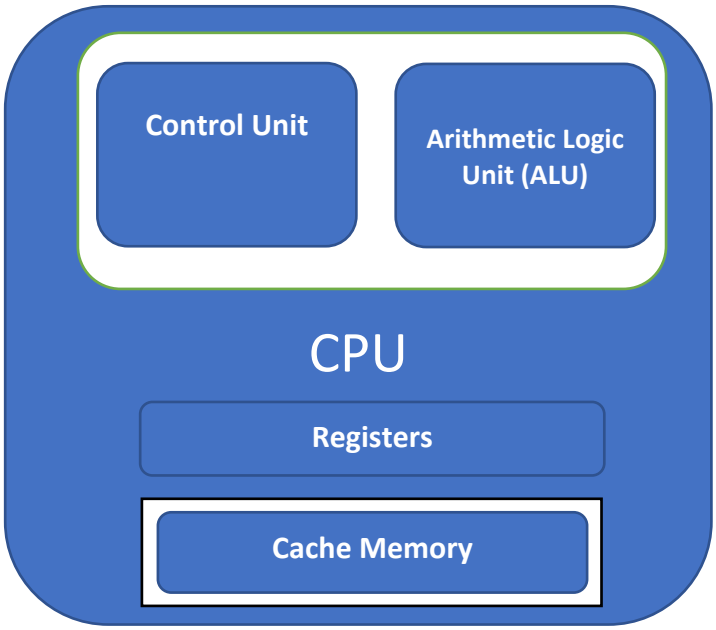
1. **Draw a schematic diagram of a computer's CPU and label it. List the functionality of each component.**



Description:

1. **The control unit** is responsible for controlling the flow of data within the CPU and between the CPU and other components of the computer. It interprets instructions from memory and executes them by sending signals to other CPU components.

2. **The ALU** performs arithmetic and logical operations on data. It can perform addition, subtraction, multiplication, division, AND, OR, NOT, NAND, and others.

3. **Registers** are small, high-speed storage locations within the CPU that holds data currently being processed. There are several types of registers, including instruction, data, and address registers.

4. **Cache memory** is a small amount of high-speed memory used to store frequently accessed data and instructions. It is located within the CPU for faster access and is used to improve overall system performance.

The CPU executes instructions and performs calculations in a computer system. The control unit, ALU, registers, and cache memory work together to process data and execute instructions as efficiently as possible.

The following are the functions of each component:

1. **Control Unit:** The control unit is responsible for controlling the flow of data within the CPU and between the CPU and other components of the computer. It interprets instructions from memory and executes them by sending signals to other CPU components.
2. **Arithmetic Logic Unit (ALU):** The ALU performs arithmetic and logical operations on data. It can perform addition, subtraction, multiplication, division, AND, OR, and NOT operations.
3. **Registers:** Registers are small, high-speed storage locations within the CPU that holds data currently being processed. There are several types of registers, including instruction, data, and address registers.
4. **Cache Memory:** Cache memory is a small amount of high-speed memory used to store frequently accessed data and instructions. It is located within the CPU for faster access and is used to improve overall system performance.

The CPU executes instructions and performs calculations in a computer system. The control unit, ALU, registers, and cache memory work together to process data and execute instructions as efficiently as possible.

Reference: (Wolf, 2012)

2. **Differentiate and distinguish between different types of computers in terms of their functionality, namely, supercomputer, desktop, laptop, and hand-held device.**

The computer's use, operation, and size determine the different computer types (Wang, 2020). For instance, they are categorised into four categories as a result:

- Supercomputers
- Mainframe computers
- Mini computers
- Microcomputers

Supercomputers are the most powerful computers on the market. They are designed for high-performance computing tasks that necessitate massive processing power. They are typically used in scientific research, weather forecasting, and other applications that require much computational ability to process large amounts of data. Supercomputers are an excellent illustration of how NASA use them to monitor and manage space exploration.

Mainframe computers are large, powerful computers designed for enterprise-level computing tasks. They are typically used by large organisations for processing and managing large amounts of data of millions of users.

Minicomputers are medium-sized computers that are more powerful than microcomputers but less powerful than mainframes. They are typically used for scientific research, engineering, and other applications requiring moderate processing power. An example would be the computer department monitoring the entire company's network activity.

Microcomputers, or personal computers, are small computers designed for individual use. They are the most common type of computer, and they are used for tasks ranging from simple word processing and web browsing to more complex tasks like

programming and graphic design. Includes Personal Digital Assistants (PDA), Tablet PCs, Desktop PCs, and Laptops.

The main differences between these types of computers are their processing power, size, and intended use. Supercomputers and mainframes are typically used for large-scale computing tasks. In contrast, minicomputers are used for more specialised applications that require more power than microcomputers but less than mainframes. Microcomputers, on the other hand, are designed for individual use and can perform a wide range of tasks, from basic word processing and web browsing to more complex tasks such as programming and data analysis.

A desktop computer is a personal computer designed to be used on a desk in a specific location. Desktop computers offer more processing power and storage capacity than laptops or hand-held devices, and they are usually more affordable. They are commonly used for office work, gaming, and multimedia applications.

A laptop is a portable computer that combines most of the features and capabilities of a desktop computer. Laptops are designed to be small and lightweight, making them easy to carry and use. They are ideal for travel, business, and personal use and offer a good balance of performance and portability.

A hand-held device is a compact, portable computer that can be easily carried and used with one hand. Hand-held devices include smartphones, tablets, and personal digital assistants (PDAs). These devices offer limited computing power and storage capacity compared to laptops or desktops. However, they are highly mobile and provide convenient access to the Internet and other applications. Hand-held devices are used for communication, entertainment, and primary productivity tasks.

Reference: (Wang, 2020).

In summary, the main difference between these types of computers is their size, processing power, storage capacity, and mobility. Supercomputers are the most potent and expensive, followed by desktops, laptops, and hand-held devices, which are smaller and more portable but have less processing power and storage capacity.

3. **Compare and contrast between a ‘Register’ and a ‘Memory’ cell. Provide examples where necessary.**

Registers and memory cells are components of a computer's memory system but have different functions and characteristics (Brookshear & Brylow, 2018).

A register is a small, fast-access memory unit within the CPU that temporarily holds data being processed by the CPU. Registers are used to keep the data being operated on, intermediate results of computations, and the addresses of instructions to be executed. Registers are usually much smaller than main memory. However, they are much faster to access because they are located directly within the CPU (Brookshear & Brylow, 2018).

For example, when the CPU needs to perform an arithmetic operation, it fetches the operands from memory into registers, completes the process, and stores the result in a register (Brookshear & Brylow, 2018).

A memory cell is a storage unit in the computer's main memory. Memory cells are used to store data and instructions that are not currently being processed by the CPU. Main memory is much larger than registers but also much slower to access (Stillings et al., 1995) .

For example, when a program runs, its instructions and data are loaded into the main memory. The CPU fetches the instructions and data from memory as needed. When the CPU finishes processing an instruction, it stores the result in memory.

In summary, registers are used for high-speed temporary data storage and instructions. In contrast, memory cells are used for longer-term data storage and instructions. Registers are much smaller and faster to access than memory cells. However, memory cells are much larger and can store more data.

Reference: (Friedman et al., 1994).

4. **What type of computer science role are you interested in?**

I am interested in one Computer Science career: Project manager in data science.

A Data Science Project Manager oversees the planning, execution, and delivery of data science projects within an organisation. A project manager in data science typically has a strong background in data science and project management and can lead a team of data scientists, engineers, and other stakeholders to achieve project goals.

The project manager in data science will typically work closely with business stakeholders to identify project objectives and develop project plans. They will also work with data scientists and other team members to ensure that data is being collected, processed, and analysed in a manner that is consistent with the project goals.

Some of the critical responsibilities of a project manager in data science may include the following:

1. Defining project scope and objectives

2. Developing project plans and timelines
3. Assigning tasks and responsibilities to team members
4. Monitoring progress and identifying potential issues
5. Communicating project status and progress to stakeholders
6. Ensuring that project goals are met on time and within budget
7. Managing project risks and making adjustments as needed
8. Identifying process improvement opportunities and recommending changes to workflows and procedures.

To succeed as a project manager in data science, individuals must possess technical and interpersonal skills. They must understand complex data science concepts and methodologies and have excellent communication and leadership skills to manage and motivate their team effectively. Additionally, they must balance competing priorities and make decisions that align with overall business objectives.

Reference: (Ramazani & Jergeas, 2015).

References:

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Stillings, N.A., Chase, C.H., Weisler, S.E., Feinstein, M.H. & Rissland, E.L. (1995). *Cognitive Science: An Introduction*. [online] *Google Books*. MIT Press. Available at: https://www.google.co.uk/books/edition/Cognitive_Science/wCRonP7EgDkC?hl=en&gbpv=1&dq=computer+science:+an+overview+13th%2BA+memory+cell+is+a+storage+unit+in+the+computer%27s+main+memory.+&pg=PR11&printsec=frontcover [Accessed 25 Mar. 2023].

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