Portfolio#1
Computer Science as Discipline, Computing Disciplines and Majors

Name: Jemuel S. Valencia
ID No#: 11600135
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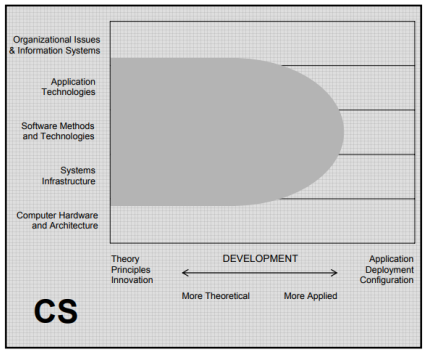
Instructor: Miss Marie Liza Navarrate

- **Computer Science as Discipline**

The dictionary defines discipline as a field of study. Peter Denning defines the discipline of computer science as "the body of knowledge and practices used by computing professionals in their work.... This discipline is also called computer science and engineering, computing, and informatics" (Dale & Lewis, 2002). He continues, "The body of knowledge of computing is frequently described as the systematic study of algorithmic processes that describe and transform information: their theory, analysis, design, efficiency, implementation, and application. The fundamental question underlying all of computing is, What can be (efficiently) automated?" (Dale & Lewis, 2002).

Computer science focuses on algorithm design, data structures, computational theory, and practical applications like AI, networking, and cybersecurity. Algorithms are fundamental to computer science because they form the basis of programming and software development. Data structures like arrays and trees optimize data management and access, while computational theory explores the limits of computation through models like Turing machines. AI and machine learning demonstrate practical applications of these concepts. Networking facilitates communication between devices, and cybersecurity ensures data protection (Huys, 2024).

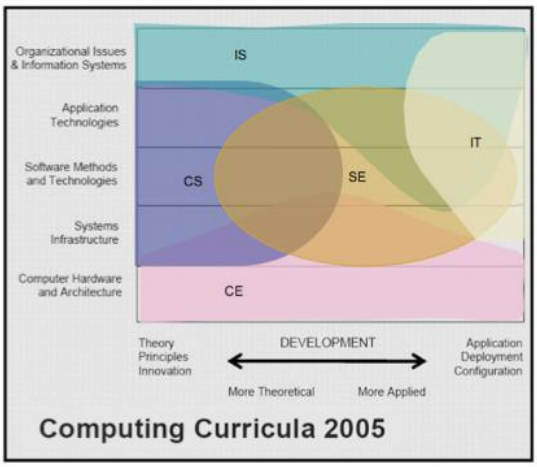


The shaded portion in the figure highlights the broad scope of computer science, which spans from hardware and software development to information systems. Computer scientists work on creating a wide range of software but do not typically engage in managing or deploying these technologies, which is why the shaded area narrows on the right (ACM, AIS, & IEEE-CS, 2005).

Computer science provides an intellectual foundation supporting the information technology industry, the worldwide digital economy and the information society (Xu & Zhang, 2021). Computer science's relevance spans multiple industries, driving innovation and efficiency in modern life (Huys, 2024). The fundamental questions of concern to computer scientists range from foundations of theory to strategies for practical implementation (Henderson, 2009). Computer scientists primarily work on software development, either at the practical level or the theoretical, with the hope that every subject that begins as theoretical ends as practical (Spraul & Masse, 2005).

In conclusion, computer science encompasses a wide range of topics, including theoretical foundations, algorithmic design, and practical applications in areas like networking and security. Gaining a deeper understanding of these principles allows individuals to leverage the power of technology to solve real-world challenges, paving the way for innovations that can improve lives and foster societal change (Huys, 2024).

- **5 Computing Disciplines and Majors (Computer Engineering, Computer Science, Information Systems, Information Technology, Software Engineering)**



To illustrate the commonalities and differences among the five computing disciplines, the image on the right depicts the conceptual territories occupied by each one (ACM, AIS, & IEEE-CS, 2005).

1. Computer Engineering

Computer engineering as an academic field encompasses the broad areas of electrical or electronics engineering and computer science. Computer engineering is a discipline that embodies the science and technology of design, construction, implementation, and maintenance of software and hardware components of modern computing systems and computer-controlled equipment, and networks of intelligent devices (ACM & IEEE Computer Society, 2016).

2. Computer Science

The discipline of computing is the systematic study of algorithmic processes that describe and transform information, their theory, analysis, design, efficiency, implementation, and application. The fundamental question underlying all of computing is, "What can be (efficiently) automated?" (Denning et al., 1989).

3. Information Systems

As an academic field, information systems study how people and organizations use networks of hardware and software to collect, process, and distribute data. involve the creation, sharing, and distribution of data generated by computers and users. Common types include operation support systems, management information systems, decision support systems, and executive information systems. While professionals in this field work with computers and software, their focus is extracting data from various sources, such as servers or the internet, to complete tasks (CityU of Seattle, 2020).

Information systems can be understood through a sociotechnical perspective, viewing them as socio-technical systems (STS) that involve the interaction of four interrelated components: task,

people, structure (or roles), and technology. This approach highlights how information systems integrate these elements to function effectively within an organization (O'Hara et al., 1999).

4. Information Technology

To define information technology in a nutshell, it is the art and the technology of acquiring, storing, structuring and managing the information; compressing and transmitting the information; and finally, processing, accessing and interpreting this information. Information technology may be viewed as a discipline which has evolved out of the marriage between telecommunications and computing technologies (Ray & Acharya, 2004).

IT systems play a vital role in facilitating efficient data management, enhancing communication networks, and supporting organizational processes across various industries. For IT projects to succeed, they must be meticulously planned, seamlessly integrated, and continuously maintained to ensure they function optimally and meet organizational objectives (Hindarto, 2023).

5. Software Engineering

According to the Institute of Electrical and Electronics Engineers (IEEE), software engineering is defined as 'the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software.' In a nutshell, software engineering can be defined as a systematic approach to develop software within specified time and budget. (Khurana, 2010)

Software engineering is a technological discipline that combines the concepts of computer science, economics, communication skills, and management science with the problem-solving approach of engineering. It also involves a standardized approach to program development, both in its managerial and technical aspects. One of the main objectives of software engineering is to help developers obtain high quality software (Khurana, 2010).

Analysis/Reaction

Trying my best to avoid plagiarism and simply copying text from websites and Wikipedia, I found it challenging to research specific information from published material, particularly from books and journals available online. Although I am not a bookworm, I came across many interesting books in various fields, not limited to computer science, from which I collected valuable information for this portfolio. Literature on computer science and the other five computing disciplines is abundant in this digital era, leaving no excuse for not learning.

From this activity, I learned that computer science is far more than just programming—it involves a comprehensive study of algorithms, data structures, computational theory, and real-world applications like AI, networking, and cybersecurity. These foundational concepts drive innovation across industries and enable the efficient automation of processes. I now understand that computer science supports the global digital economy and plays a crucial role in improving various aspects of modern life. The field spans both theoretical and practical domains, with the ultimate goal of using technology to solve real-world challenges and foster positive societal change.

In addition, this activity broadened my perspective on the different disciplines of computing. Previously, I thought computer engineering, computer science, and software engineering referred to the same discipline. However, I realized that they are distinct fields with specific goals, though they

share some overlapping similarities, such as the development of computer software and hardware to meet organizational objectives and solve real-world problems, including information systems and information technology.

This deeper understanding of these topics and disciplines helped me appreciate the diversity within computing and the opportunities each field offers for contributing to society. It also inspired me to think about how my skills in computer science can intersect with other areas like AI and networking to solve real-world problems and drive technological advancement.

GTKY: Who am I?

Hello, I am Jemuel S. Valencia. My hobbies include running, exercising, and playing table tennis. I've been studying at USC since Grade 5, and before that, I spent 9 years living abroad with my parents in the Middle Eastern country of Kuwait. I currently reside in Talisay City, Cebu, but for now, I am staying in a dorm near USC TC to avoid the heavy traffic.

- **Educational background**

I completed my Senior High School education under the Science, Technology, Engineering, and Mathematics (STEM) strand at the University of San Carlos - BED North Campus, located on General Maxilom Avenue, Cebu City, where I graduated with High Honors. Prior to this, I also completed my Junior High School education at the same campus, likewise graduating with High Honors. Throughout these periods, I had the opportunity to experience some programming, including learning the basics of C in the course Computer Fundamentals and Programming 1. I also learned how to program the Arduino using C++ in our Technology and Livelihood Education subject in junior high school. Additionally, as part of a group of selected graduating students, I participated in a work immersion program in collaboration with USC and Lexmark, where we completed various organizational tasks.

- **Why I chose Computer Science**

The top influence on my decision to major in computer science was my father, who is currently a successful senior computer programmer working with multiple companies. Seeing his success in the field inspired me to pursue the same path and follow in his footsteps. Another influence was the rapid pace of technological advancement in this digital era, including faster chips, computer hardware, and artificial intelligence. This progress motivated me to invest in this academic field because I believe it is still in its infancy and will become highly sought after in the coming years, especially as jobs in the computer and technology fields become increasingly in demand.

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