Info 335 - High Performance Computing
Class 01: Introduction

Cristóbal A. Navarro[1]

Universidad Austral de Chile, Valdivia, Chile

Outline

1. Course Overview
2. Motivation for HPC
3. What is HPC?

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Info 335 - High Performance Computing

Useful information:

- Classes: Tuesdays, from 16:00 to 19:00.
- Where: Uach, Campus Miraflores, edificio 10000.
- Learning style: theory + practice.
- Contents and rules: let's check the course syllabus.

Teaching Group

Professors:

1. Raimundo Vega.
2. Héctor Ferrada.
3. Cristóbal Navarro (R).

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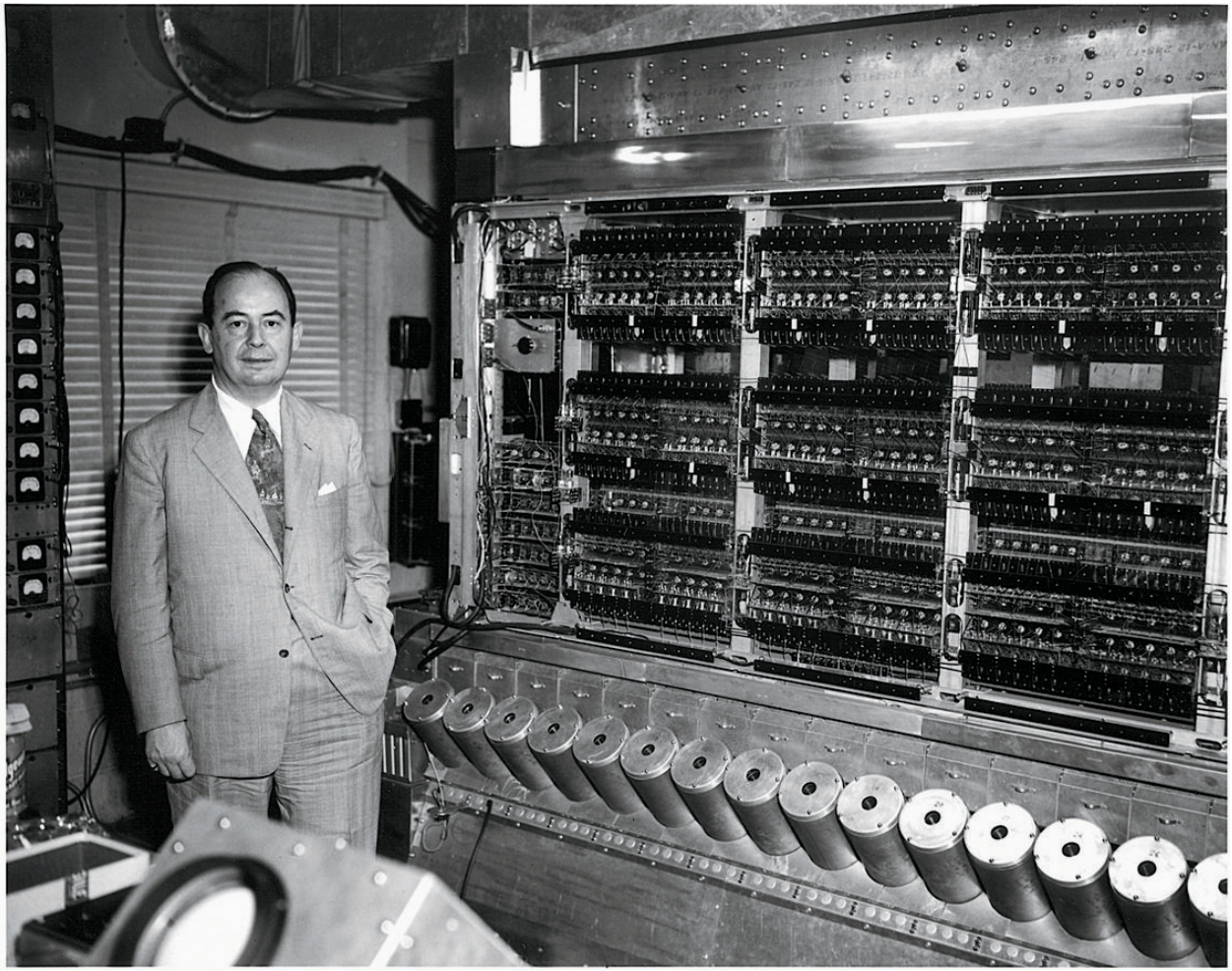

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John von Neumann

Professor of Mathematics, Princeton University
No verified email - Homepage

Quantum mechanics Economics Game theory Computer science

FOLLOW

ARTICLES CITED BY CO-AUTHORS

TITLE	CITED BY	YEAR
Theory of games and economic behavior (commemorative edition) J Von Neumann, O Morgenstern Princeton university press	33941	2007
Cybernetics or Control and Communication in the Animal and the Machine N Wiener MIT press	10067	1961
Theory of self-reproducing automata J Von Neumann, AW Burks IEEE Transactions on Neural Networks 5 (1), 3-14	6758	1966
Mathematical foundations of quantum mechanics J Von Neumann Princeton university press	6251	1955
Mathematische grundlagen der quantenmechanik J Neumann Springer-Verlag	4541 *	2013
Probabilistic logics and the synthesis of reliable organisms from unreliable components J Von Neumann Automata studies 34, 43-98	2746	1956
Zur theorie der gesellschaftsspiele J Neumann Mathematische annalen 100 (1), 295-320	2610	1928
The logic of quantum mechanics G Birkhoff, J Von Neumann Annals of mathematics, 823-843	2596	1936

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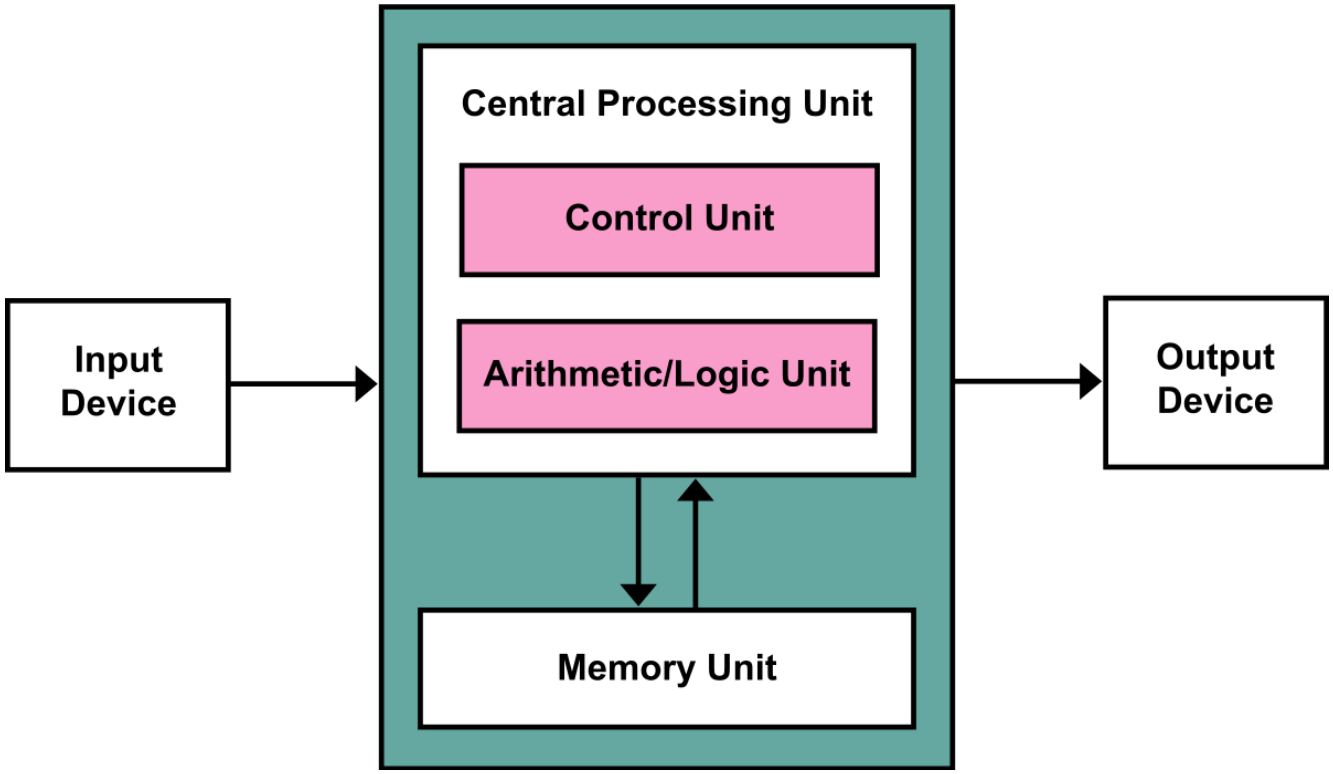
Arquitectura Von Neumann



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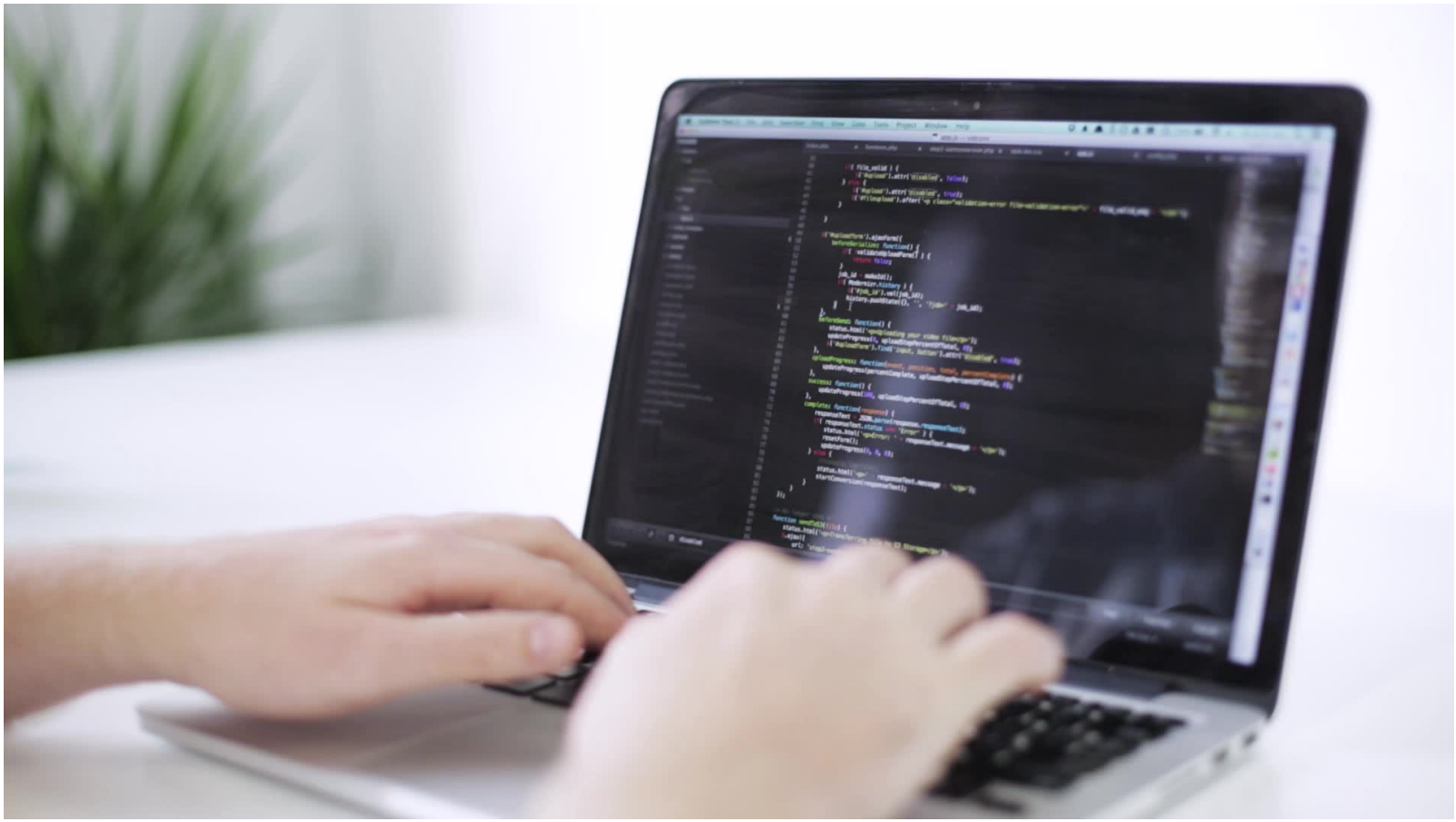

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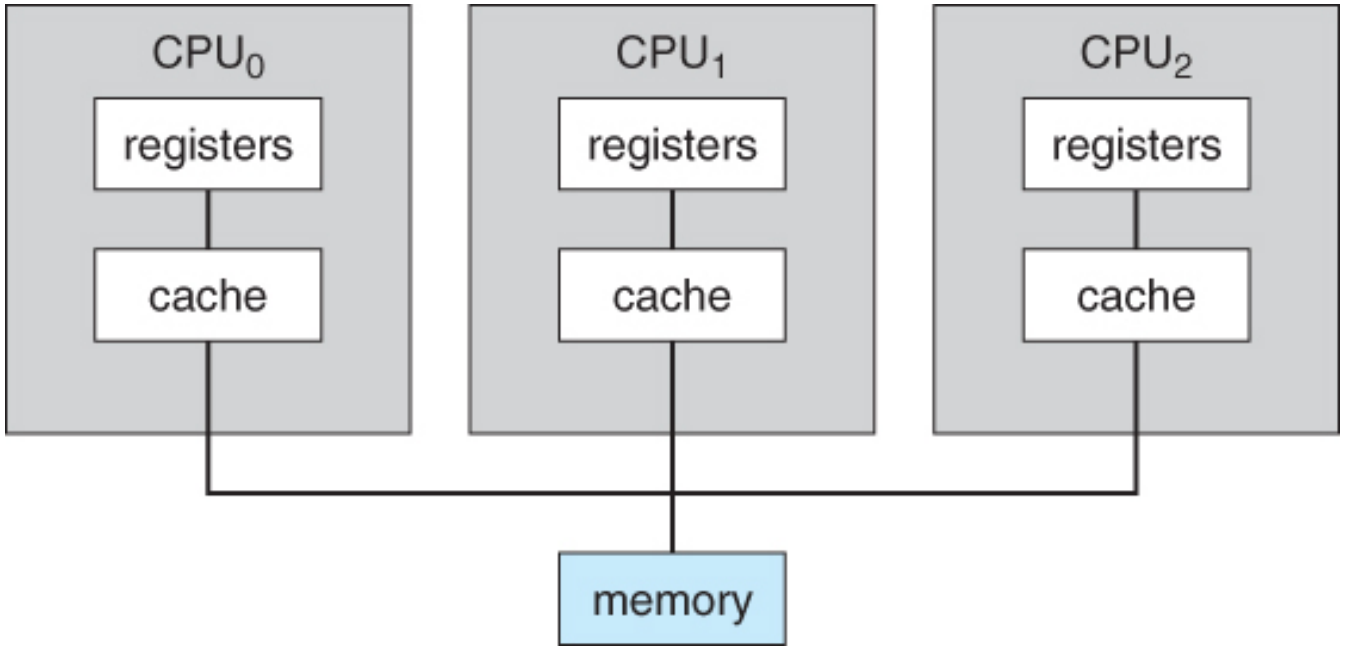
Extending the Von Neumann idea...



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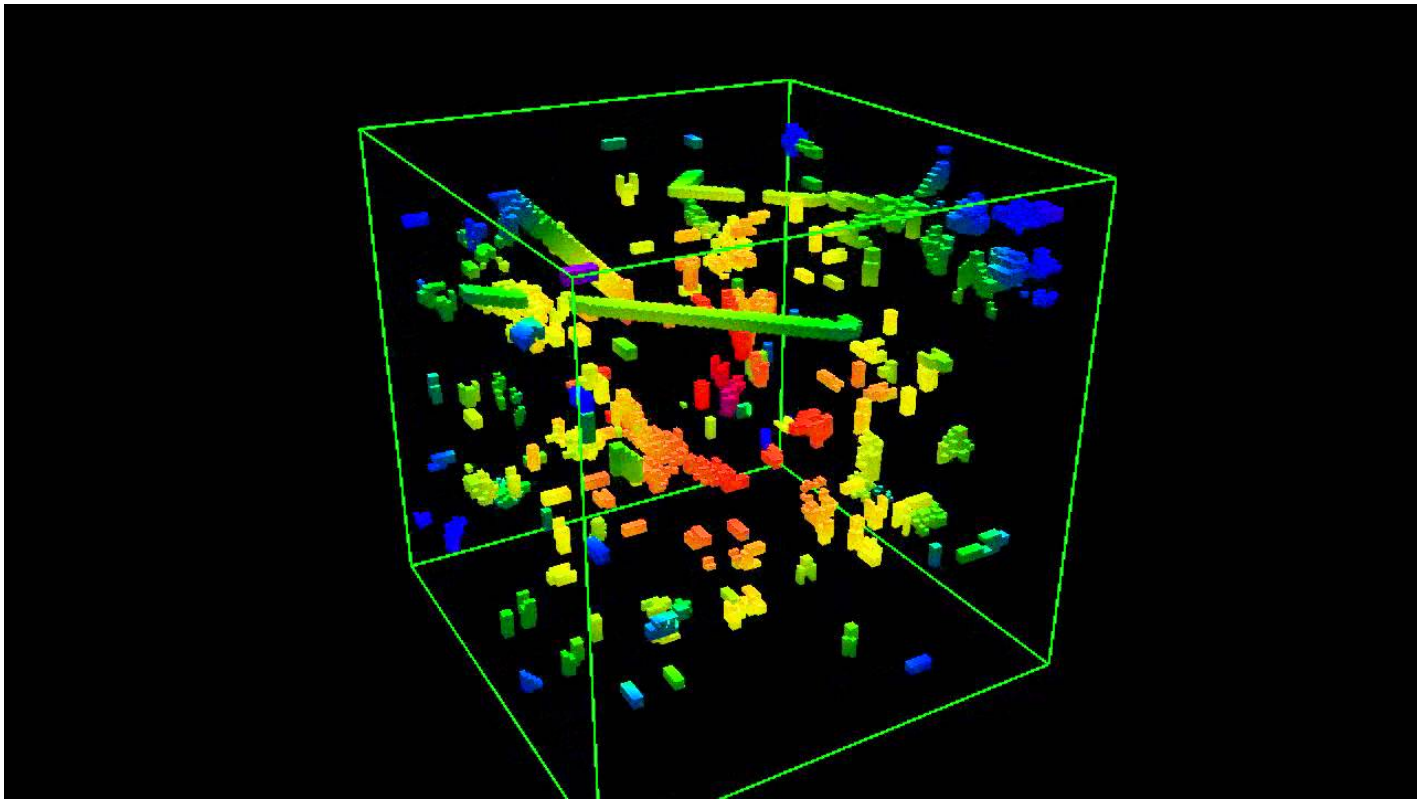

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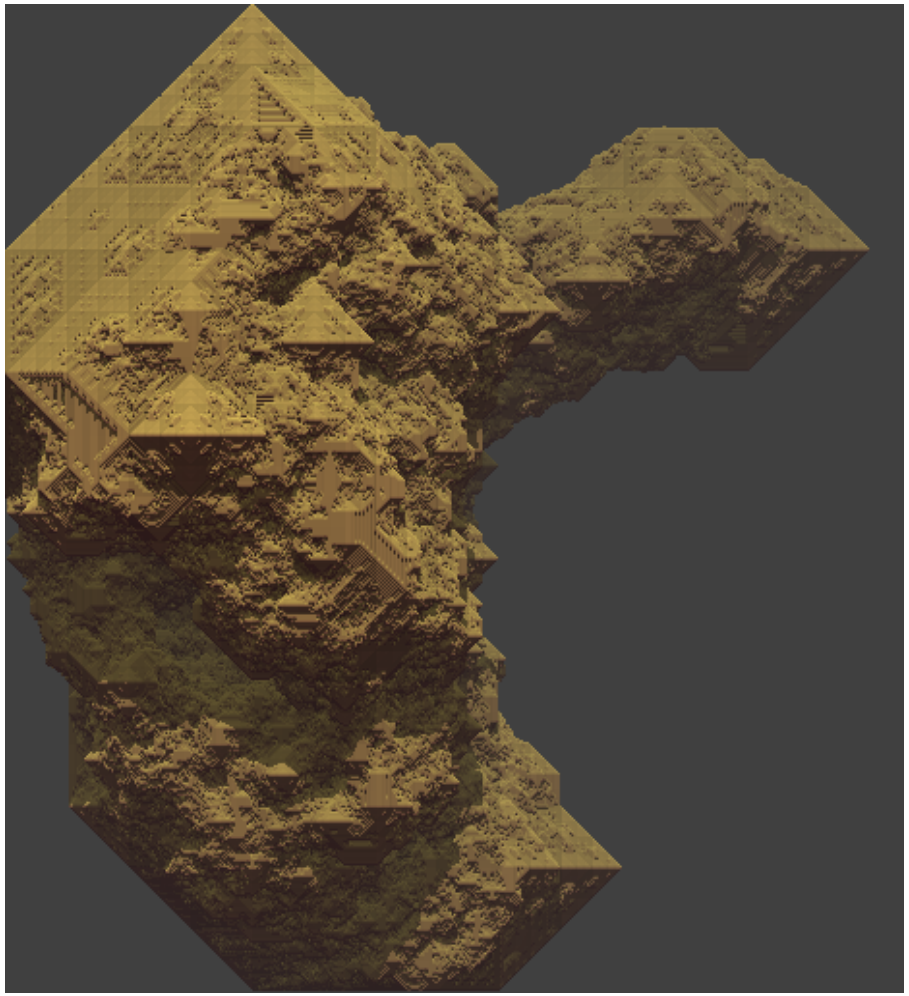

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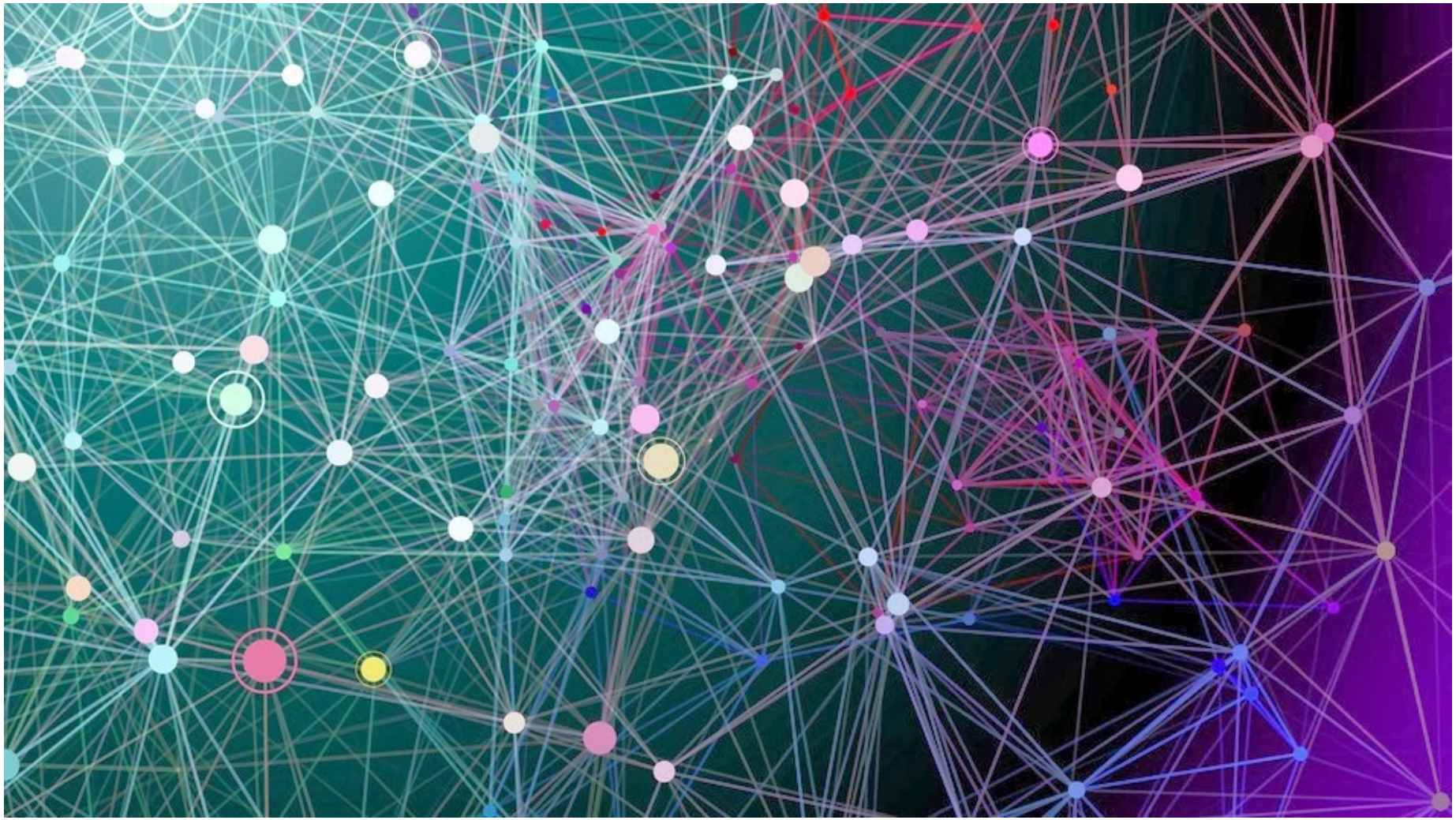

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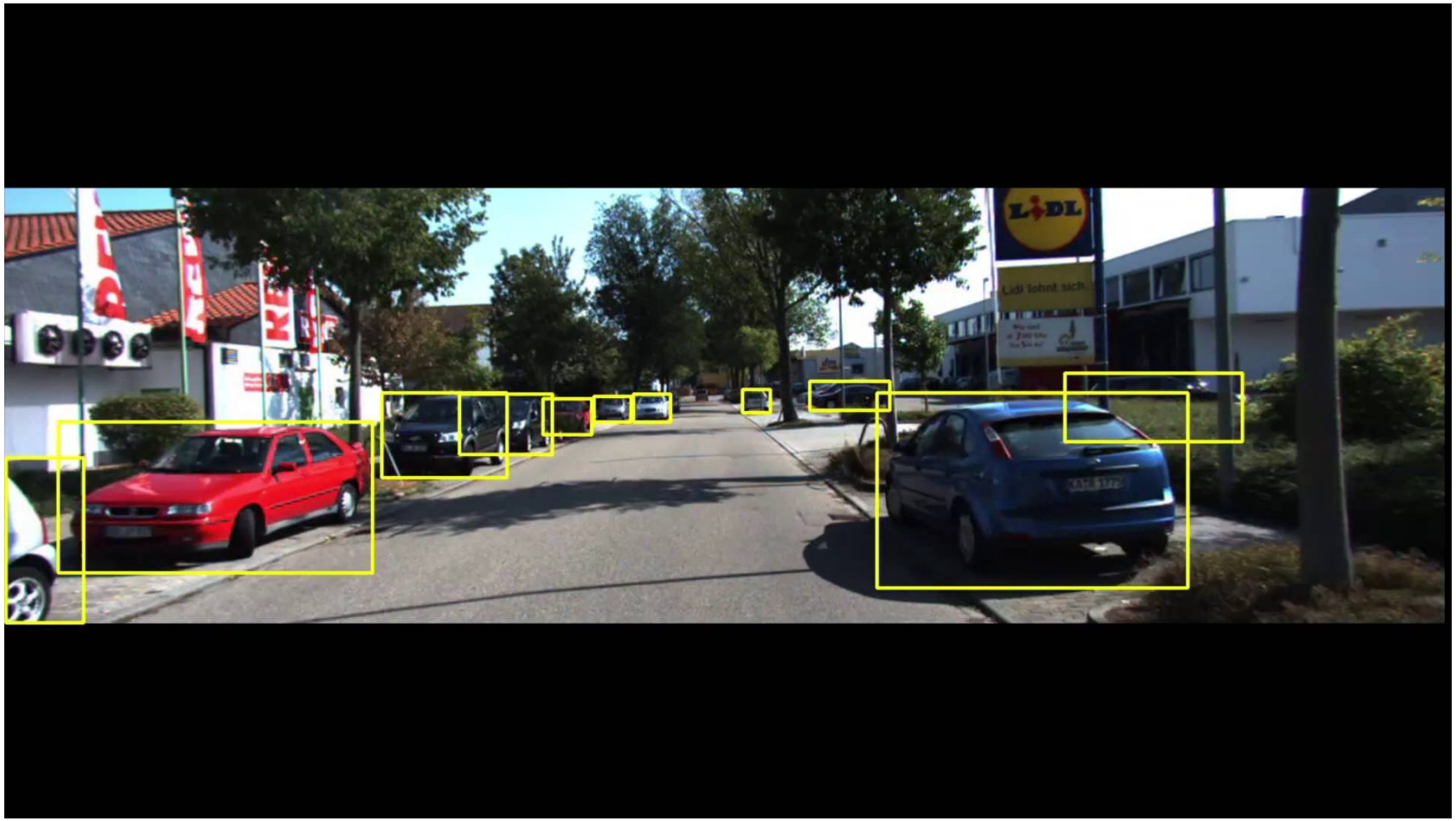

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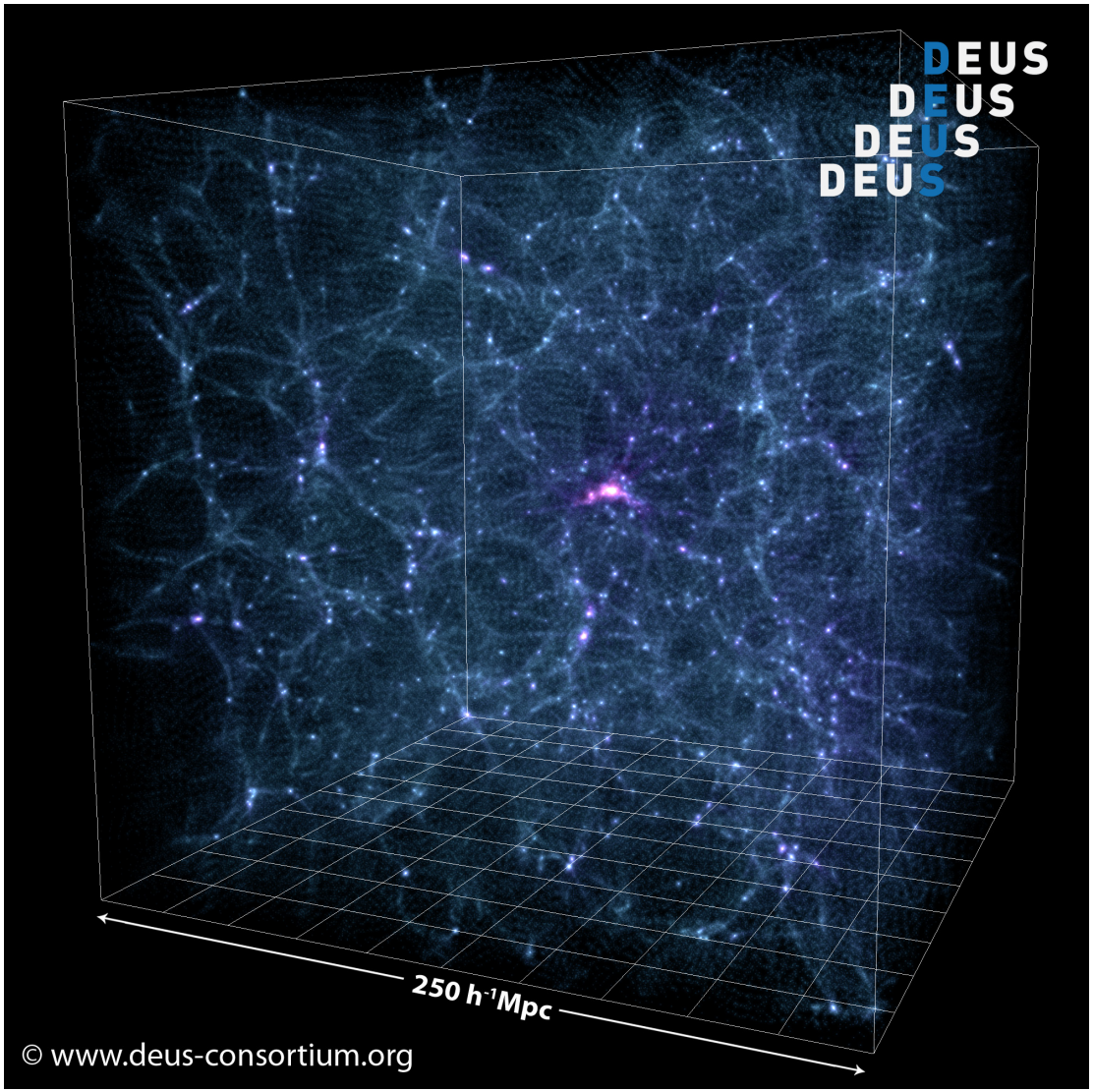

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How will the future be?

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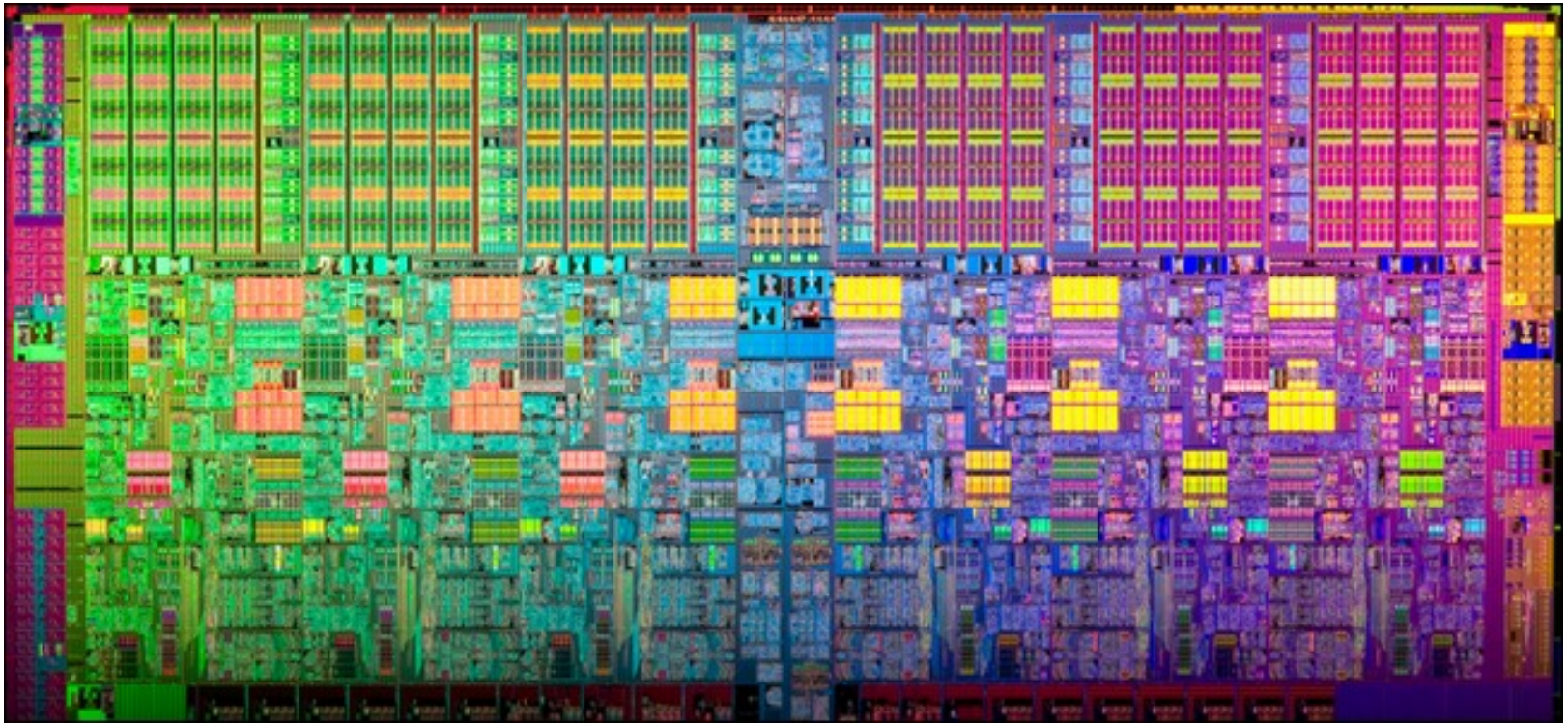
Entering HPC

Concepts related to HPC



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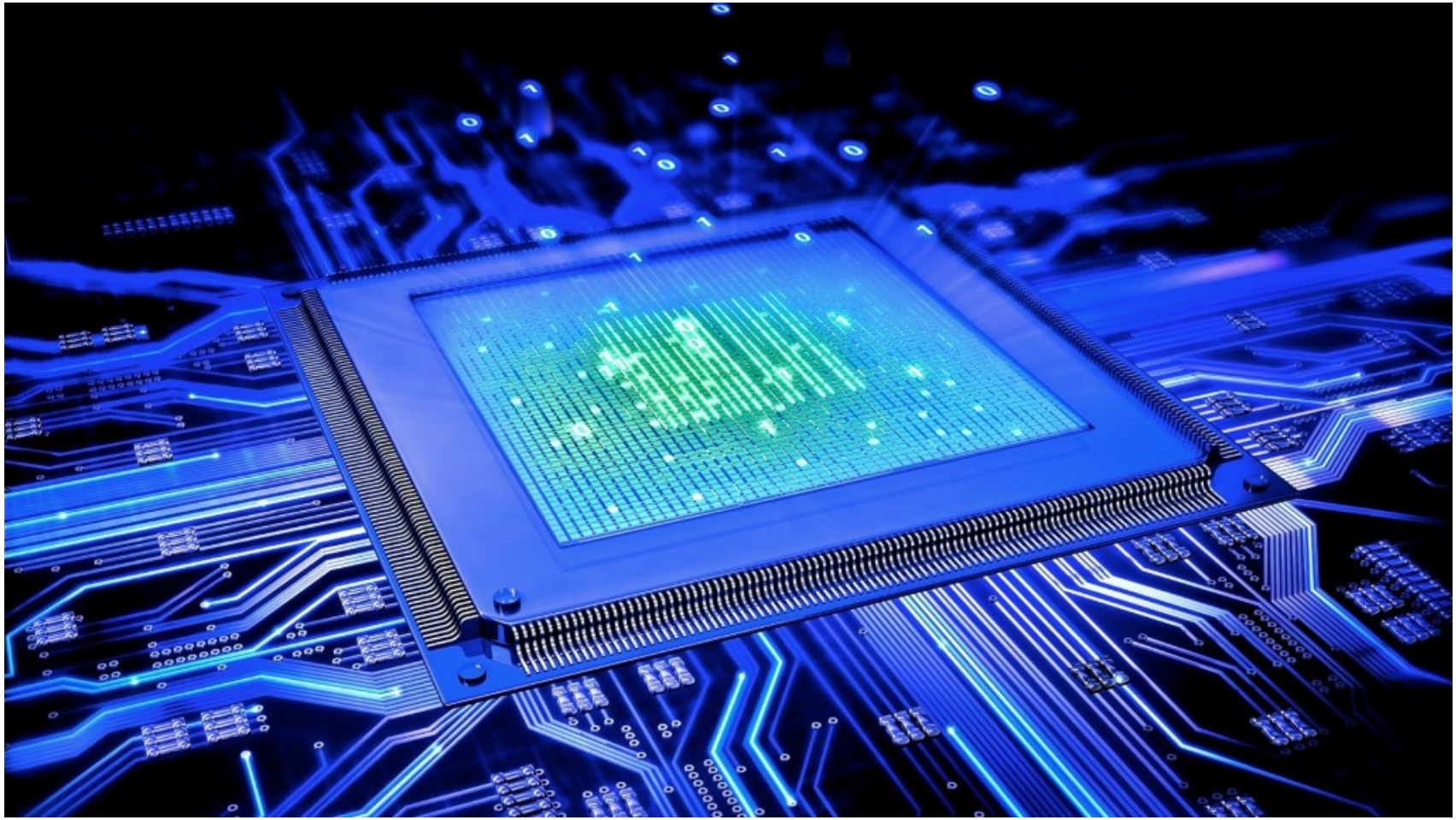

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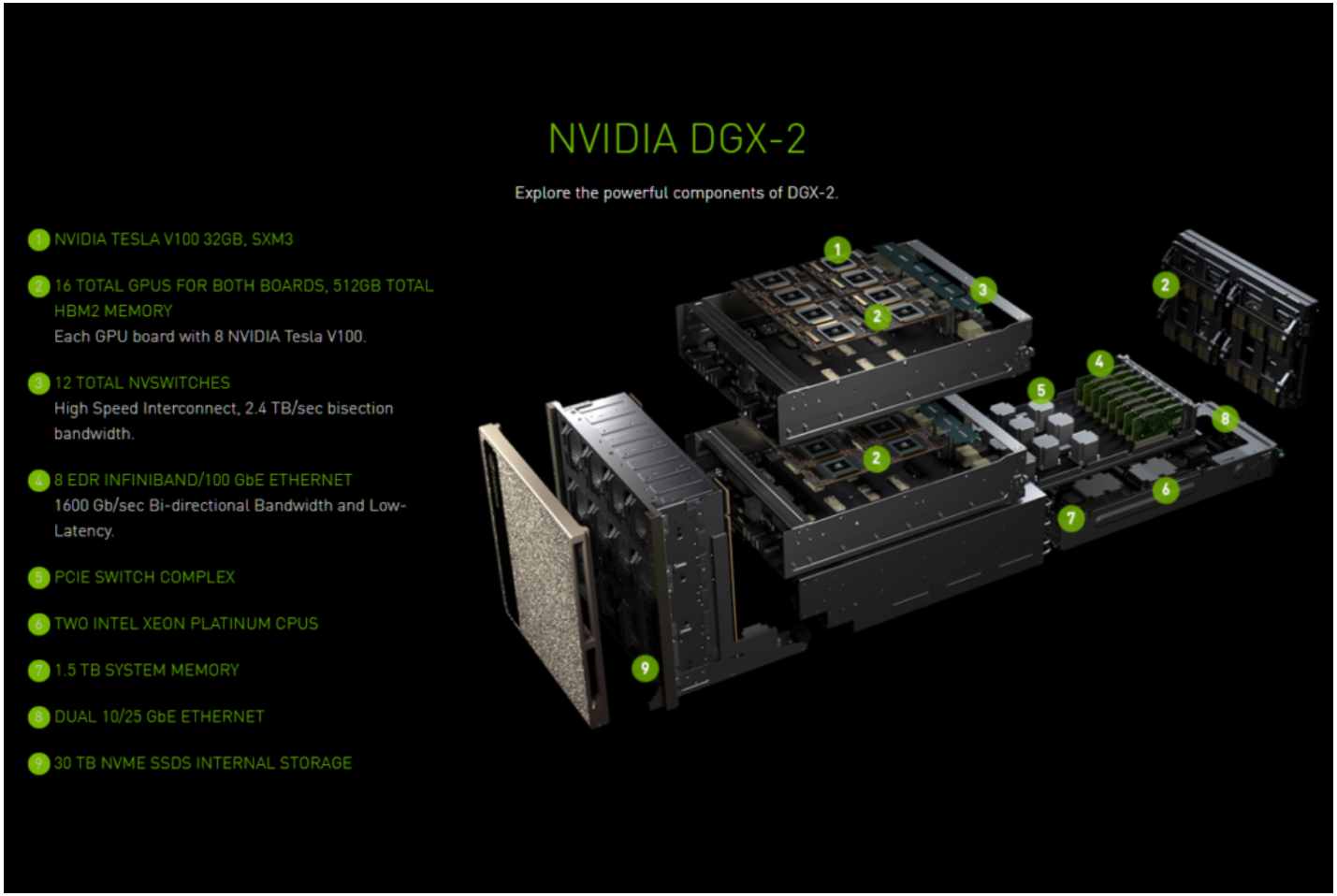

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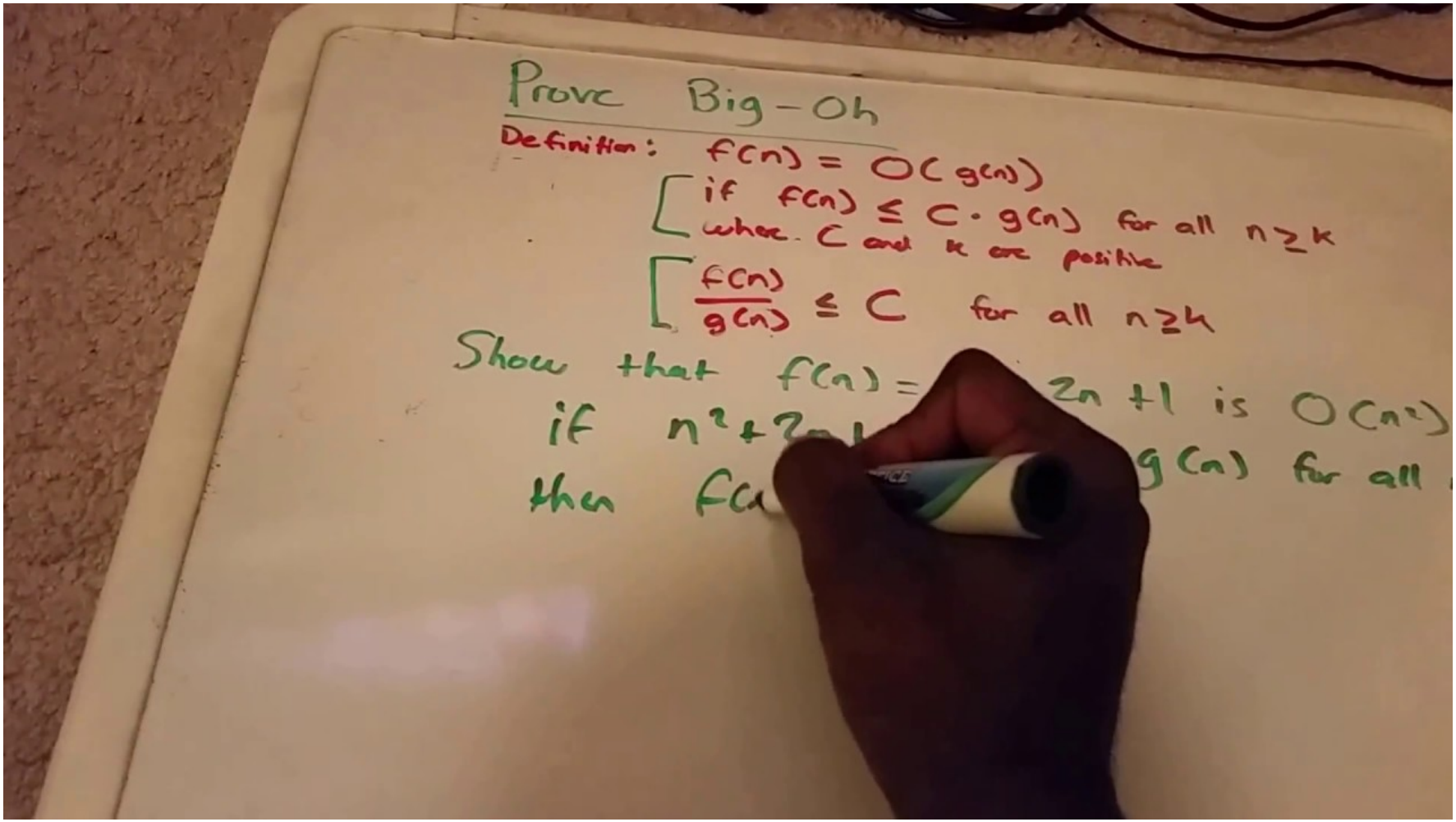

Entering HPC

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OpenMP C Code

```
while ( error > tol && iter < iter_max ) {
  error=0.0;

#pragma omp parallel for shared(m, n, Anew, A)
  for( int j = 1; j < n-1; j++) {
    for(int i = 1; i < m-1; i++) {

      Anew[j][i] = 0.25 * (A[j][i+1] + A[j][i-1] +
                           A[j-1][i] + A[j+1][i]);

      error = max(error, abs(Anew[j][i] - A[j][i]);
    }
  }

#pragma omp parallel for shared(m, n, Anew, A)
  for( int j = 1; j < n-1; j++) {
    for( int i = 1; i < m-1; i++ ) {
      A[j][i] = Anew[j][i];
    }
  }

  iter++;
}
```

Parallelize loop across CPU cores

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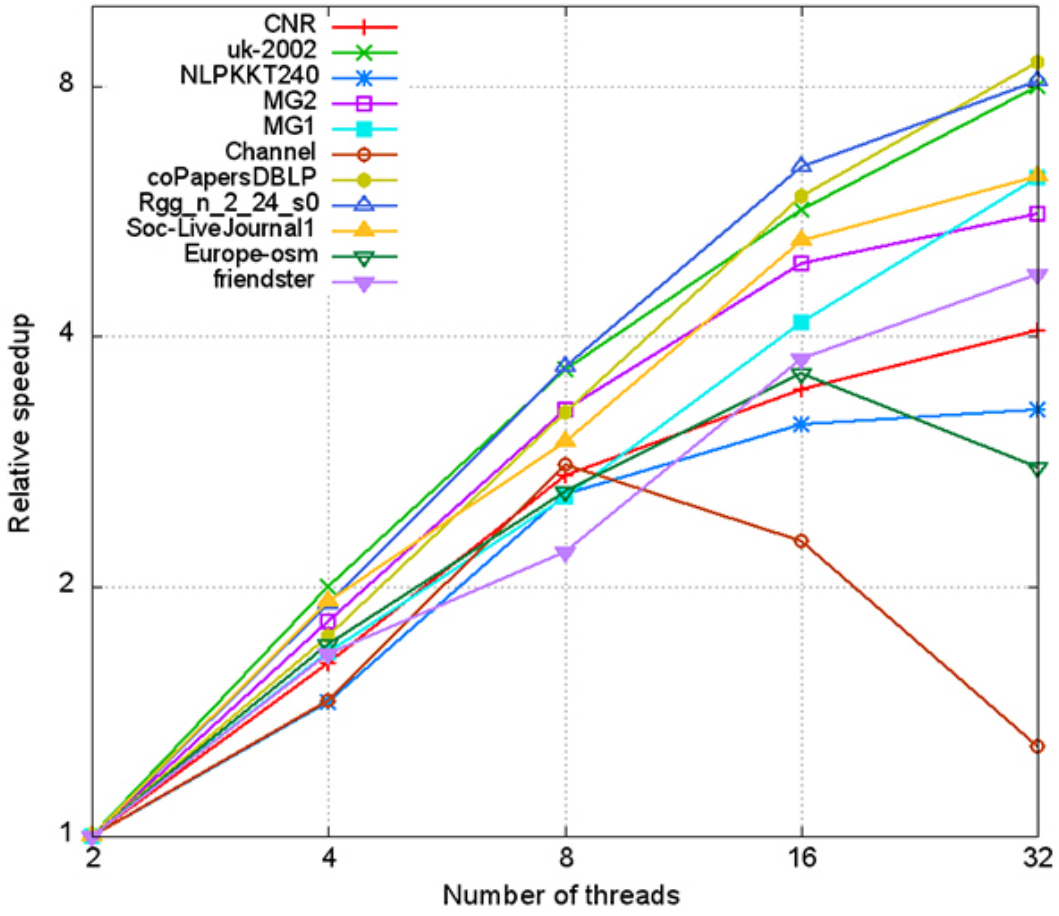

Defining HPC

From your intuition, provide a definition for HPC.

Defining HPC

HPC the a field of Computer Science that focuses on using the computing resources efficiently in order to produce fast solutions for computational problems.

Types of research involving HPC

Different people, different goals:

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