# Advancements in Computer Science

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WHAT'S COVERED

Information systems have evolved at a rapid pace ever since their introduction in the 1950s. Today, devices that we can hold in one hand are more powerful than the computers that were used to land a man on the moon. Furthermore, the Internet has made the entire world accessible to us, allowing us to communicate and collaborate with each other like never before. In this tutorial, we will take a look at the advancements that have been made in computer science, and we wil look at future trends.

Our discussion will break down as follows:

## 1. Advancements in Computer Science

Computer science is an extraordinarily vast area of human knowledge, with a myriad of real world applications. In fact, the modern information system is based on the concepts put forth by computer science, as these concepts are applicable to computer systems and all other digital systems. With that said, the advancements that are made within the field of computer science are likely to have a major impact on information systems. Listed below are some of the advancements that have been made in computer science, with a description of each.

| Advancement in Computer Science | Description | Applications/Domains |
|---|---|---|
| Cloud Computing | --Refers to services provided over a computer network (such as the Internet) through servers in a remote location<br>--Provides increased processing power to devices, as processing is spread across multiple servers<br>--Provides increased storage to devices, as storage is spread across multiple servers<br>--Services, files, information, etc. can be synced, shared, and accessed at any time by any Internet-connected device | --Google Docs<br>--Dropbox<br>--Microsoft Skydrive<br>--Amazon Web Services<br>--Windows Azure<br>--Oracle Public Cloud |
| Virtual and Augmented | --Describes the use of technology to enhance or augment the real world by using information designed to heighten sensory (auditory, visual) perception. The information is embedded into the real view of | --Google Sky Map<br>--GeoGoogle<br>--Google Earth<br>--Layar |

| | | |
|---|---|---|
| Reality | the world | --Color Blindness Simulator |
| Visualization | --Refers to the development of images, animations, charts, and diagrams to communicate an idea or message. Typically scientific and technical in nature | --Scientific Visualization<br>--Data Visualization<br>--Information Visualization<br>--Business Analytics |
| Artificial Intelligence | --Refers to computer software that is designed to simulate the way in which the human brain functions<br>--Refers to computer software or systems developed to simulate the way that human beings learn new information | --Robotics<br>--Transportation: Autonomous Cars<br>--Security<br>--Interactive Media<br>--Education |

**IN CONTEXT**

You are reading a book on your laptop while at home. You close your laptop and leave your home to go to a park 40 miles from your house. While at the park you realize that you forgot to bring your laptop. Because of cloud computing, you can turn on your mobile phone and begin reading the same book. Your mobile phone returns to the same page and paragraph that you were reading while at home.

WATCH

In this video, you'll learn how DJ Mannie Fresh uses the cloud to stay organized and succeed in his career.

# 2. Future Trends

As computer science has evolved, the advancements that have been made tend to leverage general computer science trends. These trends are what inform the design and development of information systems and software applications. For businesses and organizations, understanding these trends are very important to continued innovation and maintenance of competitive advantage. The following lists several of the major current trends in information systems, with a look at what may be ahead for each trend.

- **Globalization**: The first trend to note is the continuing expansion of globalization. The use of the Internet is growing all over the world, and with it the use of digital devices. The growth is coming from some unexpected places; countries such as Indonesia and Iran are leading the way in Internet growth.

| Country | New Internet Users (millions) 2008-2012 | % Yearly Growth |
|---|---|---|
| China | 264 | 10 |
| India | 88 | 26 |
| Indonesia | 39 | 58 |
| Iran | 35 | 205 |
| Russia | 33 | 6 |
| Nigeria | 31 | 15 |
| Philippines | 28 | 32 |
| Brazil | 27 | 6 |
| Mexico | 19 | 9 |
| USA | 18 | 3 |

*Data source: internetworldstats.com*

- **Social Media Growth**: Social media growth is another trend that continues. Facebook now has over one billion users! In 2013, 80% of Facebook users were outside of the United States and Canada. Besides Facebook, other social media sites are also seeing tremendous growth. Over 70% of YouTube's users are outside the United States, with the United Kingdom, India, Germany, Canada, France, South Korea, and Russia leading the way. Pinterest gets over 50% of its users from outside the United States, with over 9% from India. Twitter now has over 230 million active users. Social media sites not based in the United States are also growing. China's QQ instant-messaging service is the eighth most-visited site in the world.
- **The Internet Will Become More Personal**: Ever since the advent of Web 2.0 and e-commerce, users of information systems have expected to be able to modify their experiences to meet their personal tastes. From custom backgrounds on computer desktops to unique ringtones on mobile phones, makers of digital devices provide the ability to personalize how we use them. More recently, companies such as Netflix have begun assisting their users with personalizations by making suggestions. In the future, we will begin seeing devices perfectly matched to our personal preferences, based upon information collected about us in the past.
- **Mobile Will Continue to Expand**: Perhaps the most impactful trend in digital technologies in the last decade has been the advent of mobile technologies. Beginning with the simple cell phone in the 1990s and evolving into the smartphones and tablets of today, the growth of mobile has been overwhelming. Here are some key indicators of this trend:
  - Mobile device sales. In 2011, smartphones began outselling personal computers.
  - The number of smartphone subscribers grew at 31% in 2013, with China leading the way at 354 million smartphone users.
  - Internet access via mobile. In May of 2013, mobile accounted for 15% of all Internet traffic. In China, 75% of Internet users used their smartphone to access it. Facebook reported that 68% of its active users used their mobile platform to access the social network.
  - The rise of tablets. While Apple defined the smartphone with the iPhone, the iPad sold more than three times as many units in its first 12 months as the iPhone did in its first 12 months. Tablet shipments now outpace notebook PCs and desktop PCs. The research firm IDC predicts that 87% of all connected devices will be either smartphones or tablets by 2017.

# 3. Emerging Applications

- **Wearable Technology**: The average smartphone user looks at his or her smartphone 150 times a day for functions such as messaging (23 times), phone calls (22), listening to music (13), and social media (9).

Many of these functions would be much better served if the technology was worn on, or even physically integrated into, our bodies. This technology is known as a "wearable." Wearables have been around for a long time, with technologies such as hearing aids and, later, Bluetooth earpieces. But now, we are seeing an explosion of new wearable technologies. Perhaps the best known of these is Google Glass, an augmented reality device that you wear over your eyes like a pair of eyeglasses. Visible only to you, Google Glass will project images into your field of vision based on your context and voice commands. Another class of wearables are those related to health care. The UP by Jawbone consists of a wristband and an app that tracks how you sleep, move, and eat, then helps you use that information to feel your best. It can be used to track your sleep patterns, moods, eating patterns, and other aspects of daily life, and then report back to you via an app on your smartphone or tablet.

- **Collaborative Technology**: As more of us use smartphones and wearables, it will be simpler than ever to share data with each other for mutual benefit. Some of this sharing can be done passively, such as reporting our location in order to update traffic statistics. Other data can be reported actively, such as adding our rating of a restaurant to a review site.
- **3D Printing**: One of the most amazing innovations to be developed recently is the 3D printer. A 3D printer allows you to print virtually any 3D object, based on a model of that object designed on a computer. 3D printers work by creating layer upon layer of the model using malleable materials, such as different types of glass, metals, or even wax.
- **Findable**: The "Internet of Things" refers to the idea of physical objects being connected to the Internet. Advances in wireless technologies and sensors will allow physical objects to send and receive data about themselves. Many of the technologies to enable this are already available – it is just a matter of integrating them together.
- **Autonomous**: By combining software, sensors, and location technologies, devices that can operate themselves to perform specific functions are being developed. These take the form of creations such as medical nanotechnology robots (nanobots), self-driving cars, or unmanned aerial vehicles (UAVs). A nanobot is a robot whose components are on the scale of about a nanometer, which is one-billionth of a meter. While still an emerging field, it is showing promise for applications in the medical field. For example, a set of nanobots could be introduced into the human body to combat cancer or a specific disease. In March 2012, Google introduced the world to its driverless car by releasing a video on YouTube showing a blind man driving the car around the San Francisco area. The car combines several technologies, including a laser radar system, worth about $150,000. While the car is not available commercially yet, three U.S. states (Nevada, Florida, and California) have already passed legislation making driverless cars legal.

The emerging applications listed above are generally based on the future trends and advancements in computer science. These applications of the future can be characterized as follows:

- More wearable technology
- Autonomous or operate independently of a human
- Provide users with more opportunity to collaborate
- Able to be "found" based on remote sensing (i.e. GPS receiver can be "found" by a remote satellite that communicates direction data)


See how DJ Mannie Fresh embraced technology to improve his career.

## SUMMARY

As the world of information technology moves forward, we will be constantly challenged by new capabilities and innovations. Many times the new capabilities and powers that come with these new technologies will test us and require a new way of thinking about the world. Businesses and individuals alike need to be aware of these coming changes and prepare for them. In this tutorial, we discussed the **current and future trends in information technology**, as well as the **advancements** in the general area of computer science.

Source: Derived from Chapter 13 of “Information Systems for Business and Beyond” by David T. Bourgeois. Some sections removed for brevity.
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