**CS 7001: Introduction to Graduate Studies** August 31, 2009

# Assignment 1: Recognizing Good Ideas

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*Complete this assignment individually.*
*This assignment is due on* **Monday, September 14, 2009 by 11:59p.m. to the TAs.**

## 1 Purpose of this Assignment

This assignment is the first in a series of assignments where you will take the steps needed to do great research. In this assignment, you will perform one of the most common tasks that we as researchers perform to find a research problem: you will read the most recent proceedings from the top conference in your area, select two papers that you think represent "good research", and present one idea (for each paper) on how to extend that research (sometimes hints are presented in the papers themselves!).

## 2 Problem

One of the first tasks that a researcher must do—not to mention one of the most challenging ones—is finding the right problem or problems to work on. What makes a great research problem?

First, it's important to realize that there's not necessarily a "right" answer to this question, and that research is often a matter of taste. Second, it's often difficult to tell whether a research problem is truly great at first cut (see today's reading for examples where reviewers "got it wrong" the first time around).

Nevertheless, while there are no hard and fast criteria, great research problems tend to share many of the following characteristics. Here are some of our thoughts on what makes good research; when perusing conference proceedings, it may help you to keep some of the following criteria in mind when selecting papers:

- *The problem is difficult.* Life is too short to solve easy problems.
- *Solving the problem creates new knowledge.* Recognizing the difference between research and "a simple matter of engineering" is important. Many problems are difficult, but if an army of programmers could solve the problem with what we know today, it's probably not research.
- *The problem changes conventional thinking.* While there is value in confirming conventional wisdom, great research typically offers surprising results, creates a new way of thinking about or approaching problems.
- *The problem has a solution.* Not every paper needs to solve a problem completely (in fact, you'll go looking for future work as part of this assignment). Still, while posing a good question is paramount, the solution or finding presented in a paper should represent a significant advance beyond the previous body of knowledge. As a Ph.D. student, since you ultimately need to graduate, it's good to pick problems that have some solution!

Needless to say, it's difficult when first starting out on a problem do determine whether it has these characteristics, but it is often patently clear when a problem does *not* have them.

## 3 Task

**Read conference proceedings.** Each research group should select two papers from their respective conference proceedings. Please use the following conference proceedings as references:

- Architecture: *International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, March 2009
- Artificial Intelligence: *International Joint Conference on Artificial Intelligence*, January 2009
- Cognitive Science: *Cognitive Science Society Annual Meeting (CogSci)*, August 2009
- Computational Science and Engineering: *SIAM Annual Meeting*, June 2009
- Cryptography: *CRYPTO*, August 2009
- Databases: *ACM SIGMOD/PODS*, June 2009
- Graphics: *ACM SIGGRAPH*, August 2009
- HCI: *CHI*, April 2009
- Learning Science and Technology: *International Conference of the Learning Sciences*, June 2009
- Machine Learning: *Neural Information Processing Systems (NIPS)*, December 2009
- Networking: *Proceedings of ACM SIGCOMM*, September 2009
- Programming Languanges: *ACM Programming Language Design and Implementation*, June 2009
- Robotics: *Robotics Science and Systems*, June 2009
- Security: *IEEE Symposium on Security and Privacy*, May 2009
- Software Engineering: *ACM SIGSOFT Symposium on the Foundations of Software Engineering (FSE)*, September 2009
- Systems: *ACM Symposium on Operating Systems Principles*, October 2009
- Theory: *ACM Symposium on Theory of Computing*, June 2009
- Vision: *Computer Vision and Pattern Recognition (CVPR)*, June 2009

**Select and defend papers.** After selecting your two papers, write a one-page summary of each paper that provides (1) A short summary of the paper; (2) Why you think it satisfies the criteria for good research; (3) A short problem statement for a possible follow-on research problem. **Use the three criteria from Slide #21 in the "How to Recognize a Good Idea" to defend your selection.**