
COMPUTER SCIENCE

BE A CREATOR, NOT JUST A CONSUMER

WHAT WILL I LEARN?

YOU WILL LEARN, IN-DEPTH, HOW COMPUTER SYSTEMS WORK. HARDWARE. SOFTWARE. PROCESSORS.

HOW TO BE A CREATOR, NOT JUST A CONSUMER OF TECHNOLOGY.

HOW TO SOLVE PROBLEMS (INSIDE AND OUTSIDE OF COMPUTING).

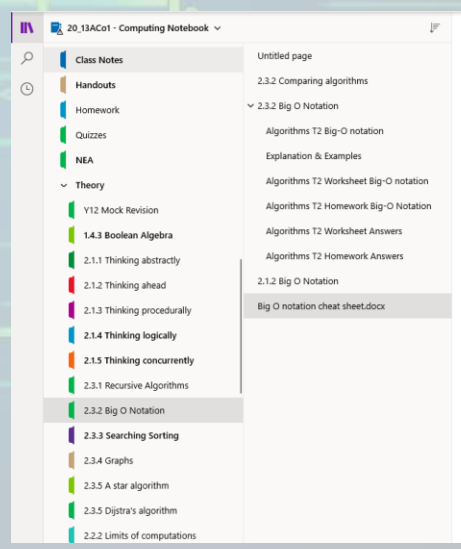
DATA TYPES, STRUCTURES AND ALGORITHMS

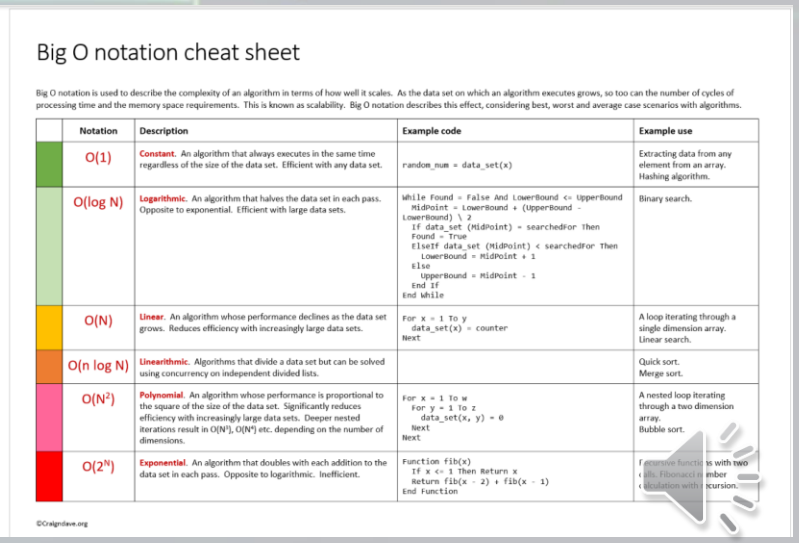
THE LEGAL, MORAL, CULTURAL AND ETHICAL ASPECTS OF COMPUTING.

Theoretical concepts

Content Overview	Assessment Overview	
• The characteristics of contemporary processors, input, output and storage devices • Software and software development • Exchanging data • Data types, data structures and algorithms • Legal, moral, cultural and ethical issues	Computer systems (01) 140 marks 2 hours and 30 minutes written paper (no calculators allowed)	40% of total A level

All notes are on-line using OneNote.





WHAT WILL I LEARN?

CREATE GAMES AND APPS

HOW TO BE A CREATOR, NOT JUST A CONSUMER OF TECHNOLOGY.

MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

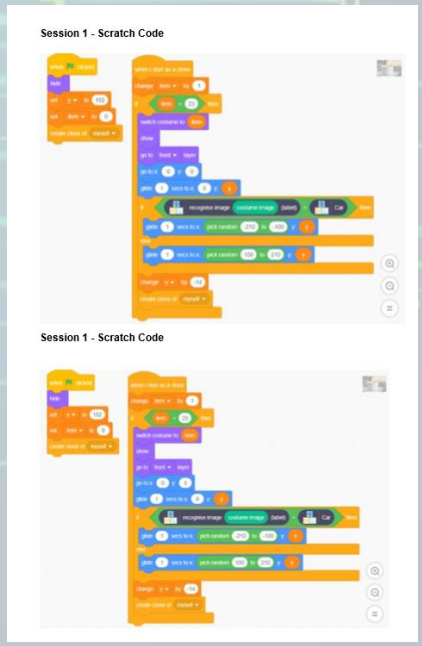
PRACTICAL PROGRAMMING.

DECOMPOSE AND SOLVE COMPLEX PROBLEMS

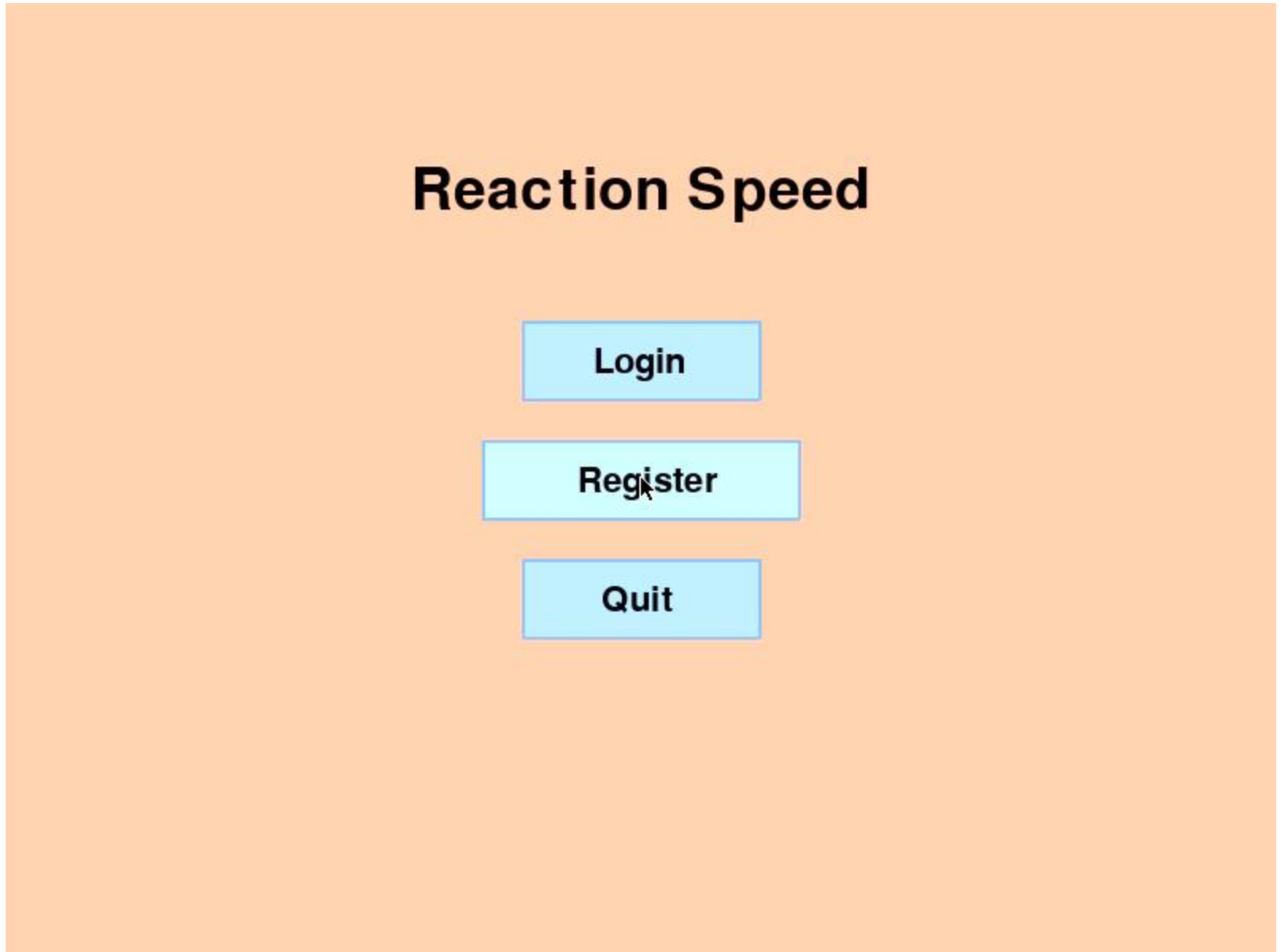
Practical aspects

• Elements of computational thinking • Problem solving and programming • Algorithms to solve problems and standard algorithms	Algorithms and programming (02*) 140 marks 2 hours and 30 minutes written paper (no calculators allowed)	40% of total A level

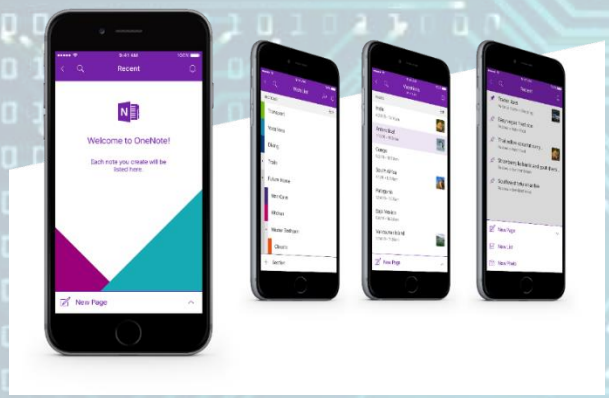
From Machine Learning in SCRATCH to Game Creation using PyGame.

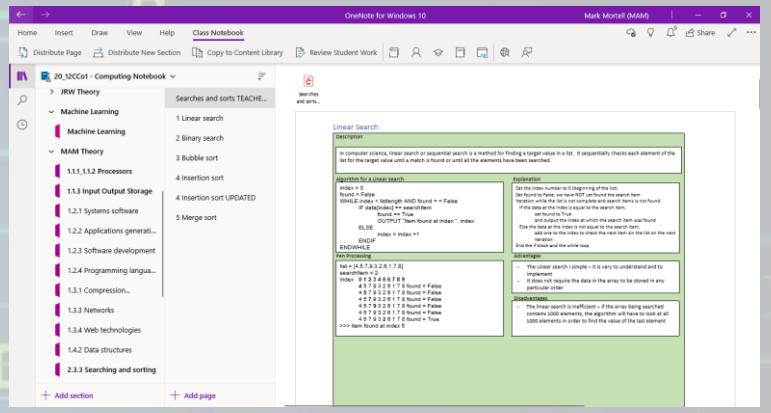



```
import pygame
import random

class Balloon(pygame.sprite.Sprite):

    def __init__(self,x,y,direction,balloonType):
        pygame.sprite.Sprite.__init__(self)

        self.Direction = direction
        self.BalloonType = balloonType

        if balloonType == 1:
            balloonImage = pygame.image.load("RedBalloon.png")
            self.Speed = 3
            self.Score = 5
        if balloonType == 2:
            balloonImage = pygame.image.load("YellowBalloon.png")
            self.Speed = 7
            self.Score = 15
        if balloonType == 3:
            balloonImage = pygame.image.load("GreenBalloon.png")
            self.Speed = 5
            self.Score = 10
        if balloonType == 4:
            balloonImage = pygame.image.load("BlueBalloon.png")
            self.Speed = 10
            self.Score = 0
```


Reaction Speed
Login
Register
Quit

HOW WILL I BE TAUGHT?





Classroom teaching is delivered using Microsoft Teams and OneNote.

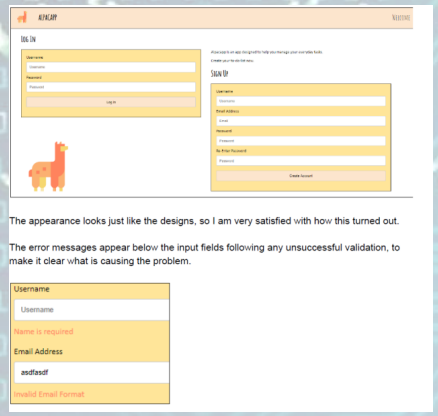
In addition you use access on-line learning platforms such as Udemy, Isaac Computer Science and Future Learn.

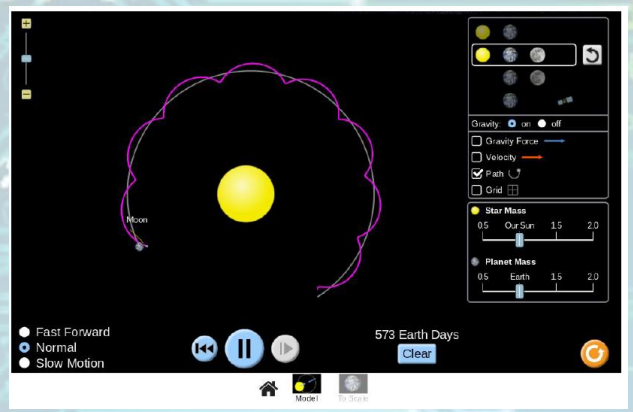
You will learn through competitions such as Cyber Discovery.

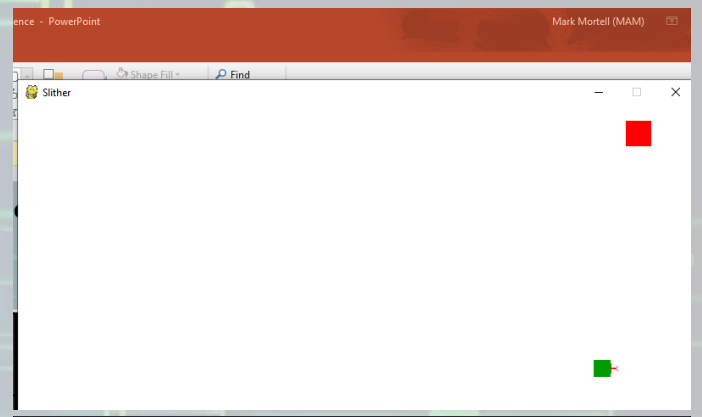
Everything you follow in class can be picked up online, at home, even out and about on your phone.

Here what do our students have to say

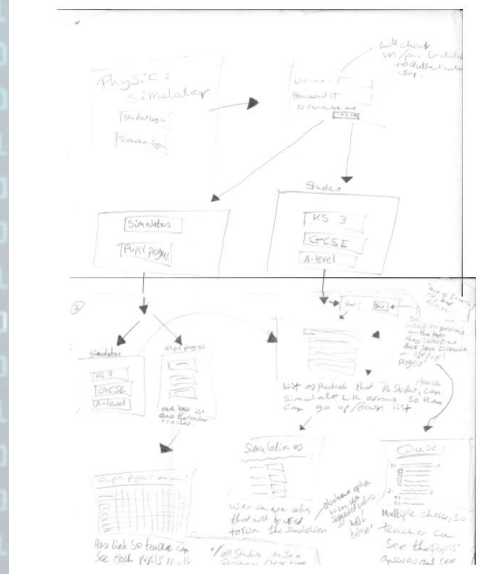
OUR STUDENTS' CREATIONS

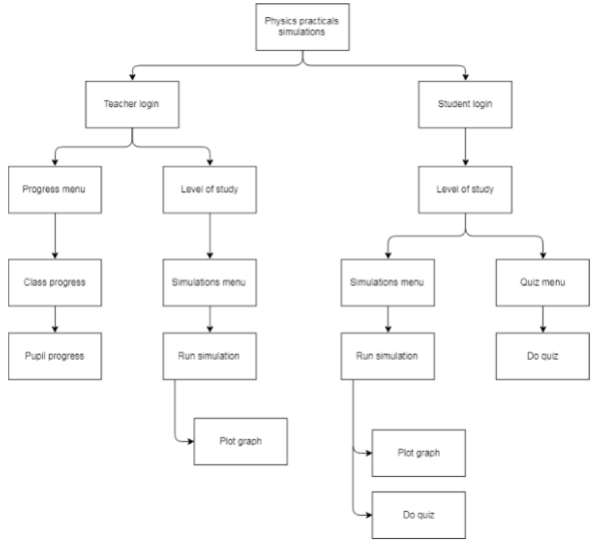




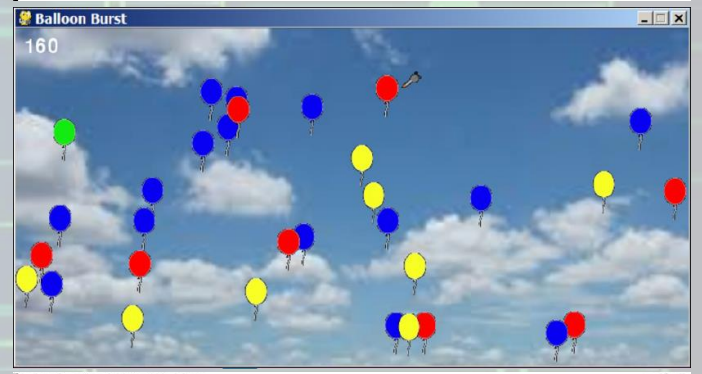


Fun things to create in class...






```
def setUpSimulationDisplay():
    gameDisplay.fill(BLACK)
    draw.line(gameDisplay, WHITE, (0,550), (800,550),2)
    #draw stickman
    draw.line(gameDisplay, WHITE, (730,550), (750,530),2)
    draw.line(gameDisplay, WHITE, (770,550), (750,530),2)
    draw.line(gameDisplay, WHITE, (750,500), (750,530),2)
    draw.line(gameDisplay, WHITE, (730,515), (770,515),2)
    draw.circle(gameDisplay, WHITE, (750,485), 15, 2)
    gameDisplay.blit(starterPistol,(720,480))
    #draw another stickman
    draw.line(gameDisplay, WHITE, (30,550), (50,530),2)
    draw.line(gameDisplay, WHITE, (70,550), (50,530),2)
    draw.line(gameDisplay, WHITE, (50,500), (50,530),2)
    draw.line(gameDisplay, WHITE, (30,515), (70,515),2)
    draw.circle(gameDisplay, WHITE, (50,485), 15, 2)
    drawDistanceArrow(100)


def KS3Simulation1():
    setUpSimulationDisplay()
    display.update()
    t.sleep(1)
    #smoke
    for i in range(1,21):
        setUpSimulationDisplay()
        draw.circle(gameDisplay,WHITE, (725,450-(i*5)), 3*i)
        display.update()
        t.sleep(0.3)
```




```
import pygame
import random

class Balloon(pygame.sprite.Sprite):

    def __init__(self,x,y,direction,balloonType):
        pygame.sprite.Sprite.__init__(self)

        self.Direction = direction
        self.BalloonType = balloonType

        if balloonType == 1:
            balloonImage = pygame.image.load("RedBalloon.png")
            self.Speed = 3
            self.Score = 5
        if balloonType == 2:
            balloonImage = pygame.image.load("YellowBalloon.png")
            self.Speed = 7
            self.Score = 15
        if balloonType == 3:
            balloonImage = pygame.image.load("GreenBalloon.png")
            self.Speed = 5
            self.Score = 10
        if balloonType == 4:
            balloonImage = pygame.image.load("BlueBalloon.png")
            self.Speed = 10
            self.Score = 0


        self.image = pygame.Surface([26,50])
        self.image.set_colorkey(black)
        self.image.blit(balloonImage,(0,0))
```

OUR STUDENTS' CREATIONS

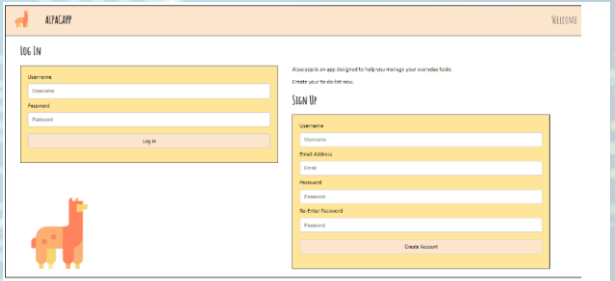
Web based projects

Login_page.php

```php
//when form submitted
if ($_SERVER["REQUEST_METHOD"] == "POST") {

    //login form submitted
    if(isset($_POST['login_submit'])) {
        //checks if the inputs have been entered, geneates error if not
        if (empty($_POST["username"])) {
            $username_error = "Enter your username";
        } else {
            $username = test_input($_POST["username"]);
            $username_submit = true;
        }
        if (empty($_POST["password"])) {
            $password_error = "Enter your password";
        } else {
            $password = test_input($_POST["password"]);
            $password_submit = true;
        }
```

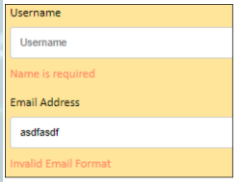
```php
//when inputs validated, access db
if($username_submit == true && $password_submit == true){
    //connect to db
    $dbh = mysql_connect("localhost", "root", "usbw");
    if (!$dbh){
        //handles possible error
        die('Sorry, could not connect: '.mysql_error());
    }
    mysql_select_db("alpacapp_db", $dbh);
    //checks username and password
    $sql = "SELECT * FROM Users WHERE Username='$username' AND Password='$password'";
    $result = mysql_query($sql, $dbh);
    if (mysql_num_rows($result) > 0) {
        //username and password correct
        $login_success = "Success";
    } else {
        $login_fail = "Username or password incorrect";
    }
}
```

In the user interface, we can see that by using the isset() comparison, the data from only one form at a time can be processed, ensuring that the login form and the create account form work independently.

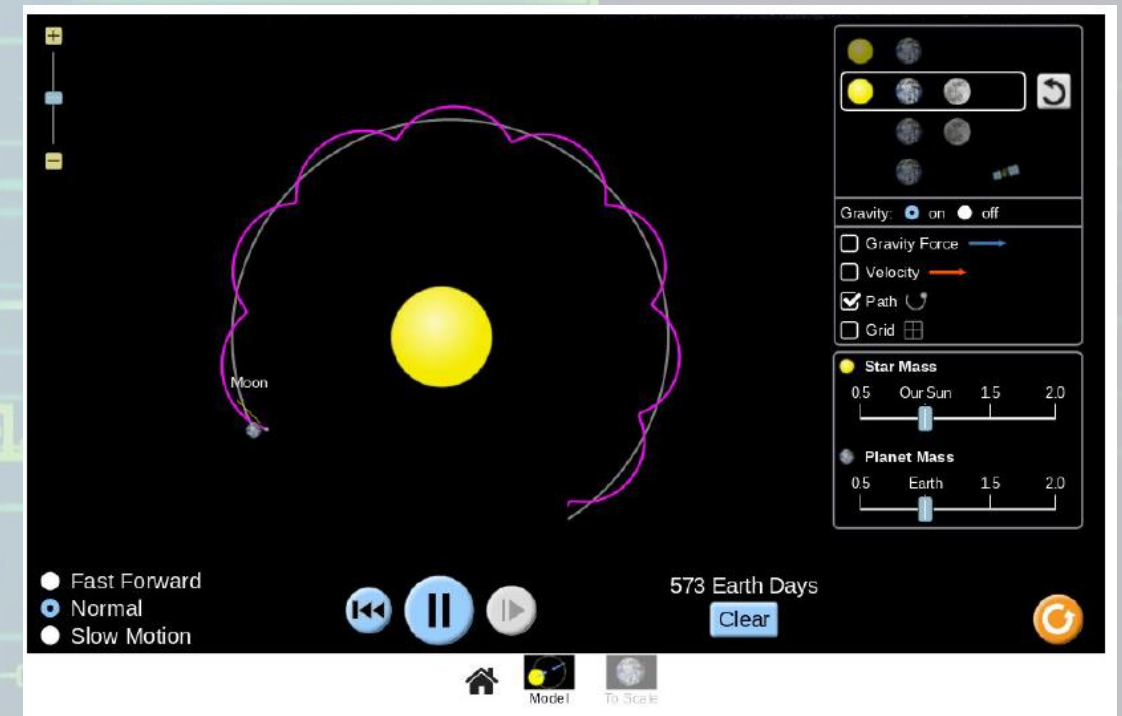


The appearance looks just like the designs, so I am very satisfied with how this turned out.

The error messages appear below the input fields following any unsuccessful validation, to make it clear what is causing the problem.



Simulations



COMPUTER SCIENCE: WHERE NEXT?

Computing technology runs through modern life and with that, an abundance of career opportunities and options for further study exist.

[Explore Careers in Computing: National Careers Service]

[Explore Computer Science: UCAS]

App developer
Computer games developer
Cyber intelligence officer
E-learning developer
Film visual effects programmer
Forensic computer analyst
Geospatial technician
Robotics engineer
Social media strategist
Software developer
Technical architect
User experience (UX) designer
Web developer

COMPUTER SCIENCE: WHERE NEXT?

WHY COMPUTER SCIENCE

Dr Hannah Fraser
MMath, MSc, PhD
Senior Research Associate in Infectious Disease Mathematical Modelling
University of BRISTOL

Mathematical Biologist (and former PGS student)

"I use infectious disease mathematical modelling to understand how diseases have spread in a population, and how they may continue to do so in the future. To do this I use MATLAB to program my models, however, I also use programming skills for data analysis in Stata.

Knowing how to program before going to university would have been invaluable as I had to learn this during my undergraduate degree in maths. Since then, I have regularly used programming skills throughout my PhD and into my career."

WHY COMPUTER SCIENCE

REBELLION®

Head of Art

Chris is Head of Art at Rebellion Games. He says "There are many people who aren't dedicated coders, but artists and animators that use Python and Mel Script to automate processes. Programming skills means they are highly prized and sought after by TV/Film, VFX houses of which the UK has a lot."

WHY COMPUTER SCIENCE

BANK OF ENGLAND

Did you know

Many Financial Institutions including The Bank of England are moving away from using Excel to programming in Python and a language called R. If you can program using Python or R you will be highly sought after in this field.

Data Scientist

Daniel who works at the Bank of England says "In my role I use computing to try and better understand the world around us, and to do that faster than any one person ever could."

WHY COMPUTER SCIENCE

IT Manager

"Coding is used for updating websites, executing commands and performing SQL database queries. Programming is definitely used more widely in many roles now.

Dev Ops and automation is where industry is heading and artificial intelligence experts and data scientists are the among the highest paid jobs in industry at the moment."

Project Manager

"Computing isn't all about coding in a dark room. There are many facets to the area from Project Management to User Interface Design to User Experience Design. There are few careers these days that allow you to innovate and create and computing is one of them."

WHY COMPUTER SCIENCE

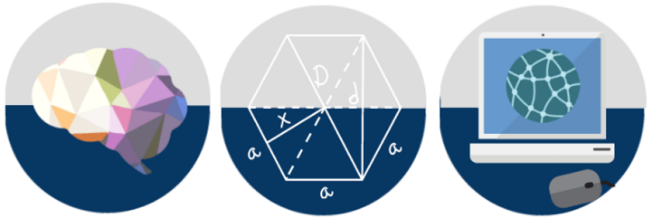
co op

Developer

Caroline, a developer at Co-op Digital. "as a developer I get to build the products that people use every day to make their lives easier. Solving interesting problems with coding and being able to see people using and benefitting from the thing you've made is so satisfying"

COMPUTER SCIENCE: WHERE NEXT?

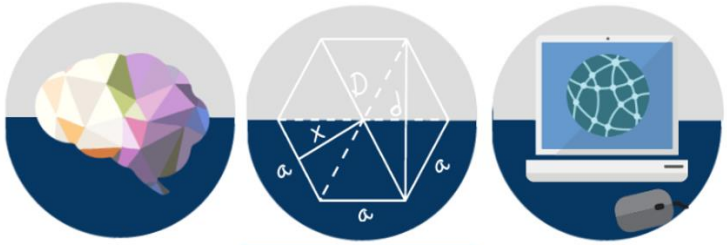
KEY SKILLS



Ability to think logically | Solid foundation in mathematics | Good problem-solving skills

Computers work based on a logical sequence of instructions, processing one operation after another. You must be able to structure your solutions to computing problems in logical steps, just as how a computer would process it. Remember that Computer Science can be quite abstract, so the ability to visualise things and processes is important as well!

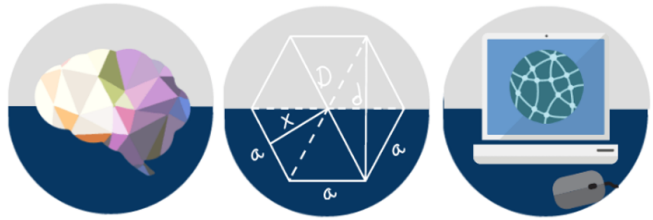
KEY SKILLS



Ability to think logically | Solid foundation in mathematics | Good problem-solving skills

Fundamental mathematics, particularly discrete math, probability, statistics and logic, is crucial, since Computer Science involves lots of computation. Having a strong mathematical mindset will help you tremendously in coming up with commands, functions and algorithms.

KEY SKILLS



Ability to think logically | Solid foundation in mathematics | Good problem-solving skills

A Computer Science A-Level, particularly programming modules, will test your ability to solve various computing problems. You must be able to understand a problem, decompose and break it down into smaller parts, solve these pieces individually and bring it all back together in an elegant solution. In addition, being able to think creatively is important as well, since there could be other ways to solve the problem more efficiently.

WHY COMPUTER SCIENCE

Solve complex & challenging problems | Gain valuable skills to build innovative solutions | Intellectually challenging & stimulating

A Computer Science course will challenge you to solve deep, multidimensional problems that require logical thinking and creativity. If you love flexing your brains and are eager to try various experiments to "hack" together solutions to solve complex problems, a Computer Science course might just be the right course for you!

WHY COMPUTER SCIENCE

Solve complex & challenging problems | Gain valuable skills to build innovative solutions | Intellectually challenging & stimulating

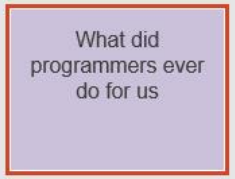
Steve Jobs once said that the computer is like a bicycle for the mind — it is the tool that enables us to accomplish many things by multiplying our capabilities!
A Computer Science course will give you the necessary skills and knowledge to build technological solutions that can change everyday life, from the way we communicate (internet, social media) to the way businesses are run (cash register systems using iPads).

WHY COMPUTER SCIENCE

Solve complex & challenging problems | Gain valuable skills to build innovative solutions | Intellectually challenging & stimulating

A Computer Science course can be quite intellectually demanding, and may not be the right fit for everyone. Finding a computing solution to various problems will test your reasoning, logic and creativity, requiring you to think in both concrete and abstract terms. Nonetheless, it can be very rewarding if you are someone who has a keen interest in this field.

COMPUTER SCIENCE: WHERE NEXT?



0 ★ 00:03


1 ★ 00:03

2 ★ 00:10


3 ★ 00:03

4 ★ 00:10


5 ★ 00:03

6 ★ 00:10


7 ★ 00:03

8 ★ 00:10


9 ★ 00:00

10 ★ 00:10


11 ★ 00:00

12 ★ 00:10


13 ★ 00:03

14 ★ 00:10


15 ★ 00:03

16 ★ 00:10


17 ★ 00:03

18 ★ 00:10

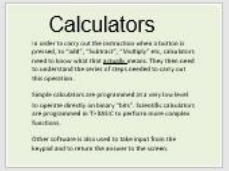

19 ★ 00:03

20 ★ 00:10


21 ★ 00:03

22 ★ 00:10

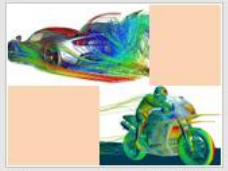

23 ★ 00:03



24 ★ 00:10


25 ★ 00:03

26 ★ 00:10


27 ★ 00:03

28 ★ 00:10


29 ★ 00:03

30 ★ 00:10


31 ★ 00:03

32 ★ 00:10


33 ★ 00:03

34 ★ 00:10


35 ★ 00:03

36 ★ 00:10


37 ★ 00:03

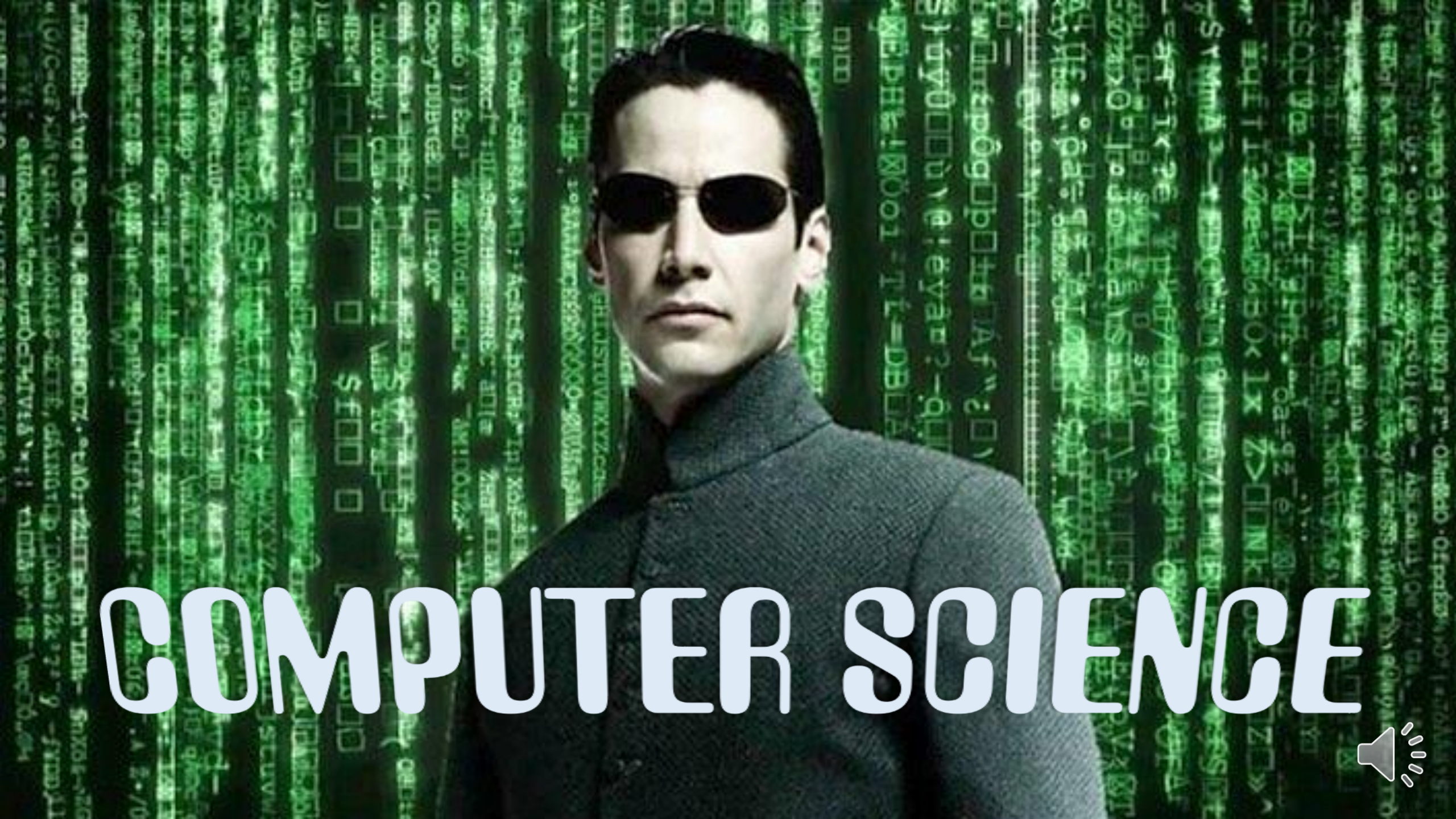
38 ★ 00:10


39 ★ 00:03

40 ★ 00:10

41 ★ 00:03

42 ★ 00:10


COMPUTER SCIENCE