

# COMP 150GIT

## Applied Functional Programming: Distributed Revision Control

Outside activities for September 6—16

September 6, 2012

From September 8 to 15, all the functional programmers will be away at the International Conference on Functional Programming. Here's what I'd like you to do to keep up.

1. Read John Hughes's paper *Why Functional Programming Matters* and come to class on September 19 prepared to discuss it.
2. Define a system of inference rules for a logical judgement about two types `a` and `b`, written

`a 'Counts' b`

and meaning that a value of type `a` contains a number of values of type `b`, which can be counted.

Here are some examples:

- “`a` counts `a`” and the number is always 1.
- “list of `a` counts `a`.”
- “If `a` counts `c` and `b` counts `c`, then the pair type `a * b` also counts `c`.”
- “If `a` counts `b`, then list of `a` also counts `b`.”

Many other rules are possible.

Please solve these two parts:

- a. Write a *formal* system of inference rules. Your system should cover lists, pairs, sums, and the ML `option` type (or the Haskell `Maybe` type).

- b. For each inference rule in your formal system, demonstrate the validity of the rule by providing a suitable *witness* function. For example, the witness for “a counts a” is the constant function `lambda x . 1`.

Please be prepared to discuss your solutions in class on Wednesday, September 26.

3. Learn enough Haskell to solve the “DVD packing problem,” which is described in another handout. Please do this by Wednesday, September 26. You will find many sources of Haskell knowledge online; one of the more popular ones is *Learn You a Haskell for a Great Good*. The popular book *Real-World Haskell* is controversial in Haskell circles, but you might like it anyway. I also recommend Graham Hutton’s book *Programming in Haskell*, although it is a little thin on types.