SENIOR RESEARCH
CSC 450-01

Dr. Garrett Dancik

Example #1: factorial function

```
// precondition: a non-negative integer (n) is ready to be specified
// postcondition: returns n! = n*(n-1)*(n-2)*...*1, with 0! = 1.
int factorial(int n) {
        int prod = 1;
        for (int i = n; i>1; i--) {
                prod *= i;
        }
        return prod;
}
```

- Can we prove that this function is *correct*?
- What if the function is called with a negative number?
- What if the function is called with a very large number? How *reliable* is the function?

Example #2: factorial function (recursive)

```
// precondition: a non-negative integer (n) is ready to be specified
// postcondition: returns n! = n*(n-1)*(n-2)*...*1, with 0! = 1.
int factorial(int n) {
        if (n == 0) return 1;
        int prod = n * factorial(n-1);
        return prod;
}
```

- Is this function *better* or *worse* than the *factorial* function on the previous page?
- How would we show that?

Paradigms in Computer Science

- Rationalist paradigm – programs are mathematical objects
  - Ex: we can theoretically *prove* a program is correct, will not crash, etc.
- Technocratic paradigm - we can empirically determine reliability through testing
  - Ex: program crashes 0.00001% of the time
- Scientific paradigm – programs are like natural processes and are amenable to experiment and study
  - Ex: Evaluate different ways of slowing a flu epidemic in a computer model of influenza infection
  - Ex, Bing vs. Google (http://www.bingiton.com)

What is scientific research?

- Scientific research means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.

Course Objectives

1. Demonstrate the ability to engage in independent inquiry
2. Apply current and critical thinking in a focused area of study
3. Reflect on the context of their independent inquiry or artistic creation
4. Reflect on this work as an outcome of a liberal arts education
5. Learn to write, communicate, and present research ideas and results in computer science.