DIGHUM

DigHum Lecture 08 April 2025

Decolonizing the Future - Computer Science Is not Just Science/Engineering Anymore As It Used to Be in the Old Days

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Social Innovation and Global Citizenship

KNOWLEDGE FOR SERVICE

W4RA

Summary

- The nature, position and (self-)image of INF/Computer Science has changed a lot in the past decades
  * From technical to sociotechnical to “technosocial”
  * Self-image INF/CS runs behind the facts

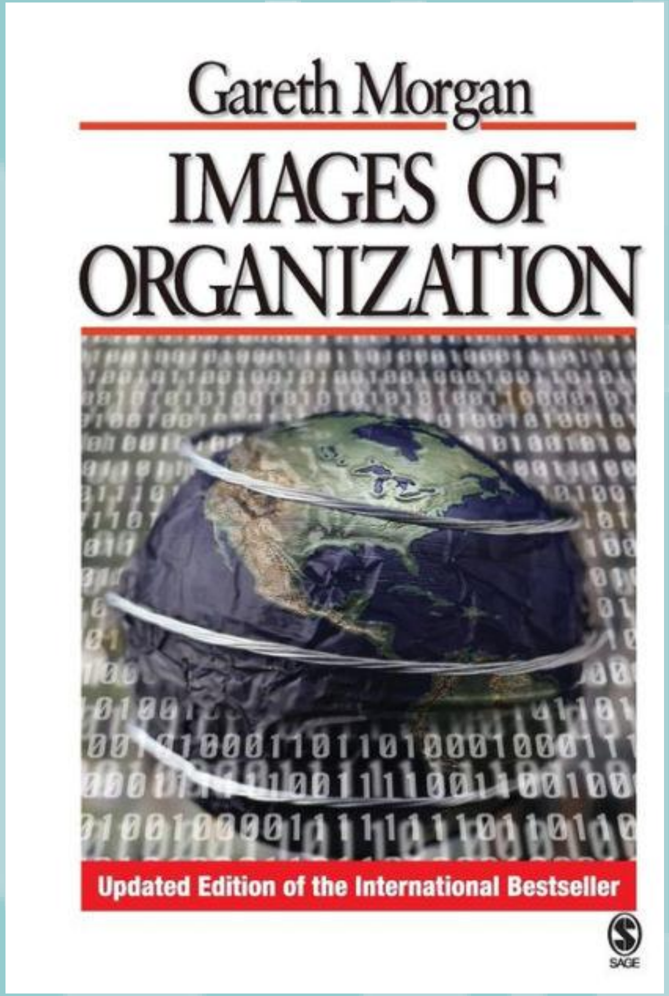
- Digital Technology has become a central force and source of power in the restructuring of society. INF/Computer Science is now at a crossroads

- We need to rethink what INF/CS “is”
  * Including the redesign of education curricula
  * Place in society: Governance (and democratization) of technology

  * Sideshow: the power of metaphor

Images of Digital Worlds (1/x)

(Wikipedia) The book particularly describes the organization *metaphorically* as (1) machines, (2) organisms, (3) brains, (4) cultures, (5) political systems, (6) psychic prisons, (7) flux and transformation, and (8) instruments of domination.



- NB - we can do this for science as well

a psychic prison

Images of Informatics / Computer Science (2/x): CS = Machine engineering and design

- This image is in the name: CS

Why not call:

- Aerodynamics - plane science,
- Thermodynamics - steam engine science,
- Telecommunications - handy science,
- Statistics - dice science
- ?

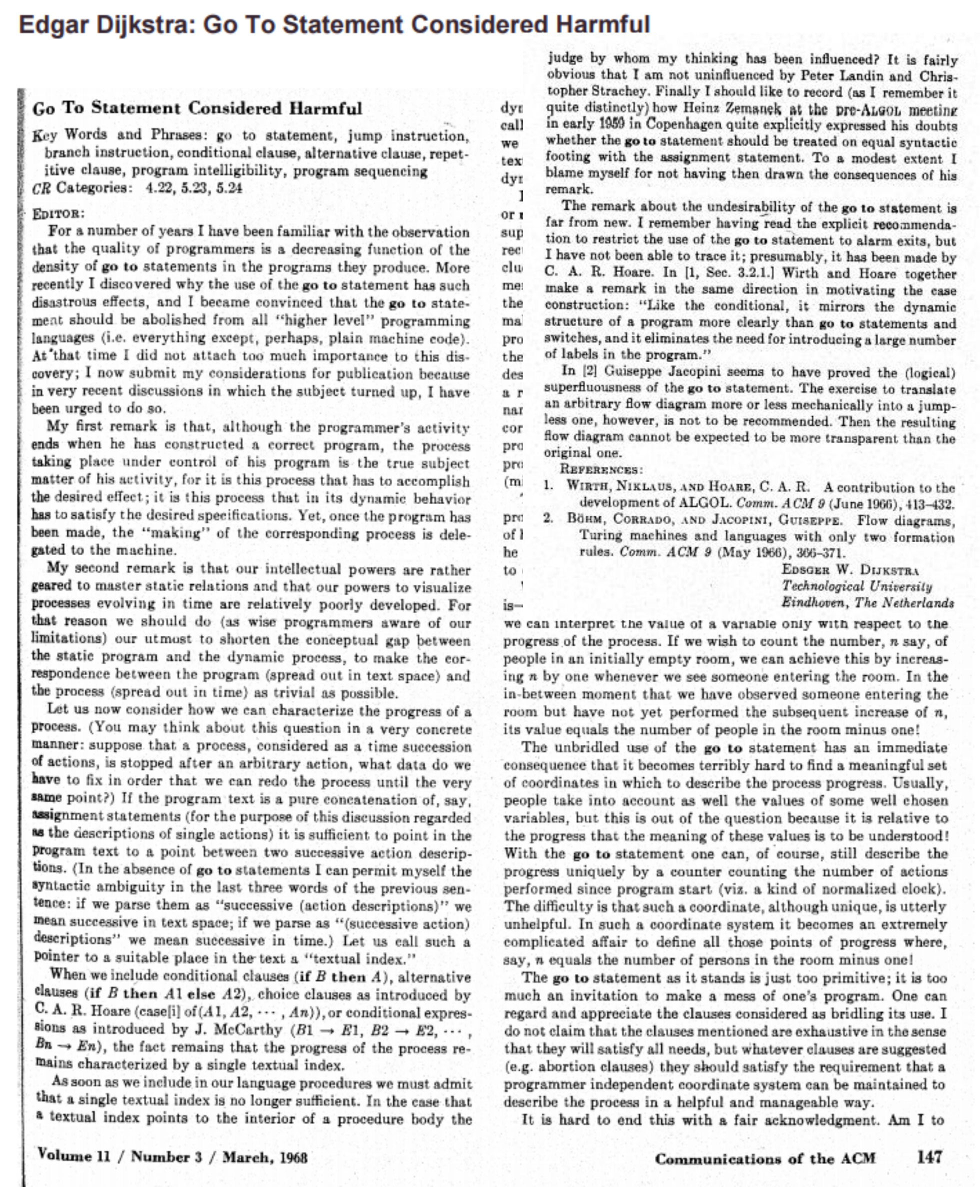
STRUCTURED COMPUTER ORGANIZATION
SIXTH EDITION
Andrew S. Tanenbaum • Todd Austin
COMPUTER ARCHITECTURE INC

Images of Informatics / Computer Science (3/x): CS = formal-mathematical theory of a machine

- Modelled after theoretical / mathematical physics, symbolic logic
- Striving for high ground of science
- Incl. no messy trial-and-error engineering anymore

(Wikipedia) (8) instruments of domination.

NB note how the label "scientific" is used as political power instrument in academia



Edgar Dijkstra: Go To Statement Considered Harmful

Go To Statement Considered Harmful

Key Words and Phrases: go to statement, jump instruction, branch instruction, conditional clause, alternative clause, repetitive clause, program intelligibility, program sequencing
CR Categories: 4.22, 5.23, 5.24

EDITOR:

For a number of years I have been familiar with the observation that the quality of programmers is a decreasing function of the density of **go to** statements in the programs they produce. More recently I discovered why the use of the **go to** statement has such disastrous effects, and I became convinced that the **go to** statement should be abolished from all "higher level" programming languages (i.e. everything except, perhaps, plain machine code). At that time I did not attach too much importance to this discovery; I now submit my considerations for publication because in very recent discussions in which the subject turned up, I have been urged to do so.

My first remark is that, although the programmer's activity ends when he has constructed a correct program, the process taking place under control of his program is the true subject matter of his activity, for it is this process that has to accomplish the desired effect; it is this process that in its dynamic behavior has to satisfy the desired specifications. Yet, once the program has been made, the "making" of the corresponding process is delegated to the machine.

My second remark is that our intellectual powers are rather geared to master static relations and that our powers to visualize processes evolving in time are relatively poorly developed. For that reason we should do (as wise programmers aware of our limitations) our utmost to shorten the conceptual gap between the static program and the dynamic process, to make the correspondence between the program (spread out in text space) and the process (spread out in time) as trivial as possible.

Let us now consider how we can characterize the progress of a process. (You may think about this question in a very concrete manner: suppose that a process, considered as a time succession of actions, is stopped after an arbitrary action, what data do we have to fix in order that we can redo the process until the very same point?) If the program text is a pure concatenation of, say, assignment statements (for the purpose of this discussion regarded as the descriptions of single actions) it is sufficient to point in the program text to a point between two successive action descriptions. (In the absence of **go to** statements I can permit myself the syntactic ambiguity in the last three words of the previous sentence: if we parse them as "successive (action descriptions)" we mean successive in text space; if we parse as "(successive action) descriptions" we mean successive in time.) Let us call such a pointer to a suitable place in the text a "textual index."

When we include conditional clauses (**if** *B* **then** *A*), alternative clauses (**if** *B* **then** *A*1 **else** *A*2), choice clauses as introduced by C. A. R. Hoare (case[i] of (*A*1, *A*2, ⋯ , *An*)), or conditional expressions as introduced by J. McCarthy ($B1 \rightarrow E1$, $B2 \rightarrow E2$, ⋯ , $Bn \rightarrow En$), the fact remains that the progress of the process remains characterized by a single textual index.

As soon as we include in our language procedures we must admit that a single textual index is no longer sufficient. In the case that a textual index points to the interior of a procedure body the

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judge by whom my thinking has been influenced? It is fairly obvious that I am not uninfluenced by Peter Landin and Christopher Strachey. Finally I should like to record (as I remember it quite distinctly) how Heinz Zemanek at the pre-ALGOL meeting in early 1959 in Copenhagen quite explicitly expressed his doubts whether the **go to** statement should be treated on equal syntactic footing with the assignment statement. To a modest extent I blame myself for not having then drawn the consequences of his remark.

The remark about the undesirability of the **go to statement** is far from new. I remember having read the explicit recommendation to restrict the use of the **go to** statement to alarm exits, but I have not been able to trace it; presumably, it has been made by C. A. R. Hoare. In [1, Sec. 3.2.1.] Wirth and Hoare together make a remark in the same direction in motivating the case construction: "Like the conditional, it mirrors the dynamic structure of a program more clearly than **go to** statements and switches, and it eliminates the need for introducing a large number of labels in the program."

In [2] Guiseppe Jacopini seems to have proved the (logical) superfluousness of the **go to** statement. The exercise to translate an arbitrary flow diagram more or less mechanically into a jumpless one, however, is not to be recommended. Then the resulting flow diagram cannot be expected to be more transparent than the original one.

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1. WIRTH, NIKLAUS, AND HOARE, C. A. R. A contribution to the development of ALGOL. *Comm. ACM 9* (June 1966), 413–432.
2. BÖHM, CORRADO, AND JACOPINI, GUISEPPE. Flow diagrams, Turing machines and languages with only two formation rules. *Comm. ACM 9* (May 1966), 366–371.

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we can interpret the value of a variable only with respect to the progress of the process. If we wish to count the number, *n* say, of people in an initially empty room, we can achieve this by increasing *n* by one whenever we see someone entering the room. In the in-between moment that we have observed someone entering the room but have not yet performed the subsequent increase of *n*, its value equals the number of people in the room minus one!

The unbridled use of the **go to** statement has an immediate consequence that it becomes terribly hard to find a meaningful set of coordinates in which to describe the process progress. Usually, people take into account as well the values of some well chosen variables, but this is out of the question because it is relative to the progress that the meaning of these values is to be understood! With the **go to** statement one can, of course, still describe the progress uniquely by a counter counting the number of actions performed since program start (viz. a kind of normalized clock). The difficulty is that such a coordinate, although unique, is utterly unhelpful. In such a coordinate system it becomes an extremely complicated affair to define all those points of progress where, say, *n* equals the number of persons in the room minus one!

The **go to** statement as it stands is just too primitive; it is too much an invitation to make a mess of one's program. One can regard and appreciate the clauses considered as bridling its use. I do not claim that the clauses mentioned are exhaustive in the sense that they will satisfy all needs, but whatever clauses are suggested (e.g. abortion clauses) they should satisfy the requirement that a programmer independent coordinate system can be maintained to describe the process in a helpful and manageable way.

It is hard to end this with a fair acknowledgment. Am I to

Volume 11 / Number 3 / March, 1968

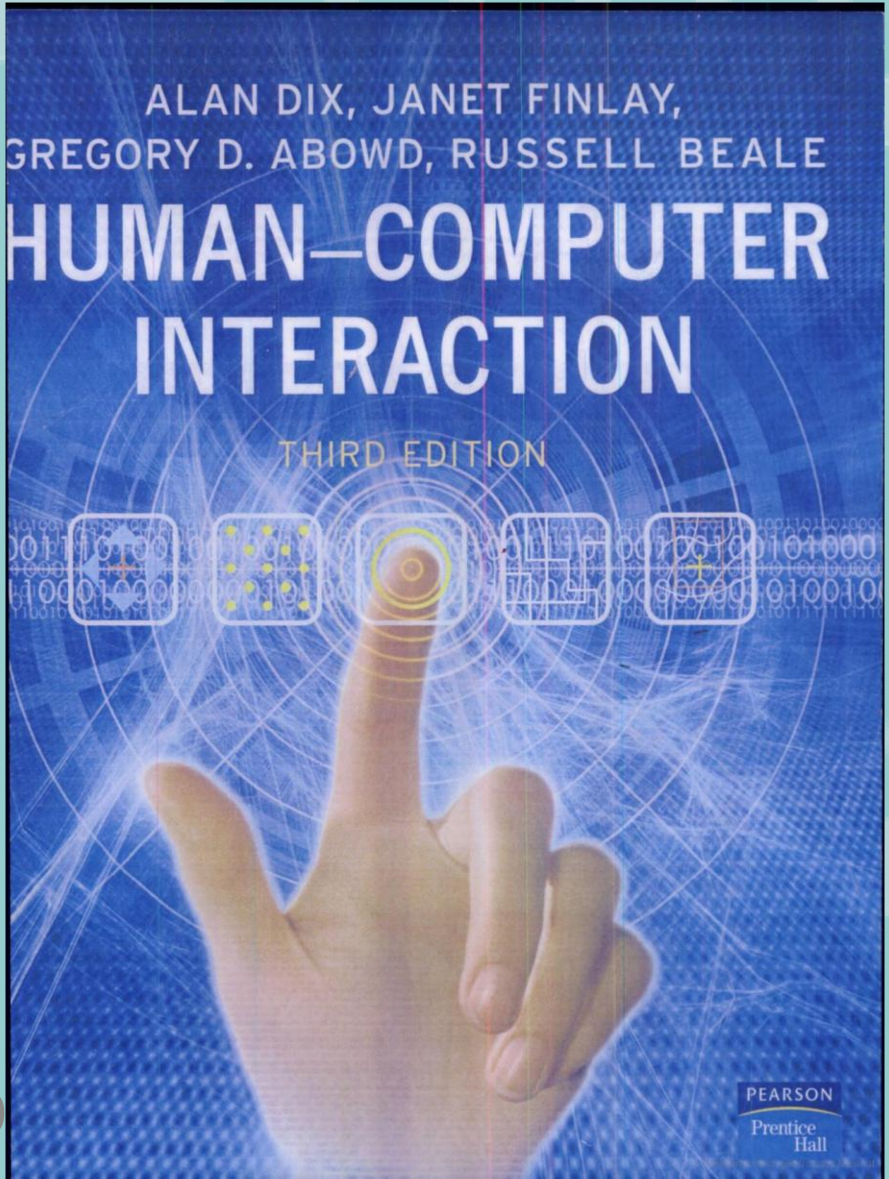
Communications of the ACM 147

Images of Informatics / Computer Science (4/x): Enters the Human: Human-Computer Interaction

- HCI fights itself in as branch of INF/CS (around 1990's)
- Emergence of notions such as socio-technical systems

Image issues:

- Is it scientific? "Does it have a theory?"
- Is it good principled engineering?
- Business Informatics: the same story

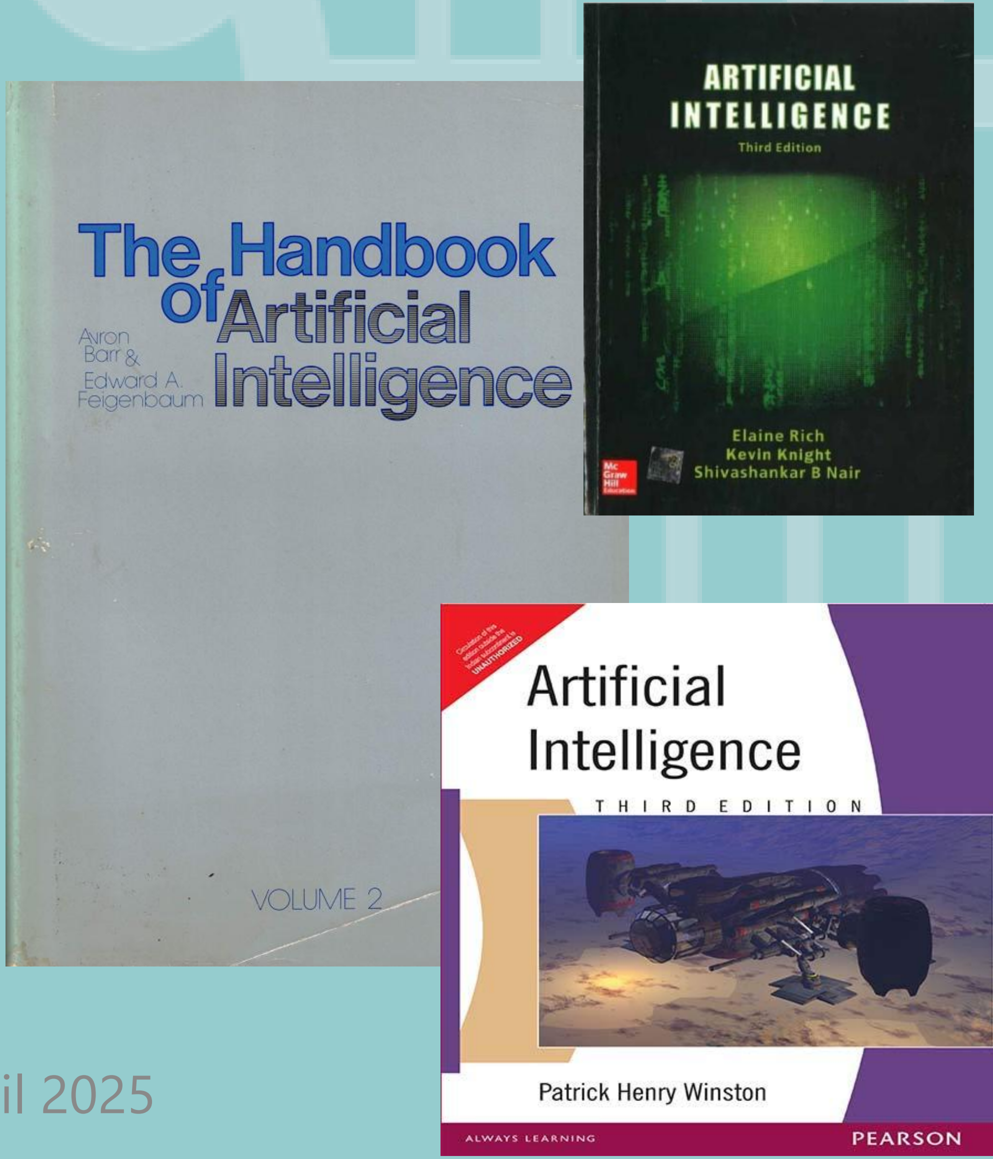


Images of Informatics / Computer Science (5/x): Enters an Alien Immigrant: Artificial Intelligence

- AI

Image issues:

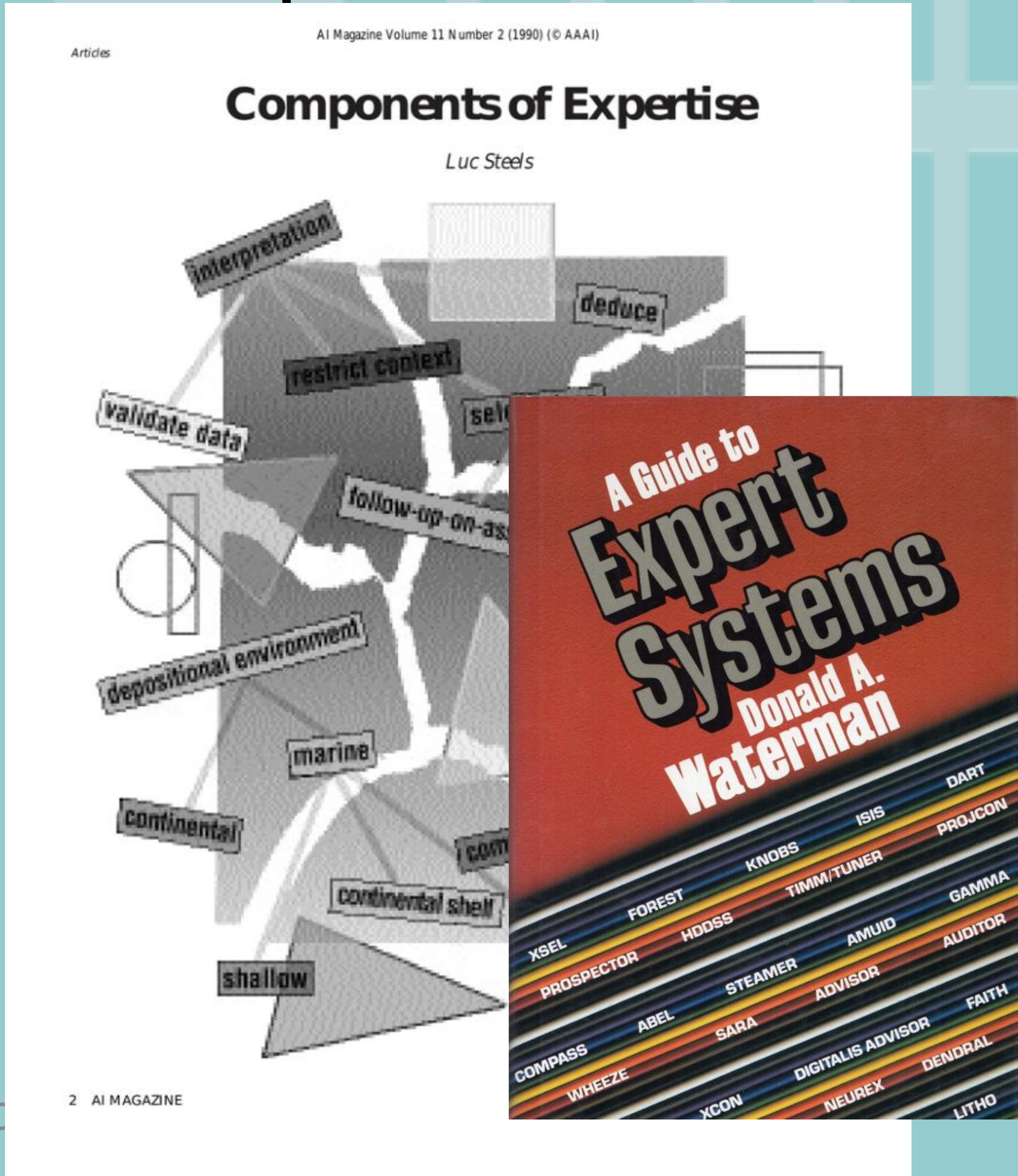
- Is it good principled engineering?
  - *Unable to provide algorithmic complexity analysis
- Is it scientific? “Does it have a theory?”
  - *Heuristic programming - Huh?
  - *AI as just metaphorical device



Images of Informatics / Computer Science (6/x): AI and the productiveness of metaphor

- AI

- Expert systems
- Knowledge management
- Ontology
  - *Reference is NOT the machine
- Neural networks
- Evolutionary, Genetic Algorithms
- Machine learning
- Agents, Multi-Agent Systems
- Intelligence



AI Magazine Volume 11 Number 2 (1990) (© AAAI)

Articles

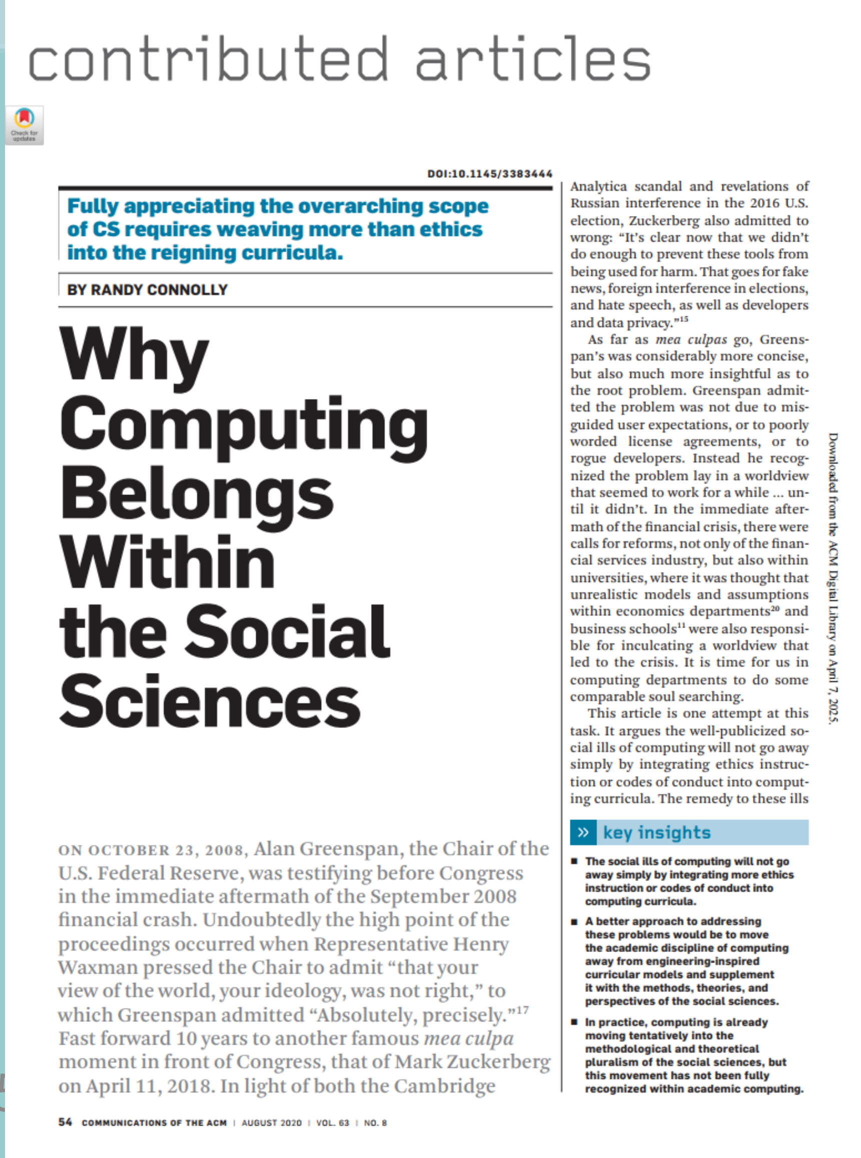
Components of Expertise

Luc Steels

2 AI MAGAZINE

Images of Informatics / Computer Science (7/x): Shift: technical – socio-technical - technosocial

- INF/CS: from purely technical via sociotechnical to (?) technosocial
- The social has become increasingly central to INF/CS
- And now also the other way around:
- The Digital Transformation: INF/CS technologies are central in restructuring society
  - *For better or worse



DOI:10.1145/3383444

Fully appreciating the overarching scope of CS requires weaving more than ethics into the reigning curricula.

BY RANDY CONNOLLY

Why Computing Belongs Within the Social Sciences

ON OCTOBER 23, 2008, Alan Greenspan, the Chair of the U.S. Federal Reserve, was testifying before Congress in the immediate aftermath of the September 2008 financial crash. Undoubtedly the high point of the proceedings occurred when Representative Henry Waxman pressed the Chair to admit "that your view of the world, your ideology, was not right," to which Greenspan admitted "Absolutely, precisely."[17] Fast forward 10 years to another famous *mea culpa* moment in front of Congress, that of Mark Zuckerberg on April 11, 2018. In light of both the Cambridge Analytica scandal and revelations of Russian interference in the 2016 U.S. election, Zuckerberg also admitted to wrong: "It's clear now that we didn't do enough to prevent these tools from being used for harm. That goes for fake news, foreign interference in elections, and hate speech, as well as developers and data privacy."[15]

As far as *mea culpas* go, Greenspan's was considerably more concise, but also much more insightful as to the root problem. Greenspan admitted the problem was not due to misguided user expectations, or to poorly worded license agreements, or to rogue developers. Instead he recognized the problem lay in a worldview that seemed to work for a while … until it didn't. In the immediate aftermath of the financial crisis, there were calls for reforms, not only of the financial services industry, but also within universities, where it was thought that unrealistic models and assumptions within economics departments[20] and business schools[11] were also responsible for inculcating a worldview that led to the crisis. It is time for us in computing departments to do some comparable soul searching.

This article is one attempt at this task. It argues the well-publicized social ills of computing will not go away simply by integrating ethics instruction or codes of conduct into computing curricula. The remedy to these ills

» key insights

- The social ills of computing will not go away simply by integrating more ethics instruction or codes of conduct into computing curricula.
- A better approach to addressing these problems would be to move the academic discipline of computing away from engineering-inspired curricular models and supplement it with the methods, theories, and perspectives of the social sciences.
- In practice, computing is already moving tentatively into the methodological and theoretical pluralism of the social sciences, but this movement has not been fully recognized within academic computing.

Images of Digital Worlds (8/x): A New Structural Change of the Public Sphere and Deliberative Politics

- 1960: Emergence of *Mass Media* (tv, etc.) has fundamentally altered public political discourse

- 2023: Digital BigTech *Social Media* fundamentally influence, and manipulate, social-political discourse and deliberation
  - *From manipulation of consumer behaviour
  - *To manipulation of socio-political behaviour

Jürgen Habermas

Ein neuer Strukturwandel der Öffentlichkeit und die deliberative Politik

Suhrkamp

Images of Digital Worlds (9/x): Digital Colonization - Land Grabbing, Mining, Extraction

- 1. Digital BigTech: enormous concentration of monopolistic economic power in and through digital technology sector

- 2. Digital Transformation: confluence of monopolistic power and domination *across* key industrial and societal sectors beyond the digital industry sector
  - * Incl. governance of society
  - * Incl. military/defense/war, a new Military-Industrial Complex

- 3. Digital BigTech has installed itself in the heart of public government, so in the centre of the political process

- 4. Note attack on civil society/sectors (education, culture, ...)

- 5. Even the very idea of human rights, equality, justice, democracy, universal human values needs our protection now

A kind of Oppenheimer moment: INF/CS has lost its innocence

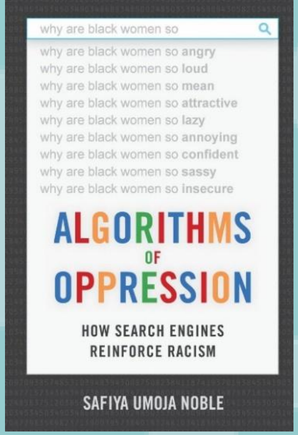
- We need to rethink / come to terms with what INF/CS "is"
  - * Content as a (socio)technical / technosocial discipline
  - * As a societal force / power instrument: how to govern all this
- We need a programme of Digital Decolonization of the Future
- Education: as part of this, we need to rethink and redesign our curricula. This is more than adding, say, a course on ethics

SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS

18 FAIR AND INCLUSIVE DIGITAL SOCIETY

(Courtesy Anna Bon)

Education example:
The Problem with "Ethics"


why are black women so
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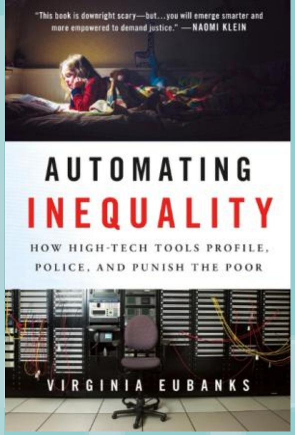
ALGORITHMS OF OPPRESSION
HOW SEARCH ENGINES REINFORCE RACISM
SAFIYA UMOJA NOBLE


"This book is downright scary—but…you will emerge smarter and more empowered to demand justice." —NAOMI KLEIN
AUTOMATING INEQUALITY
HOW HIGH-TECH TOOLS PROFILE, POLICE, AND PUNISH THE POOR
VIRGINIA EUBANKS

- (At least in the West) Ethics is commonly focused on the individual (cf. codes of conduct, research ethics)

- But the real issues are societal and systemic
  - *Including bias
- Accordingly, matters of governance / policy need to be addressed (in analysis and design)

- Staying "neutral" or a-political becomes increasingly implausible

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ADVANCED DIGITAL SKILLS
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FR GH IT IS MY NL
PT SK UA

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Number of Partners

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Thank You ! --- A&Q

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