Computational Literacy for Everyone

Name of Concept: Computational Literacy for Everyone

Overview

If RIT is to become a prominent institution of higher learning by 2025, in the century of information, it must provide computational literacy for all its students. We must ensure that all our graduates have the opportunity to develop core computational competencies.

What does being informed in the information age mean? It means being "computationally literate," and it is clear that the requisite knowledge goes beyond functional literacy, it goes way above the perception that the computer as simply a tool. Individuals need to be computationally literate at the comprehension and working literacy levels, and at the very least, be knowledgeable about computational methods and systems, interconnection networks, interactive information resources and visualization, and the wide range of application of computational methods and their limitations. This is what has been termed Computational Thinking. Teaching these topics to everyone has become critically important.

How this idea leverages current areas of RIT expertise

The computer revolution has transformed the world as we knew it creating new professions and correspondingly new academic disciplines. At RIT, evidence of this phenomenon was visible in the formation and growth of programs that culminated in 2001 with the creation of a new college, The B. Thomas Golisano College of Computing and Information Sciences.

However, to be successful, computational literacy calls for strong collaboration with all academic units throughout the university to design curricula that make sense for the given discipline and even for specific programs. The ultimate goal would be that of computation across the curriculum, or what has been called "computation-in-context," whereby computational methods and approaches are explicitly embedded in the methods and approaches to problem solving of a given discipline or knowledge area. Furthermore, advances in computing and information sciences, the enabling discipline per excellence, has been driven by the necessity to solve complex problems in areas outside that field. The success of computational methods in all areas of human endeavor has only been possible due to a close collaboration with cognate fields in all areas of human knowledge. In this way, the computing and information sciences field is informed itself by the challenges of and interactions with other disciplines. We cannot emphasize enough how important it is that for Computational Literacy for Everyone to be successful, we need to work together with colleagues from the other colleges throughout the Institute.

Main RIT on-campus champion(s) for this idea

Jorge Diaz-Herrera, professor and dea, GCCIS
Wiley McKinzie, professor and vice dean, GCCIS
Rajendra Raj, professor of computer science, GCCIS
Pengcheng Shi, professor and Ph.D. program director, GCCIS

Additional on-campus champions willing to collaborate with this individual and take a lead role in driving the idea

Dean Robert Ulim, COLA
Dean Ashok Rao, SCOB
(interim) President Jim Decaro, NTID
Dean Harvey Palmer, GCOE

Is there potential off-campus advocacy and support for the idea?

Yes, NSF, National Academies, NYSTAR, Computing Research Association, Association for Computer Machinery

Are you aware of another university that is working on a similar idea?

Georgia Institute of Technology

How you envision this idea advancing RIT's national or global stature in an important or emerging field
The advent of powerful calculating machines in the mid 20th century made it possible for many scientific discoveries and engineering feats to take place that would not have been possible otherwise. The computer revolution has transformed the world and all aspects of our daily lives. The most palpable examples are the Internet and the Web. They are pervasive and becoming ubiquitous. Today, and increasingly so, society as a whole is totally dependent on information and communication technologies services ultimately impacting its own success. It touches every single aspect of human endeavor, ranging from the most theoretically minded to the most expressive manifestation of human creation transforming entertainment and the arts, by providing new forms of communication and collaboration leading to unprecedented emergent business, behavioral, and industrial intelligence including digital democracy.1,2 These developments particularly affect how people work and think.

Although the computer revolution has brought substantial changes to the way we live, the population at large does not completely understand, for the most part, the real impact of this revolution, and furthermore, cannot begin to imagine what are the possibilities and what is yet to come. The increasingly public importance of computing systems makes it imperative for the public at large to have a sound understanding of their fundamental underpinnings as well as their limitations. Being an informed citizen rests in the shoulders of our institutions of higher learning, and forging how people think and work is an aspect that we, higher education professionals, are deeply concerned about.

**Why you believe RIT has a unique opportunity or an ability to differentiate itself through this idea**

The importance of computational methods has never been made more clear, and the accumulated knowledge in science and engineering (including social sciences?) is now only manipulable through information and communication technologies. In the 21st century, much of the vast volume of scientific data captured by new instruments on a 24/7 basis, along with information generated in the artificial worlds of computer models, is likely to reside forever in a live, substantially publicly accessible, curated state for the purposes of continued analysis. This analysis will result in the development of many new theories! A perfect illustration of this data-driven research is Johannes Kepler's discovery of the laws of planetary motion by mining and analyzing carefully archived experimental data Brahe's catalog of systematic astronomical observations to discover patterns and hence deduce principles and laws.