# IIHCC

Solving problems that exist at, and along, the interdependencies between humans, community, and infrastructure to ultimately improve quality of life.

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## Corrections for Vol. 1 No. 2
- Under SEAD Grant article. The designation for C+I is listed as "Curriculum and Instruction". The correct version should read "Creativity + Innovation DA".

# CLUSTER HIRE SPOTLIGHT

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## How do you see your work contributing to the goals and vision of IIHCC?

    I definitely see myself being more on the computational side rather than the data acquisition side. I am interested in things like near-surface geophysics, asking questions such as what is the makeup of the top 100 meters of the Earth's surface, how does it respond to seismic sources including earthquakes, and how well can it support buildings and other infrastructure? And I think in that sense I fit into the part of IIHCC investigating how the Earth interacts with the structures that we have built. Often, I am bringing in some of the more traditional geophysical methods but applied at a more human scale instead of the scale of the crust of the Earth. But, to bring things down to that scale, you have to have much larger higher-resolution data sets, and this is really difficult with existing software for many geophysical methods. Much of my work involves developing methods to process those data more quickly.

## What other areas outside of your discipline would you entertain for future research an proposal work?

    I am particularly interested in questions that are related to earth science but also topics in civil engineering and mechanical engineering, or questions dealing with how to create and manage energy. I have some experience in oil and gas, but many of that industry's large-scale computing challenges are the same problems that are often faced by companies managing other renewable energy systems. Problems like that I think are really interesting. The methods I work on for seismic networks with many physical sensors may also carry over into monitoring and improving the efficiency of next-generation manufacturing facilities. The time-series data collected at these facilities typically have many spatial and temporal redundancies, much like seismic data around infrastructure.

Streaming Data Analysis

Large-scale Inverse Problems

Continuous Monitoring Systems

Signal Processing

Near-surface Geophysics

# CLUSTER HIRE SPOTLIGHT

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## How do you see your work contributing to the goals and vision of IIHCC?

My specialties structural dynamics, large-scale experiments, and signal processing. The key factor that is missing right now is that there is a lot of work being done in data analytics and machine learning, but these methods still struggle to handle abstract data from physical sensors like accelerometers, strain gauges, fiber optic sensors, etc. There is a real need in this space for intelligent signal processing to be able to extract the right features to make data analytics more feasible for these types of sensors. That's one area where experimentation, especially large scale, is going to be very important, especially in terms of natural hazards and looking at how structures behave under different environmental conditions. For example, just trying this idea of vibrations and structural dynamics and expanding on that and seeing how we can use that information to look at how a building responds to wind. How does a building respond to a lot of occupants? What can we tell about the occupants themselves from the way this building responds? These are things that still have not been really explored. You can basically use the building, or any structure really, as a sensor itself to learn more about the environment.

## What other areas outside of your discipline would you entertain for future research an proposal work?

One that I've been thinking very strongly about these days is psychology, once again relating to sensor data. How do we visualize this data effectively? When trying to make decisons about a structure, what kind of data does a person really need right now and how do they need to interpret it? How much information do we need or how useful is it? I'll give you an example: maybe we can densely instrument a structure and make it ultra energy-efficient, but maybe the reduction in energy consumption is negligible versus what you would get from just getting people to consume less in general. And that's a psychological problem. A lot of these issues around the intelligent infrastructure area are at that crossroad between the actual technology and how people use the technology. It's very hard to get away from psychology at a certain point, so, hopefully, I will be able to tie that into some of my future research to understand how people interact with the technology. Is the technology solving problems or is it creating more problems?

Structural Health Monitoring

Infrastructure Instrumentation and Testing

Smart Cities

Sensing and Data Fusion

Vibrations and Structural Dynamics

## SCIENCE, ENGINEERING, ARTS, AND DESIGN (SEAD) GRANT

As a reminder, IIHCC, Creativity and Innovation (C+I), and the Institute for Creativity, Arts, and Technology (ICAT) are looking for proposals for a research grant worth $25,000. To support the missions of IIHCC, C+I, and ICAT, all proposals are expected to align with one or more of the IIHCC thematic areas, support the transdisciplinary mission of ICAT, and have a focus on human-centered interactions. In addition to these requirements, awardees are expected to present at the IIHCC TRAIN Talks in the fall of 2019 and ICAT Creativity and Innovation Day in the spring of 2020. The deadline for submissions is **February 1, 2019**. For more information about the SEAD grant, visit the following link or contact us at IIHCC@vtti.vt.edu.

## INSTITUTE FOR CRITICAL TECHNOLOGY AND APPLIED SCIENCE (ICTAS) JUNIOR FACULTY AWARD (JFA)

Together, IIHCC and ICTAS are providing an additional $80,000 for ICTAS's JFA. A new request for proposals (RFP) will emphasize the goals and mission of IIHCC while adhering to criteria already determined by ICTAS. The due date for proposal submissions is no later than **5:00pm on January 31st, 2019**. Proposal review is expected to begin in the first weeks of February 2019. Notification of awards will occur in March 2019. As of now, IIHCC is requesting assistance from four IIHCC stakeholders/co-leads to serve as proposal reviewers. For more information on the ICTAS JFA, visit the following link. If you wish to assist, please contact us at IIHCC@vtti.vt.edu.

## IN THE NEWS

The 2019 Consumer Electronics Show was held last week in Las Vegas, Nevada. Please visit the following links from Engineering.com for a showcase of CES technologies and innovations relating to IIHCC themes.

- CES 2019 Roundup: Autonomous Vehicle Tech
- CES 2019 Roundup: Artificial Intelligence
- CES 2019 Roundup: Wearables and Personal Devices