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We remember only 10 percent of what we read; 20 percent of what we hear and 30 percent of what we see. It has long been known that the best way to learn something—to really understand it—is to do it, immerse yourself in it. We remember up to 90 percent of what we do. *

It is the “doing” then, that allow undergrads in the College of Engineering to grasp difficult concepts and discover first-hand the data that supports theories being researched in the College.

Unique opportunities exist in the College of Engineering that allow undergrad engineering students a chance to engage in actual research with faculty. One such research opportunity was made possible through a special Research Experiences for Undergraduates (REU) supplemental grant request submitted to the National

Science Foundation by Mike Johnson, Ph.D, assistant professor electrical and computer engineering and Richard Povinelli, Ph.D., assistant professor of electrical and computer engineering and director of Computer Engineering Laboratories.

The Main Grant

Dr. Johnson explains, “Richard and I are co-principal investigators on the main grant, entitled *Integration of Stochastic and Dynamical Methods for Speech Technology*. It’s a three-year grant from a new National Science Foundation program called Information Technology Research (ITR) which we received through the Intelligent Information Systems (IIS) Division of the Directorate for Computer and Information Science and Engineering (CISE),” he said.

The project is wholly supported by the NSF at

\$120,000 per year for three years, and supports two 12-month research assistants as well as funds for equipment and professional development. There are three additional graduate students whose research is related to the ideas in the grant and who have been participating on the project team.

The Grant for Undergrads

The REU grant is a separate add-on grant for \$15,000 each year, that specifically supports the involvement of undergraduate students with the research project. The REU grant provides funds to pay the students for 5-10 hours of work a week during the semester and about 40 hours of work per week during the summer.

The Research and Benefits

The main idea of the research is to apply ideas from chaos theory, specifically the field of dynamical systems analysis, to speech processing methods, with the goal of improving the accuracy of speech recognition systems.

“The undergraduate students are working on better understanding noise and its effects on these techniques,” said Dr. Povinelli. Engaging undergrads in this process is mutually beneficial. “They come back to us with usable results while getting valuable research experience, which in turn gives them an idea about whether they would like to pursue a research-related career,” he said.

Involving undergrads in the research process has far-reaching benefits according to Dr. Johnson. “The overall research project benefits from the diverse interaction among undergraduates, graduate students and faculty on the project team,” said Dr. Johnson. “Doing research with undergrads is simultaneously challenging and rewarding. There is a somewhat higher learning curve, as many of the techniques that we use have a lot of underlying mathematical theory to them. At the same time, though, this is a good thing, because we are forced to set aside the mathematics and re-address the basic questions of *What are we trying to do? Why are we trying to do it? and What basic experiments can we design to support (or reject) our ideas?*,” said Dr. Johnson, “which is something we should all do more often in research.” •

The National Science Foundation (NSF) is an independent agency of the U.S. government, whose mission is to promote the progress of science; to advance the national health, prosperity and welfare; and to secure the national defense.

The National Science Foundation makes possible a number of opportunities for undergraduates to join research projects, allowing the students to experience first-hand how basic research is done, and to contribute consequentially. The principal support by NSF of such activities is through the Research Experiences for Undergraduates (REU) Program

