

# CS152, Spring 2011, Write a Technical Perspective

## Due: Three Deadlines As Described Below

Last updated: March 19

**Introduction:** In recent years, the magazine *Communications of the ACM* (<http://cacm.acm.org/magazines/>) has republished two computer-science research articles in each issue. It can be difficult for a typical computer scientist to appreciate cutting-edge research because it may use unusual terminology/notation or rely on other results that are not widely known. Therefore, each paper is preceded by a “Technical Perspective,” which is written by an expert other than the authors. *This short summary explains the importance of the research and the particular contributions of the paper.*

For CS152, we are going to simulate this experience, with you in the role of the Technical Perspective author. This assignment will involve three stages, *each of which is more challenging than it may appear*:

- Choose an appropriate research paper
- Understand the paper and identify the paper’s contributions over previous research
- Write a 1–3 page technical perspective

### Stage 1: Choosing a Paper

**Due Tuesday April 19, 5:00PM (earlier encouraged)**

This assignment includes a list of papers from which you can choose. Most students will probably select from this list, but doing so is not required. This list has the following significant biases:

1. Concepts and technical machinery from CS152 are *necessary* to understand them.
2. Concepts and technical machinery from CS152 are *not sufficient* to understand them. That is, you will likely need to learn additional concepts on your own by doing significant reading.
3. Recent papers (the last few years) on topics of increasing importance (concurrency, scripting languages) are over-represented.
4. Papers Dan happens to already be familiar with are over-represented (to ensure biases 1–3 efficiently).

Choose a paper by reading the abstracts and skimming or reading papers that sound interesting. Do not panic if most of a paper is impenetrable on first reading — see Stage 2.

You may choose a paper not on the list, *with instructor permission before the due date*. You can either find a paper on your own, by skimming the proceedings of programming-languages research conferences, or you can work with the instructor by telling him what sort of topic you are looking for. Note, however, that biases 1 and 2 above are essential — you need a paper that at least indirectly relies on formal semantics, type systems, or some other topic in the course. In short, pick a paper that you could not have understood without taking CS152.

**What if your friend wants the same paper:** This is an individual assignment. If multiple class members choose the same paper, that’s fine, *but* then you *cannot* work together or discuss the paper. On the other hand, if your friend chooses a different paper, then you *are* allowed to discuss your papers together and even proofread and provide suggestions for your technical perspectives. Therefore, there is some incentive to coordinate with a friend or two to avoid picking the same paper.

**Turn-in / Grading:** Email Paul and Dan your choice. If you change your choice later, your grade for the assignment will be multiplied by 0.9, i.e., there is a 10% penalty. This policy is to motivate you to start early and to choose a paper that you have looked at enough to have some confidence that you will not regret your selection.

## Stage 2: Understanding Your Paper and Its Contributions

Due Thursday April 28, 5:00PM (earlier encouraged)

You have two goals in this stage:

- Thoroughly understand the paper
- Understand what this paper contributed to human knowledge

Unlike textbooks or Wikipedia articles, research papers are often difficult to read. While CS152 has given you a solid foundation in programming-language semantics, a gap remains between the classic concepts you have learned and the state-of-the-art. In short, you are unlikely to be able to read your paper front-to-back. To find appropriate background reading, consider several strategies:

- Your paper cites previous papers. Identify which of those are most likely to provide the background you need. Continue following references transitively until you find what you need.
- Search the web for tutorials and explanations.
- Ask the course staff questions about specific topics. A good question would be, “What is an open class?” or “Do you know any tutorials on monads?” or “I understand Section 3.1 is about X but then the first sentence of Section 3.2 is completely opaque – can you help?”

**Turn-in / Grading:** Email Paul and Dan whatever you want provided that:

- It is approximately one page, and definitely not more than two.
- It makes a convincing case that you have read the paper and understand the vast majority of it.

An outline of the paper and list of contributions is a natural approach. It is not necessary to use complete sentences. You might also list what other papers and references you found most useful.

As with Stage 1, this won’t really be graded, but you will receive a 10% penalty for not getting it done by the deadline. This is for your protection, to avoid any suggestion that it is possible to do a good job on your technical perspective without sufficient time *after* you understand the paper.

## Stage 3: Write Your Technical Perspective

Due Tuesday, May 3, 5:00PM

The technical perspective must be **more than 1 and at most 3 pages**, single-spaced, single-column. Writing concisely should be more difficult than writing a longer paper. Treasure your reader’s time, with each sentence being interesting and essential. Convey all the main ideas and contributions of the paper.

The *pretend audience* is a senior studying computer science who has not taken CS152. That is, you can assume your audience is a decent programmer with a good education, but you cannot use any jargon or technology that would be known only to programming-languages experts. In contrast, the paper you are writing about *does* make such assumptions, since it was written for a more expert audience. Hence your technical perspective is providing real value by making the ideas in the work more accessible.

The *actual audience* is the course staff. They want to see that CS152 has given you the ability (1) to learn more about programming-languages research and (2) to communicate what you learn to others.

**Turn-in / Grading:** Email Paul and Dan your technical perspective. PDF is preferred, but other formats are probably fine too (check with us).

## Suggested Papers (alphabetical by first author)

1. A Unified Theory of Garbage Collection  
David F. Bacon, Perry Cheng, V.T. Rajan  
ACM Conference on Object-Oriented Programming Systems, Languages, and Applications, 2004  
<http://dx.doi.org/10.1145/1035292.1028982>
2. A Type and Effect System for Deterministic Parallel Java  
Robert L. Bocchino, Jr., Vikram S. Adve, Danny Dig, Sarita V. Adve, Stephen Heumann, Rakesh Komuravelli, Jeffrey Overbey, Patrick Simmons, Hyojin Sung, Mohsen Vakilian  
ACM Conference on Object-Oriented Programming Systems, Languages, and Applications, 2009  
<http://dx.doi.org/10.1145/1640089.1640097>
3. MultiJava: Modular Open Classes and Symmetric Multiple Dispatch for Java  
Curtis Clifton, Gary T. Leavens, Craig Chambers, Todd Millstein  
ACM Conference on Object-Oriented Programming Systems, Languages, and Applications, 2000  
<http://dx.doi.org/10.1145/354222.353181>
4. Transactional Events  
Kevin Donnelly, Matthew Fluet  
ACM International Conference on Functional Programming, 2006  
<http://dx.doi.org/10.1145/1160074.1159821>
5. A Type and Effect System for Atomicity  
Cormac Flanagan, Shaz Qadeer  
ACM Conference on Programming Language Design and Implementation, 2003  
<http://dx.doi.org/10.1145/780822.781169>
6. Phantom Types and Subtyping  
Matthew Fluet, Riccardo Pucella  
Journal of Functional Programming, 2006  
<http://dx.doi.org/10.1017/S0956796806006046>
7. The Essence of JavaScript  
Arjun Guha, Claudiu Saftoiu, Shriram Krishnamurthi  
European Conference on Object-Oriented Programming, 2010  
<http://www.cs.brown.edu/~sk/Publications/Papers/Published/gsk-essence-javascript/>
8. Automatically Restructuring Programs for the Web  
Jacob Matthews, Robert Bruce Findler, Paul T. Graunke, Shriram Krishnamurthi, Matthias Felleisen  
Automated Software Engineering Journal, 2004  
<http://www.cs.brown.edu/~sk/Publications/Papers/Published/mfgkf-web-restructuring-cps-journal/>
9. High-Level Small-Step Operational Semantics for Transactions  
Katherine F. Moore, Dan Grossman  
ACM Symposium on the Principles of Programming Languages, 2008  
<http://dx.doi.org/10.1145/1328438.1328448>
10. Proof-Carrying Code  
George C. Necula  
ACM Symposium on the Principles of Programming Languages, 1997  
<http://dx.doi.org/10.1145/263699.263712>

11. Fault-Tolerant Typed Assembly Language  
Frances Perry, Lester Mackey, George A. Reis, Jay Ligatti, David I. August, David Walker  
ACM Conference on Programming Language Design and Implementation, 2007  
<http://dx.doi.org/10.1145/1250734.1250741>
12. The F# Asynchronous Programming Model  
Tomas Petricek, Dmitry Lomov, Don Syme  
International Symposium on Practical Aspects of Declarative Languages, 2011  
[http://blogs.msdn.com/cfs-file.ashx/\\_\\_\\_key/CommunityServer-Components-PostAttachments/00-10-07-89-59/async\\_2D00\\_pad1.pdf](http://blogs.msdn.com/cfs-file.ashx/___key/CommunityServer-Components-PostAttachments/00-10-07-89-59/async_2D00_pad1.pdf)
13. Formal Verification of Object Layout for C++ Multiple Inheritance  
Tahina Ramananandro, Gabriel Dos Reis, Xavier Leroy  
ACM Symposium on the Principles of Programming Languages, 2011  
<http://dx.doi.org/10.1145/1925844.1926395>
14. Extensible Pattern Matching via a Lightweight Language Extension  
Don Syme, Gregory Neverov, James Margetson  
ACM International Conference on Functional Programming, 2007  
<http://dx.doi.org/10.1145/1291151.1291159>
15. The Design and Implementation of Typed Scheme  
Sam Tobin-Hochstadt, Matthias Felleisen  
ACM Symposium on the Principles of Programming Languages, 2008  
<http://dx.doi.org/10.1145/1328438.1328486>
16. Practical Affine Types  
Jesse A. Tov, Riccardo Pucella  
ACM Symposium on the Principles of Programming Languages, 2011  
<http://dx.doi.org/10.1145/1926385.1926436>
17. Integrating Typed And Untyped Code in a Scripting Language  
Tobias Wrigstad, Francesco Zappa Nardelli, Sylvain Lebesne, Johan Östlund, Jan Vitek  
ACM Symposium on the Principles of Programming Languages, 2010  
<http://dx.doi.org/10.1145/1706299.1706343>