Computer Science @ Cambridge
Today

- What is CS?
- Computer Lab past and present
- The aims of our course
- The CS Tripos structure
- The first year options
- Employment prospects
- The CS application process
- Where to get more info
What is CS?
What is CS?

Combines Elements of...

- Natural Science
- Engineering
- Technology
- Maths
- Electronics
- Psychology
- Natural Language
- Philosophy

Teaches...

- Critical thinking
- Rigorous problem analysis
- Efficiency
- Solution Evaluation
- Programming skills
- Logic and proof
All the usual Cambridge advantages apply: the College structure, the supervision system, the learning environment, the smart peers.

But Computer Science here is particularly special: there is a rich history both in the technology *and* the teaching of the subject.
77 Years ago...

We started as a part of the Mathematics Department in 1937

Back then we were the **Mathematical Laboratory** because the term “computer science” hadn't been invented

The world's first usable computer (EDSAC) was built here
1937 – Us!
1957 – Computing Laboratory at Oxford
1964 – School of Computing at Manchester
1975 - EECS department at MIT formed
A Department of Firsts

1937 – First CS department in the world
1949 – First stored-program computer (EDSAC)
1953 – First CS qualification (diploma)
1958 – EDSAC2
1989 – Full CS degree introduced
1964 – TITAN
1968 – Created BCPL (precursor to C)
2003 – Spun out Xen
2012 – Raspberry Pi
First Job Queue Too...
The Computer Lab Today
Our Undergraduate Degree
(the “Computer Science Tripos”)
Our Key Aims

To give an understanding of fundamental principles that will outlast today's technology

To produce graduates who create the future not just cope with it
The Course

Year 1
- Fundamentals
- Programming
- Electronics
- Maths
  [+Option]

Year 2
- Part IA
  - Theory
  - Systems
  - Hardware
  - Programming
  - Group Project

Year 3
- Part II
  - Free choice of advanced topics
  - Personal project

B.A.
First Year: CS 50% with NST/PPST

Comp Science P1

Comp Science P2

Maths from Natural Sciences

Option from NST or PPS

Any one of:
- Physics
- Social Psychology
- Evolution & Behaviour
- Geology
- Chemistry
- Physiology of Organisms

It is possible to switch out of CST to any of these subjects in the second year without catch-up
First Year: CS 50% with Maths

Half the Maths that a full maths undergraduate would do

BUT you can’t then do maths in your second year
First Year: CS 50% with Maths

IMPORTANT

If you want to do this option you MUST take STEP mathematics in addition to your current qualifications

[Only a handful of our students take CS with Maths]
First Year: CS 75%

Comp Science P1
Comp Science P2
Maths from Natural Sciences
Comp Science P3

This is a completely new option from October 2016 (a fortnight old!)

The information materials for our course did **not** mention this before this week.
Staggered Papers

Those doing 50% CS in the first year take Paper 3 in the second and Paper 7 in the third years.

→ Everyone does 11 papers in 3 years
Alternative: NST CS Option

Half the CS a 50% CS undergraduate would do

It is possible to catch up CS P2 and switch to Computer Science in the second year, but this is not the recommended route.
Catch Up for NSTs

75%

CS

50%

NST

Catch up over vacation
The Course

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
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<tbody>
<tr>
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B.A.
The Course

Year 1

Part IA
Fundamentals
Programming
Electronics
Maths
[+Option]

Year 2

Part IB
Theory
Systems
Hardware
Programming
Group Project

Year 3

Part II
Free choice of advanced topics

Optional Year 4

M.Eng.

Part III
Free choice of research topics

Research project

B.A.
The Course

Year 1
- Part IA
  - Fundamentals
  - Programming
  - Electronics
  - Maths
  [+Option]

Year 2
- Part IB
  - Theory
  - Systems
  - Hardware
  - Programming
  - Group Project

Year 3
- Part II
  - Free choice of advanced topics
  - Personal project

Optional Year 4
- Year 4

Part III
- Free choice of research topics
- Research project

Requires 1st in Part II

B.A.

M.Eng.
A Typical Week
A Typical Week

12 hours of lectures
A Typical Week

12 hours of lectures

6+ hours of practical work
A Typical Week

12 hours of lectures

6+ hours of practical work

20+ hours of study and supervision prep
A Typical Week

- 12 hours of lectures
- 6+ hours of practical work
- 20+ hours of study and supervision prep
- 4 one-hour supervisions
# Practical skills

<table>
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<tr>
<th>Year 1</th>
<th>Weekly practicals to consolidate lecture material</th>
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| Year 2 | Weekly practicals to consolidate lecture material  
**Group Project** (team work) |
| Year 3 | **Personal project** |
| Year 4 | **Research project**  
Some modules associated with additional practicals |
The language doesn't matter!
We teach fundamental programming principles

Currently Cambridge uses:

- Java, C/C++ for imperative programming
- ML for functional programming
- Prolog for logic programming
- Verilog for hardware programming
Programming Experience

You DON'T need programming experience

• We teach from the ground up.
• However, if you've never programmed before, how do you know you'll enjoy a degree that uses it?

A survey of first years...

- No experience (39%)
- Not much experience (24%)
- Some experience (18%)
- Quite a lot of experience (14%)
- Programming expert (2%)
Employment Prospects
Employability

The course gives vital skills for every sector. Good computer scientists go on to a multitude of careers: IT, business, politics, finance, science, engineering, education, arts.
Very sought-after graduates

What job shortage?

Our annual recruitment fair attracts 50+ companies, each looking to recruit 3 or 4 graduates on average → **150ish jobs**

We only have ~100 graduates p.a.!

Some of the recent Companies

Google, ARM, Amazon, Disney, Barclays, Cisco, BT, Mozilla, MathWorks, Citrix, Frontier, Red Gate, Morgan Stanley
The CS Application Process
Prerequisites

A*A*A at A-Level

A-Level Maths

- is absolutely essential

Further Maths

- to AS is essential (if your school offers it)
- to A2 is desirable
- Chose not to do Further? We recommend doing at least AS Further in your A2 year
- AEA or STEP useful *(required for CS with Maths)*
Other A-Levels

Physical sciences

- Very useful and desirable at admissions
- Prerequisites for some first year options

Electronics

- Relevant and useful
- But not as desirable as maths and physical sciences so please don't drop these in favour of electronics
**Computing**

- **NOT** a prerequisite

- Good way to show interest in the subject and to “try before you buy”

- However, the syllabuses overlap with our first year

- We generally **don't** recommend dropping a physical science or maths in favour of computing in the A2 year: can be better to drop Computing in A2
The Admissions Process

- Apply via UCAS: October
- Supplementary Questionnaire: November/December
- Written Test
- Two Technical Interviews: Interview Day (Early December)
Choosing a College for CS

College Differences

• No-one can tell you which College is best for you, and no one College is better than the others for CS academically
• You should visit Colleges and make your own mind up. Don't just choose based on proximity!!
• Factors:
  – Old/new
  – DoS compatibility
  – Atmosphere
  – Size
  – Facilities
The Decision Makers

**Director of Studies**

- Each college has a CS “DoS”
- These do the interviews and will be responsible for your academics if you get a place
- Usually (but not always) Faculty members
- You can meet some upstairs today...

**Admissions Tutors**

- One per colleges
- Responsible for all admissions in that college, not just CS
(Every?) College has some form of admissions test taken on the interview day

Contact your College of interest to get specifics

There are two commonly used tests:

- Thinking Skills Assessment (TSA)
- An in-house test created by the DoSes
A publisher produces magazines, all of which have a number of pages which is a multiple of 32. Thus, a magazine can have 32, 64, 96....... pages. The front cover is always counted as page 1.

The centre spread of the magazine could have pages numbered

A 15 and 16.
B 30 and 31.
C 50 and 51.
D 63 and 64.
E 96 and 97.
The Interviews

~25 minutes each

Questions related to CS but will not assume actual CS knowledge (unless we know you have it)

Questions start simple and ratchet up in difficulty. Our interest is in when you leave your comfort zone

Correct answers (and there may be multiple) aren't as important as you might think

We are assessing your logical thinking and problem solving abilities and your motivation to study CS
Imagine a mythical cell has two 'children' after 24 hours. Those then have two children 24 hours later, etc...
Starting with 1 cell, how long before we have >8?
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<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
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**SUM**

7
Imagine a mythical cell has two 'children' after 24 hours. Those then have two children 24 hours later, etc... Starting with 1 cell, how long before we have >2061?

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\[ Total_d = \sum_{i=0}^{d} 2^i \]
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\[ Total_d = \sum_{i=0}^{d} 2^i = 2^{d+1} - 1 \]

[Geometric progression]
Imagine a mythical cell has two 'children' after 24 hours. They then have two children 24 hours later, etc... Starting with 1 cell, how long before we have >2061?

\[ 2061 < 2^{d+1} - 1 \]

\[ \log_2(2062) < d + 1 \]

\[ d > \log_2(2062) - 1 \]
Where to get more Info...
More info...

**University**
- Prospectus
- Website

**Colleges**
- DoSes, Admission Tutors
- Open days

**Department**
- Ask us today!
- Website – www.cl.cam.ac.uk/admissions/
More info...

Email

- Me directly:
  Robert.Harle@cl.cam.ac.uk

- Dept:
  undergraduate.admissions@cl.cam.ac.uk