**Topics for Directed Independent Study (Graduate and Undergraduate level)**

**And**

**MS Thesis Topics**

Please contact: Dr. Shankar, Computer and Electrical Engineering and Computer Science (CEECS)

[shankar@fau.edu](mailto:shankar@fau.edu), (561) 306-5625/ (561) 297-3470

------------------------------------------------------------------------------------------------------------------

**Topic** #1: Android App QOS Metrics  
**Focus**: Computer Science

**Level**: UG (COT4900) - 3 credits/semester/student

**Prerequisites**: CEN 4214 (Software-Hardware Design), COT 6930 (Android Components), or background in Android programming and software engineering

**Description**: We have developed more than 45 Android Apps at FAU; we wish to refine them further and put some of them on the market. The student will develop procedures for optimal test coverage, exception handling, refactoring, and power dissipation, and for mapping to different hardware options (screen sizes, hardware accessories and memory capacities) and operating system versions. The student will also validate the processes with two or more existing Apps. This is directly transferable as a job skill.

**References**: d.android.com, PowerTutor, <http://junit.org/>, android.fau.edu

**Number of DIS Students**: Two. Students may or may not work together, as per their preference.

**Duration:** One or two semesters

------------------------------------------------------------------------------------------------------------------

**Topic** #2: Embedded Android

**Focus**: Computer Engineering

**Level**: UG (COT4900) / G (COT 6905) - 3 credits/semester/student, or MS Thesis

**Prerequisites**: Linux, C, Eclipse and background in Android programming. Background in ARM is good, but not essential. Background in microcontrollers is useful for a second related project.

**Description**: Android, with touch-based user interface and open source code, has created a groundswell of interest among embedded system developers. The student will use ARM’s DS-10 profiler which is an Eclipse Plug-in and an ARM-based board (such as the Beagleboard) to develop C-level code for Android. The book by Yaghmour shows how to create your own Android version for a particular embedded device. Android has differences with its Linux roots, though it integrates Linux components such as glibc and BusyBox. Embedded Android is in its infancy and has significant potential for creating new and exciting embedded devices as with wearable computing, medical applications and gaming.

**References**: Embedded Android by K. Yaghmour, source.android.com, and www.arm.com

**Number of DIS Students**: Two or Three. Students may or may not work together, as per their preference.  
**Duration:** One or two semesters

------------------------------------------------------------------------------------------------------------------

**Topic** #3: Biomedical signal processing with TI’s DSP board

**Focus**: Electrical Engineering

**Level**: UG (EEL4905) / G (EEL 6905) - 3 credits/semester/student, or MS Thesis

**Prerequisites**: Digital Signal Processing (DSP), C and (preferably) Eclipse

**Description**: TI provides a DSP board that works with an Eclipse-like new version of Code Composer Studio IDE (integrated development environment). One can plug in the board via a protocol emulator (on the board) to an USB input of a PC, so the IDE can be used to develop and debug C code. The student will help develop a course around their TMS DSP board and the books for a biomedical lab. This hands-on experience will help with jobs and advances in the medical field.

**References**: [www.ti.com](http://www.ti.com), “Real-Time Digital Signal Processing from MATLAB® to C with the TMS320C6x DSPs,” Second Edition, by Welch, Wright and Morrow; and “Biomedical Digital Signal Processing” by Willis Tompkins.

**Number of DIS Students**: Two or Three. Students may or may not work together, as per their preference.  
**Duration:** One or two semesters

**Topic** #4: Robotic Platform for Math Education

**Focus**: Computer Engineering, Computer Science, and/or Electrical Engineering

**Level**: UG (COT4900, EEL 4905) / G (COT 6905, COT 6900, EEL 6905), or MS Thesis

**Prerequisites**: Course on robotics/mechatronics/microcontrollers

**Description**: Low cost robots have been built in courses at FAU using Arduino boards and open source software. These robots are used in math education at the high school level, where students draw geometric art on a 6’ x 6’ canvas. The student will use modular and power efficient approaches to build software using a high level (easy-to-use) language (called Sketch) for drawing geometric primitives (arcs, lines, and angles), and use them to build more complicated shapes (circles, polygons and fractals). The UI (user interface) on the PC needs to capture raw data on speed, distance, direction, angle, and time - and use them to compute Physics and math variables of interest.

**References**: robotics.fau.edu and <http://www.arduino.cc/>.

**Number of DIS Students**: One or Two. Students may or may not work together, as per their preference.  
**Duration:** One or two semesters

**Topic** #5: Intelligent Web Technologies

**Focus**: Computer Science and Computer Engineering

**Level**: G (COT 6905, COT 6900), or MS Thesis

**Prerequisites**: Java and Eclipse. Another related project will use Python for machine learning.

**Description**: This is a new breed of algorithms that empowers a host of commercially successful applications with intelligence. Examples of success stories based on these techniques are Google, Amazon and Netflix. The algorithms can be categorized into those for search, recommendation, groupings, classification, and the combination of classifiers. Dr. Shankar has taught a graduate course on this in the past using the book by Marmanis and Babenko. Lucene and Nutch are tools that have been used by graduate students at FAU in their research. The student will develop tutorials for a subset of the algorithms in Java using Lucene, Nutch and other tools, as appropriate. A related topic will explore the use of Python for machine learning (see the book by Harrington).

**References**: Algorithms of the Intelligent Web by H. Marmanis and D. Babenko, Manning; Machine Learning in Action by P. Harrington, Manning; and http://semanticweb.fau.edu/

**Number of DIS Students**: One or Two. Students may or may not work together, as per their preference.  
**Duration:** One semester (Fall 2013)