**Assignment 4: Functional Programming/Why Functional Programming Matters**

The late 1980s/early 1990s was a “dark time” to be a functional programmer. Object-oriented programming was rising in prominence and functional programming was losing any importance it may have had due to the newer paradigm. The following paper from this time provides some insight to why functional programmers believed in their approach for solving problems. [Why Functional Programming Matters](https://www.cs.kent.ac.uk/people/staff/dat/miranda/whyfp90.pdf) John Hughes, Research Topics in Functional Programming, 1990 (based on an earlier Computer Journal paper that appeared in 1989). Recent interest in functional programming as resulted in the following articles:

* Micah Smith (2012) Why Functional Programming [Still] Matters. <https://allampersandall.blogspot.com/2012/01/functional-programming-matters.html>
* Allan MacGregor (2018) You Should Learn Functional Programming in 2018 <https://dev.to/allanmacgregor/you-should-learn-functional-programming-in-2018-4nff>
* Martin Odersky (inventor of Scala) video (2011): <https://www.youtube.com/watch?v=3jg1AheF4n0>

Not everyone agrees:

* Jon Harrop (2016) Disadvantages of purely functional programming. <https://jaxenter.com/disadvantages-of-purely-functional-programming-126776.html>

The Functional Programming Paradigm: In a strict sense of the term, functional programming defines the outputs of a program as a mathematical function of the inputs, with no notion of internal state, and thus no side effects. Functional languages tend to be associated with lists as a primary data structure.

**For this assignment:**

1. You will advocate that real-world programmers should pay attention to/learn functional programming because it helps solve real-world problems/is valid in current trends in the workplace. You can find information on how to support this from the included articles as well as your own research.
2. You will write a small program in a functional programming language to solve one of the following problems:
   1. Find the Kth element of a list. (By convention, the first element in the list is element 0)

Or

* 1. Determine whether a given integer number is prime.

Below is a list of (mostly tutorial) sites that can help you find a language/guide your work.

Scala

<http://allaboutscala.com>

<https://alvinalexander.com/scala/real-world-functional-programming-example-in-scala-cookbook-fp>

Racket

<https://docs.racket-lang.org>

<http://www.cse.uaa.alaska.edu/~afkjm/cs331/handouts/scheme1.pdf>

<https://www.cs.drexel.edu/~jjohnson/2016-17/fall/CS270/Lectures/1/racket.pdf>

Scheme

<https://web-artanis.com/scheme.html>

<http://www.shido.info/lisp/idx_scm_e.html>

Haskell

<http://www.learnyouahaskell.com/introduction>

<https://en.wikibooks.org/wiki/Write_Yourself_a_Scheme_in_48_Hours>

LISP

<http://lisp.plasticki.com>

<https://common-lisp.net/tutorials>

Elixir

<https://elixir-lang.org>

<https://www.toptal.com/elixir/getting-started-elixir-programming-language>

F#

<https://fsharp.org>

<https://www.wisdomjobs.com/e-university/f-sharp-programming-language-tutorial-1421.html>

**Requirements**

1. In the functional programming language of your choice, you will present a program to solve **one** of the following
   1. Find the Kth element of a list. (By convention, the first element in the list is element 0)

Or

* 1. Determine whether a given integer number is prime.

1. Provide a formal written report which:
   1. Introduces the assignment and functional programming
   2. Advocates for why programmers should learn functional programming. Provides at least two advantages of functional programming.
   3. Briefly discusses the steps you took and decisions you made to start and solve the problem programmatically—include why you chose the FL language you used to complete the work.
   4. Concludes the report: wrap up the report (summary of assignment and your work)

**Deliverables:** You will submit a single Word or PDF document which includes:

* 1. The written discussion elements found in #2 (in the above section)
  2. Video of your program .(the working URL to the video should be listed in the report document; at the end of the report):
     1. Compiling
     2. Showing the program run from start to finish with the output of the solution for **three** test cases
  3. List (working URLs are sufficient) all resources used to complete this work (you are expected to explore at least two sources of your own)
  4. Text of your code copied at the end of the report

**Expectations:**

* 1. **Compiling errors:** Your solutions must compile
  2. **Readability.** Your code should meet basic readability principles:
     1. Separate each component/part with white space.
     2. Align everything in a meaningful way.
  3. **Comments**: you must include enough comments to ensure that the code is described in sufficient detail such that anyone else looking at the code can easily understand the design and the purpose of the code.
  4. **All code and work associated with this assignment is your own work/written by you**.

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