

Definitions of terms for ease of reference, ripped directly out of the textbook. Made by Elvberth Yobel Rondonuwu

Module 1: Computing Fundamentals

Computer Architecture

[Computer] - Device that receives and processes data according to a set of instructions and produces the processed data

[Computer architecture] - Description of how a computer is designed and built to function, including how its various parts are designed, organised and connected

[Data] (singular: datum) - Information used in a computer program

[Bit] - Binary digit, value of either 0 or 1

[Byte] - Binary number made of 8 *bits*

[Processor] - Processes data and follows instructions

[Execute] - To follow or perform an instruction

[Software] - A set of instructions to perform specific tasks on a computer

[Main Memory] - Stores data and instructions temporarily for immediate use by the processor

[Address] - Number used to locate a byte in memory

[Volatile] - Lost power when power supply is interrupted

[Secondary Storage] - Stores large amounts of data that will not be lost when the power supply is interrupted

[Hard disk/drive] - Secondary storage where data is stored on rigid rotating disks coated with magnetic material

[Data Bus] - Transports data between memory and processor; bi-directional

[Bi-directional] - Able to work in two directions, to and fro

[Address Bus] - Transports required memory location from processor to memory; uni-directional

[Uni-directional] - Able to work in one direction only

[Input] - Data or instructions that the computer receives for processing

[Output] - Intermediate or final results produced by the computer; usually in the form of processed data

[Hardware] - Physical components of computer

[Input device] - Hardware device that allows user to enter data and instructions into a computer

[Output device] - Hardware device used to display, project or print processed data from a computer

[Lane, PCI Express] - Interface for transferring data between a computer and an expansion card

[Motherboard] - Main circuit board in computer that connects all the components together

Data Representation

[Denary number system (or decimal number system)] - A number system that is made up of 10 unique digits

[Leading zero] - The zero digit (0) that is to the left of the first non-zero digit in a number

[Binary number system] - A number system that is made up of two unique digits

[Hexadecimal number system] - A number system that is made up of 16 unique digits

[Integer overflow] - Result when an operation produces an integer that exceeds the limits of the representable range

[Two's complement] - System used by computers to represent both positive and negative numbers

[Character (text)] - A unit of textual data, usually a symbol, letter, digit or space

[Character encoding] - The assignment of numbers to characters

[American Standard Code for Information Interchange (ASCII)] - A common character encoding method for English characters, including upper-case and lower-case letters

Logic Gates

[Boolean] - Data type representing either True or False

[Logic gate] - Electrical circuit that performs logical operations based on one or more inputs and produces a single output

[Logical operation] - Operation that acts on binary inputs to produce an output according to the laws of Boolean logic

[Logic circuit] - Circuit that consists of only one logic gate or multiple connected logic gates

[Logic circuit diagram] - Visual representation using symbols to show how the component logic gates are connected together in a logic circuit

[Truth table] - Table showing the resulting output for every possible combination of inputs

Module 2: Algorithms and Programming

Problem Analysis

[Input (algorithm)] - Data used by an algorithm that can affect what is required for correct output

[Output] - Results produced by an algorithm

[Solution] - Algorithm that always gives correct outputs when provided with valid inputs

Constructs

[Control flow] - The order in which instructions of a program are run

[Flow line] - An arrow that indicates the order in which stages steps should be followed

[Flowchart] - A visual representation of an algorithm using symbols to show the flow of a sequence of steps

[Symbol (flowchart)] - A special shape to represent an action or step in a flowchart

[Construct] - An algorithm structure with exactly one entry point and one exit point

[Sequence construct] - A construct for performing multiple instructions in a fixed order

[Iteration construct] - A construct for repeated instructions while a particular condition is true

[Selection construct] - A construct for choosing between two or more branches based on a particular condition

[Structured programming language] - A programming language that encourages or is limited to the use of sequence, selection and iteration constructs that have exactly one entry point and one exit point

[Branch] - A sequence of instructions that serves as one option out of two or more choices

[Iterate] - To repeat

[Loop] - Instructions that are repeated until a condition is met

Python Code

[Program] - Set of instructions written to perform specific tasks on a computer

[Source code] - Instructions written in a programming language

[Command line interface] - A means of interacting with a program such that commands are given as lines of text

[Graphical user interface] - A means of interacting with a program such that commands are given using visual elements such as windows, icons, menus and mouse pointers

[Syntax highlighting] - Displaying different parts of source code differently (such as using different colours and fonts) in a text editor based on the rules of the programming language to make reading easier

[Kernel (Jupyter)] - A program that runs the code embedded in a notebook

[Notebook (Jupyter)] - A file where executable code is embedded in formatted documents that may contain text, images and other media

[Comment] - A piece of source code that explains the program but is ignored by Python

[Literal] - A value that is represented directly in source code

[Syntax] - Rules that determine how the words and symbols in a valid instruction are arranged

[Identifier] - A sequence of characters that follows certain rules and can be used as a variable name

[Initialise] - To store or assign a value to a variable for the first time

[Keyword] - A word that has a special meaning in a programming language and cannot be used as an identifier

[Statement] - Code that instructs the computer to perform a specific action

[Variable] - A name with an associated value that can be changed while the program is running

[Expression] - Code that produces a value

[Argument] - An additional value that can be supplied as input to a function call

[Function] - A set of instructions assigned to a name that can be used again later

[Function call] - The process of assigning arguments to new variables and running the instructions assigned to a function

[Nested function call] - Using the return value of one function call as an argument for another function call

[Return value] - The output of a function, or the value that a function call is treated as, after the instructions assigned to the function are completed

[Method] - A function that is associated with a value

[Object] - A value with associated data and/or methods

[Binary operator] - An operator that takes in exactly two values

[Operand] - A value that is manipulated by an operator

[Operator] - A symbol for performing instructions like a function but using a different syntax

[Unary operator] - An operator that takes in exactly one value

[Floating-point number] - A data type to represent real numbers that may contain a fractional part

[Integer] - A data type representing whole numbers

[String] - A data type to represent text as a sequence of characters or symbols

[List] - An ordered sequence of changeable values

[Dictionary] - A data type to represent an unordered collection of key-value pairs

[Key] - A unique value that is used to look up the corresponding value in a dictionary

[Type casting] - The process of converting a value from one data type to another

[Module] - A collection of variables and functions that need to be loaded before they can be used

[Escape code] - A sequence of characters used to input characters that are either difficult to type out as part of a literally or would create a syntax error if not treated specially

[Replacement field] - A placeholder denoted by a set of curly braces that will be replaced with a value

[Immutable] - Cannot be changed once created

[Substring] - A smaller string that appears within a larger string

[Parameters] - Special variable in a UDF (user-defined function) that an argument is assigned to when the UDF is called

[Signature (programming)] - The first line of a UDF that specifies the UDF's name and its parameters

[Local variable] - A variable that is created inside a UDF and can only be used in the UDF's body

[Global variable] - A variable that is created outside of a UDF and is readable from the UDF's body of its name is not hidden by a local variable

Testing and Debugging

[Trace Table] - Tabulation of changes in variables and output of an algorithm when performing a dry run

[Dry Run] - Process of running through a set of steps manually

[Print statements] - keep track of how variables change as program runs using print() function

[Backtracking] - technique of working backwards from location of unintended behaviour to determine its cause (of the logic error)

[Length Check] - Check length of input

[Range Check] - Check that input is within certain limits/range of values

[Presence Check] - Check that required inputs needed for program are provided and not empty

[Format Check] - Check that input satisfies additional complex requirements

[Existence Check] - Check that input exists in a certain collection or repository of data

[Calculation of Check Digit] - A check digit is a numerical value added to a sequence of characters, used to detect errors in data entry or transmission by validating the accuracy of the original data. A check digit is mathematically related to the sequence of characters.

[Syntax] - incorrect source code that violate rules of language, prevents code from running

[Logic] - program does not behave as expected, actual output differs from expected output

[Run-time] - occurs while program is running, possible result of logic/syntax errors

[Purpose of testing] - To detect run-time and logic errors

[Test Case] - set of inputs and corresponding set of expected outputs for particular program which is used to verify whether program works as intended

[Testing] - process by which defects in a program can be detected

[Normal Conditions] - input data is expected input during normal use of program

[Boundary Conditions] - input is at limit of what program is designed for, or where special handling of input is required

[Error Conditions] - input data that should be rejected by program via input validation

Algorithm Design

[Algorithm] - Set of step-by-step instructions for solving a problem or performing a calculation

[Computational Thinking] - process of formulating problems so their solutions can be represented as algorithms

[Decomposition] - Breaking down complex problem into smaller and manageable parts

[Generalisation] - Identifying common features from two or more similar items

Software Engineering

[Software Engineering] - Process of designing, creating and maintaining software applications

[Gather Requirements] - Determine nature of problem, why program is needed and what program is expected to do

[Design Solutions] - Consider options available before code is written, choose algorithm based on resources available

[Write Code] - Write code that performs algorithm as planned in previous stage as efficiently as possible

[Test and Refine Code] - Identify and fix errors or bugs, ensure software functions as intended, improve performance and enhance reliability and user experience before deployment

[Deploy Code] - Actually “roll out” program to be used by intended audience

Module 3: Spreadsheets

[Cell] - The space for data in particular column and row of spreadsheet

[Spreadsheet] - An electronic worksheet used to manage and manipulate data arranged in columns and rows

[Cell address] - Location name for a cell formed by its column name and row number

[Range address] - Location name for rectangular range of cells formed by top-left cell's address, a colon and the bottom right cell's address

[Formula] - A way to perform calculations on the data in a spreadsheet; may contain functions, operators as well as cell and range references

[Cell reference] - Description of a cell that can be used in a spreadsheet formula

[Absolute cell reference] - A cell reference that does not change when a formula is copied or moved to another cell

[Relative cell reference] - A cell reference that changes when a formula containing it is copied or moved to another cell

[Mixed cell reference] - A cell reference that has either a fixed column or a fixed row, but not both, using a dollar sign (\$) to lock one part

[Range reference] - Description of multiple cells that can be used in a spreadsheet formula

[Conditional Formatting] - Spreadsheet feature which automatically formats a cell based on a given criteria

Module 4: Networking

Concepts

[Computer network] - A system of two or more computers (or devices) that are connected together by a *transmission medium* for the exchange of data

[Transmission medium] - A means of connecting two or more computers together using copper cables, radio waves or light pulses so that they may exchange data and interact with each other

[Ethernet] - Most commonly used wired network standard for local area networks

[Wired network] - A network of devices connected by physical cables

[Wi-Fi] - Most commonly used wireless network standard for local area networks

[Wireless network] - A network of devices in which signals are transmitted without the use of physical cables

[Local area network] - A network of computing devices connected within a small geographical area, typically within the same building, such as a home, school or office

[Wide area network] - A network of computing devices covering a large-scale geographic area, typically across multiple geographical locations

[Client] - A device that initiates a connection to a server to request for resources and services

[Server] - A device that shares resources with and responds to requests from *clients*

[Bandwidth] - The average number of bits of data that can be transmitted from a source to a destination over the network in one second; usually measured in megabits per second (Mbps) or gigabits per second (Gbps)

[Topology] - The physical layout of a network in terms of devices and connections

[Star Topology] - Network hardware such as a switch or wireless access point is centre of network with connections to all other computers, with computers sending data to central network hardware and hardware forwards data to intended destination

[Mesh Topology] - Devices are connected to each other and cooperate to relay messages to their intended destination

[Network protocol] - A set of standards and rules that govern how two or more devices communicate over a network

[Packet (computing)] - A unit of broken-up data containing a header with information that are needed for transmission, such as the source and destination addresses

[Packet number (or sequence number)] - A number in a packet's header that indicates the position of that packet in the sequence of data being transmitted

[Parity bit] - An additional bit, which can be either 0 or 1 depending on whether an odd or even parity system is used, that is appended or prepended to a string binary data before transmission

[Parity check] - An error-checking technique which uses a parity bit to detect errors

[Checksum] - A calculated value that is used to determine the integrity of transmitted data

[Echo check] - An error detection method where the receiver sends a copy of what was received back to the sender

[Automatic Repeat Requests (ARQ)] - An error detection and correction method where the sender automatically resends the data if no acknowledgement from the receiver is received within the timeout period

[Timeout (ARQ)] - A time limit used by the sender to wait for an acknowledgement before it is assumed that the data or acknowledgement itself was lost in transit

Home Networks and the Internet

[Gateway] - A device that serves as an entry and exit point for communication with devices that are not in the local network

[Internet Service Provider (ISP)] - An organisation that offers services for accessing the Internet

[Modulation] - Conversion of digital data into a form suitable for transmission

[Demodulation] - Conversion of transmitted signals into digital data

[Modem] - Device responsible for *modulation* and *demodulation*

[Network Interface Controller (NIC)] - Provides the hardware interface to enable transfer of data between a device and a network

[Network switch] - Constructs a single network by connecting multiple devices together

[Wireless access point (WAP)] - Network hardware that lets wireless devices connect to a wired network

[Service set identifier (SSID)] - A 32-byte string that identifies a Wi-Fi network

[Router] - Network hardware that forward packets between separate networks

[Network address] - A unique name in the form of a sequence of bytes

Security and Privacy

[Confidentiality] - Protection from unauthorised access

[Integrity] - Protection from unauthorised modification

[Availability] - Ability to access the data in a timely and uninterrupted fashion

[Data corruption] - Introduction of errors and inconsistencies in data

[Denial-of-service attack (DOS)] - A type of attack where a server is overwhelmed with excessive requests such that it cannot respond or responds very slowly to legitimate requests

[Personal Data] - Any data related to a person that may allow that person to be identified

[Anti-malware] - Software to detect, remove and stop malware from running

[Signature] - Identifying characteristics that are used to detect a known version of some malicious software

[Firewall] - Device or computer program that prevents unauthorised access to or from a network

[Encryption] - Process of encoding a message so that a secret key is needed to decode the data

[Personal Data Protection Act (PDPA)] - A law that governs the collection, protection and use of personal data in Singapore

[Adware] - Type of malware that installs itself without the user's knowledge and displays unwanted advertisements

[Malicious software] - Software that is intentionally used to damage, disrupt or gain unauthorised access to a computer system

[Spyware] - Type of hidden malware that secretly collects personal information about its users and transmits this information to attackers without the users' knowledge

[Cookies] - Small pieces of data stored by the web browser when a user visits a website

[Phishing] - Use of emails, messages and fake websites that appear to be from reputable companies to steal personal data from users

[Pharming] - Interception of requests sent from a computer to a legitimate website and the redirection of those requests to a fake website to steal personal data

[Authentication] - The process of verifying the identity of a user

[Authentication factor] - A category of evidence that is used for authentication

[Security token] given by banks/organisations to users accessing accounts online

[Two-factor authentication] like an OTP generated from security token or mobile phone that user owns

[Biometrics] - Type of authentication based on measurement of human physical characteristics

[Backups] - Copy of data that is made so it can be recovered if the original is lost

Module 5: Impact of Computing

Intellectual Property

[Intellectual Property] - Creations of the mind that have value but can exist purely as data with no physical form

[Originality and Creativity] - Work must be original and showcase a degree of creativity and cannot be copied from existing works

[Fixation] - Work must be fixed in a tangible medium of expression and cannot be an idea without a fixed and recorded description

[Ownership] - Work must have an identifiable owner or author for legal rights to be assigned and enforced

[Copyright] - Legal right of owners to control the use and distribution of their intellectual property

[License] - Official description of activities that are authorised or forbidden by the owner of intellectual property

[Free and open-source software (FOSS)] - Software where users are given freedom to change, copy, study and share the software and its source code

[Proprietary Software] - Commercial software for which most of the legal protections under copyright are retained

[Shareware] - Demonstration software that is distributed for free but for a specific evaluation period only

[Freeware] - Proprietary software that is available for use at no cost

[Crack] - Program that modifies software so that the software cannot detect that it is being used illegally

[Software Piracy] - Crime copying, distributing and/or using copyrighted software in a manner that is not permitted by its license

[Copyright Infringement] - Use or distribution of copyrighted work without permission of copyright owner

Communication

[Engagement rate] - Measure of how much other users actively interact with a social media post

[Feed (social media)] - Feature of social media sites where posts from other users are displayed as a continuously updated stream of content

[Post (social media)] - Any content (e.g. text, pictures, videos, links) shared by a user on social media

Emerging Technologies

[Artificial intelligence (AI)] - Ability of a computer to perform complex tasks without constant human guidance and improve its performance as more data is collected

[Generative AI] - AI that can create new content such as text, images sounds and videos

[Machine learning] - Technique used in AI that enables a computer to perform complex tasks without explicit programming

[Model (machine learning)] - Mathematical representation of the patterns and relationships that are found as a result of training an ML system

[Training data (machine learning)] - Collection of examples that is used to teach an ML model how to make predictions or decisions

[Inference (machine learning)] - Process of applying an ML model on new data to make predictions or decisions

[Nearest neighbour (NN) method] - Simple ML algorithm for classification that assigns to a data point the label of its closest neighbouring data point in the training data

[Data point (machine learning)] - A unit of information representing an instance or example relevant to an ML problem

[Feature (machine learning)] - A measurable property or characteristic of a data point

[Label (machine learning)] - The target output of each data point

[Overfitting (machine learning)] - When an ML model learns random noise present in the training data to the extent that it results in poor generalisation when applied to new data

[Underfitting (machine learning)] - When an ML model is too simple to learn the underlying patterns of the training data

[Bias (artificial intelligence)] - When an AI system produces results that are systematically prejudiced or discriminatory in an unfair manner

[Deepfake] - A convincing AI-generated depiction of people doing things they never actually did

[Hallucination (artificial intelligence)] - Falsehoods that are presented as facts by generative AI