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# Selective Image Compression for Mobile Web Applications

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**2016 RCEU Proposal**
**Title: Selective Image Compression for Mobile Web Applications**

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**Note : Female and minority students are encouraged to apply.**

## Project Summary

Mobile devices and social media are generating and transferring huge amount of visual data. Traditional image compression techniques have difficulty in keeping up with the explosion of ñbig dataò. However, not all the information in visual data is created equal. Some regions in an image might contain more important information than other regions for a certain application. For instance, human identity information such as face plays a more critical role than background information in face recognition applications. To this end, a *region of interest* (ROI) can be identified as a selected subset of pixels in the image that contains objects of interest. Once the ROIs are selected, we can compress the ROIs using a different method than the rest of the image. It is usually beneficial to apply lossless compression on ROIs while applying lossy compression algorithms (typically at a much higher compression ratio than lossless compression) on other regions such as the background. Thus, we can significantly increase the overall compression ratio for the entire image, while maintaining the crucial information about the ROIs.

Selective image compression techniques are becoming increasingly useful in many mobile applications, where many smartphones and tablets are equipped with high-resolution cameras. It is reported that approximately 300 million photos are uploaded to Facebook every day. An additional 40 million go up on Instagram while Flickr has 4.5 million. Uploading and downloading these images consumes a huge amount of mobile network bandwidths, which are severely limited. Thus efficient image compression techniques enable faster and smoother web browsing, as well as data usage reduction, which can translate into lower monthly bills on wireless data plans.

The student will conduct research on selective image compression in the *Mobile Cloud Computing* ($MC^2$) *Lab* (EB 241) directed by the faculty mentor. The lab is equipped with all the necessary software and hardware platforms (including mobile devices such as tablets) for the

research. The expected delivery of the project will include a mobile App that enables selective image compression. The App will allow the user to define the ROIs and choose from a set of compression algorithms developed by the faculty mentorôs research group to compress those ROIs. The research will allow us to study performances (e.g., compression ratios, computation efficiencies, and network bandwidth consumption) of the selective compression techniques in comparison with the traditional non-selective image compression methods in a realistic mobile web environment.

Through the project, the student will gain hands-on experience on image-compression algorithm implementation in the mobile web environment. It is expected the high-quality research and development will lead to scholarly publications.

**Student Prerequisites**

Coursework on computer programming languages (C/C++, or Java) is required; Experience with Matlab is preferred.

**Student Duties**

- Study the performances of the following image compression methods (i) lossless compression techniques (e.g., Huffman Codes), (ii) lossy compression techniques (e.g., JPEG.), and (iii) selective compression methods (developed by my research group).
- Implementation and testing of the selective image compression methods on a mobile platform.
- Writing weekly progress report and final report. Preparing slides for presentation in biweekly research-group meeting.

**Mentor Supervision and Interaction**

The faculty mentor will be available during the summer to provide timely guidance and feedbacks to the student. The student will conduct research in the *Mobile Cloud Computing* (*MC*$^2$) *Lab* directed by the faculty mentor, whose Ph.D. students will also be available to provide assistance with the project.

There will be one meeting per week to ensure constant progress being made. There will be two formal reviews conducted, including a mid-term and a final review, in order to evaluate the performance of the studentôs work and make adjustments if necessary.