Website Exemplar

Higher Projects
Unit: P201

Topic: What are the viable options after a degree in computer science?

edexcel

A form should be completed for each candidate and submitted with the work for moderation.

Candidate Record Sheet - Level 1 Foundation & 2 Higher Projects

Learner Name

Learner number

Centre Name

Centre Number

Unit Name The Project – Level 2

Unit Number Project-Level 2

Unit 1

Project checklist
The final Project should include the following items:
- a Project Proposal Form
- a Project activity log or diary
- records of research carried out (which could be included within the project outcome or given separately)
- the Project Outcome
- an evaluation

Project Contents

Please list the format of the items submitted as part of the Project, note whether this evidence is shared with other candidates and if so who (A4 Report, portfolio, sketchbook, CD of sound track, DVD of play/film, video, etc)

Written A4 Report

Authentication confirmation/consent

Candidate: I hereby certify to the best of my knowledge that this work: • has been produced without any assistance beyond that recorded and allowed by the scheme of assessment. • is not work which has been or will be submitted for another qualification. I also agree to my coursework being used to support Professional Development, Online Support and Training of both Centre-Assessors and Edexcel Moderators.	Signature:
Teacher: I confirm that the learner's work was conducted under the conditions laid out by the specification. I have authenticated the learner's work and am satisfied that to the best of my knowledge the work produced is: • solely that of the learner • is not work that has been or will be submitted for another qualification.	Signature: **Print Name** *in block capitals please:*
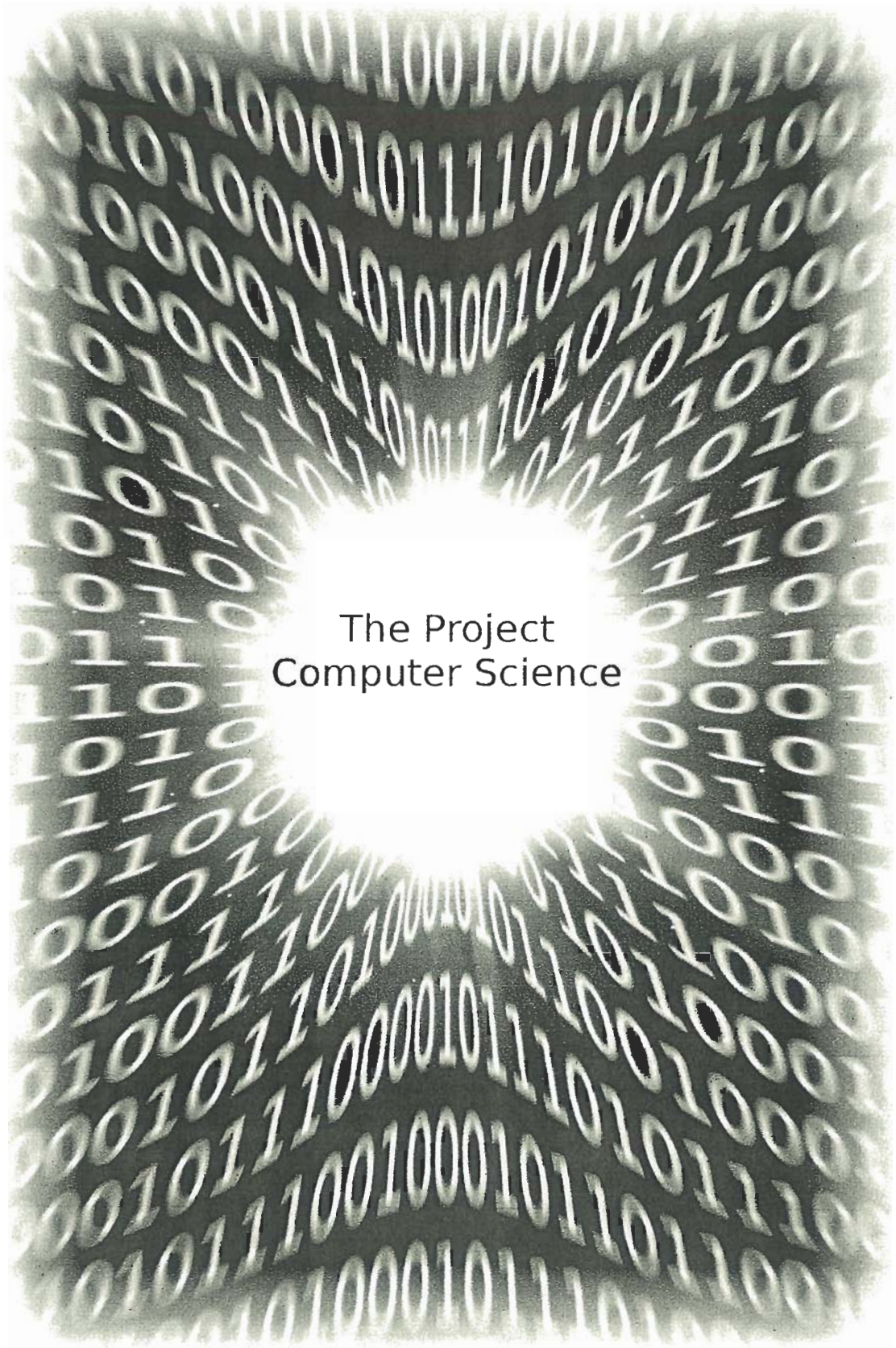
The Project
Computer Science

Project Proposal form

Learner Name		Learner number	
Centre Name		Centre Number	
Teacher Assessor		Date	19/01/10

Unit   The project - Level 2

Proposed project title   What are the viable career options after a degree in computer science?

Section One: Title, objective, responsibilities

My project title is "What are the viable career paths after a degree in computer science?"
To help with my research I am going to break down the original question into several separate questions which will help me identify different areas of research.
These questions will be:
What job exactly is computer science?
What A Levels could be applied to computer science?
How far can a computer science degree help me to enter employment in the future?
What is the content of a typical computer science degree and what careers could this lead to?
How has computer technology advanced over the past 10 years and how could this provide a career in the future?
What areas of computer science are local and transnational computing companies involved in?

The objective of this project is to look into areas of computer science that interest me and to provide a starting point with which I can create a career plan for the future. I aim to learn more about what computer science is and how I could enter employment in this area.
I will be working individually so I will be responsible for all aspects of the project.

Section Two: Reasons for choosing this project

I have chosen this project title because I am interested in taking a degree in computer science and I feel that this is an excellent opportunity for me to find out about where this could take me in the future. Completing this project will allow me to think in depth about possible career paths and what they could involve.
Computer science has been an interest of mine for some time and I find the rapid growth of computers in society fascinating. I hope to use this project as a chance to explore how new technology is being used in business and at home, how the computing industry is changing and where it is likely to go in the future. As somebody who wants to learn more about computers, I will be able to use this opportunity to look at the different areas of computer science the fundamentals of the subject. This will give me a starting point with which I could further investigate into the more complex aspects of computer science and areas of personal and occupational interest. This will allow me to make a more educated decision regarding what particular career path I may choose.
As I am going to be taking responsibility for my own learning, this project is also going to help improve my independent research skills. I intend on taking the Project Qualification Level 3 as an additional AS Level at college, so this will be a perfect chance to learn more about how to plan, research, analyse and publish a report on a particular topic. These skills are also necessary for further education such as university, as well as in employment.

Section Three: Activities and timescales	
Activity and details • Create a plan of action looking at how I am going to complete my project • Research information online and from books and carry out a survey within my class • Create my project and analyse my research to answer the original question. • Evaluate my work and look back at what I have learnt and what skills I have gained.	How long this will take 1 - 2 weeks 3 - 4 weeks 6 - 7 weeks 1 - 2 weeks
Milestone one: Completion of all research Target date (set by tutor-assessor): February 9th 2010 Milestone two Completion of presentation Target date (set by tutor-assessor): March 30th 2010	
Section Four: Resources	
The resources I will use will be: • A variety of websites and online documents and spreadsheets for my research. • Paper to create a questionnaire that I will hand out to my class and to print out my project. • A Computer to research and analyse information and to create my project.	
Comments and agreement from tutor-assessor	

Is the learner taking this project as part of the Diploma?   Yes / (No)

Is project derived from work which has been/will be submitted for another qualification?   Yes   / (No)

Which qualification (title and unit)?   Project Qualification Level 2
Comments (optional):

I confirm that the project is not work which has been or will be submitted for another qualification and is appropriate.

Agreed: V.Tissington   Date: 19/01/10

Comments and agreement from project proposal checker

Comments (optional):

I confirm that the project is appropriate.

Agreed: (name)   20|1||0   (date)

Project Activity Log

Learner Name   Learner number

Centre Name   Centre Number

Unit Name   The Project (Level 2)   Unit number   Level 2

Teacher Assessor

Proposed project title   What are the viable career options after a degree in computer science?

This form should be used to record the process of your project and be submitted as evidence with the final piece of work.
You may want to discuss:

- what you have done (eg, from one week to the next)
- if you are working in a group, what discussions you have had
- any changes that you have or will need to make to your plans
- what resources you have found or hope to find
- what problems you are encountering and how you are solving them
- what you are going to do next

Date	Comments
05/01/2010 - 19/01/2010	During this period, I decided on the title of my project and what I aimed to gain by doing it. I created a plan of action describing different areas of computer science that I wanted to investigate. This plan would also help me to think ahead and plan how I would structure my project into different questions. It would also aid me in my research as I would already know what to look into so that I could specifically search for the information that would be useful in answering my project question.
19/01/2010	I filled in the project proposal form to identify precisely why I had chosen the project title and what skills and information I hoped to gain from the project.
20/01/2010 - 09/02/2010	At this time, I carried out research into computer science and I collected data and information that would help me to answer the original question. I learnt more about what computer science is and how I can enter a career in this area.
16/02/2010	I carried out a survey into personal computer usage by asking people in my class to complete a survey. This would tell me about the influence of computer science in the real world. After collecting my results, I analysed the results by finding statistical information such as averages.
17/02/2010 - 30/03/2010	In this period, I wrote up my project, looking at all of the research that I had done, analysing it and using it to answer my initial question. I kept to the timescale and had finished all of the main discussion stage of the project by the target date.
31/03/2010	On this day, I summarised what I had previously written into a short conclusion, explaining what I had learnt and how it had affected me personally.

What are the viable career paths after a degree in computer science?

Introduction

Over the past few decades, there has been massive growth and change in the computing industry. Computers have changed our lives in everything from communications to entertainment, from business to shopping. By doing this project, I hope to gain an understanding of how computers are affecting the world and what careers paths I could follow in the future.

Why am I doing this project?

I chose this particular project because I intend on taking a computer science degree at university. However I would like to research further into what jobs I could do afterwards and which would be the most appropriate for me I hope to look at the range of careers that are available and how these have changed recently. In doing this, I also want to find out more about what exactly computer science is and what kind of course content I could study at university.

Over the past few years, I have had a growing interest in how computers work and the way that they are able to solve complex problems. I find it fascinating how quickly computers have evolved to play a vital role in the infrastructure of society and I hope to find out more about recent developments in computing and what the future holds for computers. I would like to learn more about the impact of this rapid rise in the use of computers and what new jobs it has created. To do this, I will have to look at the history of computing and how careers in this area have changed. ·

By completing this project, I also want to improve my independent learning skills which will be vital both during further education and in employment. I intend on taking the Extended Project Qualification Level 3 as an additional AS Level at college and I feel that this is the perfect opportunity to learn about how to create a project through better time management, essay writing, and organisation and planning skills.

Objectives

To find out more about what computer science is and what I would be studying if I were to take a degree in this subject.

To learn about career opportunities in the computer science industry.

To confirm whether or not I want to enter employment in computer science.

To find out how I can follow a particular career path in computing.

How do I intend on completing this project?

To complete this project, I am going to break down the original question into several smaller questions. This will allow me to concentrate on a single area at a time and it will help me in finding the answer to the question.

I have chosen the following relevant questions to break my project down into:

- What exactly is computer science?

- What A Levels could be applied to computer science?

- How far can a computer science degree help me to enter employment in the future?

- What is the content of a typical computer science degree and what careers could this lead to?

- How has computer technology advanced over the past 10 years and how could this provide a career in the future?

- What areas of computer science are local and transnational computing companies involved in?

What exactly is computer science?

There is often a lot of confusion surrounding the phrase "computer science". Many people hear the word "computer" and associate it with their own usage of computers: typically including email, web browsing and using basic office software. However, computer science covers the fundamental aspects about how computers work and what goes on inside a computer. It is the study of the maths and the science behind how a computer solves massive calculations instantly, how it can produce fully working operating systems featuring software programs, multitasking, and user interaction, and even how computers can be programmed to think and behave like humans.

Computer science can be broken down into several different subcategories, and I will briefly describe a few of these to gain more of an understanding of what exactly computer science is.

Algorithms

Algorithms are a vital part of computer science and they are necessary in almost all other aspects of the subject. An algorithm is simply a set of instructions that a computer uses to carry out a process in the most efficient way possible. This could be anything from finding all the prime numbers between two values to displaying a website in a web browser. An algorithm can either be written using a programming language, as code for a computer to execute, or it can be visually shown as a flow chart to show the different steps that it takes to solve a problem.

These steps typically include mathematical calculations, Boolean logic, reading input, displaying output, and executing processes.

Computer security

Computer security plays a massive role in society, both for individuals and for large organisations. Many of us rely on digital security when making financial transactions using a debit or credit card or making purchases online. We also send emails, texts, and call people on phones, again confident that our communications are private because of computer security. In addition to this, the infrastructure of society relies on secure systems such as traffic control systems and financial systems and a lot of secret information is stored digitally. All of these require high level security and computer security is the study of how this is done. In computer science, you learn about the maths behind how data is encrypted and how to analyse and create a secure computer system. Computer security also encompasses learning about computer viruses and worms and understanding how they work and how to prevent them.

Artificial Intelligence and Robotics

We've all heard about Artificial Intelligence in the popular media such as the recent Hollywood films: I-Robot, Terminator, and the Matrix. In these films, AI is presented as a threat to humanity, but how far has computing technology evolved and what is the reality behind artificial intelligence? Artificial Intelligence is a subject that links in with both maths and psychology, as studying the human mind can help to replicate the level of intelligence in a computer.

According to Moore's Law, computer processing power will double every 2 years. This has proven true over the past 40 years of computer and is shown in the exponential rate at which computers have become more powerful. Modern pocket sized mobile phones have processors faster than desktop computers built 10 years ago, which, in turn, are faster than room-sized mainframes built 30 years ago. This has a profound impact on artificial intelligence and means that computers are able to process information faster, make calculations faster, and ultimately make more intelligent decisions.

We've already seen computers beat world champions at chess, and AI is seen in many games such as Real Time Strategy (RTS), puzzle, and First Person Shooters (FPS) where the computer acts as an opponent that is able to think and make decisions.

Artificial Intelligence can also be seen in a wide variety of other areas, in particular, the robots used in industry and manufacturing. While these robots are only carrying out repetitive and menial tasks, technology is moving up the job market in terms of skill level. As you can see, AI is a highly innovative subject in computer science and it is likely to grow rapidly within the next 50 years.
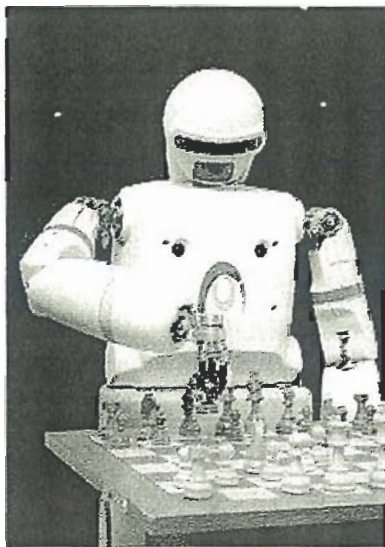
This is a robot called REEM and it is able to recognise objects, faces, and voice commands and navigate around a building independently. It ran on a standard Intel Pentium processor, often found in personal computers.
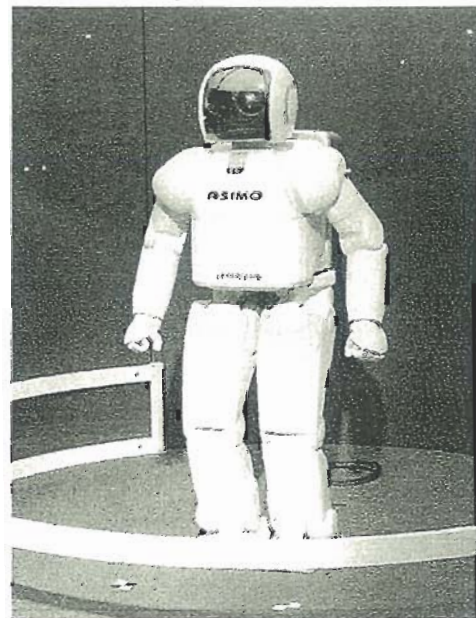
This robot is called ASIMO and it was developed by Honda. It is able to both walk and run, and it can also recognise faces, gestures, objects, and sounds and react to its environment.

Computer Architecture

Computer architecture is a sub-category of computer science that concentrates on the hardware behind a computer and how it works. For example, it includes the study of how a processor works and how it is able to multitask and interact with the user. It is heavily linked in with subjects such as electronics and physics as circuits are an important aspect of computer architecture, as well as maths mathematical logic is required for working with digital information.

Software Engineering

Software engineering is a major part of computer science and it involves the design, programming, and maintenance of software. This software could be Windows, Microsoft Word, Adobe Reader, the software that controls a plane's flight, or any other program. Programming links in with many other areas of computer science and it is undoubtedly a necessary skill to have when taking a computer science degree.

Discrete Mathematics

Discrete mathematics is an area of maths that features heavily in theoretical computer science. In most A Level maths courses, you are able to pick some optional modules based on discrete maths, so as a prospective computer science student, I should certainly try and pick these modules.

This subject is the study of integers and many aspects of it have practical applications in computer science. For example, it encompasses mathematical logic which can be used in algorithms and software development to solve problems, as well as in computer architecture and the hardware of computers. Another example is number theory, which is commonly applied to cryptography. In many ways discrete maths overlaps with other areas of computer science and some computer science departments such as that of Warwick University even teach it as a separate degree.

Even though I have listed only the main aspects of computer science, there is evidently a wide range of topics that I could explore. This could allow me to look at the career paths that are available to me and possibly to specialise in a particular area of both personal and occupational interest.

I have seen that computer science overlaps with many other subject areas, in particular, maths, but science and psychology can also be applied to different areas of computing.

What A Levels could be applied to computer science?

A Levels are the standard form of further education in the UK, focusing on academic studies and as I intend on doing A levels in the near future, I should research into how different subjects can be applied to a computer science degree and which A levels are required and recommended to take computer science as a degree.

Obviously, a computing or ICT A Level would be very useful, as it shows an interest in computers and how they work. However, computer science is far more complex than A Level and most universities do not consider ICT as a requirement.

I have already seen how maths is used throughout computer science and it is obvious that maths and further maths A levels would be extremely useful. In particular, the decision maths modules are based on discrete maths and can be applied to many areas of computing.

Science related A levels are also considered useful, in particular, physics and chemistry as computing is a very scientific course and many aspects of science can, like maths, be used in computer science.

Engineering subjects such as electronics could also be considered useful, particularly if the student is concentrating on the hardware aspects of the subject such as robotics and computer hardware engineering.

Source 13 is a list of some A Level subjects that the different Cambridge colleges consider essential, preferred, and useful. While Cambridge entry requirements will be stricter than most other universities, it is a good way to find the A Level subjects that are useful to computer science. In all colleges, maths is a requirement, and further maths is preferred, and in most colleges, physics is considered useful or preferred. Chemistry and electronics are also seen as useful by some colleges.

The A Level options that I have chosen are Maths, Further Maths, Physics, and ICT as I both enjoy these subjects and think that they will be helpful in successfully applying to universities for a computer science degree.

How far can a computer science degree help me to enter employment in the future?

To answer my initial question of what the viable career paths are after a degree in computer science, one of the most appropriate things to do is to look at how far a degree in this subject can help me to find a job.

Current Employment Rates of Computer Science Graduates
I am going to use data regarding the employment of graduates from the Higher Education Statistics Agency (HESA) because this is a reliable source that I can trust to have accurate data about graduates. The data I will be using can be found in sources 1.1 – 1.5.
I will be using data over a range of years because this will allow me to look at the average employment rate of computer science graduates and to identify the long term trends. Using this data, I have created a graph to show the percentage of computer science graduates who entered employment. This graph shows "the number of graduates who say they are working or studying (or both) as a percentage of all those who are working, studying or seeking work".

Graduate Employment Rates
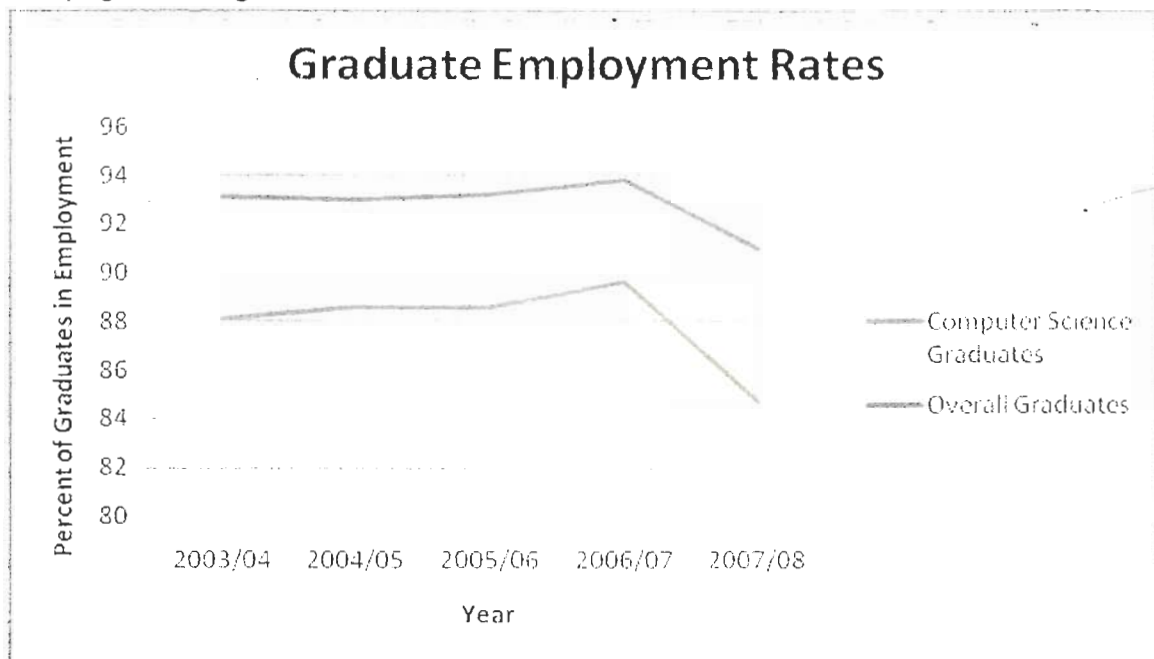
The graph shows that the employment rate of all graduates, including computer science students has been increasing slowly until the year of 2007 / 08. This is probably because of the global recession that would make it difficult to find work after graduating.
It also tells me that the employment rate of computer science graduates is approximately 5% below the average employment rate of other graduates. This could mean that computer science careers are very competitive to get into, leading to many people not being able to enter employment. However, it could also indicate that a high proportion of computer science graduates are choosing to continue in education and take a postgraduate degree. This could be because computer science is a complex subject that requires a lot of time

spent in education to enter a career in, but it also supports the view that computer science is a competitive industry as people may feel that they need a postgraduate degree to enter a career in this area. Either way, computer science careers are evidently difficult to enter at the moment, but what about the future?

Projected Growth of the Computer Science Industry

To look at the projected growth of computer science careers, I am going to use data from the Bureau of Labour Statistics (BLS) which is a US government agency that collects and analyses statistics regarding job sectors. This makes it a reliable source to use as it is government information that covers the whole of America. I feel that there will be a similar growth seen here as well because of the increased use of computers in industry, business, and home environments.

Source 2.1 is a list of the jobs that are expected to grow the most in demand between 2008 and 2018. Computer related careers accounted for 3 of the top 30 fastest growing job sectors, and most people entering these careers did so with a Bachelor's, or undergraduate, degree.

Source 2.2 is a list of all the job sectors that there is data for. This tells me how far different jobs are expected to grow between 2008 and 2018. Of the job sectors, professional occupations are expected to grow the most, with a 16.83% growth over the ten years. Of these, computer and mathematical science occupations is the group with the largest projected growth of 22.27%. In other words, computer related careers are the fastest growing occupation of the fastest growing job sector. This means that, while computer science jobs may be competitive now, the expected growth will lead to higher demand and means that it is a good career path to follow.
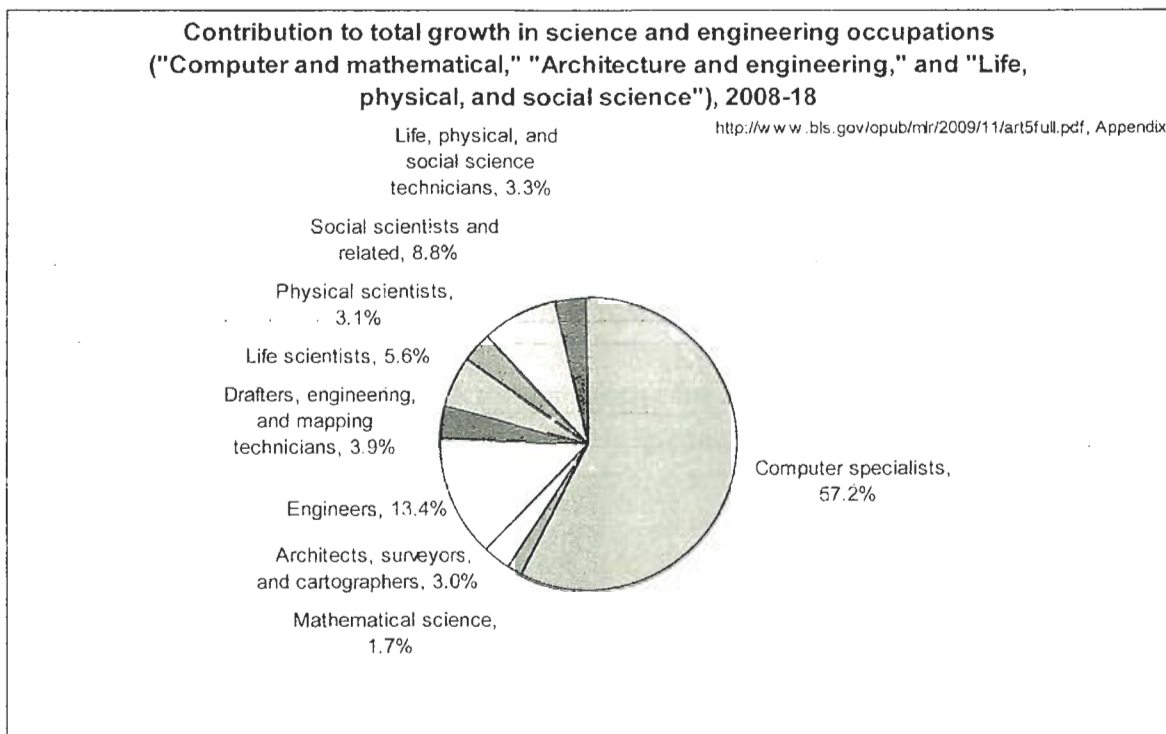
The table below shows the projected growth of all the computer specialist occupations.

Career	Number employed		Change 2008 - 2018	
	2008	2018	Number	Percent
Computer and information scientists, research	28900	35900	7000	24.18
Computer programmers	426700	414400	-12300	-2.87
Computer software engineers	909600	1204800	295200	32.46
Computer software engineers, applications	*514800*	*689900*	*175100*	*34.01*
Computer software engineers, systems software	*394800*	*515000*	*120200*	*30.44*
Computer support specialists	565700	643700	78000	13.80
Computer systems analysts	532200	640300	108100	20.31
Database administrators	120400	144700	24400	20.26
Network and computer systems administrators	339500	418400	78900	23.23
Network systems and data communications analysts	292000	447800	155800	53.36
All other computer specialists	209300	236800	27500	13.14

The careers here that are particularly linked to computer science include computer and information scientists and researchers, computer programmers, and computer software engineers. Computer programming is the only occupation that is expected to shrink, although this does link in heavily with software engineering, which is expected to grow by a massive 32.46% over the decade.

Computer and information scientist and researcher careers arealso projected to grow by 24.18%. Again, this quite a high number and shows that the demand for people with computer science degrees is growing rapidly.

Source 3 is an online article that is commenting on the BLS job growth report from a computing oriented view. It contains the following graph which compares the proportion of growth that of each of the science related subjects accounts for.

Contribution to total growth in science and engineering occupations ("Computer and mathematical," "Architecture and engineering," and "Life, physical, and social science"), 2008-18

http://www.bls.gov/opub/mlr/2009/11/art5full.pdf, Appendix

Life, physical, and social science technicians, 3.3%

Social scientists and related, 8.8%

Physical scientists, 3.1%

Life scientists, 5.6%

Drafters, engineering, and mapping technicians, 3.9%

Engineers, 13.4%

Architects, surveyors, and cartographers, 3.0%

Mathematical science, 1.7%

Computer specialists, 57.2%

It says that "Among all occupations in all fields of science and engineering, computer science occupations are projected to account for nearly 60% of all job growth between now and 2018." This is excellent news for me, as it shows that a computer science degree will certainly prove to be valuable in the future.

With regards to the starting salary of graduates, source 4.1 ranked computer science as 18th out of 57 subjects with an average salary of £21714 compared with the overall average of £20763. Again, this is good for me as a prospective computer science student as it shows that I could expect a higher than average salary.

What is the content of a typical computer science degree and what careers could this lead to?

In this section of my project, I hope to gain more of an understanding of what type of jobs are available in the computer science industry, and what working conditions I can expect. I will also look into the content of a typical computer science degree to see how this could lead to a one of these careers.

The University Courses

I am going to look at the course content for 5 of the top universities in computer science to see what I could expect to be studying during a degree and how I could specialise in a particular area of the subject.

To select 5 of the top universities, I am going to look at some subject specific university league tables from sources 4.2, 5, and 6. This will allow me to look at the course content for some of the best universities to study computer science at and see how this could link in with a career in the future.

The table below shows the ranking that each league table has for the 5 universities that I selected.

University	Complete University Guide	Guardian	Times	Average
Cambridge	1	3	1	2.7
Oxford	2	1	2	2.7
Imperial College London	3	7	3	4.3
Southampton	9	4	4	5.7
Warwick	11	5	9	8.3

The information that I collected about the computer science course at each university can be found in Appendix 1.

I found that universities allow a variety of subjects that can be combined with computer science to offer a joint honours degree. In particular, most universities said that it could be combined with maths because of the way that the two subjects are interlinked. In addition to this, Cambridge offers combinations with psychology, physics, chemistry, geology, physiology, and evolution and behaviour and Warwick offers computer science with philosophy, as well as letting students select modules from a wide range of other subjects. In the first year of the course, most universities teach students the core principles of computer science, with many of the modules being compulsory. In the second and third years, students are then allowed to specialise into their prefered topics, such as robotics, computer architecture, or theoretical computer science and most courses include a group or individual project. If I were to continue on and do a Masters degree at postgraduate level, then I would have much more freedom to choose the course content I wanted to study. For example, I would be able to specialise even further, in preparation for a particular career path through courses such as Computation in Biology and Medicine, Software Engineering, or Artificial Intelligence.

Careers in Computer Science

Now that I've looked at what a computer science degree is, I want to know more about how I could apply the skills learnt at university in a job. This will help me to answer my intial question of "What are the viable career paths after a degree in computer science?".

Computer Science Researcher

Computer science and information researchers are people who are creating cutting edge technology and researching into new methods of creating and using computers. All of the technology that you use was initially designed by a computer science researcher, whether it's the invention of the microchip, the computer itself, the Internet, or the mobile phone. Computer science researchers have to be highly innovative and creative, and be able to apply knowledge from other fields to computers. Recent examples could include how chemists have been able to use nanotechnology, or how physicists have been able to use quantum mechanics to create ever faster and smaller computers.

Because of the complexity involved, this is one of the highest paid careers in the computing industry, and I would almost definitely have to complete a postgraduate degree if I were to enter such a job.

Computer Hardware Engineer and Roboticist

A compute hardware engineer is someone who creates computer components such as microprocessors, computer architectures, and computer chips. It is very similar to electrical engineering, but it focuses on computers. These components could be used in all sorts of electrical items, from regular electronics such as mobile phones, computers, and digital watches, to specialised hardware that could be used in robotics or science experiments. Roboticists simply build robots from these components. Robots are frequently used in industry for their speed and efficiency in manufacturing and innovative uses for robots can be seen in recent examples such as the unmanned aircraft being deployed in the Afghan war. Roboticists need to be good engineers and also have a sound knowledge of artificial intelligence to make robots able to react to their environment. Source 7.4 says that salaries for a computer hardware engineer vary from £18000 to £50000, meaning that introductory salaries are some of the lowest in the computing industry.

Software Engineer

A software engineer is someone who designs, creates, develops, tests, and maintains software for a computer. This career is often incorporated into many other careers in computing, as programming is a necessary skill for almost all other aspects of computer science. Software engineers can be employed in a wide range of industries such as finance, engineering, and public organisations, to help solve complex problems and analyse and store information through the use of computers.

The software that is created could be for almost any purpose, but there are 2 main types. The first type is software that is written for embbeded computers such as those in aeroplanes, digital watches, or calculators. It interfaces directly with the hardware that it runs on and it is often created for a specific task. Many of us rely on this type of software everyday, whether it's the software that controls when to run the alarm that we use to wake us up, or the software that controls the electronic safety features on a car to maintain control for the driver.

The second main type of software is the programs that runs on your computer. This could be software that most people use for daily tasks such as checking checking email or browsing the Internet in programs such as Internet Explorer or creating documents in an office suite. It could also be created for a specific purpose, perhaps for a bank to allow them to check financial transactions, or a business to control a database.

They often work in an office environment, and in small teams to produce the software and they are expected to be capable programmers and know a lot about computer science and how computers and software work.

Source 7.1 says that salaries for a software engineer could range from £25000 to £65000 depending on the experience and skill of the programmer.

This graph is from source 8 and looks at the salaries of software engineers.
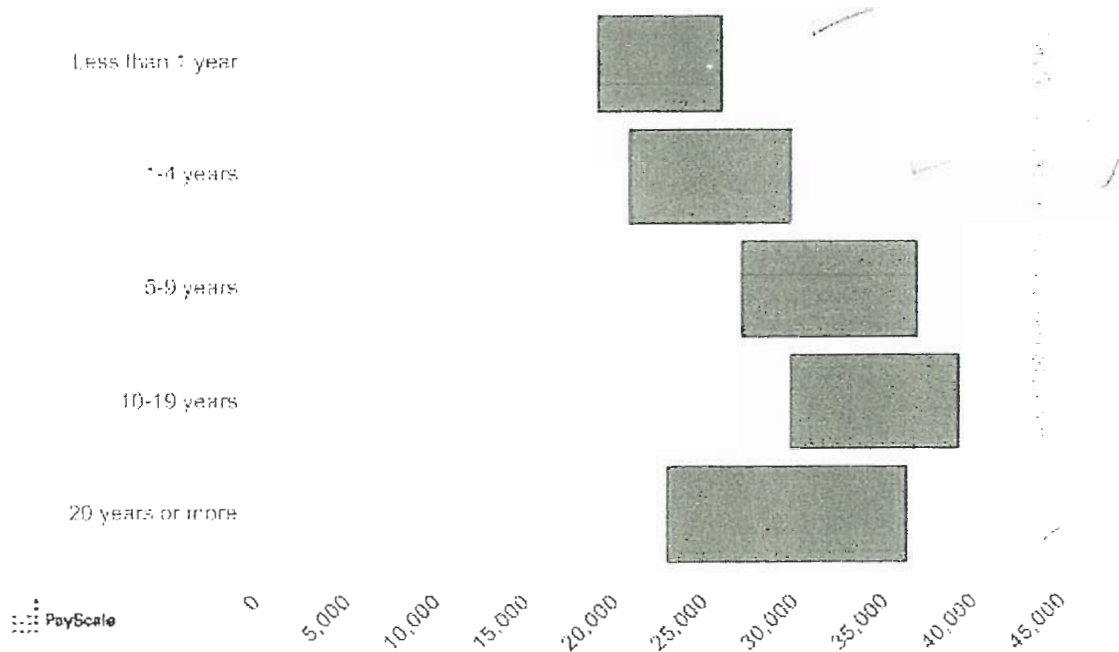
Source 9 is an independent look at jobs in America, and it ranked software engineering as the single best job based on salary and career prospects. This combined with the projected growth of software engineering that I looked at earlier, would make it an excellent choice of career.

Computer Games Programmer

The computer games industry is a large part of the UK media industry and with the growth of personal computing and games consoles in recent years, there has been a massive growth in the demand for people who can program computer games. A computer games programmer is a specialised form of a software engineer, who focuses on creating the software of the game. They often work as a team, alongside artists and market specialists to create the game and their job is to make the game work and to make it interactive. They often need to be knowledgeable in physics to create realistic effects in the game, as well as artificial intelligence to allow the game to interact with the user and to make intelligent opponents.

According to source 7.2, salaries range from £19000 to £55000 depending on the experience of the individual.

Systems Analyst

While not strictly related to computer science, a systems analyst is someone who analyses the computer systems used by a business or organisation and makes improvements, perhaps developing new software to use. They are required in almost all industries as computer systems play a vital role in creating an effective and reliable business model. As such, most systems analysts work as contractors, and only temporarily work for a business to analyse analyse their computer system.

Systems analysts are expected to have a good knowledge of both how businesses work as well as the IT technology.

According to source 7.3, salaries may range from £25000 to £50000 a year.

Source 9 ranked the career of IT analyst as the 7th best job in America based on salary and prospects.

Cryptographer

I have already seen how cryptography and computer security are vital in society and how we rely on data such as financial and personal information to be kept secure and encrypted. The government and the military in particular require high level encryption to prevent sensitive information from being stolen. In addition to this, computer systems such as networks, or air traffic control systems also need to kept secure. With more and more information being stored digitally, there is a greater demand for people who can make sure that that data is safe and taking into account the rapid growth in the power of computers, both encryption and hacking methods are in a race to become more effective than the other.

Cryptographers are people who apply the principles of discrete maths and computer science to encrypt data and keep it secure. Cryptanalysers apply the same methods to try and obtain encrypted information.

If I were to enter a career in cryptography, then I think that it would be most appropriate to take a joint honours degree in maths and computer science.

Computational Scientist

Computational science concentrates on the practical applications of computing in science. Computers have the massive advantage of being able to make millions of calculations within seconds and with computers becoming more powerful, they are making more and more significant contributions to science. Computers have been used to help with many major breakthroughs such as the sequencing of the human genome, creating models to help make climate and weather predictions, creating vaccines for diseases, and proving scientific theories such as those relating to quantum mechanics that would otherwise be difficult to prove. In addition to this, science often involves a lot of statistical analysis and the processing of masses of data which is why computers are used.

If I wanted to become a computational scientist, then I would have to take a joint degree in a science subject such as physics or chemistry with computer science.

How has computer technology advanced over the past 10 years and how could this provide a career in the future?

In this section, I aim to look back at the past decade to see how computers have evolved and what role they play in society today. Computer science is such a rapidly evolving subject that it is virtually impossible to predict what new technology will be invented in the future. However, I will look at current and highly innovative technology to try and guess where the computing industry is heading and what new careers could be available in the future.

A brief history of computer science

Before computers were even invented, the subject of computer science was a branch of maths regarding how to automate calculations using a machine. In 1623 the first mechanical calculator was invented by Wilhelm Schickard and throughout the 17th to 19th century, mechanical calculators were designed that used gears to carry out mathematical operations. Charles Babbage was a prominent 19th century English mathematician who is widely credited with the concept of a programmable computer and his designs show an extremely complex device that would have functioned correctly if it had been built. He also designed the room sized difference engine which could make calculations to within 30 digits of accuracy.

Throughout the early 1900's, the advancement and use of electronic computers began to grow and by 1943 the Colossus computer was built as the first "all electronic calculating device" and it succeeded in breaking the encrypted German messages during World War 2. It was effectively the first functional computer and it was vital to the war effort as it helped to track enemy movement and communications.
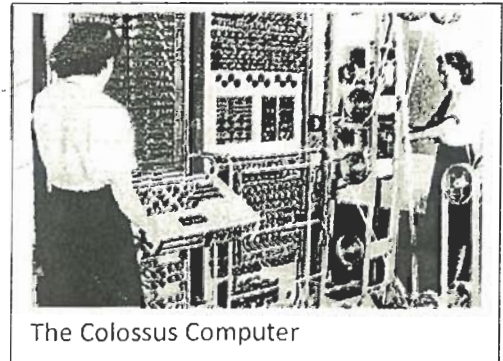
The Colossus Computer

During the 1950's and 60's, new computer techniques such as programming languages and compilers were invented which helped to boost the growing market for computers in business. Computers aided important scientific events such as the space race and the moon landing, and the idea of the modern desktop was conceived with inventions such as the mouse.
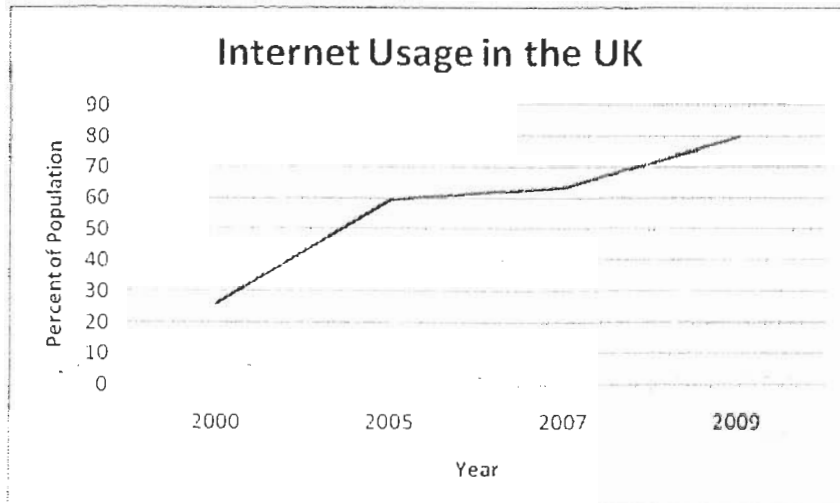
Since then, computers have become smaller, faster, and have become vital to the infrastructure of society. Computers have become mainstream and with the creation of Personal Computers and the Internet, normal people have begun using computers in their everyday life. Instead of the traditional command line, computers now use Graphical User Interfaces, or GUI's to make them easier to use and interact with. A GUI is what makes up the interface between you and the computer in a graphical way, such as buttons, text, the cursor, images, and the programs that you run.

Individuals, governments, and businesses have all been affected by the technological revolution that we are in.

How computers have advanced over the past 10 years

Personal computer usage has grown rapidly over the past decade, with computers becoming cheaper and more readily available to home users. Source 10 says that in 2008, 47 million people in the UK owned a PC, making it approximately 75 – 80% of the population. This is one of the most important technological changes of the past 10 years, as normal people have begun using computers at home.

Source 11 shows the percent of the UK with Internet access over the past decade and I have used this data to create a graph which shows the increase in the number of Internet users.

Internet Usage in the UK

A line graph titled "Internet Usage in the UK" with the y-axis labelled "Percent of Population" ranging from 0 to 90, and the x-axis labelled "Year" showing 2000, 2005, 2007, and 2009. The line rises from about 25% in 2000 to about 80% in 2009.

With the Internet becoming faster and more websites being added to it, the purpose of the world wide web is changing. One example is cloud computing where new technology such as web applications have allowed websites to be more interactive and it has allowed users to run programs from within a web browser. This could include online games, photo editors, and even office suites such as Google Docs.

The Internet has also changed the way that businesses work as well. It has become standard for businesses to have a corporate website to inform users and promote their products or services. A new industry of e-commerce has seen an explosion in demand with sites like Amazon.com becoming multibillion pound businesses and more traditional high street shops using the web to sell their products online.

Computers have also affected the way that we communicate. The usage of mobile phones has also seen a massive increase over the past decade. Many modern pocket sized devices are able to function like a handheld laptop computer, running desktop software and with processors faster than desktops built 10 years ago. Source 12 is a list of countries and the number of mobile phones per person. The UK ranks 9th with 84.49 mobile phones per 100 people and some countries such as Taiwan and Luxembourg have more phones than people. Many people now own social networking and email accounts and digital communication is used because of its speed and efficiency.

Convergence devices have also grown in usage over the past decade. A convergence device is a device that can do the sam job that multiple devices would previously have been required to do. A perfect example is found in the mobile phone industry, where modern mobile phones often have dozens of extra features attached to them such as a digital

camera, GPS software, and a web browser. This has been enabled by the increase in the processing power of computers which has allowed them to perform more and more tasks and become more complex.

Entertainment is another area where computers have advanced significantly in the past decade. Motion sensitive gaming has revolutionised how games are played because of major computing advancements such as the Nintendo Wii and Microsoft's upcoming Project Natal which recognises gestures and voice commands without a control. 3D Television is another brand new technology that has recently become popular with the release of the Hollywood film Avatar in 3D. Many major television manufacturers including Toshiba, Samsung, Sony, Panasonic, and LG Electronics all plan on introducing commercially available 3D TV's within the next year.
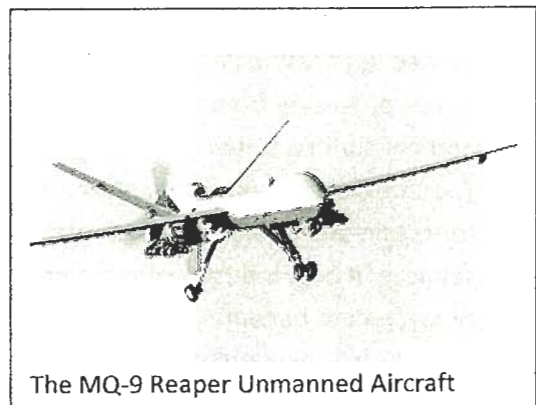
To see how far computers are used in society today by a typical person of my age, I am going to carry out a survey where I will ask 20 people in my class to fill in a questionnaire regarding computer usage.

The results from my survey can be seen in Appendix 2. They show that 100% of people asked had a mobile phone, games console, internet access, and an email account and that 95% of people had a social networking account. This means that people are evidently using computers in their daily life for entertainment, communication, and other reasons.

I also asked about the number of computers and the number of people in each household and I found an average of 3.2 computers and 3.9 people per household, meaning that there is 1 computer for approximately every 1.2 people.

But it's not just individuals and households that have benefitted from the advancements in computer technology.

Over the past 10 years, the military has used computer technology to build unmanned aircraft such as the MQ-9 Reaper which is used in Afghanistan to carry out missions without endangering a pilot. Another recent development in weapons technology has allowed the company Boeing to construct a computerised infrared laser system that can track and shoot down missiles or

The MQ-9 Reaper Unmanned Aircraft

aircraft. While this is only in testing at the moment, it still indicates a significant increase in the use of computers in the military over the past decade.

To conclude, we appear to be in the middle of a technological revolution, primarily aimed at the consumer. In particular, new computer technologies seem to be focused on entertainment and communication, allowing users to connect with each other, often via the Internet. Personal computers have changed the way that society works and it is remarkable to look at how quickly technology is evolving.

What areas of computer science are local and transnational computing companies involved in?

To answer my question of what careers paths are avaliable after a computer science degree, I will look at both local and transnational companies that are involved in computing.

Transnational Companies

Company	Areas of computing	Products	Key facts
Microsoft	Software and hardware engineering.	Windows operating system, Microsoft Office, Internet Explorer web browser, Bing search engine, Zune Mp3 Player, X-Box games console.	Released first version of Windows in 1985. Has a 91% market share in the personal computer operating system market.
Intel	Computer hardware manufacturing and research.	Computer processors, motherboards, graphics cards, RAM.	Founded in 1968. It has a market share of 77.3% in the processor industry.
Google	Software engineering, cloud computing, and research.	Google search, G-Mail, Google Maps, Android mobile operating system, Chrome browser and operating system.	It has an 85.7% market share in search. Many products are free, funded by advertising.
Nokia	Mobile phone manufacturing, software engineering	Nokia phones, smartphones and netbooks, and mobile operating systems.	It is the world's largest mobile phone manufacturer with a market share of 39%.
Apple	Software and hardware engineering.	iPhone, iPod, iTunes, Mac computers and operating system.	It was set up in 1976.

There is undoubtedly a large industry in computer science, including many transnational companies that are involved in a wide range of subject areas within computer science. The companies that I have looked at here create products aimed at the average consumer such as mobile phones and software for personal computers.

There are also some local companies that are involved in computer science. One example could be ASD Solutions which is a software engineering company that is based in Derby city centre and creates software and web technology solutions for clients. Quinki is another company that is based in Derby, and it is currently designing a new method of creating faster computer processors. It combines the careers of hardware and software engineers, as well as computer science researchers. Until 2006, Core Design was a games development company based in Derby that created the popular Tomb Raider series of games.

Review

Conclusion

Now that I have completed my project, I can conclude that I have learnt a lot about computer science as a subject and how far a degree can help me to find a career in the future.

I have found out more about the main subject areas within computer science and how I could specialise in a particular topic or personal or occupational interest. While I have only brushed the surface of what computer science is, I now have a starting point with which I could further explore the subject.

I have found that, while computing related careers are currently very competitive to get into, there is a massive projected growth in the demand for these jobs. This means that it is likely that in the future, with computers playing a more and more important role in society, that a computer science degree will prove to be valuable. I also found that computer science graudates have an average starting salary of about £1000 higher than the average for other degrees.

The main body of my project was researching into the viable career paths after a degree in computer science. I looked at the course content for some of the top universities which has helped me to understand more about what I am likely to be studying during a degree, as well as what courses I can combine with computer science and how I can choose which areas of the subject I want to study most. I have learnt about the wide range of careers that I could enter, and what working conditions and salary to expect. I have also researched how these careers are applied by local and transnational companies to see how a computer science degree can, and has been, applied in the real world.

I have also found out more about the history of computing and how computers are used in society today. This has included the massive growth of personal computers and the internet and looking at convergence devices such as mobile phones. This has told me that computer science is a highly innovative and constantly changing subject that is leading many of the advances in technology and is affecting everyone in many ways.

How this has affected me

Carrying out this project and finding out about the importance of computing in society has only further cemented my interest in computer science and it has helped me to confirm that I have made the correct choice for a degree. By researching into what the course content is at some of the top universities, I am now able to make a more educated decision about what areas of computer science I may want to specialise in and how I could follow a particular career path. This will allow me to create a career plan as I now know what I want to do in the future and I can work out how I can get there.

To conclude, I am happy to have completed this project as I have gained a deeper understanding of what computer science is and I hope that I can use the knowledge and research I have obtained to further investigate into areas of interest.

Skills gained

Completing this project has helped to build up and improve many personal skills which will help me in the future, both in further education and university, as well as in employment. Having worked completely independently, I have improved upon my ability to concentrate on a task on my own. This has included having to manage my time and work to specific deadlines for handing in the project which has helped me to become more organised. This is an extremely important skill to have as this will help me to plan my work more effectively in the future.

Another skill I have improved on is my ability to independently research online and find the specific information that will be useful to me. With more and more information becoming available on the Internet, this is another useful skill to have.

Evaluation

I feel that I have met most of my targets as I have learnt more about computer science and I have found out about the different career paths that a degree could lead to. I have looked into the different subject areas of computing and this will help me to make choices about what I want to do in the future.

If I were to redo my project, then I could carry out a work experience placement at a local computing company. This would allow me to get a real life look into the world of work and see what kind of employment opportunities could be available to me in the future. It would also help me to learn about how computer science is applied in a working environment and it would give me an idea about the working conditions that I could expect.

I could also extend my project by comparing local university courses with some of the top universities as this would mean I could look for differences in the style and content of the course and I could make a more educated decision on what career path I may want to follow.

In addition to this, I may want to research more into brand new technology that will let me make predictions about where the computer science industry is heading. This could involve both looking at the new products of large computer companies, as well as the smaller and less well known new technologies.

Overall, I think that I have carried out a thorough investigation into computer science and I have completed all of my objectives. However, there are several ways that I could extend and improve what I have done.

Appendix 1

Cambridge

URL	http://www.cam.ac.uk/admissions/undergraduate/courses/compsci/
Requirements	A*AA, including Maths. Further Maths and a science are desireable
Degree	Bachelor of Arts (BA) in Computer Science
Combinations	Maths, Psychology, Physics, Chemistry, Geology, Physiology, Evolution and Behaviour
Year 1 Modules	Data abstraction, algorithm design, object oriented programming, operating systems, discrete mathematics, digital electronics, finite automata, software design, and professional practice.
Year 2 Modules	Computer design, digital communication, compiler construction, graphics, semantics, logic and proof, complexity, a group project, laboratory work, and programming assignments
Year 3 Modules	System modelling, advanced graphics, digital communication, specification and verification of hardware and software, artificial intelligence, projects, and a 12000 word dissertation.
Masters	MPhil in Advanced Computer Science.

Oxford

URL	http://www.ox.ac.uk/admissions/undergraduate_courses/courses/computer_science/computer_science.html
Requirements	AAA, including Maths. Further Maths and a science are desireable
Degree	Bachelor of Arts (BA) in Computer Science
Combinations	Maths
Year 1 Modules	Functional programming, design and analysis of algorithms, imperative programming, digital hardware, calculus and linear algebra, discrete mathematics, logic and proof, probability.
Year 2 Modules	Object oriented programming, concurrency, models of computation, computer architecture, computer graphics, compilers and programming languages, concurrent programming, advanced data structures and algorithms, formal programming design, networks and operating systems, numerical analysis.
Year 3 Modules	Computer security, machine learning, databases, logic of multi-agent information flow, intelligent systems, integer programming, computational complexity, project.
Year 4 (Masters) Modules	Computer animation, information retrieval, game semantics, computational linguistics, program analysis, theory of data and knowledge, computer aided formal verification, automata logic and games, software verification, database systems, randomised algorithms, probabalistic model checking, project.
Masters	MSc in Computer Science, MSc by Research in Computer Science, MSc in Mathematical Modelling and Scientific Computing.

Imperial College London

URL	http://www3.imperial.ac.uk/ugprospectus/facultiesanddepartments/computing/undergraduatecourses
Requirements	A*AA including A* in maths
Degree	Bachelor of Engineering (BEng) in Computing
Combinations	Maths
Year 1 Modules	Computer systems, databases, discrete maths, artificial intelligence, hardware, logic, object oriented programming, mathematical methods, professional issues, programming, reasoning about programs.
Year 2 Modules	C short course, compilers, complexity and computability, networks and communications, operating systems, software engineering - design, statistics, algorithms, computational techniques, computer architecture, concurrency, artificial intelligence.
Year 3 Modules	Databases, computer architecture, automated reasoning, decision analysis, distributed systems, graphics, introduction to bioinformatics, machine learning, organisations and management processes, robotics, simulation and modelling, software engineering.
Masters	MEng Computing, MEng Artificial Intelligence, MEng Computation in Biology and Medicine, MEng Games, Vision, and Interaction, MEng Software Engineering.

Southampton

URL	http://www.southampton.ac.uk/study/undergraduate/courses/2010/comp_sci_software_eng/bsc_computer_science.html
Requirements	AAA including maths
Degree	Bachelor of Science (BSc) in Computer Science or Bachelor of Engineering (BEng) in Software Engineering
Combinations	Maths
Typical Course Content	Practical programming, applications and systems, software engineering, distributed computing, computational systems, theory of computing, computers and networks, artificial intelligence, hypertext and web technologies, scripting languages.
Masters	MEng Computer Science, MEng Computer Science with Artificial Intelligence, MEng Computer Science with Distributed Systems and Networks, Computer Science with Image and Multimedia Systems, MEng Software Engineering.

Warwick

URL	http://www2.warwick.ac.uk/study/undergraduate/courses/depta2z/compsci/g400
Requirements	AAB including maths
Degree	Bachelor of Science (BSc) in Computer Science
Combinations	Philosophy
Year 1 Modules	Programming for computer scientists, design of information structures, computer organisation and architecture, mathematics for computer scientists, professional skills.
Year 2 Modules	Data structures and algorithms, automata and formal languages, software engineering principles, operating systems and computer networks, relational databases, formal specification and verification, further automata and formal languages, algorithm design.
Year 3 Modules	Complexity of algorithms, programming language design and semantics, compiler design, artificial intelligence, advanced topics in algorithms, history of computing, design of dependable systems, mobile robotics, theory of databases, computer graphics, neural computing, uses of computers in business and industry, efficient parallel algorithms.
Year 4 (Masters) Modules	Advanced specification methods, advanced compiler design, high performance computing, distributed multimedia systems, agent based systems, empirical modelling, future directions of computing, system lifecycle management.
Masters	MEng in Computer Science

Appendix 2

Computers in household	No. in household	Mobile Phone	Games Console	Internet Access	Social Networking	Email
3	3	/	/	/	/	/
2	4	/	/	/	/	/
3	4	/	/	/	/	/
3	2	/	/	/	/	/
4	4	/	/	/	/	/
4	4	/	/	/	/	/
6	4	/	/	/	/	/
9	7	/	/	/	/	/
2	2	/	/	/	/	/
4	3	/	/	/	/	/
3	4	/	/	/	/	/
4	4	/	/	/	/	/
1	4	/	/	/	/	/
1	2	/	/	/	/	/
1	4	/	/	/	/	/
3	5	/	/	/	/	/
3	6	/	/	/	/	/
3	5	/	/	/	/	/
3	4	/	/	/	/	/
2	3	/	/	/	x	/
64	78	Total				
3.2	3.9	Average				

Bibliography

This is a list of the sources that I have used to help me with my project.

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1.2	http://www.hesa.ac.uk/dox/performanceIndicators/0405/se1_0405.xls
1.3	http://www.hesa.ac.uk/dox/performanceIndicators/0506/se1_0506.xls
1.4	http://www.hesa.ac.uk/dox/performanceIndicators/0607/se1_0607.xls
1.5	http://www.hesa.ac.uk/dox/performanceIndicators/0708/se1_0708.xls
2	http://www.bls.gov
2.1	ftp://ftp.bls.gov/pub/special.requests/ep/ind-occ.matrix/ep_table_103.xls
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