

## ISI-LED PROJECTS RECEIVING MAJOR GOVERNMENT FUNDING IN 2016

**\$30.9M**

### Rapid Analysis of Various Emerging Nanoelectronics (RAVEN)

Goal: Develop tools capable of imaging even the smallest of features in modern silicon integrated chips to ensure they are free of defects.

**\$6M**

+\$6M OPTION

### SIGINT-based Anticipation of Future Events (SAFE)

Goal: Devise techniques for generating probabilistic warnings of future events, such as terrorism.

**\$47M**

### IARPA Quantum Optimization (QEO)

In collaboration with Ming Hsieh Electrical Engineering Department.

**\$15.3M**

### Effectively Forecasting Evolving Cyber Threats (EFFECT)

Goal: Better forecast of emerging cyber threats by integrating information from a variety of novel sensors.

## SUCCESS BY THE NUMBERS

**\$104.5M**

**20+**

In FY17 revenues — a new record for research support

Governmental funding sources and corporations

**25**

**25**

**49**

New employees 2016, 18 new research staff

New employees Jan - Aug 31, 2017, 19 new research staff

Graduate Research Assistants (PhD students)

## DIVERSE RESEARCH PORTFOLIO

ISI's multidisciplinary portfolio spans artificial intelligence, cyber security, networking, electronics, health informatics, quantum computing, space systems engineering, and more. Our researchers perform theoretical research, applied research, and prototyping of innovative software systems and devices:

- Artificial intelligence
- Quantum and theoretical computing
- Forecasting
- Natural language processing
- Trusted electronics
- Big data and machine learning



*"ISI RESEARCHERS TODAY DRIVE REVOLUTIONARY ADVANCES IN AREAS RANGING FROM MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE TO CYBERSECURITY, FROM NOVEL ELECTRONICS TO HIGH-PERFORMANCE COMPUTING ARCHITECTURES AND QUANTUM COMPUTING, AND FROM HEALTH INFORMATICS TO FORECASTING OF SOCIETAL AND CYBER EVENTS."*

— Prem Natarajan, ISI's inaugural Michael Keston Executive Director

## USC Viterbi at a Glance

USC Engineering began in 1905

### Student Population

Approximately 2,700 undergraduate students and 5,700 graduate students

### Faculty

210 tenure-track faculty, with 77 endowed chairs and professorships, 70 NSF Career Awardees, 20 full-time and just over 35 affiliated faculty who are members of one or more National Academies (NAE, NAS, NAM, and NAI), 13 MIT TR35 winners

### Academic Departments

Eight

### Alumni

Nearly 77,500

### Annual Research Expenditures

More than \$192 million, with more than 50 research centers and institutes

### Research Centers and Institutes

#### Home to:

- » Information Sciences Institute (ISI)
- » The Ming Hsieh Institute
- » The Daniel J. Epstein Institute
- » Two (now graduated) National Science Foundation (NSF) Engineering Research Centers (ERC)
  - > Integrated Media Systems Center (IMSC)
  - > Biomimetic MicroElectronic Systems Center (BMESC)
- » University Center of Excellence of the U.S. Department of Homeland Security - Center for Risk and Economic Analysis of Terrorism Events (CREATE)
- » DOE/White House Materials Genome Initiative Center
- » Center for Energy and Nanoscience at USC
- » HTE@USC (Health, Technology and Engineering@USC)
- » LADWP/DOE Smart Grid Demonstration Project
- » USC-Lockheed Martin Quantum Computation Center
- » Center for Interactive Smart Oilfield Technologies (CiSoft)
- » Pratt & Whitney Institute for Collaborative Engineering (PWICE)
- » Airbus Institute for Engineering Research (AIER)
- » Center for Advanced Manufacturing (CAM)
- » Center for Artificial Intelligence in Society (CAIS)
- » Northrop Grumman Institute of Optical Nanomaterials and Nanophotonics (NG-ION<sup>2</sup>)
- » USC Machine Learning Center (MASCLE)
- » Center for Interdisciplinary Decisions and Ethics (DECIDE)

#### Affiliated with:

- » Alfred E. Mann Institute for Biomedical Engineering (AMI)
- » USC Institute for Creative Technologies (ICT)
- » USC Stevens Center for Innovation

### Education Centers

- » Division of Engineering Education
- » Min Family Engineering Social Entrepreneurship Challenge
- » KIUEL (Klein Institute for Undergraduate Engineering Life)
- » VAST: Viterbi Adopt-a-School, Adopt-a-Teacher
- » Maseeh Entrepreneurship Prize Competition (MEPC)

**USC Viterbi**

School of Engineering





**USC**  
**Viterbi**

School of Engineering

Founded in 1971, the Information Sciences Institute of the USC Viterbi School of Engineering has led the computer and information sciences revolution right from its beginning. In this process and throughout its history, it has pioneered the evolution and application of technology for the benefit of the nation. From creating the domain name system to being the home of Root Server B and of MOSIS, and to advancing research in artificial intelligence, forecasting, trusted electronics and quantum computing, ISI has been a model academic institution that bridges scholarship with systems integration and technological innovation. Together with the USC Viterbi academic departments of Computer Science and Electrical Engineering and the Institute of Creative Technologies, ISI constitutes one of the three pillars of CS@SC. This overarching home of computer and engineering excellence is recognized as a leading recipient of federal research support in computer science and as a fundamental engine for the growth of the SCilicon Beach ecosystem. Fortunate to

have been led by two previous visionary leaders (Keith Uncapher and Herb Schorr), ISI benefits today from the outstanding leadership of its third director, Professor Prem Natarajan, the Keston Executive Director, and Vice Dean of Engineering at USC Viterbi. Under his exceptional leadership, ISI and its outstanding faculty and staff, have reached new heights of excellence. ISI has surpassed the \$100-million mark in research expenditures. It has pioneered new directions across a wide spectrum of information and computer sciences. And it has extended its physical footprint across the nation by establishing a third physical presence in Boston, Mass, in addition to the main campus in Marina Del Rey, California and Arlington, Virginia. With the potential of technology to increase exponentially fast, ISI's mission and purpose is more focused than ever, for the benefit of the nation and of society at large.

**Yannis C. Yortsos**  
**Dean, USC Viterbi**  
**School of Engineering**

### ISI: DISTINGUISHED PAST, INNOVATIVE PRESENT

A world leader in information processing, computer, and communications research, ISI is one of the nation's largest and most technologically diverse university-affiliated computer research institutes.

For 45 years, ISI's pioneering contributions have helped create some of the most ubiquitous, enduring technologies of our time, and we continue to perform groundbreaking work in cutting-edge areas, including natural language processing, deep machine learning and computer vision.

### PIONEERING CONTRIBUTIONS

- Internet Domain Name System – .edu, .net, .com
- Voice over Internet Protocol (VOIP) and Video over Internet Protocol
- Language Weaver, the first statistical machine translation company, was spun out of ISI
- First quantum computer in an academic setting, first installed D-Wave unit anywhere outside D-Wave facilities
- MOSIS, a low-cost service for silicon prototyping and production, has generated more than 60,000 chip designs

### CUTTING-EDGE INFRASTRUCTURE



In 2016, ISI launched a major Information Technology refresh program. The upgrades include cutting-edge 100 gigabit firewalls and network connectivity, an expanded virtual compute cluster, a new identity and security management system, and an improved website. An updated security-by-design philosophy ensures that sensitive research data is protected without impeding collaboration, performance or innovation.

### WORLD CLASS COMPUTING RESEARCH INFRASTRUCTURE

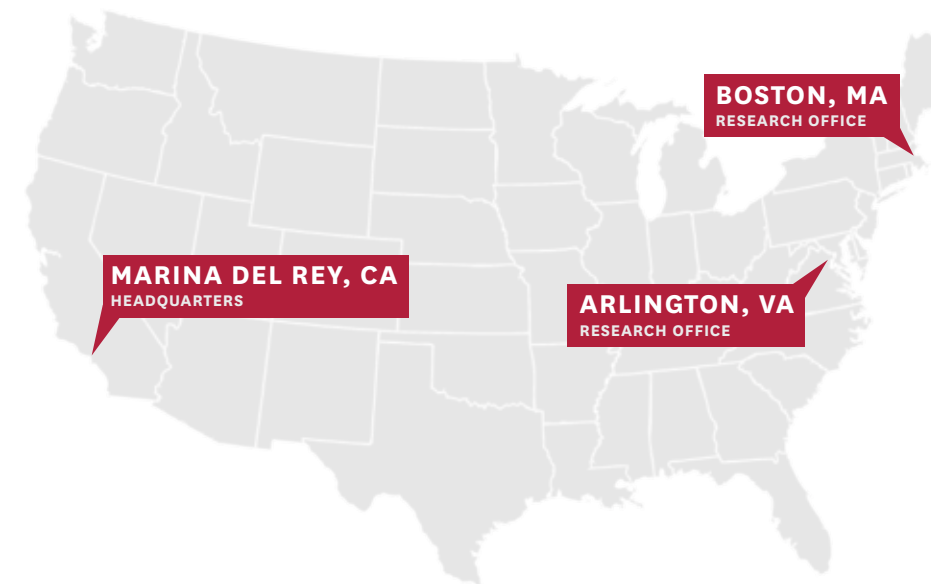
ISI has the largest concentration of GPU-based computing power at USC, with over **650 teraflops** of newly installed GPUs in a single managed-cluster environment. GPU computing power is crucial for machine learning applications, including computer vision and natural language processing.



### BICOASTAL PRESENCE

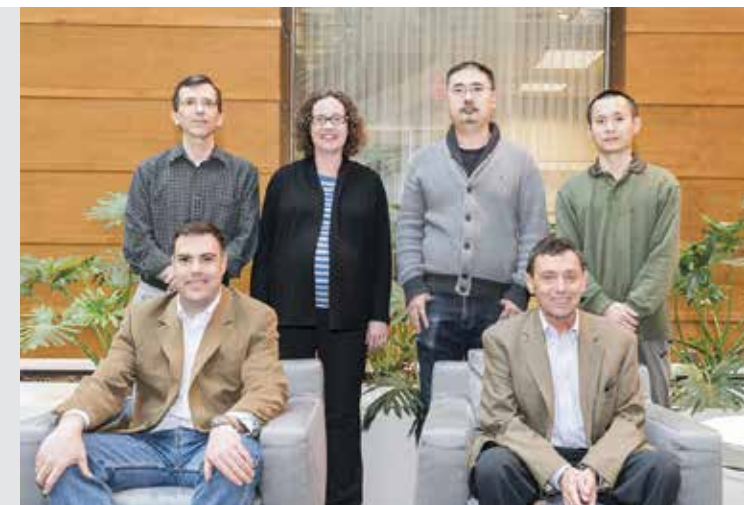
Headquartered in Marina del Rey, California, ISI boasts a bicoastal presence, with research offices in Arlington, Virginia (located within walking distance from DARPA, NSF and ONR) and Greater Boston.

*In the service of the nation for the advancement of computing science and technology*



### ISI BOSTON — A BEACHHEAD IN MIT'S BACKYARD

ISI recently extended its footprint across the nation, establishing a third physical presence: in Greater Boston, Mass., close to major universities and numerous high-tech companies. ISI's Boston team of highly regarded senior computer science researchers is pioneering new natural language processing techniques, including quantum information processing and information extraction and retrieval. Another key area of research is computer vision, a cutting-edge field that is suddenly crucial for companies ranging from Apple to Tesla.



### THE WORLD'S MOST POWERFUL QUANTUM COMPUTER

The USC-Lockheed Martin Quantum Computing Center at ISI houses the first D-Wave system installed anywhere in the world outside of D-Wave's factory—it is still only one of only two operational D-Wave computers available outside of quantum computing company's campus in Canada (the other is operated by Google). Recently upgraded in 2016 with a new quantum processor, the D-Wave computer promises to enable transformative advances in optimization, machine learning and complex sampling problems.



### NATIONAL AND REGIONAL PARTNERSHIPS

ISI serves as a strategic partner for some the largest and most important aerospace companies, including Lockheed Martin, Northrop Grumman, Raytheon and beyond, leveraging ISI's advanced prototyping capabilities.

### THREE GENERATIONS OF LEADERSHIP

#### KEITH UNCAPHER — FOUNDING ISI DIRECTOR



**1972 — 1987**

**Previous Position:** RAND Corporation, director of computer science division

**Accomplishments:** ISI joined universities and the federal government in the 1970s to help create the Internet.

#### HERBERT SCHORR



**1988 — 2013**

**Previous Position:** IBM Research, systems vice president

**Accomplishments:** ISI's artificial intelligence group became one of the world's largest and most influential; Helped spawn the creation of the Institute for Creative Technologies (ICT)

#### PREM NATARAJAN



**2013 — Present**

**Previous Position:** Raytheon BBN Technologies, executive vice president, principal scientist

**Accomplishments:** ISI recently received more than \$100 million in federal funding in a single year for the first time ever; the number of governmental funding sources has risen significantly.