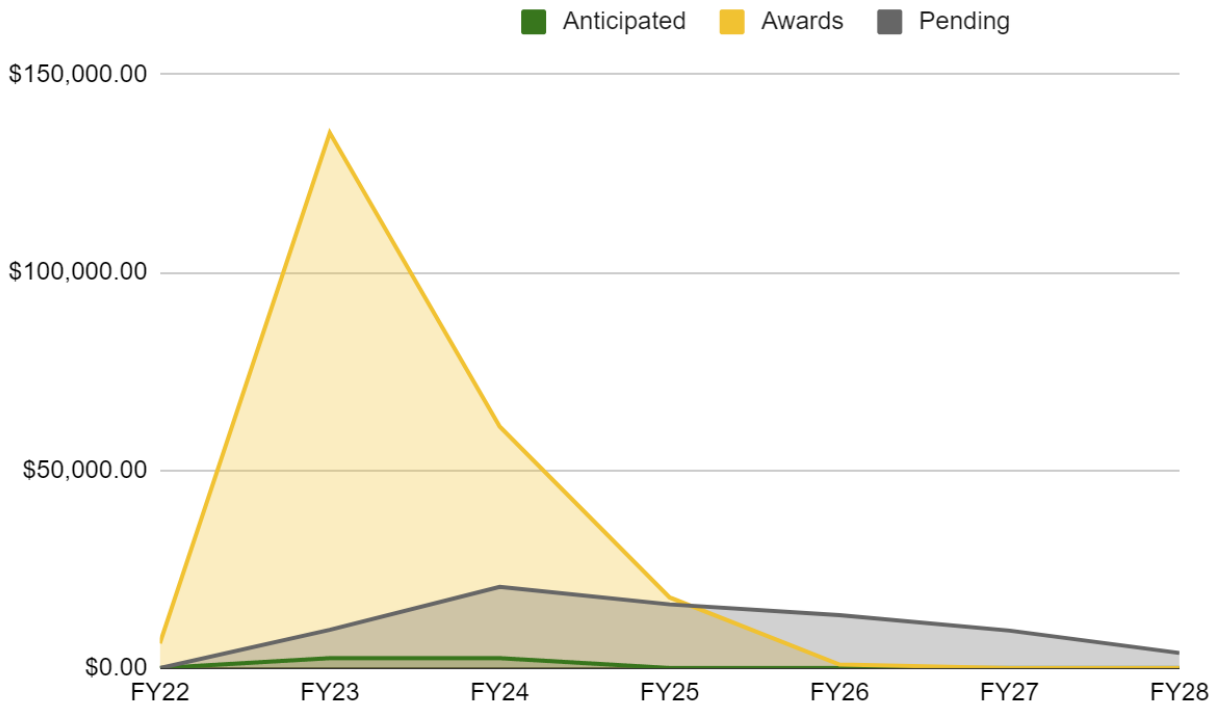
PI	Sponsor	Proposal Title	Award Type	Duration	Amount (without cost share)
H. An (CPS/HCC/ SAS)	NSF	CRII: RI: Building a Self-Learning Neuromorphic System through Associative Memory	New	2 year	$174,724.00
T. Pinar (DataS)	GS Engineering	SBIR - Tethered UAS	New	2 year	$14,671.00
T. Oommen (DataS)	National Aeronautics & Space Administration (NASA)	Characterizing Martian Landslides Using Deep Learning to Understand its Triggering Mechanisms	Pre-Proposal	3 year	$0.00
L. Brown (CompEd/ DataS)	Children's Hospital Medical Center	ELL: An EHR-Linked Learning Librarian for Pediatric BMT Patients and Caregivers	New	4 year	$131,410.00
S. Paheding (DataS)	NSF	Collaborative Research: DTI: ViGaM: Visualization-Integrated Game-based Machine Learning Modules for Smarter STEM Workforce Development	New	3 year	$364,080.00
C. Wallace (CompEd/ HCC)	NASA	Automated Integration of Mission Control Software	New	4 year	$348,576.00
L. Brown (CompEd/ DataS)	NSF	A Dataset for Education and Analysis on Code C Security	New	3 year	$327,200.00
S. Paheding (DataS/BDH)	NSF	Collaborative Research: DTI: ViGaM: Visualization-Integrated Game-based Machine Learning Modules for Smarter STEM Workforce Development	New	3 year	$364,080.00
Bos (DataS)	Exciting Technology Corporation	POWER: Powered Optical Wavefront-controlled Energy Recharge	New	1 year	$67,487.00

	(ETC)/DARPA/ DOD				
J. Jiang (BDH)	University of Wisconsin-Madison/NIH	Development of quantitative digital subtraction angiography	New	4 year	$307,386.00
Dukka KC (BDH/ DataS)	Oklahoma State University/NSF	Institute for Advancing Climate-Smart Agriculture Through AI	Pre-Proposal	4 year	$0.00
N. Rawashdeh (DataS)	NSF	REU Site: Research Experience in Mechatronics and Applied Computing (REMAC)	New	3 year	$378,789.00
W. Zhou (BDH)	NIH	Discover relationships between genetic markers and and FEA-computed hip fracture load from quantitative CT images	New	2 year	$446,397.00
L. Zhang (CPS)	ORAU	POWE IoT-Aware Federated On-Device Intelligence	New	1 year	$5,000.00
L. Ureel (CompEd)	NSF	Enhancing Teaching and Learning by Using Machine Learning to Identify and Provide Feedback on Antipatterns in Novice Code	New	3 year	$849,939.00
C. Schelly (DataS)	NSF	NRT-AI: STEM training to advance Socially Ethical and Ecologically Sustainable AI (SEES-AI)	New	5 year	$2,990,813.00
Cai (CompEd/ CyberS)	National Security Agency (NSA)	Innovative GenCyber Student Camp at Michigan Tech in the Age of AI	New	2 year	$146,782.00
S. Chatterjee (DataS)	Missouri University of Science and Technology (MUST)/CDC/ NIOSH/Office of Mine Safety and Health Research	Improving Real-Time Coal Dust Monitoring using a Machine Learning Calibration Model for Low-Cost Particulate Matter Sensors	New	2 year	$74,997.00
J. Jiang (BDH)	BCBS-MI	Multi-modality integration for improving interventions for structural heart disease	New	1 year	$108,896.00
W. Zhou (BDH)	NIH	Early identification of patients at risk of hip fracture	New	4 year	$3,101,096.00
J. Bos (DataS)	D-Tech, LLC/US Army	ML-Driven Intrusion Detection and Prevention for Real-Time Control Area Networks	New	6 month	$68,858.00
Dukka KC (BDH/DataS)	Camille and Henry Dreyfus Foundation	Multi-modal Deep-Learning based approach for prediction of allosteric sites	New	1 year	$194,564.00

W. Zhou (BDH)	AHA	Integrative analysis of electrical and mechanical dyssynchrony to improve cardiac resynchronization therapy	New	3 year	$299,825.00
B. Chen (CyberS/ DataS)	NSF	CAREER: Towards Secure Deletion on Flash-based Storage Media by Mitigating Side-channel Attacks	New	5 year	$499,933.00
B. Yuan (CyberS/ DataS)	Indiana University/NIH	Data Generation Projects for the NIH Bridge to Artificial Intelligence (Bridge2AI) Program (OT2)	New	4 year	$49,638.00
S. Ghosh (DataS/BDH)	NSF	Collaborative Research: Harnessing the Large Deformation Electromechanical Response of Low-Dimensional Materials using an integrated Machine Learning - First Principles Approach	New	3 year	$349,485.00
V. Busov (DataS)	NSF	Role of a novel regulatory module in control of poplar root development under low nitrogen	New	3 year	$1,082,946.00
L. Brown (CompEd/ DataS)	NSF	A Dataset for Education and Analysis on Code C Security	New	3 year	$327,200.00
J. Yue (SAS/BDH)	NSF	In Storage Accelerator for Large-scale Graph Neural Networks	New	3 year	$575,577.00
S. Paheding (DataS/BDH)	NSF	Collaborative Research: SCH: AI-powered in silico Assistant for Patient-Specific Cardiac Ablation Procedures	New	4 year	$399,803.00
J. Jiang (BDH)	Blue Cross Blue Shield of Michigan Foundation (BCBS-MI)	Multi-modality integration for improving interventions of structural heart disease in rural areas	New	1 year	$70,000.00
S. Chatterjee (DataS)	NIOSH	Digital Twin Model for Hazard Identification from Mining Automation System using Robotic Simulation	New	2 year	$304,536.00
W. Zhou (BDH)	NIH	R15: Early identification of patients at risk of a hip fracture	New	5 year	$2,832,808.00
S. Paheding (DataS/BDH)	NSF	Collaborative Research: FW-HTF-R: axFORCE: Integrating AI and XR to Improve Workforce Productivity in Power and Utilities	New	4 year	$1,072,483.00
S. Hristova (DataS)	National Endowment for the Humanities (NEH)	Algorithmic Approaches to Visual Culture Summer Institute	New	1 year	$243,108.00

F. Costa (CPS)	NSF	Collaborative Research: SAI-R SYN&GO: Synergistic Milestones and Networked Power Infrastructure with Collaborative Governance in a Hurricane-Prone Area	New	2 year	$599,952.00
T. Havens (DataS)	Comerica Charitable Foundation	Computing[MTU] Showcase Undergraduate & Graduate Student Poster	New	1 month	$2,000.00
W. Zhou (BDH)	American Heart Association (AHA)	Integrative analysis of electrical and mechanical dyssynchrony to improve cardiac resynchronization therapy	New	3 year	$299,825.00
W. Zhou (BDH)	NIH	A new approach to improving coronary revascularization in patients with stable coronary artery disease	New	2 year	$413,172.00
L. Brown (CompEd/ DataS)	Wake Forest Baptist Health/NIH	Predicting and preventing medication errors using machine learning and FHIR	New	4 year	$345,008.00
				Total in declined proposals, FY 22	**$20,233,044.00**

Appendix C: Budget Projection Chart from ASPIRE - Five-Year Forecast



Appendix C: ICC IRAD Spending, FY22

ICC IRAD Expenses, FY22	
Category	**Sum of Actual**
Audiovisual & Photographic Service	$1,675.00
Business meals	$668.50
Cyber Security	$234.55
Equipment	$17,751.47
Facilities	$17.50
Fees and Licenses	$575.00
Furniture	$987.40
Honorarium	$1,000.00
Lab supplies	$183.98
Mail	$53.93
Matching grants	$3,647.00
Office Supplies	$393.91
Other Intra-University Charges	$225.00
Payroll	$37,834.05
Print shop	$76.71
Printing	$112.18
Promotional Supplies	$414.98
Room rental	$350.00
Software	$2,011.31
Student support	$15,526.33

Student support Tuition	$585.00
To D90830 VPR Ind Qualtrics	$1,000.00
To E35313 Sangyoon Han IRAD	$2,000.00
Travel	$19,766.88
Total	**$107,090.68**