

HCI Research as Problem-Solving

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ABSTRACT

This essay contributes a meta-scientific account of human-computer interaction (HCI) research as problem-solving. We build on the philosophy of Larry Laudan, who develops *problem and solution* as the foundational concepts of science. We argue that most HCI research is about three main types of problems: empirical, conceptual, and constructive. We elaborate upon Laudan's concept of *problem-solving capacity* as a universal criterion for determining the progress of solutions (outcomes). Instead of asking whether research is 'valid' or follows the 'right' approach, it urges us to ask how its solutions advance our capacity to solve important problems in human use of computers. This offers a rich, generative, and 'discipline-free' view of HCI and resolves some existing debates about what HCI is or should be. It may also help unify efforts across nominally disparate traditions in empirical research, theory, design, and engineering.

Author Keywords

Human-computer interaction; Problem-solving; Scientific progress; Research problem; Larry Laudan

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI); Miscellaneous

INTRODUCTION

The spark for writing this essay comes from feelings of confusion, and even embarrassment, arising in describing our field to students and other researchers. What is human-computer interaction (HCI) as a field? As numerous ideas and disciplines contribute to HCI, its unique character is elusive. Although HCI is in intellectual debt to many other fields, few would agree that it reduces to them. It has its own subject of enquiry, which is *not* part of the natural or social sciences. It does not belong to engineering, computer science, or design either. So what is it?

The essay has a grand ambition: to develop a conceptually coherent account of the '95% of HCI research'. We know of no other paper offering an attempt to address the field as a whole. We are motivated first and foremost by the intel-

lectual enigma pertaining to what HCI *is*: There is no accepted account that would tell how HCI's numerous approaches contribute to pursuit of shared objectives. In contrast, HCI has been criticised for lack of 'motor themes, mainstream topics, and schools of thought' [25] and for being fragmented 'across topics, theories, methods, and people' [38]. Consequently, some have called for 'a hard science' [36], others for 'strong concepts' [19] or an 'inter-discipline' [3]. These are serious concerns with serious implications for the field.

Why bother with a meta-scientific paper at a technical conference? Because the stakes are high. Philosophies of science are at worst an impotent topic worthy of hallway conversations. But if the critics are right, our field is seriously crippled, from the project level to the larger arenas of research *Realpolitik*. Lacking a coherent view of what HCI is, and what good research in HCI is, how can we communicate results to others, assess research, co-ordinate efforts, or compete? In addition, as we show, philosophical views offer thinking tools that can aid in generating ideas and generally enhance the quality of research.

The contribution here lies in describing HCI as *problem-solving*. An overview is given in Figure 1. The view originates from Larry Laudan's philosophy of science [28]. Laudan describes scientific progress in terms of two foundational concepts: *research problem* and *solution*. Laudan's 'problem' is not what we mean by the term in ordinary language. It is defined via inabilities and absences occurring in descriptions; knowledge; or, as often in HCI, constructive solutions. For example, a research problem may involve lack of understanding of how colour schemes on a web page affect the aesthetic experience of its use. More generally, Laudan's research problem subsumes what we traditionally understand in HCI as a 'design problem' but also problems to do with theory and empirical research.

Most of our argumentation builds on a concept put forth by Laudan that links problems with solutions: *problem-solving capacity*. For Laudan, a solution is something special, too. In the above-mentioned case of aesthetic perception of web pages, possible solutions range from descriptions of self-reports to models of aesthetic impressions. These solutions change the status of the inabilities and absences but in different ways. Laudan qualifies this in terms of *improvements to problem-solving capacity*. This is counter to some traditional notions of progress [28, p. 14]:

In appraising the merits of theories, it is more important to ask whether they constitute adequate solutions to significant problems than it is to ask whether they are 'true'.

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Laudan Problem Solving And Is Building

Emiliano Ippoliti, Fabio Sterpetti



Laudan Problem Solving And Is Building:

Building Theories David Danks, Emiliano Ippoliti, 2018-01-18 This book explores new findings on the long neglected topic of theory construction and discovery and challenges the orthodox current division of scientific development into discrete stages the stage of generation of new hypotheses the stage of collection of relevant data the stage of justification of possible theories and the final stage of selection from among equally confirmed theories The chapters written by leading researchers offer an interdisciplinary perspective on various aspects of the processes by which theories rationally should and descriptively are built They address issues such as the role of problem solving and heuristic reasoning in theory building how inferences and models shape the pursuit of scientific knowledge the relation between problem solving and scientific discovery the relative values of the syntactic semantic and pragmatic view of theories in understanding theory construction and the relation between ampliative inferences heuristic reasoning and models as a means for building new theories and knowledge Through detailed arguments and examinations the volume collectively challenges the orthodox view's main tenets by characterizing the ways in which the different stages are logically temporally and psychologically intertwined As a group the chapters provide several attempts to answer long standing questions about the possibility of a unified conceptual framework for building theories and formulating hypotheses

The Relationship Between a Model-building

Problem-solving Classroom and Conceptual Change Learning John S. Lemberger, 1995 Theory Construction in Second Language Acquisition Geoff Jordan, 2004-02-04 Recently many SLA researchers have adopted a postmodernist approach which challenges the assumption that SLA research is a rationalist scientific endeavour The resulting epistemological arguments plus problems of theory proliferation contradicting theories and theory domain hinder progress towards a unified theory of SLA Theory Construction in SLA addresses these problems by returning to first principles it asks whether there is such a thing as reliable knowledge what is special about scientific method and how we can best explain SLA It is the first book to use the philosophy of science in order to examine the epistemological underpinnings of SLA research and evaluate rival theories of SLA Part One explores the central issues in the philosophy of science defends rationality against relativists and offers Guidelines for theory assessment Part Two examines different theories of SLA and evaluates them in terms of how well they stand up to the Guidelines

Formal Theory in Sociology Jerald Hage, 1994-01-01 A group of renowned sociological theorists analyze why the attempts to make sociological theory formal in the 1960s and early 1970s failed This becomes not only an unusual and interesting analysis in the sociology of knowledge but several of the articles move to the level of analyzing the entire discipline explaining why positivism did not take hold and what are the distinctive characteristics of sociology as a discipline Anyone interested in sociology as a discipline and more specifically sociological theory will find interesting analytical models

Mathematics Education as a Research Domain: A Search for Identity Anna Sierpinska, Jeremy Kilpatrick, 2014-02-19 No one disputes how important it is in today's world to prepare students to un

derstand mathematics as well as to use and communicate mathematics in their future lives That task is very difficult however Refocusing curricula on fundamental concepts producing new teaching materials and designing teaching units based on mathematicians common sense or on logic have not resulted in a better understanding of mathematics by more students The failure of such efforts has raised questions suggesting that what was missing at the outset of these proposals designs and productions was a more profound knowledge of the phenomena of learning and teaching mathematics in socially established and culturally politically and economically justified institutions namely schools Such knowledge cannot be built by mere juxtaposition of theories in disciplines such as psychology sociology and mathematics Psychological theories focus on the individual learner Theories of sociology of education look at the general laws of curriculum development the specifics of pedagogic discourse as opposed to scientific discourse in general the different possible pedagogic relations between the teacher and the taught and other general problems in the interface between education and society Mathematics aside from its theoretical contents can be looked at from historical and epistemological points of view clarifying the genetic development of its concepts methods and theories This view can shed some light on the meaning of mathematical concepts and on the difficulties students have in teaching approaches that disregard the genetic development of these concepts

Problems in Second Language Acquisition Michael H. Long, 2017-09-25 Second language acquisition has an identity problem It is a young field struggling to emerge from the parent fields of education and applied linguistics In his new book *Problems in Second Language Acquisition* Mike Long proposes a way to help second language acquisition develop a systematic and coherent focus using the philosophy of science as the lens The volume is neatly organized into three parts theory research and practice This structure allows a focus on areas of SLA of interest to many in the field These include theory proliferation and comparative theory evaluation the Critical Period Hypothesis and negative feedback and the practice of synthetic language teaching The controversial volume will be of interest to researchers educators and graduate students in second language acquisition applied linguistics TESOL and linguistics programs It may be recommended as additional reading for an introductory SLA course in order to stimulate class discussions

Theories of International Trade Adam Klug, 2006-09-27 This book presents the results of a thorough survey into the different theories of international trade Conducted by the Israeli economic historian Klug before his untimely death in 2000 and now available for the first time

[Rasch Models for Solving Measurement Problems](#) George Engelhard, Jr. Jue Wang, 2020-12-13 This book introduces current perspectives on Rasch measurement theory with an emphasis on developing Rasch based scales Rasch measurement theory represents a paradigm shift in measurement theory away from classical test theory and creates a framework for scaling that can yield invariant measurement *Rasch Models for Solving Measurement Problems* Invariant Measurement in the Social Sciences is a broadly accessible text Authors George Engelhard Jr and Jue Wang introduce Rasch measurement theory step by step with chapters on scale construction evaluation maintenance and use Points are illustrated and techniques are demonstrated through an

extended example The Food Insecurity Experience FIE Scale The Rasch analyses in the book are run using the Facets computer program Facets syntax and R code for the ERMA program created by the authors to obtain parameter estimates and to examine model data fit together with sample data sets are all available on a website for the book

Systematic Theology as a Rationally Justified Public Discourse about God Michael Agerbo Mørch, 2023-01-23 For centuries it has been discussed whether systematic theology is a scientific discipline But it is not obvious what is meant by either systematic theology or scientific discipline Michael Agerbo Mørch presents an understanding of systematic theology as a tripartite discipline and science as a rationally justified public discourse about a given topic Systematic theology is shown to meet the most generally accepted criteria for scientific work since its theories can be tested and even falsified in an intersubjective setting This can be done by the most proper tool we have for assessing and comparing scientific theories which is coherence theory Therefore even though systematic theology is a distinct and normative discipline it is not compromising for its theories because it can present its theses in a transparent way that can be checked and criticized by peers and compared to relevant alternatives As such the book shows that systematic theology is a scientifically strong discourse that meets accepted criteria to the same degree as other disciplines

The Heuristic View Emiliano Ippoliti, Fabio Sterpetti, 2025-10-01 This volume offers a series of thought provoking analyses that explore non mainstream perspectives on knowledge acquisition and scientific discovery A central theme across many of the contributions is the heuristic conception of method a view that finds its philosophical roots in Imre Lakatos's work in the philosophy of mathematics and more distantly in Platonic notions of philosophical inquiry Knowledge acquisition is frequently conceptualized as a form of problem solving and problem solving is typically regarded as a rational endeavor However the dominant view in the philosophy of science has long held that scientific discovery resists systematic explanation in terms of logic and rationality If an alternative account of discovery grounded in these terms can be developed it would represent a significant theoretical advancement The essays collected in this book critically assess the promise and limitations of such non standard accounts and they investigate the possibility of framing scientific discovery within a logical and rational framework This volume will be of particular interest to scholars in the philosophy of science epistemology philosophy of mathematics and philosophy of logic as well as to scientists engaged in theoretical inquiry and graduate students working in these or related areas

Roads to Commensurability D. Pearce, 2012-12-06 How many miles to Babylon Three score and ten Can I get there by candle light Yes and back again If your heels are nimble and light You may get there by candle light Any philosopher who takes more than a fleeting interest in the sciences and their development must at some stage confront the issue of incommensurability in one or other of its many manifestations For the philosopher of science concerned with problems of conceptual change and the growth of knowledge matters of incommensurability are of paramount concern After many years of skating over skimming through and skirting round this issue in my studies of intertheory relations in science I decided to take the plunge and make the problem of

incommensurability the central and unifying theme of a book The present volume is the result of that decision My interest in problems of comparability and commensurability in science was awakened in the formative years of my philosophical studies by my teacher Jerzy Giedymin From him I have learnt not only to enjoy philosophical problems but also to beware of simpleminded solutions to them The vibrant seminars of Paul Feyerabend held at Sussex University in 1974 left me in no doubt that incommensurability was and would remain a major topic of debate and dispute in the philosophical study of human knowledge

Explanation from Physics to Theology Philip Clayton, Dean of Claremont School of Theology Philip Clayton, 1989-01-01 A valuable exposition of the thesis that the explanatory work of theology possesses formal similarities with that of the physical sciences the social sciences and philosophy Clayton exhibits an impressive command of a broad area of scholarship and his reflections are balanced and carefully argued Michael J Buckley S J Jesuit Theological Seminary

Error and Inference Deborah G. Mayo, Aris Spanos, 2011 Explores the nature of error and inference drawing on exchanges on experimental reasoning reliability and the objectivity of science

New Philosophical Perspectives on Scientific Progress Yafeng Shan, 2022-11-01 This collection of original essays offers a comprehensive examination of scientific progress which has been a central topic in recent debates in philosophy of science Traditionally debates over scientific progress have focused on different methodological approaches notably the epistemic and semantic approaches The chapters in Part I of the book examine these two traditional approaches as well as the newly revived functional and newly developed noetic approaches Part II features in depth case studies of scientific progress from the history of science The chapters cover individual sciences including physics chemistry evolutionary biology seismology psychology sociology economics and medicine Finally Part III of the book explores important issues from contemporary philosophy of science These chapters address the implications of scientific progress for the scientific realism anti realism debate incommensurability values in science idealisation scientific speculation interdisciplinarity and scientific perspectivalism New Philosophical Perspectives on Scientific Progress will be of interest to researchers and advanced students working on the history and philosophy of science

Managing Ethics in Business Organizations Linda Klebe Treviño, Gary Richard Weaver, 2003 Aimed both at broadening the range of theoretically informed empirical research on business ethics and at addressing the underlying questions regarding the nature of business ethics research this is a comprehensive state of the art portrait of the role of ethics in organizations

Scientific Cognition, Semiotics, and Computational Agents: Essays in Honor of Lorenzo Magnani - Volume 2 Selene Arfini, 2025-09-19 This book the second of two volumes focuses on scientific cognition computationalism and scholars reception of what Lorenzo Magnani named eco cognitive views on the mind The authors of these chapters address complex questions which regard in part Magnani s contributions in the field of model based science the role of inferential models in mathematics the transformations and possible applicability of Charles Sanders Peirce s and Immanuel Kant s concepts and insight into current understanding of scientific progress and the still unsolved questions

regarding the methodological steps that take researchers to scientific discoveries Some contributions also address the problematic understanding of artificial agents as intelligent how cognition can be discussed within the limits of computationalism and how the eco cognitive perspective on the mind also affects the conception of scientific reasoning and socially constructed phenomena The book is of great interest to those interested in epistemology philosophy of science mathematical logic and AI **Advanced Practice Nursing: Essential Knowledge for the Profession** Susan M.

DeNisco,2023-02-07 Advanced Practice Nursing Essential Knowledge for the Profession Fifth Edition is a core advanced practice text used in both Master s Level and DNP programs Along with original chapters this bestselling text is a thoughtfully crafted compilation of existing chapters from a variety of advanced practice nursing textbooks from Jones Bartlett Learning The strength of this approach is that each chapter was written by experts in each of the content areas creating a comprehensive and well rounded resource for the advanced practice nursing student The Fifth Edition is framed around the new Domains from the AACN Essentials for advanced practice education as well as the Essentials for Doctoral Education featuring the most up to date content on each set of Essentials Thoroughly updated the authors address current and emerging trends including emergency preparedness financing health care the impact of big data on healthcare outcomes ethical leadership and more timely topics A Model of "integrated Scientific Method" and Its Application for the Analysis of Instruction Craig F. Rusbult,1997

Creating a Dialectical Social Science I.I. Mitroff,R.O. Mason,2012-12-06 The depth intensity and long standing nature of the disagreements between differing schools of social thought renders more critical than ever the treatment of dialectical reasoning and its relationship to the social sciences The nature of these disagreements are deeply rooted in fundamentally differing beliefs regarding among many things 1 the nature of man 2 the role of theory versus data in constructing social theories 3 the place and function of values versus facts in inquiry etc It has become more and more apparent that such fundamental differences cannot be resolved by surface appeals to rationality or to consensus Such for it is precisely the definitions of appeals are doomed to failure rationality and consensus that are at odds That is different schools not only have different definitions of rationality and consensus but different notions regarding their place and function within a total system of inquiry A dialectical treatment of conflicts is called for because such conflicts demand a method which is capable of recognizing first of all how deep they lie Secondly a method is demanded which is capable of appreciating that the various sides of the conflict fundamentally depend on one another for their very existence they depend in other words on one another not in spite of their opposition but precisely because of it **Philosophies and Theories for**

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