Introduction to HCI

Lecture #2

Agenda

- Genesis
- What is HCI?
  - Definition
  - Characterization
  - Notions
    - Human
    - Computer
    - Interaction

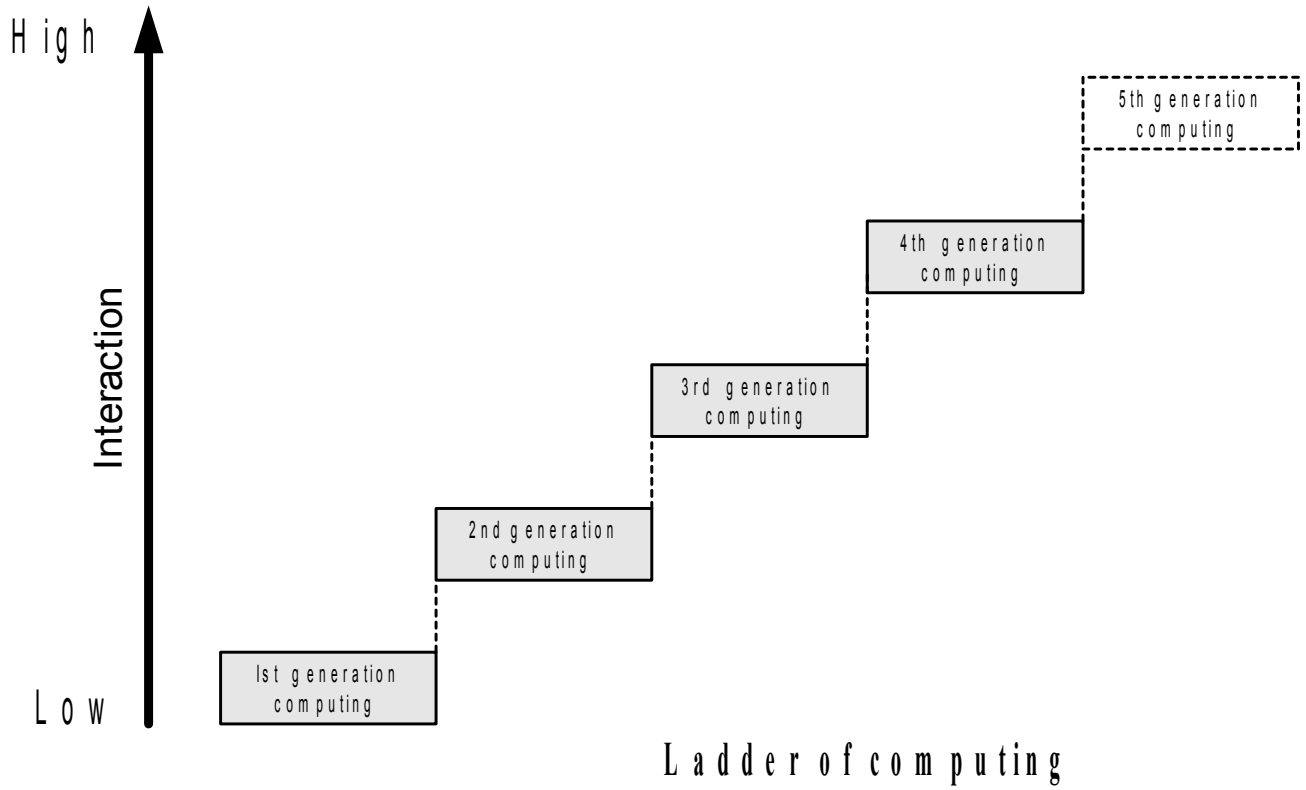
Genesis

- **Shift of focus from**
  - System-centered computing
    - Almost no interaction
    - Computer = hardware + machine-level code

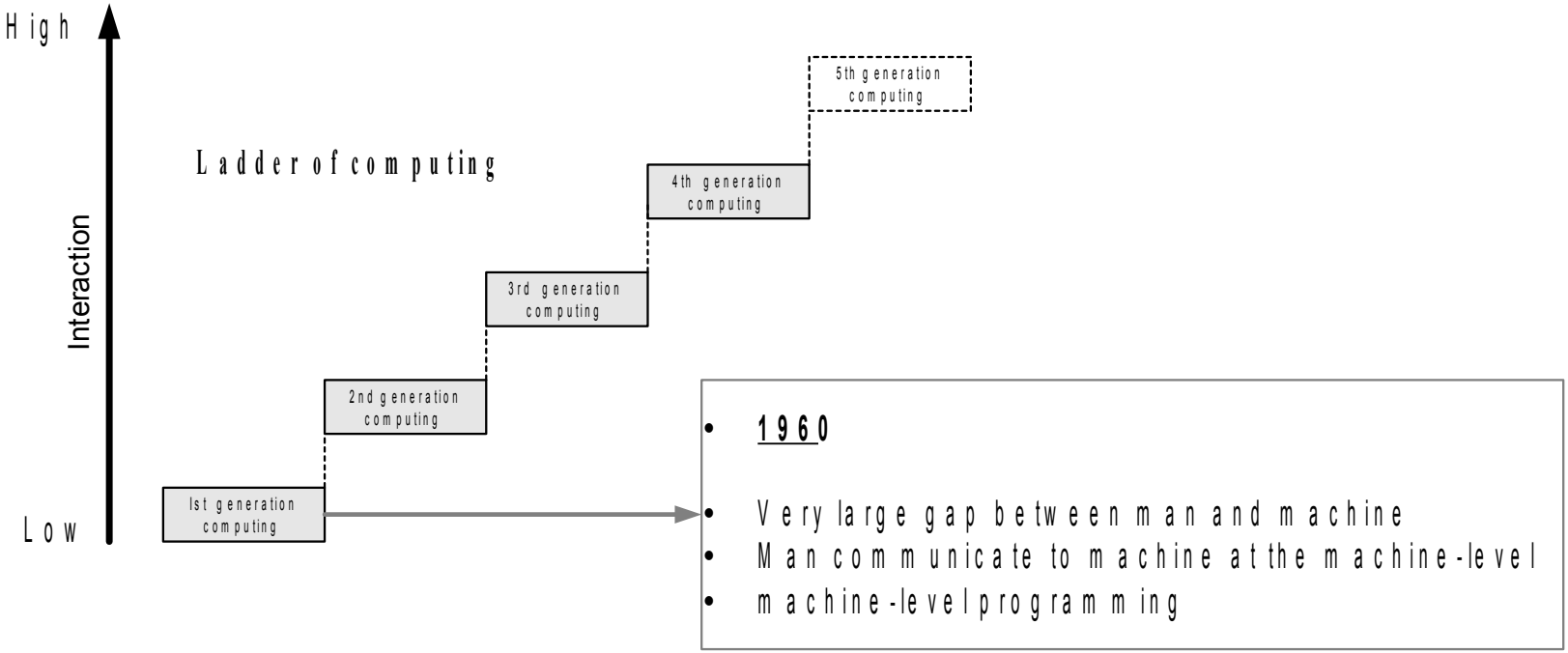
  to

  - People-centered computing
    - Very high-level interaction
    - Computer = hardware + software + algorithm

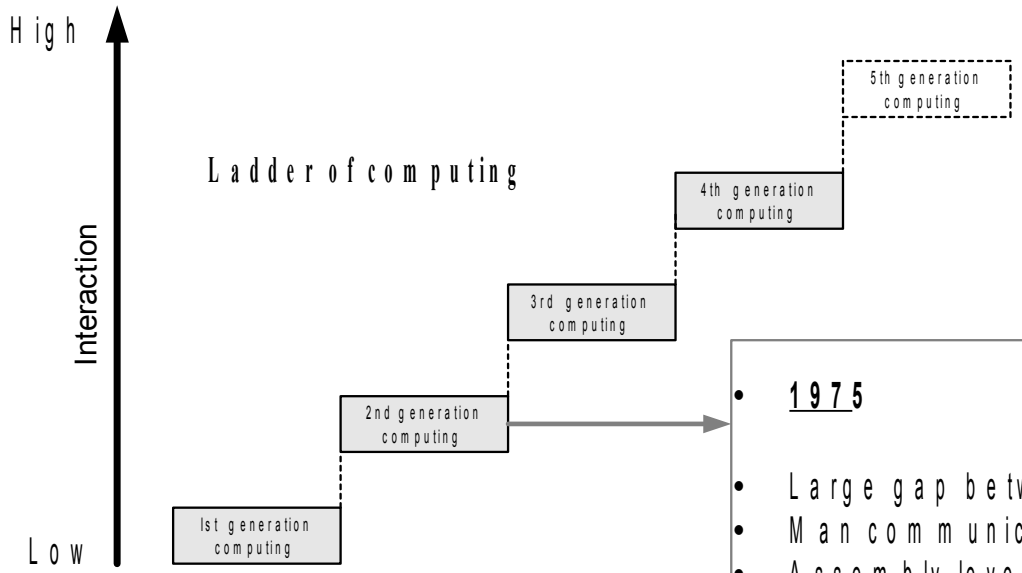
Genesis


High
Interaction
Low
1st generation computing
2nd generation computing
3rd generation computing
4th generation computing
5th generation computing
Ladder of computing

Genesis

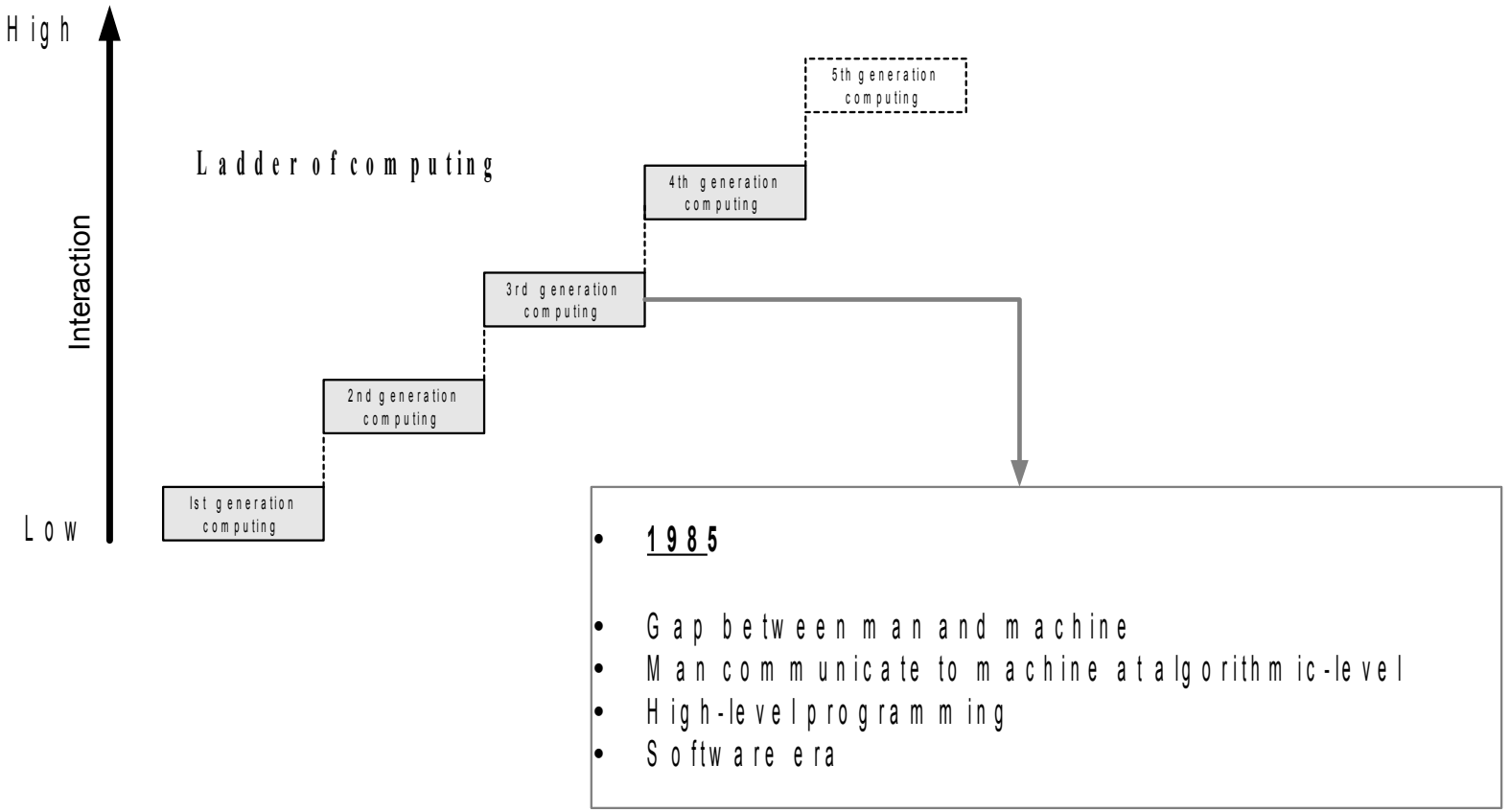

High
Interaction
Low
Ladder of computing
1st generation computing
2nd generation computing
3rd generation computing
4th generation computing
5th generation computing
1960
Very large gap between man and machine
Man communicate to machine at the machine-level
machine-level programming

Genesis



- **1975**
- Large gap between man and machine
- Man communicate to machine at mnemonic code-level
- Assembly-level programming
- Microprocessor era

Genesis


High
Interaction
Low
Ladder of computing
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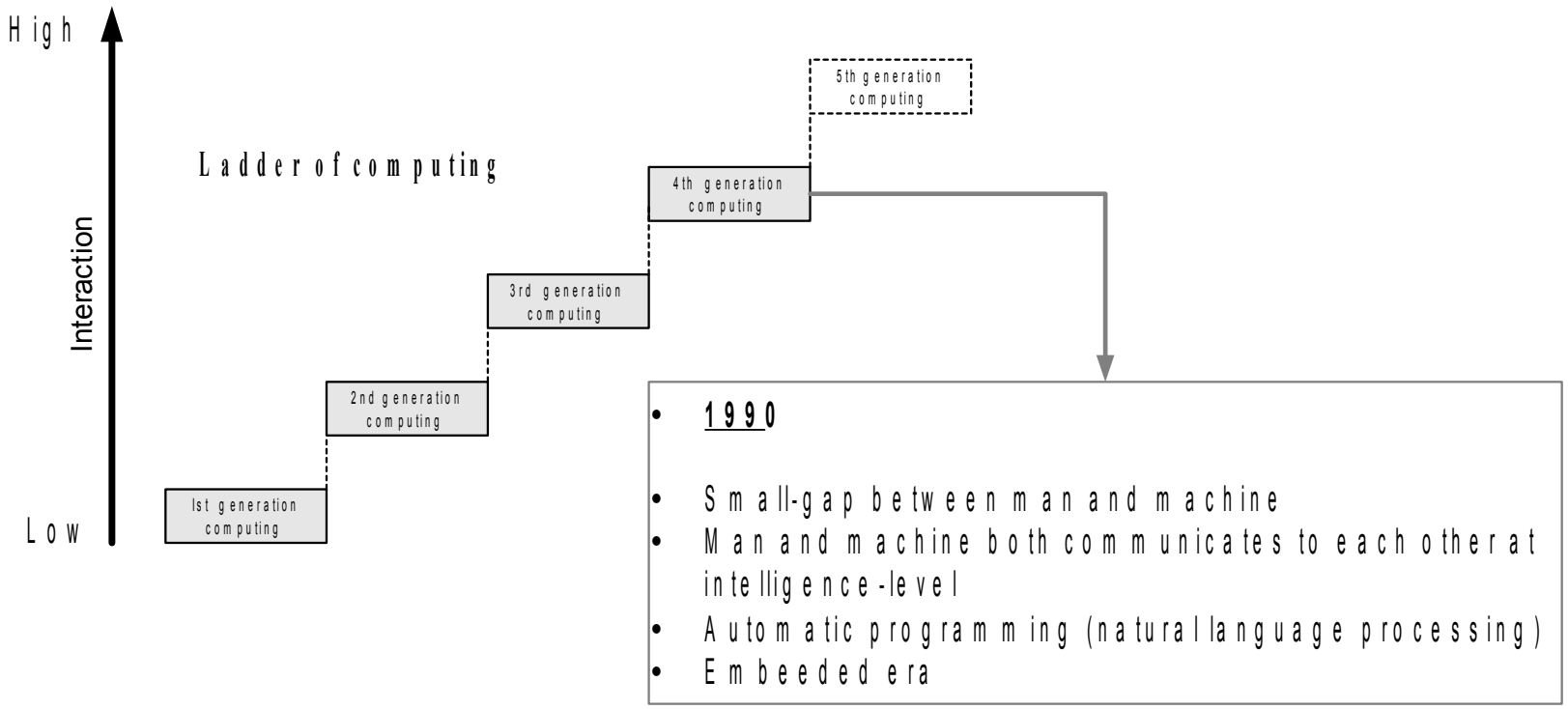
5th generation computing
1985
Gap between man and machine
Man communicate to machine at algorithmic-level
High-level programming
Software era

Genesis


High
Interaction
Low
Ladder of computing
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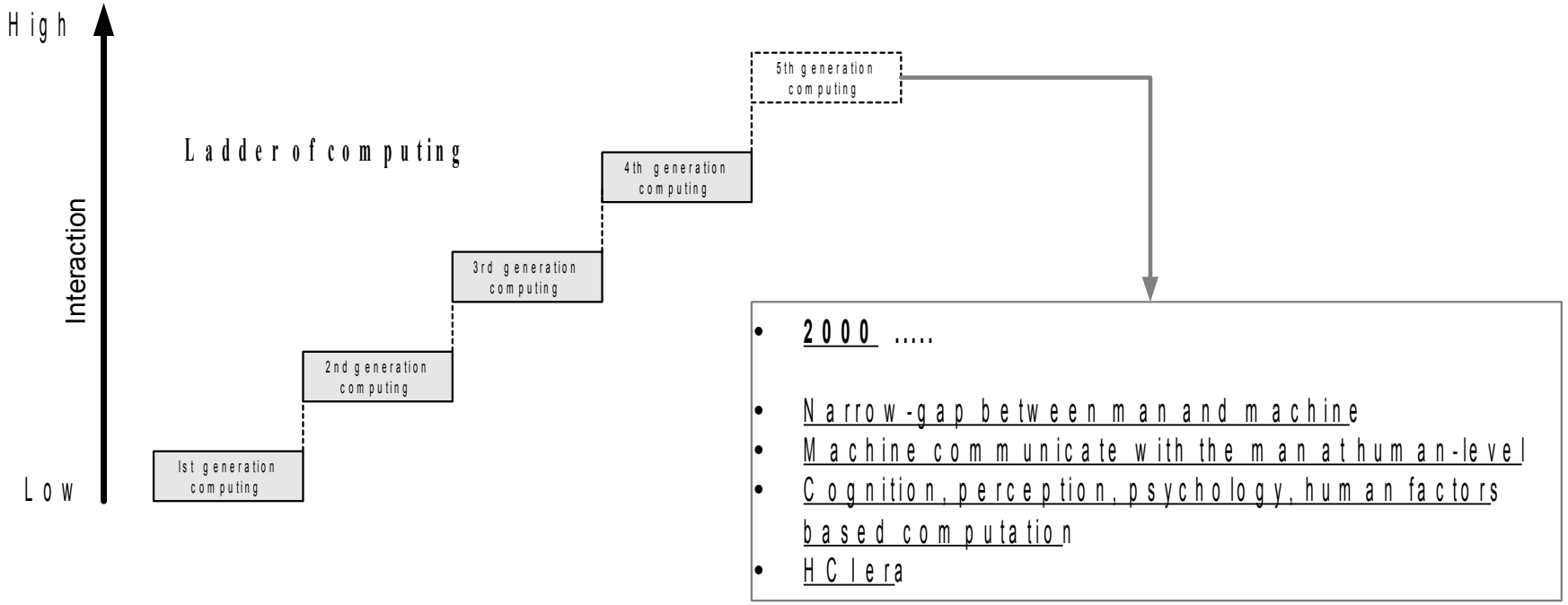
2nd generation computing
3rd generation computing
4th generation computing
5th generation computing
1990
Small-gap between man and machine
Man and machine both communicates to each other at intelligence-level
Automatic programming (natural language processing)
Embeeded era

Genesis


High
Interaction
Low
Ladder of computing
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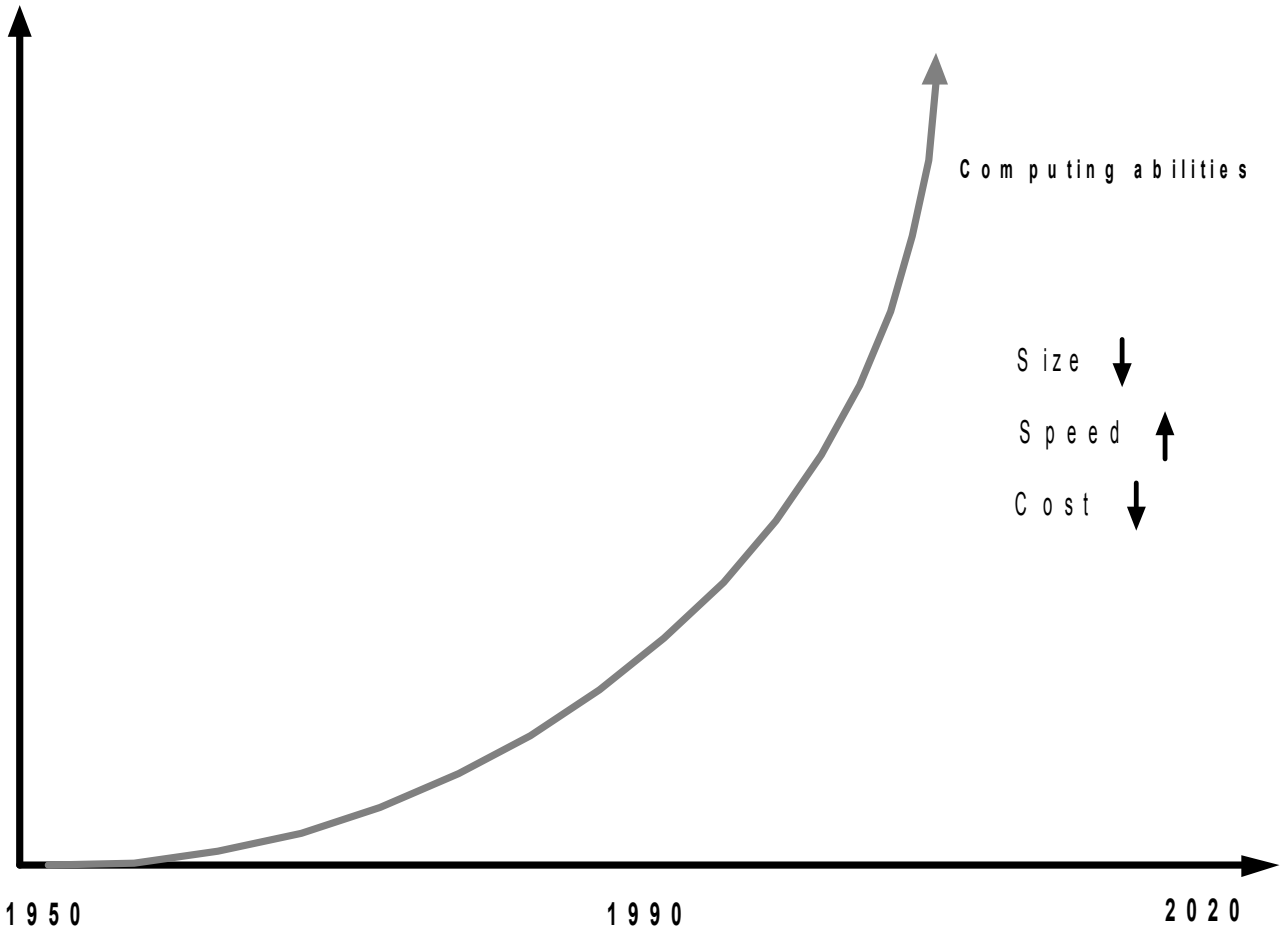
4th generation computing
5th generation computing
2000 .....
Narrow-gap between man and machine
Machine communicate with the man at human-level
Cognition, perception, psychology, human factors based computation
HC lera

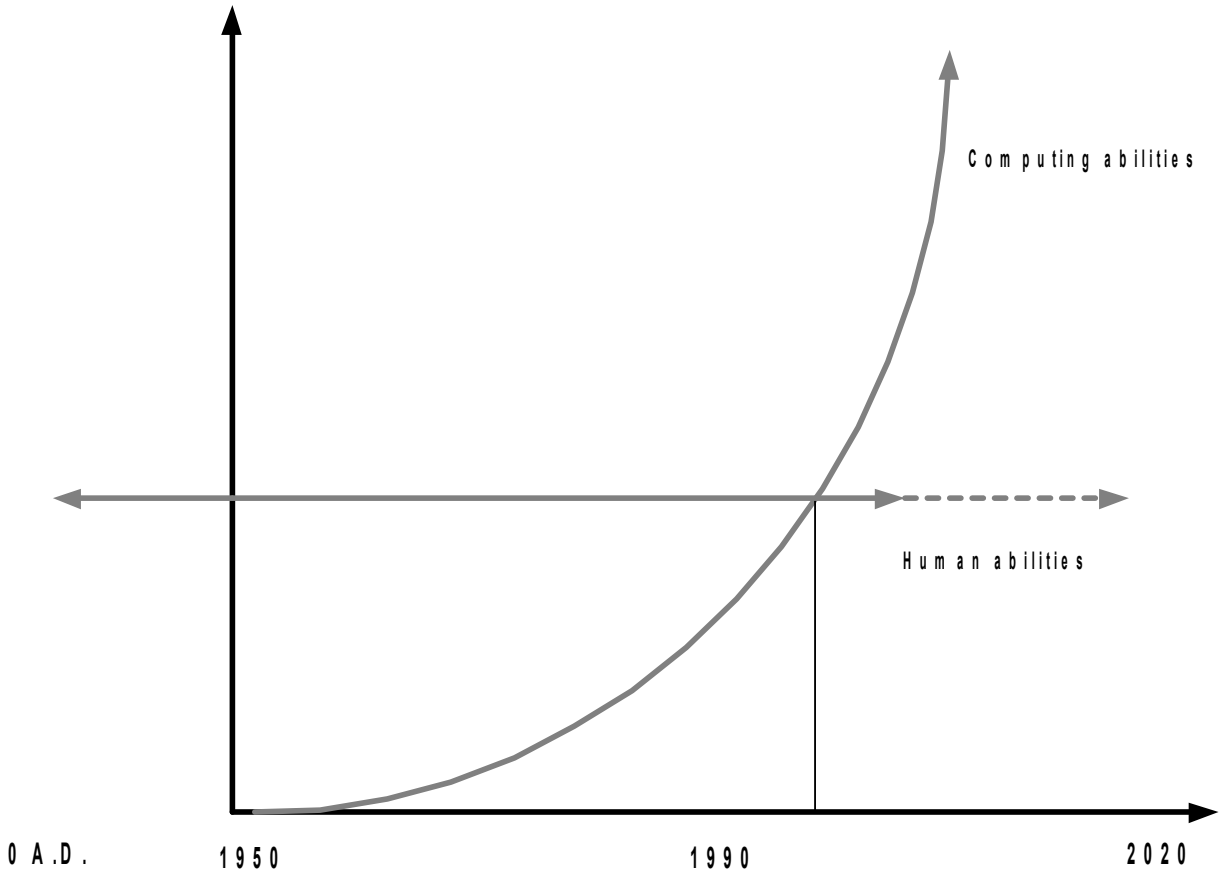
Feasibility of HCI

- **Moore's law**
  - David Moore, an Intel researcher, 1967
- **Human abilities**
  - Past, present and future human
- **Compuman**
  - Towards a reality, Mark Minasi

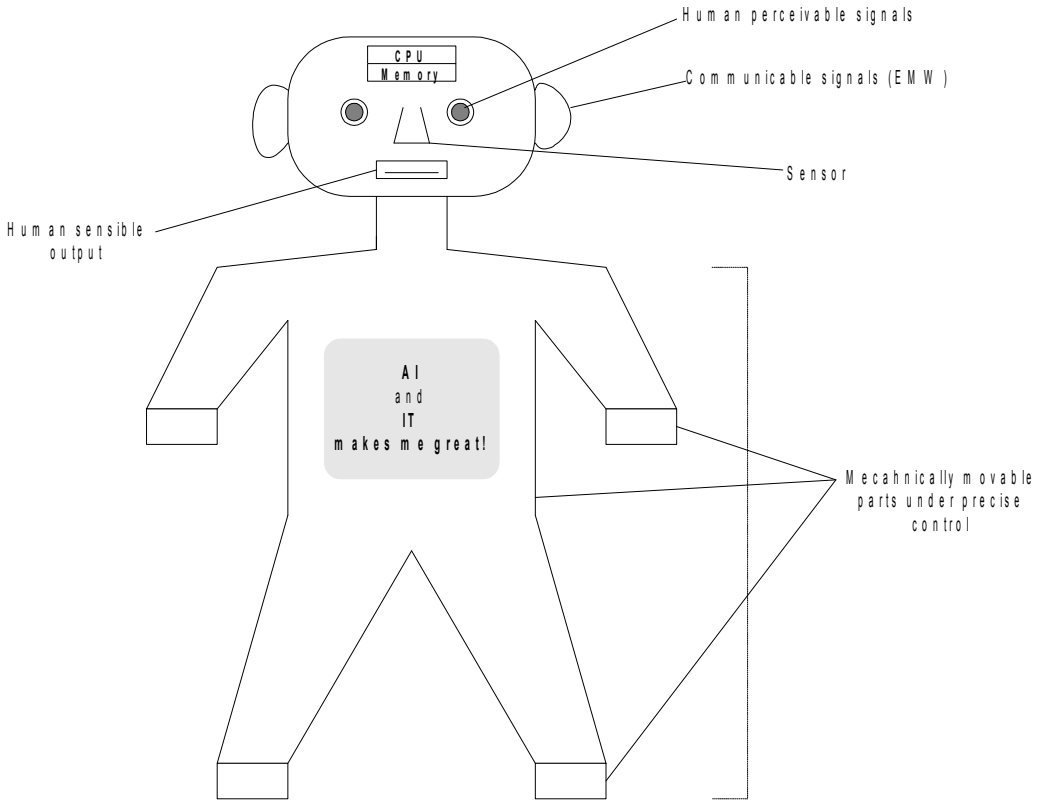
Moore's Law



Human Abilities



Reality: Compuman



Reality: Compuman

- Processing speed → Computer
- Memory → Computer
- Human factors → Human
  - » mind, mood, emotion, perception, cognition, psychology etc.
  - » Breakthrough: Computer can behave very close to Human
  - » Simon, Minasi etc.

Towards the Reality….

- So far computing speed is concerned enough has been achieved
- More researches are in pipeline to achieve more
  - Quantum computing
  - Molecular electronics
  - DNA Computer
  - etc.

Towards the Reality….

- Still a new paradigm shift is highly in demand
  - From today's human-centered computing
  - to tomorrow's human-centered computing

- How more accurately and efficiently the behavior of human can be simulated in a computer

Target: HCI

- An emerging discipline in IT
  - More usefulness of computer
  - User-friendly use
  - Low user error rate
  - Subjective user satisfaction
  - User retention over time
    - Expected projection by 2010: average computer time per user is 8 hours day

Focus: HCI

- **Human-computer interaction focuses on**
  - Interaction design
  - Interface environment development
    - Hardware
    - Software
    - Methodologies

HCI: A Multi-Disciplinary Area

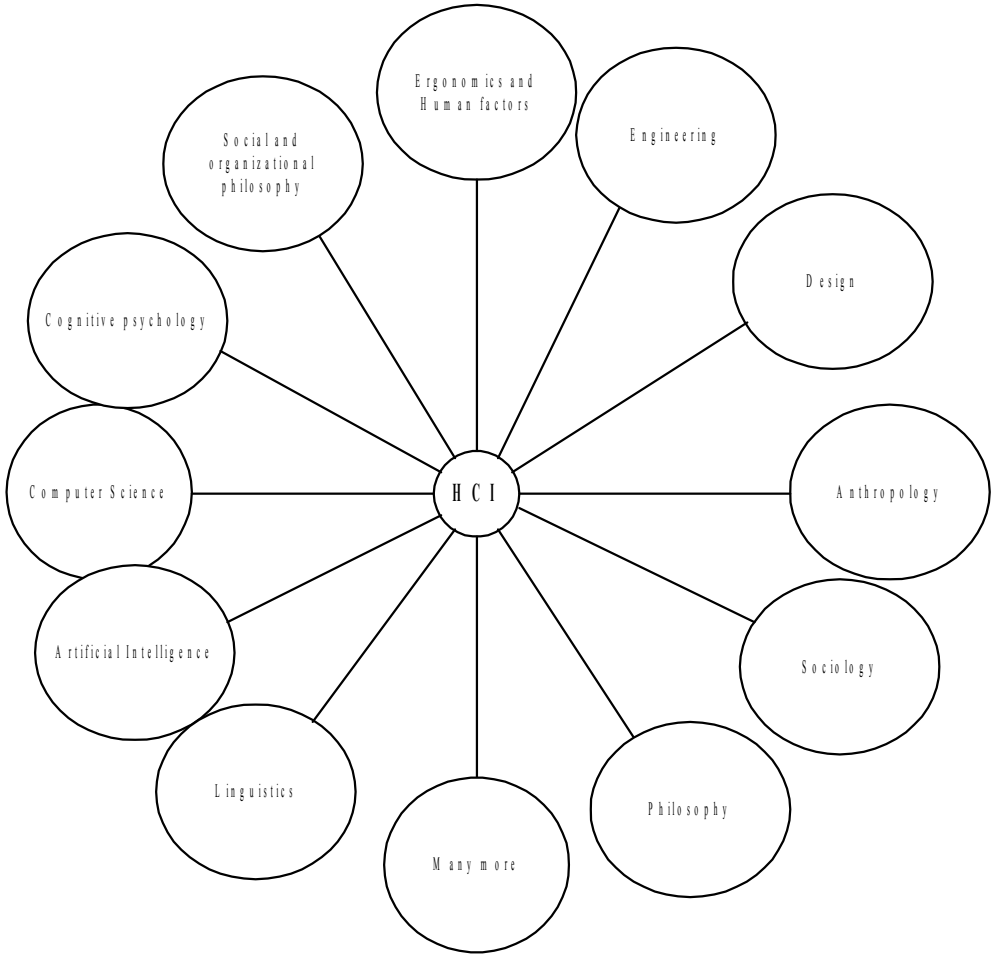
- **HCI draws attention from several fields**

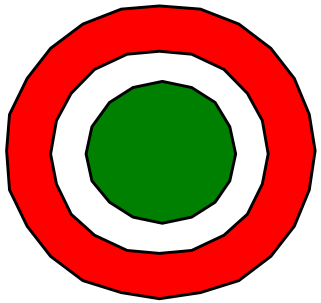
  Apart from Computer Science, Electronics, Electrical, IT

  - Cognitive and behavioral science
  - Human factors
  - Some empirical studies
  - Interface device development
  - Graphical design

  and many more…….

HCI: A Multi-Disciplinary Area





Definition of HCI

- HCI is an abbreviation for

  Human **C**omputer **I**nteraction

Context of HCI

Scenario 1

A person using an interactive graphics program on a workstation

Scenario 2

A browser searching for information in the Net

Scenario 3

A committee engaged in a video conference meeting

Note: The context between **one or more humans** and **one or more computational machines**

Notion of Computer in HCI

- So far the notion of machine is concerned:
  - Computers in the form of desktop PCs or workstations
  - Computers in the form of embedded computational machines, such as parts of spacecraft cockpits or microwave oven
  - Computers in the form of network of computers (Internet)

Notion of Human in HCI

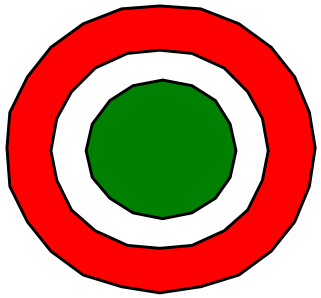
- So far the notion of human is concerned:
  - Human is a classical user (having a general knowledge on usage of computer)
    - e.g. students, manager
  - Human is a specialized user (little or no background of computer)
    - e.g. public in street, station, shopping complex, children and disabled persons

Notion of Human in HCI

- Notion of human (continued…):
  - Human is a group of persons (interfaces in a distributed systems)
    - e.g. two or more online users in a network
  - Human is an organization (computer aided communication among humans, or the nature of the work being cooperatively performed by means of the system)
    - e.g. corporate office

Notion of Interaction in HCI

- So far notion of interaction is concerned:
  - Each interaction has its own context
  - Interaction leads to a rich space of possible topics
  - In fact, the study of HCI means we wish to identify interaction as more central to its focus



HCI actually…..

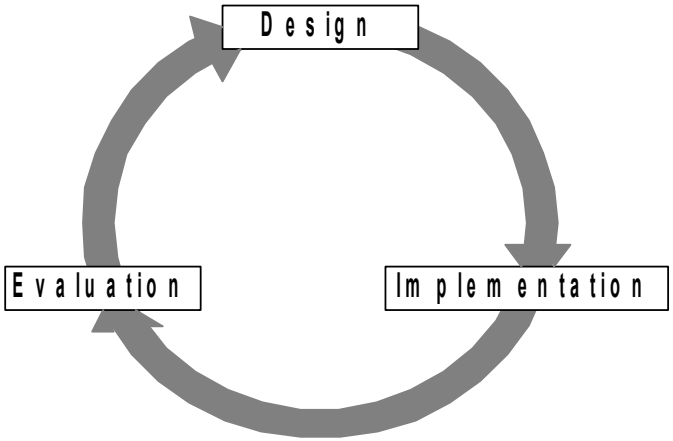
A discipline concerned with

Design

Implementation

Evaluation

of interactive computing system for human use



Working Definition of HCI

- Definition according to ACM SIGCHI

Human-computer interaction is a discipline concerned with the design, implementation and evaluation of interactive computing systems for human use and with the study of major phenomenon surrounding them.

A Precise Characterization of HCI

- Human-computer interaction is concerned with the joint performance by human and machine
- The structure of communication between human and machine
- Human capabilities to use machines (including the ability to learn an interface)

A Precise Characterization of HCI

- Algorithms and programming of the interface itself
- Engineering concerns that arise in designing and building interfaces
- The process of specification of design and implementation of interface
- Design trade-off

Human-computer interaction thus has Science, Engineering and Design aspects

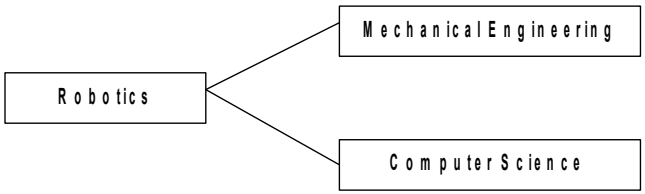
HCI: Which Discipline it Belongs?

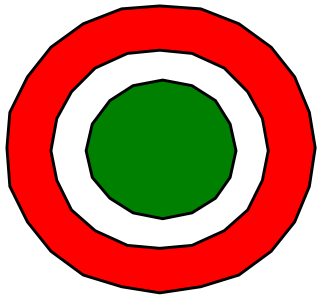
- HCI in the large is an interdisciplinary area
- It is emerging as a specially concern within several disciplines, each with different emphasis
  - Computer Science (application design and engineering of human interfaces)
  - Psychology (application of theories of cognitive processes and the empirical analysis of user behavior)

HCI: Which Discipline it Belongs?

- Sociology and anthropology (interaction between technology, work and organization)
- Industrial design (interactive products such as Cell phone, Washing machine, Microwave oven etc.)

- According to ACM SIGCHI, Computer Science is the basic discipline and other discipline serves as supporting discipline





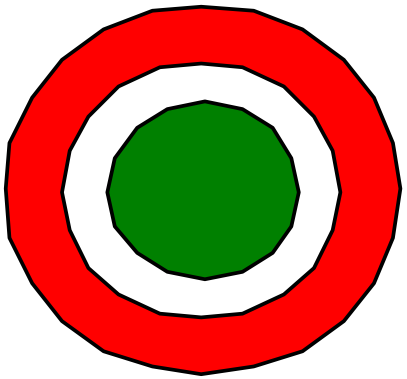
Summary

- Human-computer interaction studies a human and a machine in communication
- HCI draws supporting knowledge on both the machine side and the human side
- **On machine side**
  - Techniques in computer graphics, operating systems, programming languages, algorithms and development environments are relevant

Summary

- **On human side**
  - Communication theory, graphics and industrial design discipline, linguistic, social sciences, cognitive, psychology and human performance (AI) are relevant

- **On interaction side**
  - Engineering and design methods are relevant



Recommended Links

- My Home page
  http://www.facweb.iitkgp.ernet.in/~dsamanta
  (For the presentation slides of the current lecture)
- ACM SIGCHI
  http://sigchi.org/cdg/index.html
  (For Introduction to HCI, HCI courses etc.)
- Alan Dix's Books on HCI 3rd Edn.
  http://www.amazon.com/
  (Also see the presentation slides Lecture#1)