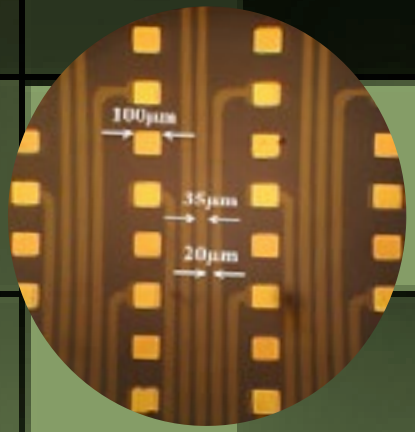

Microscopic view of the micro-electrode array fabricated for the ICAS Visual Prosthesis

Wireless Interfacing

Different efficient circuit ideas for the design and development of low-power high-data-rate modulators and demodulators (e.g., BPSK and 4-FSK) have been proposed in the ICAS Lab. A novel counterpart for the conventional inductive approach has been proposed by ICAS researchers for short-range power telemetry to implantable microsystems.

Artwork : Masoud Hoveidar

Meet Our Lab.

Integrated Circuits and Systems (ICAS) Laboratory is a research laboratory at the Electrical and Computer Engineering (ECE) Faculty of K.N. Toosi University of Technology, Tehran, Iran.
It is the interdisciplinary and multidisciplinary nature of the work along with team-work spirit and system-level aspects of research in this lab that has attracted many interested students over a very short span of time.

Director : Amir M. Sodagar, Ph.D.

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Research Laboratory for Integrated Circuits and Systems

ICAS

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K.N.Toosi
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Faculty of Electrical & Computer Engineering
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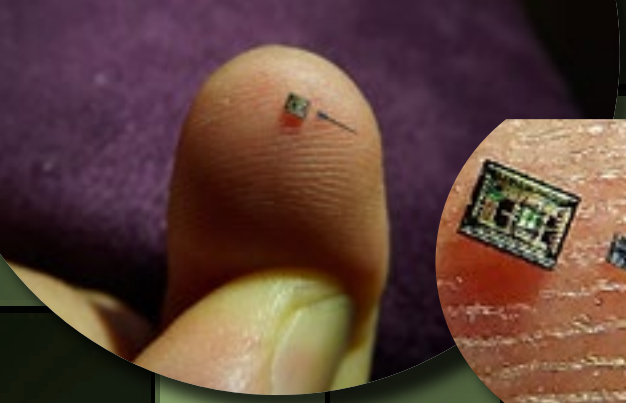
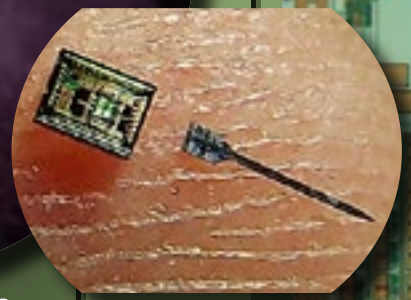
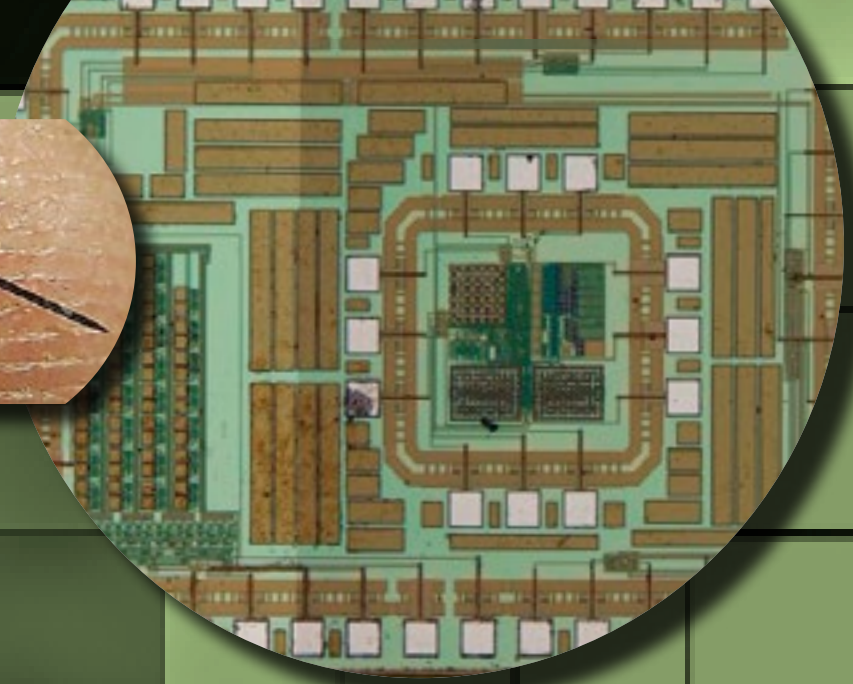
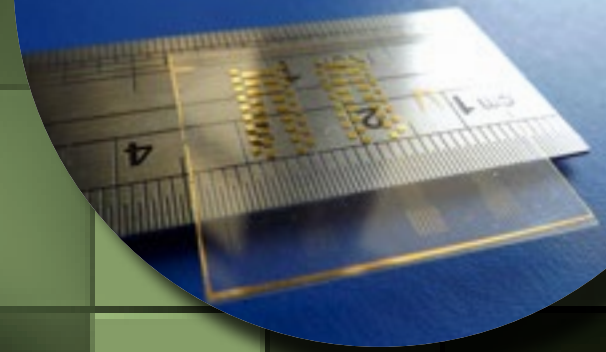




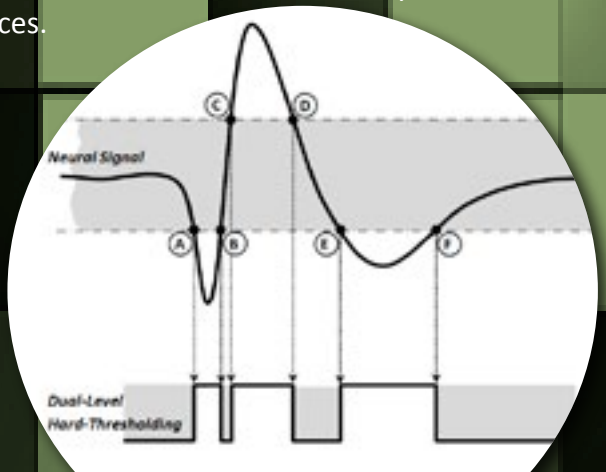




Neural Interfacing

Development of wearable and implantable systems for multi-channel intra-cortical neural recording and stimulation is one of the active research areas in the ICAS Laboratory.

Novel ideas and architectures for multi-channel neural recording, such as an architecture based on delta-sigma ($\Delta\Sigma$) modulation and a frequency-division-multiplexed architecture, have been proposed for the first time by ICAS researchers. Penetrating silicon microprobes have been designed with 1- and 2-D structures for intra-cortical neural recording and stimulation with high spatial resolution, and fabricated for the first time in the country. In-vivo neural recording and stimulation experiments are performed in collaboration with the Neuroscience Research Center of Shahid-Beheshti University of Medical Sciences.



Integrated Circuits

Design of analog and mixed-signal integrated circuits is a key thrust in the ICAS Laboratory. Novel ideas have been proposed by ICAS researchers for low-power analog-to-digital converters (ADCs), digital-to-analog converters (DACs), operational transconductance amplifiers, and low-noise bio-potential amplifiers.

Biological Signal Processing

As a necessity for the realization of implantable microsystems capable of multi-channel bio-signal handling and high-rate data exchange with the external world, biological signal processing is an active line of research in the ICAS Laboratory. Contributions of ICAS researchers in the automatic detection of action potentials, denoising of neural signals, and compression of the data transmitted off biomedical implants are among the strengths of ICAS research.

Visual Prosthesis

As the integration of a wide variety of research projects, a retinal visual prosthesis (VP) is developed by ICAS researchers. Design and microfabrication of a high-density microelectrode array made of flexible organic materials in collaboration with the Semiconductor Devices Lab. at K.N.Toosi University of Technology, design of an embedded special-purpose controller, and development of an external video capture equipped with new ideas for image preprocessing are examples of the ICAS VP sub-projects. On the medical side, implantation and surgical issues of the ICAS VP as well as biocompatibility studies are in progress in collaboration with the Eye Research Center of Farabi Hospital.