The Only Thing Constant is Change

Heraclitus’ wise point was sharpened by Benjamin Franklin who said, “When you’re finished changing, you’re finished.” And so, 2019 became a year of transition for the Iowa Informatics Initiative (UI3), the people who drive it and the constellation of amazing programs and services it sponsors.

UI3 wheels of change were put into motion by Interim Provost Sue Curry in Q2 when she announced that seven faculty clusters would “transition to independence” after ten years of direct oversight and financial support by the Iowa Office of the Provost. This funding had supported the UI3 Cluster Faculty Program, UI3 Affiliates Program, UI3 training and Interdisciplinary Graduate Program in Informatics (IGPI) administration. Consequently, the current incarnation of UI3 Cluster Faculty, Affiliates and training programs will end December 31, 2019, but the IGPI program will continue under Graduate College oversight.

About the same time, it was decided that distributed College of Public Health (CPH) teams currently housed in the Westlawn building—scheduled to be razed in 2020—and University Capitol Centre (UCC), would join their sister programs in the CPH building at 145 North Riverside Drive. They will occupy the fifth-floor suite that is currently home to UI3 training staff, their conference and classrooms, IGPI administration and cluster faculty offices. IGPI students will soon find a new home in the Iowa Advanced Technology Laboratory (IATL). UI3 staff with offices in the CPH building will be relocated to UCC 2500 in November.

UI3 was founded as a campus-wide effort to foster interdisciplinary research collaborations, scholarship opportunities and data-intensive discovery. The trends, challenges and demands that originally motivated its creation remain an institutional priority. If anything, the process of discovery in every domain has become even more compute- and data-intensive; volume and workflow complexity accelerates as more fields employ machine learning, neural networks and other artificial intelligence (AI) methodologies.

Once they have a chance to acquaint themselves with the landscape, Provost Montserrat Fuentes and Vice President for Research J. Martin Scholtz will take a keen interest in shaping UI3 progeny that will be strengthened by ancestral experience, and that align with fresh institutional priorities, strategies and objectives.

Thank you for your past collaborations, and continued support through this transition!

Sincerely,

Gregory R. Carmichael
Director, University of Iowa Informatics Initiative
Karl Kammermeyer Professor of Chemical and Biochemical Engineering
College of Engineering
We’re proud of UI3 accomplishments; here are a few highlights:

• UI3 recruited 24 highly-specialized data science faculty to campus with expertise in artificial intelligence (AI), cybersecurity, climate and environmental sciences, biostatistics, energy, hydroengineering, political science, genomics, biomedical engineering, epidemiology, chemistry, the “Internet of Things,” and more.

• Feature articles about UI3 Cluster Faculty research and student-mentor accomplishments are chronicled on the informatics website. Once UI3 ends, cluster faculty will remain in their home departments where they will continue to support Iowa’s institutional mission through their teaching, research and service.

• UI3 has hosted several symposia since 2014. An artificial intelligence (AI) themed program in February and a Computational Psychiatry symposium in May drew hundreds of participants from just about every department and unit on campus.

• With ITS-RS Campus Engagement Team specialists, UI3 Cluster Faculty help researchers, students and staff hone the skills they need to remain globally-competitive, and regionally-responsive. ITS-RS will continue to host advanced-skills training, but UI3 symposia can no longer be supported.

• The UI3 Affiliates program includes more than 300 faculty, student and staff who foster interdisciplinary collaborations, cultivate new research opportunities and train future generations of data-savvy practitioners to transform information into knowledge and actions. UI3 will continue to accept applications in an effort to preserve this important community of practice for the future.

A glance back; looking forward

A list of frequently-asked questions and answers was added to the UI3 website (navigational element titled, “Looking Forward”), with links to surveys that will collect fresh queries and insights. UI3 and ITS-Research Services leadership look forward to working with everyone as we shape Iowa’s informatics future together.

Omar Chowdhury, assistant professor in the Department of Computer Science and UI3 Cluster Faculty member, won a Young Faculty Award from the Defense Advanced Research Projects Agency (DARPA), an advanced-technology division of the U.S. Department of Defense.

Chowdhury’s research will aim to identify security and privacy weaknesses of the existing and emerging cellular network systems through the novel use of formal verification techniques. His research could substantially improve current and future generations of the cellular network ecosystem by empowering device users to be aware of cellular network attacks.

The award is $497,000 for two years with an option to extend the award another year, at $283,000.

UI3 Welcomes Karen Dunn Lopez

Dunn Lopez is the Director of Research for the Center for Nursing Classification and Clinical Effectiveness in the College of Nursing.

Her scholarship focuses on nursing informatics; identifying factors that can improve the usability and usefulness of health information technologies with the overarching goals of improved decision-making and health outcomes.

To date, her research involves the novel applications of NANDA-I (Nursing Diagnosis), NIC (Nursing Intervention Classification) and NOC (Nursing Outcome Classification) to develop clinical decision-support technologies. She has served as principal investigator, or co-PI on a research grant portfolio exceeding $5.4 million, including three federal grants.

Dr. Dunn Lopez led the first systematic review of clinical decision support that targets decision making by acute care nurses. She found that although technologies designed to support nurse decision making have lagged behind medical decision supports, nurse decision making is associated with improved patient outcomes. She also co-led a project to develop and test an algorithm to determine the differences between nurse and physician use of terminologies that provided quantitative evidence of the differences between nurse and physician care.
IDAS: “Automagic” HPC With Training Wheels

High-performance computing (HPC) for research is notorious for having steep barriers to entry. For this reason, high-tech disciplines were early adopters, have used the most cycles and typically drove hardware and software purchasing decisions. But as more fields engage with data-intensive research and artificial intelligence (AI) workflows, data-center hardware and software landscapes are changing to meet a larger and more diverse community of practice.

Iowa’s Interactive Data Analytics Service (IDAS) is an HPC resource that supports large-scale and collaborative data analytics workflows involving RStudio for R and Jupyter Notebook for Python (but not limited to Python). Applications via the IDAS interface look and feel like they do on a regular workstation, but with access to thousands of times the computing power. IDAS has its own HPC and graphics processing units (GPUs) and allows users to perform interactive data analysis tasks with applications used for machine learning and AI. In the future, the UI Research Services development team will assist with custom environments. There are plans to add a feature that allows researchers to access Iowa’s Argon supercomputer if more power is needed, or to purchase commercial cloud if locally-hosted HPC isn’t enough.

While RStudio for classroom use is available, RStudio commercial licensing terms changed and pricing increased midterm as IDAS was being developed. Therefore, until a more affordable and dynamic license distribution method is available, IDAS employs the free RStudio classroom license. In the future, a remote desktop feature will be added.

IDAS especially appeals to those who may not have used HPC in the past, but whose data-intensive research would benefit from advanced computational capabilities. Such disciplines are often referred to as, “the long tail of science,” and many have begun to engage with AI methodologies which make their work more computationally-intensive than ever. While they aren’t always the biggest compute consumers, their collective needs represent critical mass that IDAS accommodates quite well.

Experimentation within IDAS is safe with associated storage options that are appropriate for most classifications of data. Sensitive data should be evaluated for IDAS consideration on a case-by-case basis. “If you aren’t sure about your data’s classification, you can arrange a consultation with our compliance specialist,” said Research Services Director Danny Tang.

IDAS Jupyter Notebook serves both general research and classroom needs which were optimized during its pilot phase. A dozen faculty and staff from six departments test-drove the research platform for several months, and classroom attributes were trialed by students in Data Scientist Kang Lee’s (Research Services; College of Business) summer business analytics class.

IDAS Faculty Profiles:
Paul Gowder (College of Law)
At the time of the mid-August launch, eight classroom instances were registered, including one by Professor Paul Gowder. Gowder’s research involves the impact of machine learning and predictive modeling on both the practice and concept of law. Gowder said, “I’m planning to use IDAS in my ‘Introduction to Quantitative and Computational Legal Reasoning’ course, and may also utilize it for my research involving AI to understand contracts and records from publicly-available court documents.”

Brandon LeBeau (College of Ed)
Professor Brandon LeBeau uses IDAS in an introductory statistics course that allows future educators to explore statistical concepts, remove assumption barriers in the statistical analysis, and introduces them to best practices surrounding script-based analyses. “The goal for this course is for students to learn how to reason with data and make appropriate statistical/data arguments, vs. learning how to program,” he said, and added, “This hands-on approach will help them on their journey to becoming stronger data connoisseurs.”

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The Proof is in the IGPI Pudding: Student Highlights

Following are four IGPI student highlights. Each chronicles a unique way that Iowa scholars have developed personalized educational experiences and the tremendous impact they’re already making.

Eric Pahl (Health Informatics PhD)

Among examples of how this structure accelerated the process of research discovery, innovation and commercialization, is the case of Eric Pahl (Health Informatics PhD Scholar who co-founded OmniLife).

As an undergrad, Pahl had an epiphany inspired by personal experience and realized he’d need guidance from a number of disciplines to bring his ideas to fruition as he pursued an advanced degree. With IGPI, he was able to cherry-pick an interdisciplinary team of expert advisers from Iowa’s Electrical and Computer Engineering department, Tippie College of Business; Management Sciences; and UI Hospitals and Clinics. This proved to be Pahl’s recipe for rapid success.

While completing his PhD, Pahl’s innovation was already saving lives. His company now employs 20 student interns and 10 full-time professional software engineers in Johnson County; they have raised ~$5 million from state, federal (National Institutes of Health), and private investments, and they’ve only just begun!

When asked how he did it, he credited a number of things that wouldn’t have been possible without the university’s investment in high-end computational and data resources, UI3 expertise and IGPI’s interdisciplinary nature. From a February 2019 interview with Pahl:

As an IGPI scholar, Pahl and his team have access to the high-performance computing resource, Argon, and exploit the acceleration possible with its graphics processing units (GPUs). “Argon GPUs are used to run experiments that identify which variables are more predictive of organ transplant success or failure at various post-op time intervals,” said Pahl. “We were able to halve the time from initial organ offer to transplant. Over the past three years, median offer to transplant times were 16, 19 and 21 hours, respectively.” But during their intervention year, they observed a median time of 10 hours. “Fewer hours on ice are critical to organ transplant success; this time-savings was a significant improvement that wouldn’t be possible without AI,” he added.

IGPI Magic: The Secret’s in the Interdisciplinary Sauce

An early iteration of the Interdisciplinary Graduate Program in Informatics (aka IGPI) began at the University of Iowa 19 years ago, but the number of student participants increased 70 percent since 2015 under Iowa Informatics Initiative (UI3) administration. In the past academic year, 40 master’s and PhD IGPI students were enrolled, compared to 28 in 2015. More than 100 faculty from 40 collegiate programs and departments participate, and hundreds of UI3 Affiliates serve as ambassadors that collaborate, advise and share lessons learned. As for degree programs, IGPI scholars may pursue an Informatics PhD, Informatics MS, or an Informatics Certificate in Bioinformatics, Geoinformatics, Health Informatics and Information Science.

The biggest benefit of IGPI’s interdisciplinary framework is that students whose interests don’t fit well with an existing program find the flexibility to customize a unique curriculum. In doing so, they’re free to pursue personal interests, passions and goals from a number of departments where they can learn from nationally-recognized faculty who will support their objectives.

UI3-IGPI Lessons Learned:

IGPI is a successful interdisciplinary program that is of high value to Iowa students. Since it’s oriented toward student success, its graduates are in soaring demand as is reflected in their outstanding placement rates upon graduation.

However interdisciplinary programs are under pressure under the new university business model which is more college-centric. One challenge for IGPI students, in particular, and all graduate students, in general, is ensuring access to classes that contribute to a mastery of computational domain science and AI workflows.

UI3 Director Greg Carmichael explained that departments give their own students priority registration for the courses they host. “Some reach capacity on opening day,” he said. IGPI scholars might be counseled by advisers from a number of colleges and/or departments, so the advising process requires more time. If they’re late to register, they may not be able to enroll in the courses they need to succeed. “We hope all colleges will continue to expand the curriculum to accommodate the growing number of scholars who are pursuing data-intensive academics and careers,” he said.

Carmichael also explained that navigating the political aspects of interdisciplinary registration requires a well-informed and, at times, fierce IGPI champion. This task had been undertaken by the IGPI program officer whose position was eliminated in 2019. Otherwise, IGPI scholars benefit from having strong self-advocacy skills coupled with an understanding of how the overall registration process is managed. “But few possess that knowledge,” Carmichael added.

With the close of the campus cluster programs, how IGPI will be managed in the future is currently under discussion. For now, it is jointly-administered by UI3 and the Graduate College. Standing IGPI commitments will be honored; students will continue to benefit from the support they currently receive, and access to collaborative spaces in the CPHB will continue until alternative space is identified.

We will continue to share IGPI student news and program updates on the UI3 website until an alternative platform is created by the Graduate College.

OmnLife Team; Eric Pahl is third from left.
Luiza Superti Pantoja (Human-Computer Interaction PhD)

Luiza Superti Pantoja knew that when it comes to designing better technology for children, it would help to begin with an entirely fresh framework for innovation and discovery.

As a Brazilian native, Pantoja was familiar with Seymour Papert’s Samba School Learning Communities that gained inspiration from the African-Brazilian dance and drumming style. She had also spent five years working directly with preschool children to develop a better understanding of how they play, and what interests them.

Unlike the common authoritarian education model where children are required to sit still and pay attention to the teacher, Samba Schools encourage movement, creativity, and freedom of expression. It is believed that this environment fosters more empowered and enlightened adults; Pantoja is living proof that it must work.

“While preschool children use technology, to date there are no well-documented participatory design methods that included this age group in the process of development,” she said. To address the oversight, she formed her thesis around the concept of Play-Based Design principles to VUIs and Internet-of-Things devices that have become ubiquitous in most homes, but that are typically only road-tested by adults.

Pantoja’s dissertation propelled her on an interdisciplinary journey at U-Iowa through child development theories, storytelling for children, graphic design, qualitative methods, software development, and related approaches from literature. As an IGPI scholar, she was advised by professors in Communication Studies, Communication Sciences and Disorders, College of Education and Computer Science. She learned coding skills by taking Intro to Python and Stata workshops offered by the UI3 and Iowa Social Science Research Center (ISRC).

Taking it a step further, her team explored the possibility of applying Play-Based Design principles to VUIs and Internet-of-Things devices that have become ubiquitous in most homes, but that are typically only road-tested by adults.

Pantoja successfully defended her thesis in July and became one of Iowa’s first Human-Computer Interaction PhDs. Prior to pursuing a PhD, she worked as a designer for six years. She now looks forward to continuing her professional career with a startup that develops computer applications for children. In retrospect, she’s thankful for the challenges that motherhood presented. “While it wasn’t easy, having a baby strengthened my passion for improving educational resources for young children, and I’m more motivated than ever to commercialize products my son can use,” she added.
The Proof is in the IGPI Pudding: Student Highlights cont'd...

Samantha Atkinson (Informatics PhD)

After completing a master of science degree in biotechnology at Illinois State University, Samantha Atkinson pursued an informatics PhD at the University of Iowa. She hoped to skip the educational aspects involving mice and the dissection of biological specimens; she wanted to dive straight into the data. Therefore, an IGPI marriage of bioinformatics and computational biology was the perfect path for Atkinson whose research explores the human gut microbiome and factors relating to obesity.

She was making great strides when after completing her second year of PhD studies, John Kirby, her adviser and the principal investigator of U-Iowa’s gut microbiome research, left to become the Chair of Microbiology and Immunology at the Medical College of Wisconsin (MCW). Through the IGPI program, Atkinson was able to physically transfer to MCW to continue her work with Dr. Kirby while completing her IGPI Informatics degree program at U-Iowa.

Atkinson is grateful for the help of Dr. Kirby, IGPI Adviser Terry Braun (College of Engineering; PhD in Genetics) and IGPI Program Manager Andrea Flaherty.

Yi Wang (Geoinformatics PhD)

The world’s 100 most polluted cities are in seven countries, and half are in China. Industrial manufacturing processes and transportation emit trace gasses, such as sulfur dioxide and nitrogen oxides; pollutants which have a tremendously adverse effect on public health. Once dispersed, the levels of concentration fluctuate with atmospheric conditions.

Geoinformatics PhD Yi Wang’s thesis involved using satellite data to measure sulfur dioxide and nitrogen oxides emissions, which is further applied to improve air quality forecasts.

"Each year, outdoor air pollution causes ~3 million premature deaths worldwide according to Lelieveld’s research (Nature, 2015)," said Wang. It is therefore helpful to forecast air quality accurately so that people can take precautions as early as possible.

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IDAS Highlights Continued…

James Kent (UI Interdisciplinary Graduate Program/Neuroscience)

Teaching Assistant James Kent aides Professor Michelle Voss with Iowa's structural/functional Magnetic Resonance Imaging (MRI) methods course. "Our two biggest challenges were installing software on heterogeneous hardware, and random-access memory (RAM) restrictions when running a virtual machine," said Kent. "With Jupyter Notebook on IDAS, the HPC is handled in the background; this provides students with enough computational power to complete full analyses on real MRI data, not the toy datasets we always curated for this class," he added.

Kent explained how useful he imagines IDAS will be for workshops, too. Since most are one to three hours in length, less instructional time will be spent installing software and/or learning how to master the hardware." Some students get discouraged if the preparation phase is too tedious; it presents an unnecessary hurdle," he said. "If students feel this time is wasted, some may skip the workshop, leave early or walk away with the impression that programming is inaccessible to them," he added.

Outside of the formal classroom setting, Kent thinks IDAS will be perfect for hackathons. "They're often about prototyping and Jupyter Notebooks provides a great platform on which to interact with code and receive immediate feedback," said Kent. In the past, a downside of hackathons was that machine learning models can take a lot of RAM and/or use significant GPU power. HPC is the answer for increased RAM and GPU usage, but mastery of Jupyter Notebooks was difficult with the traditional HPC interface. Kent expressed appreciation for IDAS' development when he said, "IDAS combines Jupyter Notebooks' ease of prototyping with the power of HPC that runs and scales 'automagically' in the background!"

Yi Wang (IGPI Geoinformatics PhD), Cont'd...

"Air quality forecasts rely on accurate emission inventories which are usually estimated through a 'bottom-up' approach where you gather data such as coal consumption, traffic information, and so on," he said. "But the 'bottom-up' approach usually has at least a one-year time lag, which results in less timely and accurate forecasts," he added.

Wang creates emissions inventories using satellite data, which are near real-time and can therefore contribute to more timely and accurate forecasts. "For example, a parent of an asthmatic child would need to know by Monday if the coming week's conditions warrant different childcare provisions, or if the child should stay inside all together," he said, and added, "Such data inform health alerts that appear on the daily news, and banners on certain apps."

Since the amount and complexity of analyses are increased with satellite data, it was necessary for Wang to gain programming expertise and knowledge of machine learning and other AI methodologies. He honed the necessary skills by taking workshops offered by UI3. His research was supported by a National Aeronautics and Space Administration (NASA) grant led by his adviser, Professor Jun Wang. The IGPI program supported his interdisciplinary journey, and his PhD committee included Daven Henze (Mechanical Engineering; U-Colorado at Boulder), Charles Stanier (U-Iowa; Chemical and Biochemical Engineering), Marc Linderman (U-Iowa; Geographical and Sustainability Sciences), and Jun Wang (U-Iowa; Chemical and Biochemical Engineering). He defended his thesis in May—became U-Iowa’s first IGPI Geoinformatics PhD—and plans to continue working with Professor Jun Wang as a U-Iowa postdoc.
What’s New in ITS Research Services?

Argon 40 Percent More Powerful; Compute Nodes & GPUs for Sale!

In response to community feedback collected during two open forums last spring, a request for purchase was issued and an award was granted in July. This has allowed us to make the following upgrades to the Argon high-performance Computing (HPC) environment:

Hardware: Argon will soon increase its power by 40 percent, with double the number of graphics processing units (GPUs). Up to eight GPUs will be available on a single system. The new hardware will be available in late October, and its warranty runs through October 2024. For more details, or to purchase a dedicated compute node, visit the Research Services website: https://hpc.uiowa.edu.

Software: Argon’s software stack is now more flexible and agile than ever before. Fall 2019 updates were loaded to an environment module which allows new and old application versions to coexist in the stack. Initially, new compiler and OpenMPI versions were added, with Python-2 and Python-3 updates. Additional packages will be added in the future. For instructions on loading the environment module, visit the Research Services website: https://hpc.uiowa.edu.

Research groups or colleges may purchase dedicated compute nodes within the Argon HPC cluster. Dedicated compute nodes and GPUs are available in a variety of strengths and configurations. For more information, visit the Research Services website: https://hpc.uiowa.edu.

Questions? Please contact research-computing@uiowa.edu.

Personnel changes in UI3 and ITS-Research Services

IGPI Program Coordinator and Assistant to the UI3 Director Andrea Flaherty’s position was directly affected by the elimination of cluster faculty funds. While she was officially furloughed in July, she soon thereafter accepted a different position on campus.

While Andrea is missed by UI3 staff, cluster faculty and IGPI scholars whom she mentored, every effort has been made to ensure a smooth transition for our students. IGPI commitments will be honored by collaborating departments, and UI3 Associate Director of Informatics Education Juan Pablo Hourcade is working with the UI Graduate College to facilitate the transfer of administrative duties. Student employee Mackayla Highly continues to support the IGPI program.

UI3 Data Scientist Kang Lee joined the College of Business and AI Initiative 50/50 percent in August. With Lee’s departure, Data Science Consultant Giang Rudderham (below) was hired to oversee data skills training and support researchers and educators who utilize the new Interactive Data Analytics Service (IDAS). Rudderham has a background in statistics, and previously served as a data manager for the Iowa Social Science Research Center.

Baylen Brus (above) has been a student employee in ITS-RS since April, 2018. In August, Brus accepted a full-time, professional position with ITS-Research Services as a high-performance computing systems administrator. Brus is mentored by HPC Architect Glenn Johnson who can now allocate more of his time to scientific software packaging.

In Q3-19, UI3 Associate Director and Director of Research Services Ben Rogers assumed leadership of the ITS Enterprise Services team, and UI College of Engineering Chief Technology Officer Danny Tang became the new director of Research Services. Rogers will continue to serve UI3 until December.

When you see them, please wish Andrea, Kang, Giang, Baylen, Ben, and Danny the best of luck in their new roles!

HPC Accounts Now Ready in Three Hours, or Less!

Changes were recently made to the account creation process to decrease the wait-time for new users. New faculty and staff accounts are generated within three hours (and others once the sponsor approves) – even on weekends!

When the new account is ready, an email will be sent to the owner notifying them that the account has been activated.

As part of this change, the HPC account request form is no longer used to request access to a group’s dedicated storage share or licensed software on the Argon HPC system. To request access to a storage share or licensed software, please contact research-computing@uiowa.edu.

Pardon our dust; we’ve moved!

ITS-Research Services staff with offices in the College of Public Health Building recently moved to the University Capitol Centre room 2500B. With this move, they are closer to the rest of the team who occupy space in the lower level of Lindquist Center.