Innovating for Society: Realizing the Promise and Potential of Computing

Farnam Jahanian
Directorate for Computer and Information Science and Engineering
National Science Foundation

The computing discipline is at the center of an ongoing societal transformation. The explosive growth of scientific and social data, wireless connectivity at broadband speeds for billions of mobile endpoints and seamless access to computational resources in the "cloud" are transforming the way we work, learn, play, and communicate. Advances in computation and data-enabled techniques will continue to accelerate the pace of scientific discovery and engineering innovation, with the impact becoming more pervasive throughout society for decades to come.

We can envision a day where static infrastructure, such as buildings or factories, have been transformed into smart spaces that continuously adapt to consumption, growth, usage, and environmental stimuli through the use of networked instrumentation and distributed software control. We can imagine improved quality of life through personalized healthcare and assistive technologies, enabled in part by robust, usable, and trustworthy wearable mobile devices integrated with instrumented environments. We can anticipate that during a time of natural disaster or national emergency, *unmanned* search, rescue, and recovery will save lives and minimize loss through the use of autonomous, highly coordinated, and remotely operated robotic systems. By developing rich ecological and environmental distributed monitoring systems, we can create accurate models that support forecasting and management of increasingly stressed watersheds and ecosystems. These are just a few example of advances that promise to reshape our world with more responsive, precise, and scalable systems that augment human capabilities, work in dangerous or inaccessible environments, provide large-scale, distributed coordination, and enhance societal well-being.

In this talk, I will discuss some of the technological and societal trends that are shaping our future and providing new opportunities for foundational research. I will explore how these advances serve as key drivers of economic competitiveness and how they will be crucial to achieving our national priorities in environmental sustainability, smart transportation, education and life-long learning, and national security.