

Assignment I

Mapping Your Knowledge of Data Structures and Algorithms

One or two pages to be handed in to the instructor at classtime.

Time allocation: two hours thinking, two hours writing

Construct an outline of what you know about data structures and algorithms.

A **data abstraction** is a way to organize computational information and consequently computer memory. It usually consists of a storage representation and a set of operations to construct, access, modify, delete, deconstruct, test for membership, and/or display stored instances.

An **algorithm** is the structured computational process which converts data into a solution to a particular set of problems. Useful algorithms usually apply to large classes of problems.

These concepts can be understood at **different levels of the design hierarchy**. Data structures and algorithms can be seen

- as ways of implementing low level computational processes,
- as ways of structuring an implementation in a programming language,
- as ways of organizing pseudo-code in preparation for implementation,
- as ways of constructing the mathematical model of a problem, and
- as ways of thinking about and coming to understand a problem space.

How to outline your knowledge:

There are many different ways to collect and organize what you know about a particular topic. The most important thing to recognize is that each person is unique and has a unique understanding of the world. Therefore you should use an outlining technique which feels most comfortable to you. Some choices include

- list major topics and minor topics, similar to the chapter organization of a textbook
- collect words which you can define, and how they relate to each other, similar to a semantic network of object nodes and relational links
- form clusters of similar ideas
- rank the topics covered in the textbook in order of your confidence of understanding
- write down all the things that you have heard about but do not understand
- copy someone else's organization of the topic, marking what you understand and don't
- draw a picture of what you see when you visualize the topic

Remember: Outlines are short. This assignment is not asking you to demonstrate what you know, only to indicate strong and weak areas of knowledge. You do not need to include any form of justification, rationale, or documentation.

Final suggestion: It is often very useful to indicate the degree of confidence you may have for your understanding of a particular topic, as well as the degree of understanding itself. Be sure to test your understanding by asking things like:

- what is the definition? how is this used?
- have I ever actually used this in an implementation? was it successful?
- do I know when not to use this? do I know how to select between alternatives?