UNIVERSITY OF LIVERPOOL

Department of Computer Science
Computer Science Taster Days

Wednesday XX Jan/Feb/March 2023

Programme of Activities

10.00 – 10.15	Arrival in our Lab & Welcome (including security induction & account registration)
10.15 – 11.00	**Workshop 1: TBD**
11.00 – 11.30	**Giant Sorting Network** (outdoor activity)
11.30 – 12.00	Lunch Break
12.00 – 12.45	**Workshop 2: TBD**
12.45 – 13.45	**Hands-on Workshop: Lego EV3 drives the warehouse**
13.45 – **14.00**	Closing Talk

All workshops take place in Lab 3 of the George Holt building.

Information about the Activities

Wavefunction collapse algorithm

Wavefunction collapse is an algorithm based on concepts from quantum computing. Using just one input image, it outputs an image of selected size without aid of machine learning techniques. The goal of this lesson is to teach the students of both the algorithm's existence and Shannon entropy, the metric the algorithm uses to pick which pixel to 'collapse' next. This will occur intuitively via a board game and a connecting slideshow.

Introduction to AI

Artificial Intelligence is a field of computer science that reshapes how we think about computers. Understanding AI is paramount in today's rapidly evolving society.
Starting with Alan Turing creating the 'Imitation Game' in 1950, the field of AI has mostly grown exponentially, evolving how we think of computers from a tool to a machine that can think, make its own decisions and, much like Turing envisioned, imitate a human.
This lesson aims to provide a foundational knowledge of how AI has developed since Turing's vision of a future in 1950.

Logic circuits

Logic underpins the entirely of computer science, from writing large pieces of code to the very bits that make up a computer. To be able to study and work in computer science you need to have a good understanding of basic logic such as AND, OR and NOT. People also need to be able to use the 3 (and others) in conjunction with each other to on programs for example. This lesson will help students understand how useful logic gates are and become more comfortable with complex knowledge of gates and circuits as well as their real-life applications in computer science.

Classified mission: Encryption 101

Encryption has been used throughout history to ensure privacy of sensitive information, all the way from ancient Egypt to our text messages every day. In this introductory lesson, students will learn what encryption is, how it works, its applications, and why it's important. Following a spy theme, students will get the chance to encrypt and decrypt text using Caesar and Vigenère cipher in a competitive group activity.

Code breaking

Cryptography is the practice of encoding information in order to secure it and prevent it being read by unauthorised parties. In history, secret messages were communicated using ciphers to minimise the risk of them being intercepted by the enemy. Today, encryption is a crucial part of online security, especially since most communication happens on the internet. In this engaging and hands-on lesson, students will be introduced to two basic ciphers and create their own cipher wheel. They will have the opportunity to use this tool to encrypt and decrypt secret messages, enhancing their problem-solving skills and allowing them to experience the thrill of code breaking.

Cybersecurity

Cyber Security is a rising industry within computer science today and many companies are looking to hire more people within the field as they are looking to protect their companies and the data they hold in the most secure way possible. Within this lesson students will have an insight into what cyber security and cryptography is and they will get to see and complete some basic and more complex ciphers in teams.

Giant Sorting Network

In this outdoor lesson, pupils will play the role of the “compute nodes” in a parallel sorting algorithm. They will experience first hand how parallelism speeds up computation, but also makes it more challenging to reason about programs.

Lego EV3 Drives the Warehouse

Robots managing large warehouses are one of the many example where automation helps humans to solve a task faster and cheaper. For this to be effective, robots need to be at least partially autonomous, i.e., able to sense and react to the physical world without (constant) human intervention. In this hands-on lesson, pupils program Lego EV3 robots to follow a line, avoid obstacles, and ultimately navigate a warehouse safely and autonomously.