Change of Representation and Inductive Bias
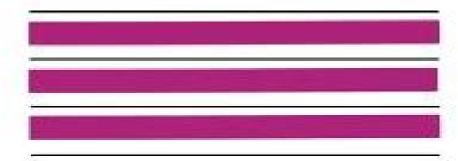
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Change Of Representation And Inductive Bias

Tsu-Chang Lee

Change Of Representation And Inductive Bias:

   Change of Representation and Inductive Bias D. Paul Benjamin,2012-12-06 Change of Representation and Inductive Bias One of the most important emerging concerns of machine learning researchers is the dependence of their learning programs on the underlying representations especially on the languages used to describe hypotheses The effectiveness of learning algorithms is very sensitive to this choice of language choosing too large a language permits too many possible hypotheses for a program to consider precluding effective learning but choosing too small a language can prohibit a program from being able to find acceptable hypotheses This dependence is not just a pitfall however it is also an opportunity The work of Saul Amarel over the past two decades has demonstrated the effectiveness of representational shift as a problem solving technique An increasing number of machine learning researchers are building programs that learn to alter their language to improve their effectiveness At the Fourth Machine Learning Workshop held in June 1987 at the University of California at Irvine it became clear that the both the machine learning community and the number of topics it addresses had grown so large that the representation issue could not be discussed in sufficient depth A number of attendees were particularly interested in the related topics of constructive induction problem reformulation representation selection and multiple levels of abstraction Rob Holte Larry Rendell and I decided to hold a workshop in 1988 to discuss these topics To keep this workshop small we decided that participation be by invitation only   *Change of Representation and Inductive Bias* D. Paul Benjamin,1989-12-31   **Proceedings of the Workshop on Change of Representation and Problem Reformulation** ,1992   Abstraction, Reformulation, and Approximation Ian Miguel,Wheeler Tuml,2007-08-24 This is a subject that is as hot as a snake in a wagon rut offering as it does huge potentiality in the field of computer programming That s why this book which constitutes the refereed proceedings of the 7th International Symposium on Abstraction Reformulation and Approximation held in Whistler Canada in July 2007 will undoubtedly prove so popular among researchers and professionals in relevant fields 26 revised full papers are presented together with the abstracts of 3 invited papers and 13 research summaries   *Goddard Conference on Space Applications of Artificial Intelligence* ,1991   *1991 Goddard Conference on Space Applications of Artificial Intelligence* James L. Rash,1991   **Abstraction, Reformulation, and Approximation** Sven Koenig,Robert C. Holte,2003-08-02 It has been recognized since the inception of Artificial Intelligence AI that abstractions problem reformulations and approximations AR A are central to human common sense reasoning and problem solving and to the ability of systems to reason effectively in complex domains AR A techniques have been used to solve a variety of tasks including automatic programming constraint satisfaction design diagnosis machine learning search planning reasoning game playing scheduling and theorem proving The primary purpose of AR A techniques in such settings is to overcome computational intractability In addition AR A techniques are useful for accelerating learning and for summarizing sets of solutions This volume contains the proceedings of SARA 2002 the fifth Symposium on Abstraction Reformulation and

Approximation held at Kananaskis Mountain Lodge Kananaskis Village Alberta Canada August 2 4 2002 The SARA series is the continuation of two separate threads of workshops AAAI workshops in 1990 and 1992 and an ad hoc series beginning with the Knowledge Compilation workshop in 1986 and the Change of Representation and Inductive Bias workshop in 1988 with followup workshops in 1990 and 1992 The two workshop series merged in 1994 to form the first SARA Subsequent SARAs were held in 1995 1998 and 2000   Machine Learning Proceedings 1990 Bruce Porter,Raymond J. Mooney,2014-05-23 Machine Learning Proceedings 1990   **Structure Level Adaptation for Artificial Neural Networks** Tsu-Chang Lee,2012-12-06 63 3 2 Function Level Adaptation 64 3 3 Parameter Level Adaptation 67 3 4 Structure Level Adaptation 70 3 4 1 Neuron Generation 70 3 4 2 Neuron Annihilation 72 3 5 Implementation 74 3 6 An Illustrative Example 77 3 7 Summary 79 4 Competitive Signal Clustering Networks 93 4 1 Introduction 93 4 2 Basic Structure 94 4 3 Function Level Adaptation 96 4 4 Parameter Level Adaptation 101 4 5 Structure Level Adaptation 104 4 5 1 Neuron Generation Process 107 4 5 2 Neuron Annihilation and Coalition Process 114 4 5 3 Structural Relation Adjustment 116 4 6 Implementation 119 4 7 Simulation Results 122 4 8 Summary 134 5 Application Example An Adaptive Neural Network Source Coder 135 5 1 Introduction 135 5 2 Vector Quantization Problem 136 5 3 VQ Using Neural Network Paradigms 139 Vlll 5 3 1 Basic Properties 140 5 3 2 Fast Codebook Search Procedure 141 5 3 3 Path Coding Method 143 5 3 4 Performance Comparison 144 5 3 5 Adaptive SPAN Coder Decoder 147 5 4 Summary 152 6 Conclusions 155 6 1 Contributions 155 6 2 Recommendations 157 A Mathematical Background 159 A 1 Kolmogorov s Theorem 160 A 2 Networks with One Hidden Layer are Sufficient 161 B Fluctuated Distortion Measure 163 B 1 Measure Construction 163 B 2 The Relation Between Fluctuation and Error 166 C SPAN Convergence Theory 171 C 1 Asymptotic Value of Wi 172 C 2 Energy Function   **Abstraction in Artificial Intelligence and Complex Systems** Lorenza Saitta,Jean-Daniel Zucker,2013-06-05 Abstraction is a fundamental mechanism underlying both human and artificial perception representation of knowledge reasoning and learning This mechanism plays a crucial role in many disciplines notably Computer Programming Natural and Artificial Vision Complex Systems Artificial Intelligence and Machine Learning Art and Cognitive Sciences This book first provides the reader with an overview of the notions of abstraction proposed in various disciplines by comparing both commonalities and differences After discussing the characterizing properties of abstraction a formal model the KRA model is presented to capture them This model makes the notion of abstraction easily applicable by means of the introduction of a set of abstraction operators and abstraction patterns reusable across different domains and applications It is the impact of abstraction in Artificial Intelligence Complex Systems and Machine Learning which creates the core of the book A general framework based on the KRA model is presented and its pragmatic power is illustrated with three case studies Model based diagnosis Cartographic Generalization and learning Hierarchical Hidden Markov Models   Machine Learning Proceedings 1994 William W. Cohen,2014-06-28 Machine Learning Proceedings 1994   *PRICAI 2000 Topics in Artificial Intelligence*

Riichiro Mizoguchi,John Slaney,2007-12-07 PRICAI 2000 held in Melbourne Australia is the sixth Pacific Rim Interna tional Conference on Artificial Intelligence and is the successor to the five earlier PRICAIs held in Nagoya Japan Seoul Korea Beijing China Cairns Aus tralia and Singapore in the years 1990 1992 1994 1996 and 1998 respectively PRICAI is the leading conference in the Pacific Rim region for the presenta tion of research in Artificial Intelligence including its applications to problems of social and economic importance The objectives of PRICAI are To provide a forum for the introduction and discussion of new research results concepts and technologies To provide practising engineers with exposure to and an evaluation of evolving research tools and practices To provide the research community with exposure to the problems of practical applications of AI and To encourage the exchange of AI technologies and experience within the Pacific Rim countries PRICAI 2000 is a memorial event in the sense that it is the last one in the 20 century It reflects what researchers in this region believe to be promising for their future AI research activities In fact some salient features can be seen in the papers accepted We have 12 papers on agents while PRICAI 96 and 98 had no more than two or three This suggests to us one of the directions in which AI research is going in the next century It is true that agent research provides us with a wide range of research subjects from basic ones to applications *Foundations of Intelligent Systems* Zbigniew W. Ras,Setsuo Ohsuga,2003-07-31 Of Testing ExperimentsConclusion Acknowledgments References Can Relational Learning Scale Up Introduction Phase Transition in Hypothesis Testing Experiment Goal and Setting Results Interpretation The Phase Transition Is an Attractor Correct Identification of the Target Concept Good Approximation of the Target Concept Conclusion References Discovering Geographic Knowledge The INGENS System Introduction INGENS Software Architecture and Object Data Model Learning Classification Rules for Geographical Objects Application to Apulian Map Interpretation

Investigating Explanation-Based Learning Gerald DeJong,2012-12-06 Explanation Based Learning EBL can generally be viewed as substituting background knowledge for the large training set of exemplars needed by conventional or empirical machine learning systems The background knowledge is used automatically to construct an explanation of a few training exemplars The learned concept is generalized directly from this explanation The first EBL systems of the modern era were Mitchell s LEX2 Silver s LP and De Jong s KIDNAP natural language system Two of these systems Mitchell s and De Jong s have led to extensive follow up research in EBL This book outlines the significant steps in EBL research of the Illinois group under De Jong This volume describes theoretical research and computer systems that use a broad range of formalisms schemas production systems qualitative reasoning models non monotonic logic situation calculus and some home grown ad hoc representations This has been done consciously to avoid sacrificing the ultimate research significance in favor of the expediency of any particular formalism The ultimate goal of course is to adopt or devise the right formalism *The Logic of Adaptive Behavior* Martijn van Otterlo,2009 Markov decision processes have become the de facto standard in modeling and solving sequential decision making problems under uncertainty This book studies lifting Markov decision processes

reinforcement learning and dynamic programming to the first order or relational setting **Inductive Logic Programming** Stephen Muggleton,1992 Inductive logic programming is a new research area emerging at present Whilst inheriting various positive characteristics of the parent subjects of logic programming an machine learning it is hoped that the new area will overcome many of the limitations of its forbears This book describes the theory implementations and applications of Inductive Logic Programming *Multistrategy Learning* Ryszard S. Michalski,2012-12-06 Most machine learning research has been concerned with the development of systems that implememnt one type of inference within a single representational paradigm Such systems which can be called monostrategy learning systems include those for empirical induction of decision trees or rules explanation based generalization neural net learning from examples genetic algorithm based learning and others Monostrategy learning systems can be very effective and useful if learning problems to which they are applied are sufficiently narrowly defined Many real world applications however pose learning problems that go beyond the capability of monostrategy learning methods In view of this recent years have witnessed a growing interest in developing multistrategy systems which integrate two or more inference types and or paradigms within one learning system Such multistrategy systems take advantage of the complementarity of different inference types or representational mechanisms Therefore they have a potential to be more versatile and more powerful than monostrategy systems On the other hand due to their greater complexity their development is significantly more difficult and represents a new great challenge to the machine learning community Multistrategy Learning contains contributions characteristic of the current research in this area

Explanation-Based Neural Network Learning Sebastian Thrun,2012-12-06 Lifelong learning addresses situations in which a learner faces a series of different learning tasks providing the opportunity for synergy among them Explanation based neural network learning EBNN is a machine learning algorithm that transfers knowledge across multiple learning tasks When faced with a new learning task EBNN exploits domain knowledge accumulated in previous learning tasks to guide generalization in the new one As a result EBNN generalizes more accurately from less data than comparable methods Explanation Based Neural Network Learning A Lifelong Learning Approach describes the basic EBNN paradigm and investigates it in the context of supervised learning reinforcement learning robotics and chess The paradigm of lifelong learning using earlier learned knowledge to improve subsequent learning is a promising direction for a new generation of machine learning algorithms Given the need for more accurate learning methods it is difficult to imagine a future for machine learning that does not include this paradigm From the Foreword by Tom M Mitchell Concept Formation and Knowledge Revision Stefan Wrobel,2013-03-14 A fundamental assumption of work in artificial intelligence and machine learning is that knowledge is expressed in a computer with the help of knowledge representations Since the proper choice of such representations is a difficult task that fundamentally affects the capabilities of a system the problem of automatic representation change is an important topic in current research Concept Formation and Knowledge Revision focuses on

representation change as a concept formation task regarding concepts as the elementary representational vocabulary from which further statements are constructed Taking an interdisciplinary approach from psychological foundations to computer implementations the book draws on existing psychological results about the nature of human concepts and concept formation to determine the scope of concept formation phenomena and to identify potential components of computational concept formation models The central idea of this work is that computational concept formation can usefully be understood as a process that is triggered in a demand driven fashion by the representational needs of the learning system and identify the knowledge revision activities of a system as a particular context for such a process The book presents a detailed analysis of the revision problem for first order clausal theories and develops a set of postulates that any such operation should satisfy It shows how a minimum theory revision operator can be realized by using exception sets and that this operator is indeed maximally general The book then shows that concept formation can be triggered from within the knowledge revision process whenever the existing representation does not permit the plausible reformulation of an exception set demonstrating the usefulness of the approach both theoretically and empirically within the learning knowledge acquisition system MOBAL In using a first order representation this book is part of the rapidly developing field of Inductive Logic Programming ILP By integrating the computational issues with psychological and fundamental discussions of concept formation phenomena the book will be of interest to readers both theoretically and psychologically inclined From the foreword by Katharina Morik The ideal to combine the three sources of artificial intelligence research has almost never been reached Such a combined and integrated research requires the researcher to master different ways of thinking different work styles different sets of literature and different research procedures It requires capabilities in software engineering for the application part in theoretical computer science for the theory part and in psychology for the cognitive part The most important capability for artificial intelligence is to keep the integrative viewand to create a true original work that goes beyond the collection of pieces from different fields This book achieves such an integrative view of concept formation and knowledge revision by presenting the way from psychological investigations that indicate that concepts are theories and point at the important role of a demand for learning to an implemented system which supports users in their tasks when working with a knowledge base and its theoretical foundation   An Introduction to Fuzzy Logic Applications in Intelligent Systems Ronald R. Yager,Lotfi A. Zadeh,2012-12-06 An Introduction to Fuzzy Logic Applications in Intelligent Systems consists of a collection of chapters written by leading experts in the field of fuzzy sets Each chapter addresses an area where fuzzy sets have been applied to situations broadly related to intelligent systems The volume provides an introduction to and an overview of recent applications of fuzzy sets to various areas of intelligent systems Its purpose is to provide information and easy access for people new to the field The book also serves as an excellent reference for researchers in the field and those working in the specifics of systems development People in computer science especially those in artificial intelligence knowledge based

systems and intelligent systems will find this to be a valuable sourcebook Engineers particularly control engineers will also have a strong interest in this book Finally the book will be of interest to researchers working in decision support systems operations research decision theory management science and applied mathematics An Introduction to Fuzzy Logic Applications in Intelligent Systems may also be used as an introductory text and as such it is tutorial in nature

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