SENIOR RESEARCH
CSC 450-01

Dr. Garrett Dancik

Example #1: factorial method

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

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

Example #2: factorial method (recursive)

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

- Is this method *better* or *worse* than the *factorial* function on the previous page?
- How could we compare the two methods?

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.