A university-level research institute positioned at the nexus of the arts, design, engineering, and science, the Institute for Creativity, Arts, and Technology is uniquely partnered with the Center for the Arts at Virginia Tech. By forging a pathway between trans-disciplinary research and art, educational innovation, and scientific and commercial discovery, the institute works to foster the creative process to create new possibilities for exploration and expression through learning, discovery, and engagement. This includes:

- Preparing students in kindergarten through 12th grade and higher education environments to succeed in a world that demands teamwork and collaboration of science, technology, engineering, and math (STEM) disciplines;
- Promoting new research domains that transcend institutionalized boundaries; and
- Participating with people of all ages in the process of co-creation.

More than just a media lab, ICAT is a trans-disciplinary living lab, tightly integrated with educational, commercial, and arts communities.

**Studio Model of Innovation**

We are a collection of collaborative studios composed of faculty, students, industrial partners, and community volunteers working together toward creating a one-of-a-kind collaborative environment for enacting change. ICAT includes five studios: IDEA, IMAGE, IMPACT, IMPLEMENT, and INTERACT.

**THE ICAT STUDIOS**

**IDEA**
Exploring transdisciplinarity and creativity in science, technology, engineering, and math (STEM) education

**IMAGE**
Revealing science through the arts and forging frontiers of computation and interaction for entertainment, training, and learning

**IMPACT**
Understanding the continuum between the body, computation, and imagination

**IMPLEMENT**
Incorporating new materials, objects, and methods for creativity

**INTERACT**
Stimulating local innovation and cultural awareness in Southwest Virginia
**Biodiversity and Biosonar**

Dane Webster, associate professor in the School of Visual Arts and studio head for the Institute for Creativity, Arts, and Technology, is working with Rolf Mueller, associate professor in mechanical engineering and an affiliated faculty member with the Institute for Critical Technology and Applied Science, to find different ways to use visualization and rendering software to better understand biosonar in bats. This process can also be used to create a large repository of digital models that catalog the biodiversity of bats. Using the same digital sculpting and animation tools that artists use for video games and animated films, Webster and his students are developing a production pipeline that cleans scanned data of bat specimen noses so they can then be used to study the ultrasonic behavior of the dynamic devices using high performance computing.

**Collaborative Colleges:** College of Engineering, College of Architecture and Urban Studies

**Participants:** Dane Webster (School of Visual Arts), Rolf Mueller (Department of Mechanical Engineering), Anupam Gupta (Department of Mechanical Engineering)

**Type:** 3D Visualization

**Lantern Field Project**

Lantern Field is an interactive sound and light installation that responds to the natural forces the site and the motions of people. The project is a study in the use of space as an interface to affect the environment, namely the light and sound qualities. First installed publicly in 2011 by Aki Ishida, assistant professor of architecture, at the Japan Society in New York, it has become an on-going series of collaboration involving architects, sonic artists, and engineers. The work is designed specifically for each site and context, both to incorporate the constraints and accordances of each place. Public participation in the making of, as well as the experiencing of the work, has been a key component of the project. In 2011, it was installed at the Blacksburg Farmers Market, and most recently in 2013, at the Smithsonian’s Freer Gallery in Washington, D.C. Through integration of digital technology and hand-constructed materials, the Lantern Field brings awareness to our interconnectedness among people occupying a public space.

**Collaborative Colleges:** College of Engineering, College of Architecture and Urban Studies, College of Liberal Arts and Human Sciences

**Participants:** Aki Ishida (School of Architecture and Design), Ivica Ico Bukvic (Department of Music), R. Benjamin Knapp (ICAT Director & Department of Computer Science), Brennon Bortz (Department of Computer Science & Application)

**Type:** Visual art, sonic art, technology, interactive space, participatory making

**Multiple Coordinated Visualization of the Dynamic in Financial Market**

Financial market data, especially stocks trading records, is difficult to be analyzed, mostly because of its enormous volume, multidimensionality, and dynamic changes. Yong Cao, assistant professor of computer science, has collaborated with the Pamplin College of Business and developed a dynamic data visualization tool for large scale temporal datasets, to analyze the stock market transactions for more than 14,000 companies during a 30-year period. The tool supports multiple coordinated views, including time-series, histogram, parallel coordinate, and history dynamics, which allow us to combine the analysis functionality and enable cross-window interaction. The tool is also powered by the massive parallel computing capacity from the Graphics Processing Units (GPUs) to allow smooth and interactive visualization.

**Collaborative Colleges:** College of Engineering, College of Architecture and Urban Studies, College of Business

**Participants:** Yong Cao (Department of Computer Science), Steve Sheetz (Accounting & Information Systems), Chris North (Department of Computer Science), Dane Webster (School of Visual Arts)

**Type:** Data Visualization

**Design Thinking in Middle School**

The IDEA Studio is dedicated to promoting the development of critical and creative thinking skills in learners of all ages. To that end, the studio joined forces with two eighth grade teachers in Roanoke County to implement a design-based learning environment with 50 students over the course of 18 weeks. The trans-disciplinary, collaborative learning environment aimed to emphasize the importance of the connections between and among disciplines and to expose students and teachers to a project-based learning methodology that puts students in control of their own learning. Student design teams engaged with projects related to civic responsibility as they identified problems in their community and designed solutions to those problems. Among the solutions were an anti-bullying robot, a solar panel car kit to alleviate the rising cost of gas, and a fingerprint-activated medication dispenser to prevent teens from stealing prescription drugs. Through the process, students investigated and utilized knowledge not only from the disciplines from which their teachers originated, civics and language arts, but also from the arts, science, technology, engineering, and math. Design teams crafted interactive exhibits to share their solutions with the public at the Science Museum of Western Virginia.

**Collaborative Colleges:** none

**Participants:** Teri Wagner, Liesl Baum, Phyllis Newbill (IDEA Studio)

**Type:** K-12 Collaboration