

# Introduction to COMP26120: Video 3

## What is a Data Structure?

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COMP26120

```

1  procedure BFS( $G$ , root) is
2      let  $Q$  be a queue
3      label root as discovered
4       $Q.enqueue(root)$ 
5      while  $Q$  is not empty do
6           $v := Q.dequeue()$ 
7          if  $v$  is the goal then
8              return  $v$ 
9          for all edges from  $v$  to  $w$  in  $G.adjacentEdges(v)$  do
10             if  $w$  is not labeled as discovered then
11                 label  $w$  as discovered
12                  $w.parent := v$ 
13                  $Q.enqueue(w)$ 

```

(taken from Wikipedia)

# Abstract Data Type and Data Structure

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## Abstract Datatype

Defines the behaviour of a set of possible operations on data of a certain type

Example: A list may have the operations

*add.* Adds an element to the end of the list

*head.* Returns the first element of the list

*tail.* Returns the sublist after the head

## Datastructure

A way to store and organise data in order to facilitate access and modifications.

*Implements an ADT.*

Examples: Linked List, Binary Tree, Hash Table



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My Lovely Datastructure



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Is it correct?

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Does it implement the  
given abstract datatype?

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How do the operations perform  
in terms of time and memory  
and in relation to the size and  
layout of the data structure?

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What are the trade-offs?  
Between time and memory.  
Between different operations.





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What are the trade-offs?  
Between time and memory.  
Between different operations.

Is it deterministic?  
Is its performance deterministic?

# Describing Algorithms (and Data Structures)

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## Pseudocode

*Careful English*  
*Abstract*  
*No syntax errors!*

## Abstract Machine

*Sequential execution*  
*Constant operations*  
*Infinite memory*

## Real Code e.g. C, Java Python

*Fixed syntax (often verbose)*  
*Low-level details*  
*Handling memory*

Compiler/Interpreter  
Virtual Machine?  
Operating System  
Computer Chip + Memory  
Architecture

# COMP26120 Outcomes

- **Standard Problems and Standard Solutions.** *e.g. sorting and quick sort. Recognise and Adapt.*
- **Generic Problem Solving Techniques.** *e.g. divide-and-conquer*
- **Methods for analysing algorithms.** *Experimentally and theoretically*