

Mathematical Methods *for Computer Science*

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Web page: <http://www.doc.ic.ac.uk/~jtb/teaching/145/>

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Methods Course Details

- ➔ Course title: Mathematical Methods
- ➔ Course lecturers:
 - ➔ Dr. J. Bradley (Weeks 2-5)
 - ➔ Prof. P. Harrison (Weeks 6-10)
- ➔ Course code: 145
- ➔ Lectures
 - ➔ Mondays: 3–4pm, rm 308
 - ➔ Wednesdays: 11–12 noon, rm 308 (until and inc. 7th November)
 - ➔ Thursdays: 10–11 am, rm 308
- ➔ Tutorials
 - ➔ Thursdays: 11–12 noon OR Tuesdays 5–6pm
- ➔ Number of assessed sheets: 5 out of 8

Assessed Exercises

- ➔ Submission: through CATE
 - ➔ <https://sparrow.doc.ic.ac.uk/~cate/>
- ➔ Assessed exercises (for 1st half of course):
 1. set 8 Oct; due 18 Oct
 2. set 15 Oct; due 25 Oct
 3. set 22 Oct; due 8 Nov

Recommended Books

You will find one of the following useful – no need to buy all of them:

- Mathematical Methods for Science Students. (2nd Ed). G Stephenson. Longman 1973. [38]
- Engineering Mathematics. (5th Ed). K A Stroud. Macmillan 2001. [21]
- Interactive Computer Graphics. P Burger and D Gillies. Addison Wesley 1989. [22]
- Analysis: with an introduction to proof. Steven R Lay. 4th edition, Prentice Hall, 2005.

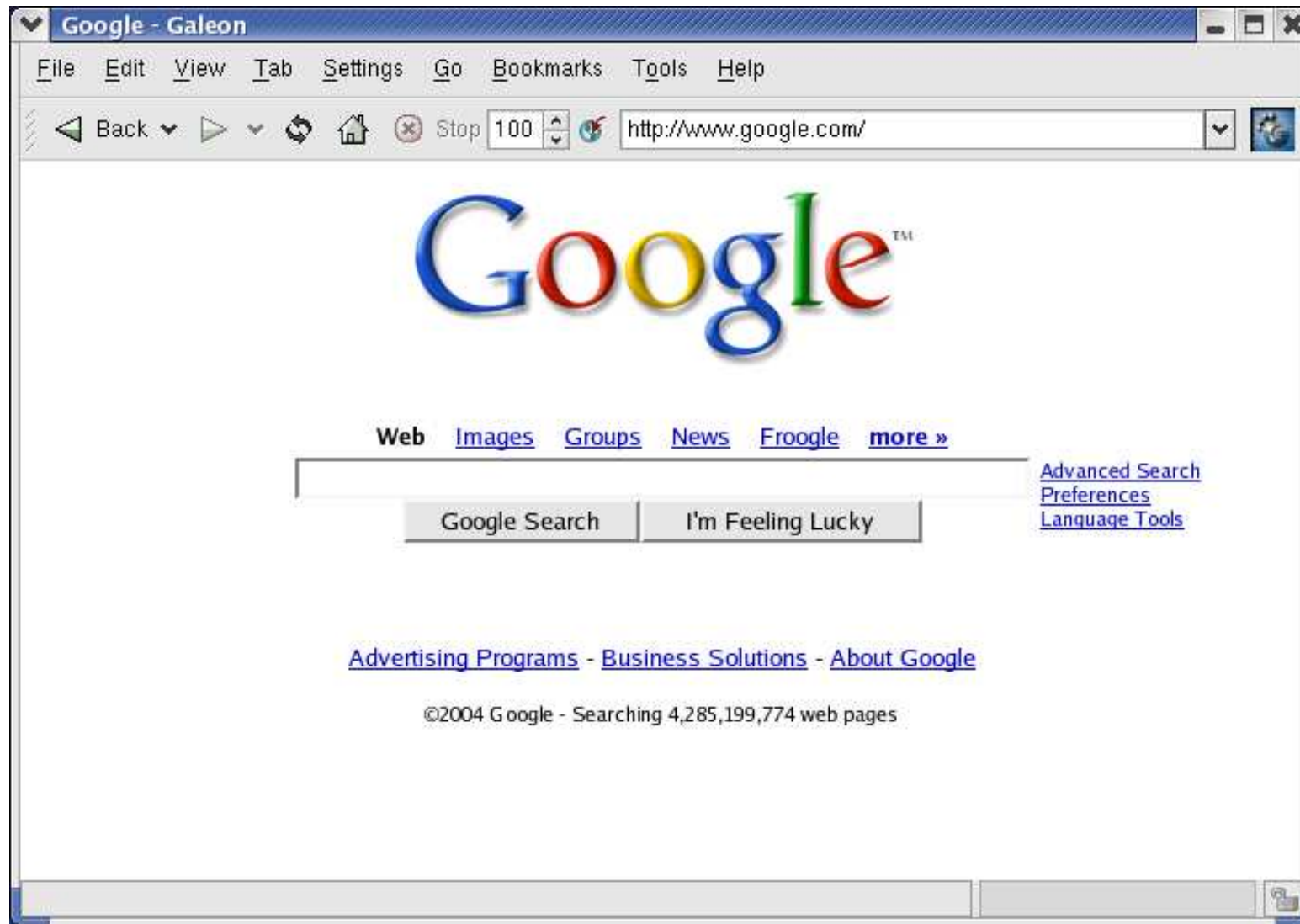
Maths and Computer Science

- ➔ Why is Maths important to Computer Science?
- ➔ Maths underpins most computing concepts/applications, e.g.:
 - ➔ computer graphics and animation
 - ➔ stock market models
 - ➔ information search and retrieval
 - ➔ performance of integrated circuits
 - ➔ computer vision
 - ➔ neural computing
 - ➔ genetic algorithms

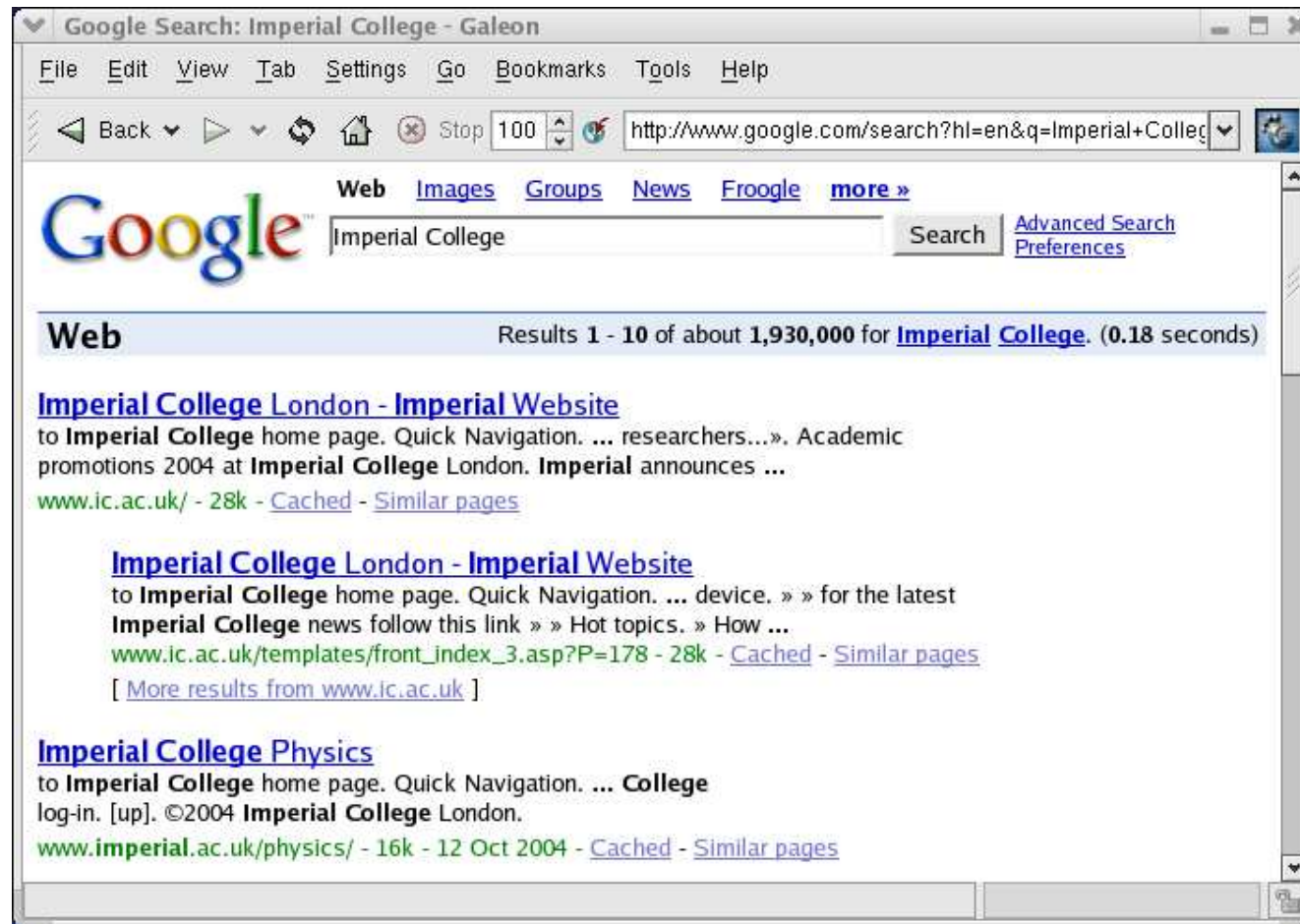
Highlighted Examples

- ➔ Search engines
 - ➔ Google and the PageRank algorithm
- ➔ Computer graphics
 - ➔ near photo realism from wireframe and vector representation

Searching with...

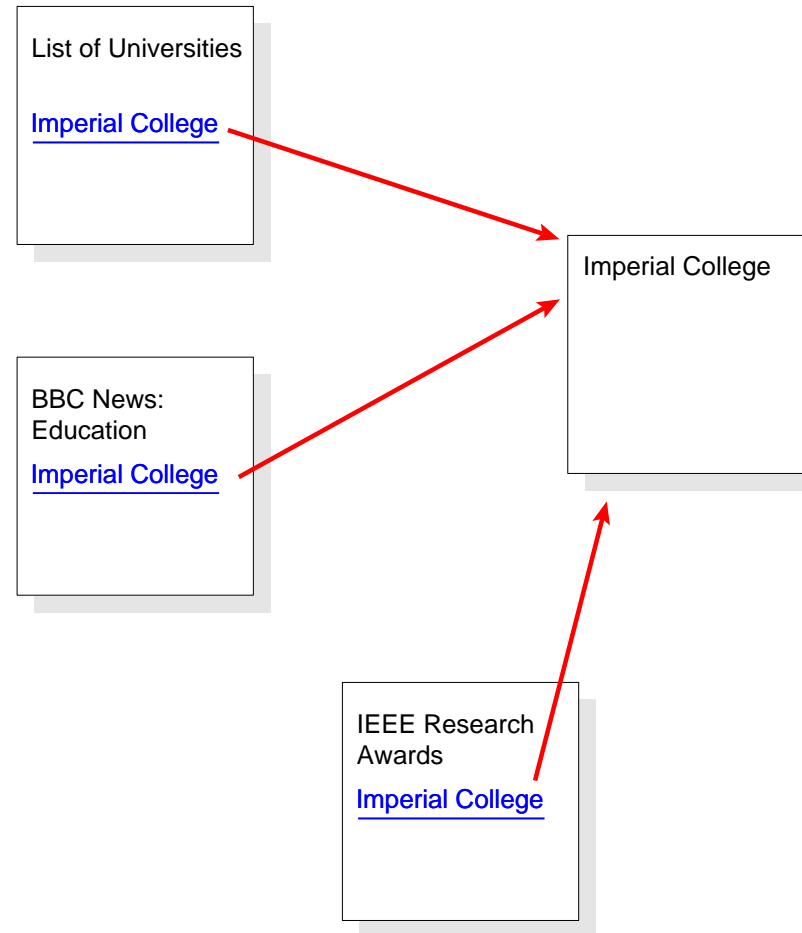


Searching for...



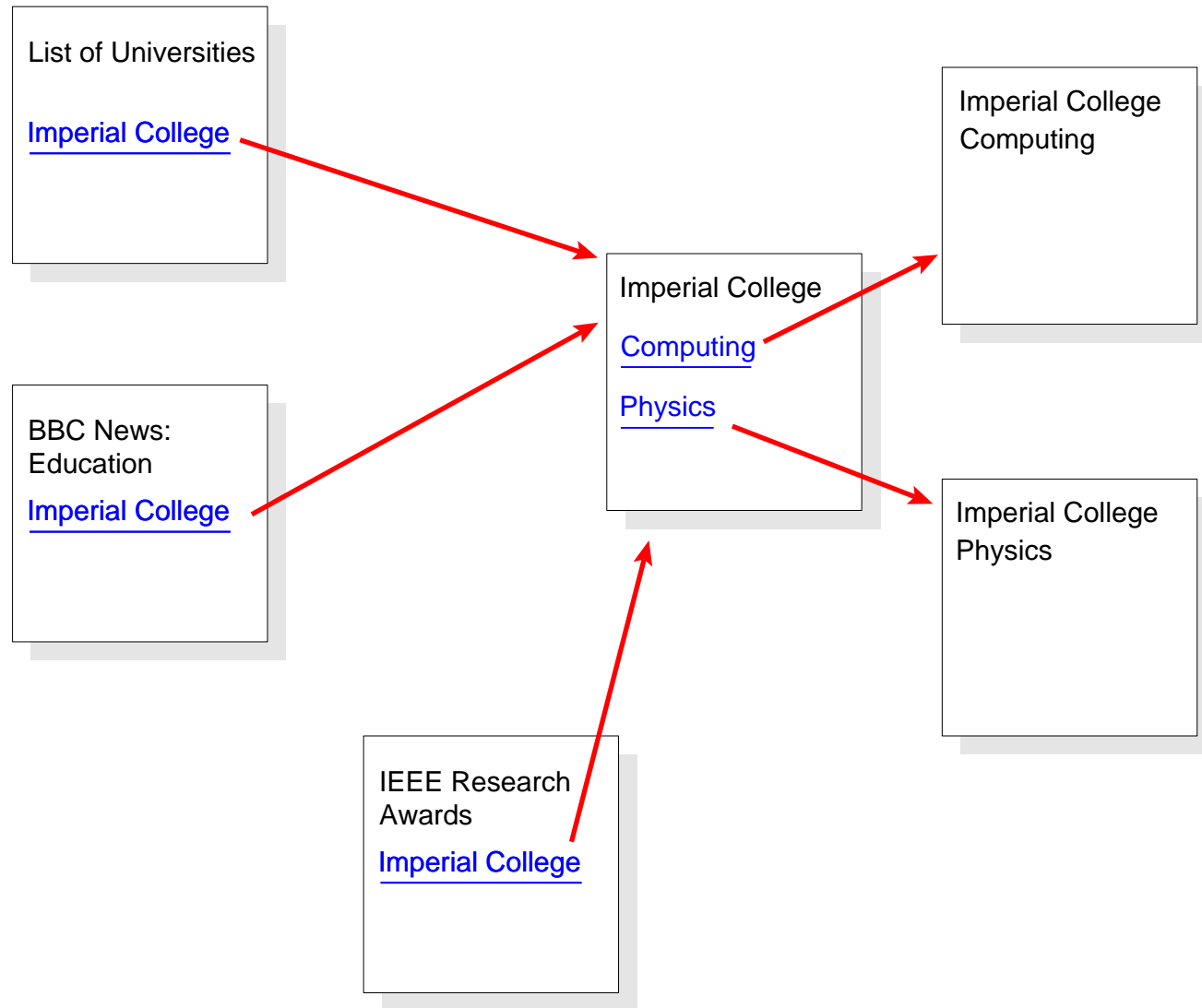
➔ How does Google know to put Imperial's website top?

The PageRank Algorithm



- ➔ PageRank is based on the underlying web graph

Propagation of PageRank



PageRank

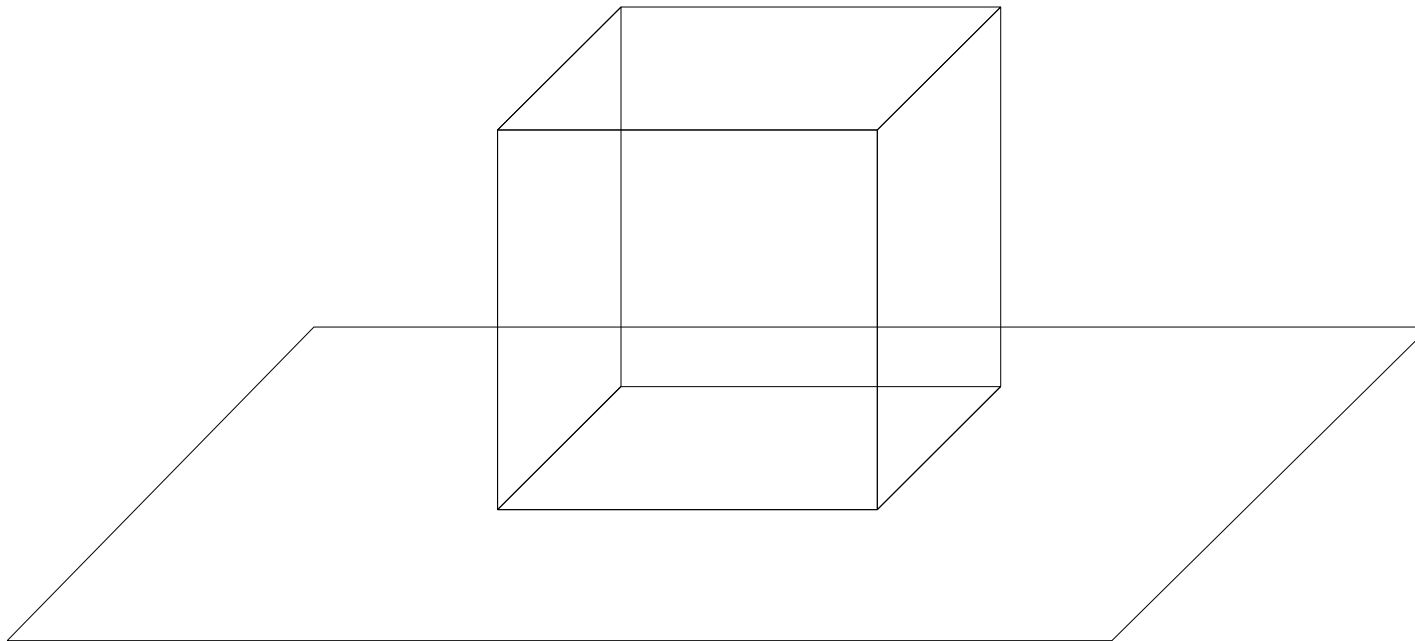
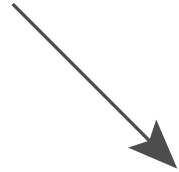
- ➔ So where's the Maths?
 - ➔ Web graph is represented as a matrix
 - ➔ Matrix is **9 billion** \times **9 billion** in size
 - ➔ PageRank calculation is turned into an eigenvector calculation
 - ➔ Does it converge? How fast does it converge?

Computer Graphics



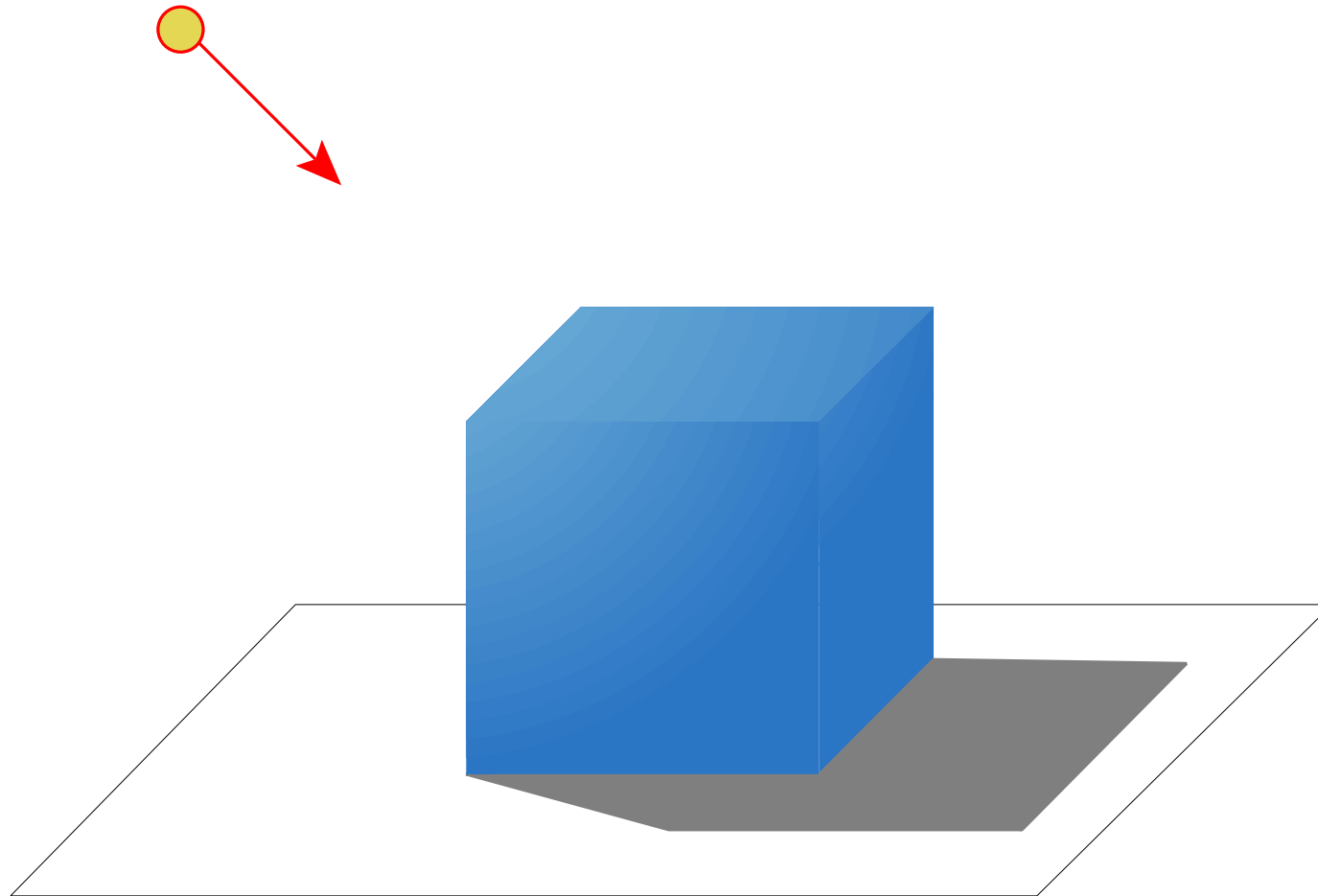
➔ Ray tracing with: POV-Ray 3.6

Computer Graphics



- ➔ Underlying wiremesh model

Computer Graphics



- ➔ How can we calculate light shading/shadow?

Computer Graphics

- ➔ Key points of model are defined through vectors
- ➔ Vectors define position relative to an origin

