

Data Structures & Algorithms

Lecture 01

Fahad Zafar

My Profile

- ▶ Name:

- ▶ Fahad Zafar

- ▶ Education:

- ▶ MS Software Systems and Engineering from

- ▶ Mohammad Ali Jinnah University Islamabad

- ▶ Professional

- ▶ Currently working as a ‘Solutions Architect’.

- ▶ More than 7 years of experience in implementing quality web based/desktop applications by following the industry’s best practices for national/international clients.

My Profile

- ▶ Contact Information:

- ▶ Email: (Preferred mean of communication)

- ▶ sagefahad@hotmail.com

** (In subject of your email mention your semester and name, otherwise it will not be entertained)

Key Skills

Technologies:	.NET Framework 3.5, ASP.NET 2.0, VB.NET, C#.NET, ADO.NET, Silver Light, WPF, WCF Web Services, Workflows, Windows Services, <u>Zend Framework(MVC)</u> , <u>J2EE(JSP/Servlets)</u> .
Programming Languages:	C#, VB.NET, VC++, ASP.NET, XAML, MXML, JAVA, PHP, PL/SQL, OpenGL, LINQ.
Scripting Languages:	Java Script, AS3, <u>JQuery</u> , <u>JQuery UI</u> .
RDBMS:	SQL Server, Oracle 8i/9i, MySQL.
<u>XMLRelated Technologies:</u>	XAML, XML, XSL, XSLT, <u>XPath</u> , MXML.
Development Tools:	Eclipse, VisualStudio.NET 2005-2010, Flex Builder 4.0, <u>JBuilder</u> 2005, <u>Zend Studio</u> 9, Oracle SQL Developer, <u>Telerik</u> , <u>Farpoint</u> , <u>TeeChart</u> , Dream Weaver CS4, Corel Draw.
Reporting Tools:	Microsoft Report Viewer, Crystal Reports, Jasper <u>iReports</u> 4.0.
Design Tools:	UML (Rational Rose), Enterprise Architect.
Application Servers:	IIS, Tomcat, Glassfish, XAMPP.
Development Framework	SCRUM

Rules

Take it seriously & you will prosper

Take it lightly & you will doom

Course Overview

- ▶ Fundamentals of Algorithms
 - ▶ Review of Programming
 - ▶ Sorting and Searching
 - ▶ Stacks
 - ▶ Queues, Priority Queues and Circular Queues
 - ▶ Linked List
 - ▶ Trees
 - ▶ Hashing
 - ▶ Graphs
- and much more

Pre-Requisite of the course

- ▶ The history of computing / objects / types / console I/O
- ▶ Operators / loops / methods / parameter passing
- ▶ Selection statements / arrays / strings
- ▶ Exceptions / debugging
- ▶ File input / file output
- ▶ Pointers / unsafe code / linked lists
- ▶ Collections / multi-dimensional arrays / search algorithms
- ▶ Sorting algorithms
- ▶ Object-oriented design / polymorphism / interfaces / inheritance
- ▶ Abstract class

DS&A Covers

In this course, we will look at:

- ▶ *Algorithms* for solving problems efficiently
- ▶ *Data structures* for efficiently storing, accessing, and modifying data

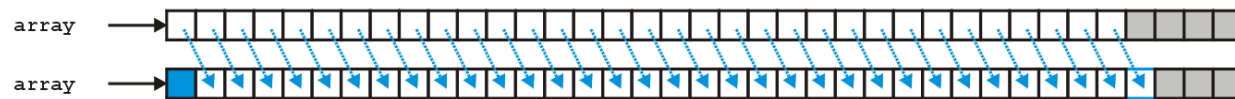
We will see that all data structures have trade-offs

- ▶ There is no *ultimate* data structure...
- ▶ The choice depends on our requirements

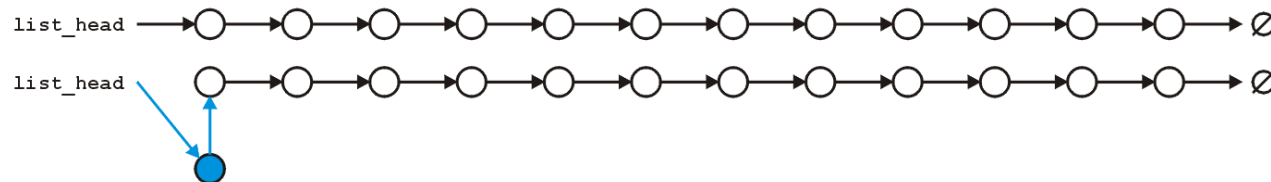
Example

Consider inserting a new entry to the start of an array or a linked list

- ▶ An array requires that you copy all the elements in the array over
 - ▶ Slow for large arrays



- ▶ A linked list allows you to make the insertion very quickly
 - ▶ Very fast regardless of size



Data and Information

- ▶ What is the difference between data and information

Data and Information

- ▶ Grimfoo
- ▶ 13
- ▶ +199999
- ▶ \$23

Data and Information

- ▶ 'Grimfoo' is a website
- ▶ Ahmed is '13' years old
- ▶ +199999 is my cell number.
- ▶ A good chocolate cost is '\$20'

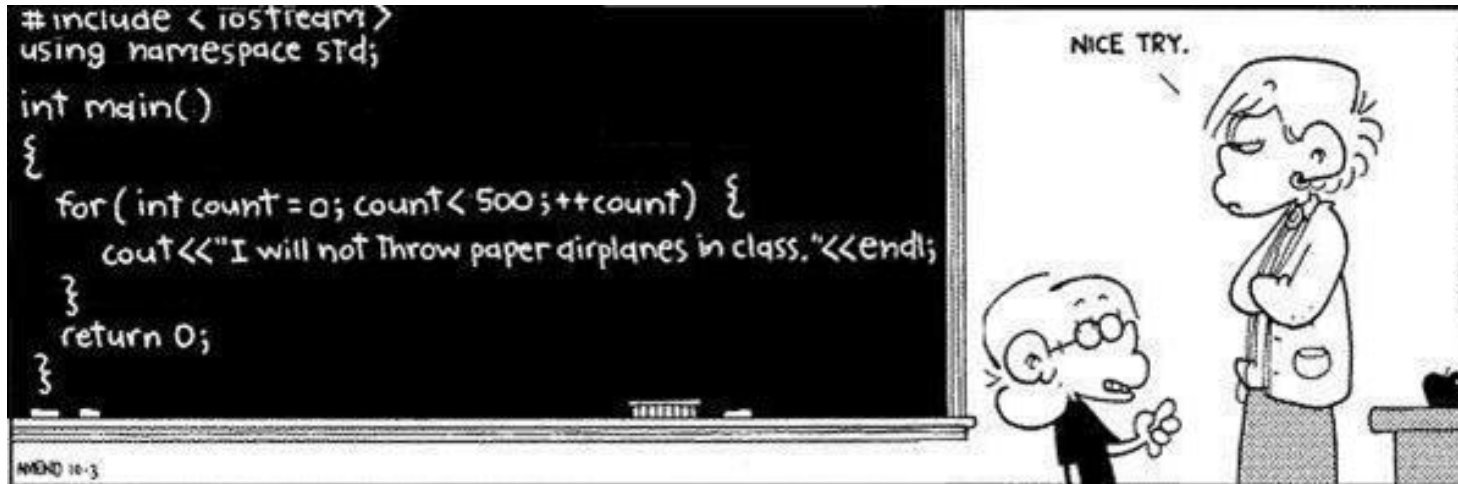
Information has significance whereas data doesn't have it

- ▶ Collection of Data+Information = Record
 - FirstName: Fahad
 - LastName: Zafar
 - Email: xyz@gmail.com
 - Location: Pakistan

Classroom Etiquette

C++

- ▶ You will be using the C++ programming language in this course



C++

This course does not teach C++ programming

- ▶ You will use C++ to demonstrate your knowledge in this course

One lecture covers:

- ▶ Features of C++

Attendance

Attendance will be marked in the end of class

- ▶ Only attendance of those students will be marked, who are present and have attended the whole lecture.

Course Labs

Laboratories are held once in a week

- ▶ Laboratories is associated with a material of the course.

Grading Policy

- ▶ 18 Mid Tem Exam
- ▶ 30 Final Theory Exam
- ▶ 20 Final Practical Exam
- ▶ 12 Quizzes and Assignments

Quiz/Assignments Policy

▶ Quizzes:

- ▶ Quizzes will be unannounced.
- ▶ They will be taken either in the first ten minutes of the class (so come to the class on time & be prepared!) or in the last ten minutes of the class (so listen to the lecture carefully).
- ▶ If you miss a quiz, you miss it!
- ▶ It's up to the instructor's discretion to choose the number of quizzes for evaluation purposes.

▶ Assignments:

- ▶ Assignments need to be submitted on time. There will be 30% per day deduction on late submissions
- ▶ For each assignment, you will be required to implement one or more of the data structures taught in class
- ▶ Your output must perfectly match our output

Plagiarism and Cheating Policy

- ▶ Students indulging in any acts of the said offences should be ready to bear grim consequences.
- ▶ You may not copy code directly from any other source
- ▶ If you viewed another code (from books or lecture notes), you must include a reference in your project
- ▶ You may not share code with any other students by transmitting completed functions to your peers
- ▶ You may discuss projects together and help another student debug his or her code; however, you cannot dictate or give the exact solution

Plagiarism and Cheating Policy

Collaboration with other students must be limited to

- ▶ Discussions
- ▶ High-level pseudocode
- ▶ Assistance with debugging (only through the offering of advice)
- ▶ Sharing test files

All such collaborations **must** be documented in your source code

Plagiarism and Cheating Policy

When one student copies from another student, both students are responsible

The penalty for plagiarism on a Project/Assignment is a mark of 0

Plagiarism and Cheating Policy

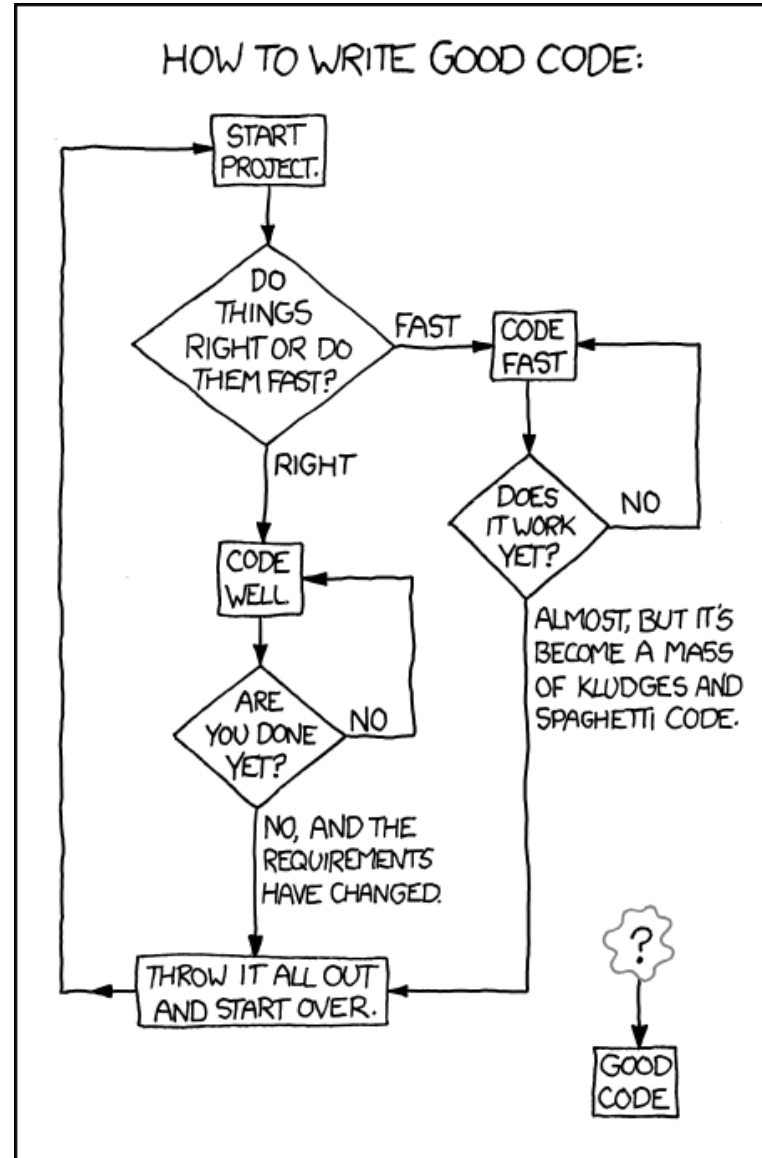
The best way to avoid plagiarism is:

- ▶ review the C++ tutorial
- ▶ read the project as soon as it is available
- ▶ start the project so that there is sufficient time to contact myself if you have difficulty
- ▶ do not give your code to anyone

Project Work

- ▶ Student will present on given topics in the final week

Project/Assignment Work



FB Group Info

Web: <https://www.facebook.com/groups/DSA.UIT.Fall.2016/>

Email: DSA.UIT.Fall.2016@groups.facebook.com

Text Books and Contents

- ▶ Data Structures by Gillberg Forouzan
- ▶ Data Structures Using C and C++
By *Y. Langsam, M. J. Augenstein, A. M. Tenenbaum*
- ▶ Data Structures and Algorithms
By *A. V. Aho, J. E. Hopcroft, J. D. Ullman*
- ▶ Introduction to Algorithms
By Thomas H. Cormen and et. el.

Improving Your Performance

The human brain can retain approximately 5-9 independent items of information in its short-term memory

George Miller, *The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information*, Psychological Review, Vol.63 pp.81-97, 1956

The introduction of new information causes the brain to discard an item currently in your short-term memory

- ▶ For example, consider the 12 words which will appear on the next sequence of screens

Your goal: at the end, write down all twelve words

Improving Your Performance

Cat

Improving Your Performance

Ultimate

Improving Your Performance

Knife

Improving Your Performance

Asteroid

Improving Your Performance

Motion

Improving Your Performance

Shipwreck

Improving Your Performance

Peach

Improving Your Performance

Ford

Improving Your Performance

Pencil

Improving Your Performance

Metre

Improving Your Performance

Curtain

Improving Your Performance

Forever

Improving Your Performance

- ▶ Most of you will be able to write down somewhere between 7 through 9 of these
- ▶ It may even be possible to remember more new topics, however, you will note that there is no relationship between these objects

Improving Your Performance

To transfer information from your short-term memory to your long-term memory, that information must be imposed on your mind at least three times

You should always try the following:

- ▶ Look at the topic before class
- ▶ Attend lectures
 - ▶ You see the information again with commentary
- ▶ Review the lecture after the class
 - ▶ Rewrite and summarize the slides in **your** words

Summary

- ▶ Self Introduction.
- ▶ Course Introduction.
- ▶ Policies.
- ▶ Improving your performance.