



人工智慧學會通訊

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中華民國人工智慧學會

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理事長的話



各位人工智慧學會會員大家好：

中華民國人工智慧學會自民國八十四年成立至今，已將近有十年歷史，在此期間歷經五位前任理事長之努力經營，已為學會奠立了良好的運作基礎。本人很榮幸的接任本學會第六屆理事長的職務，將循著學會過去運作的軌跡，繼續前進。學會在未來將著重下列幾項工作：

1. 增加學會之會員人數，
2. 發行 Online TAAI Newsletter (人工智慧學會通訊)，
3. 強化學會網站的建置，報導會員動態，加強對會員的服務，
4. 積極主/協辦與人工智慧相關之學術會議與推廣活動，包括：
 - (1) 舉辦 AI Forum 以促成更廣泛之學術交流，
 - (2) 舉辦 TAAI Conference 以提昇國內人工智慧之研究水準及促進國內人工智慧研究之發展與產業上之應用，
 - (3) 主/協辦其他與人工智慧相關之研討會與活動，
5. 舉辦碩/博士論文獎比賽及 TAAI 研討會最佳論文獎比賽，提昇國內人工智慧之研究水準，
6. 加強國際學術交流，
7. 提昇學會對產業界及社會之貢獻。

人工智慧學會為一個專業性的學術社團，學會成員人才濟濟，是一個菁英社團。未來，我們期盼所有學會成員一起努力，一起創造人工智慧豐富之研究成果。期盼所有學會成員繼續在人工智慧與應用領域努力耕耘，以提昇全體人民在現代化資訊社會中之工作與生活品質。最後，感謝李祕書長育杰及各位理監事無私的奉獻，敬祝大家

新年快樂
萬事如意

弟

陳錫明 敬筆
94. 1. 16

學會簡介



中華民國人工智慧學會為內政部正式立案之學術團體(立號文案：內政部 84 年 5 月 30 日台(84)內社字第 8414022 號)，本學會宗旨為促進國內人工智慧及相關領域之研究、發展、應用及交流。

人工智慧領域自一九五六年確立門戶以來，一直以追求塑造一個匹擬人類解題能力的智慧型系統為目標。在這近半世紀的追求過程中，發展出許多適宜精製智慧型系統的理論與技術，即所謂的人工智慧科技。本科技著重於賦予一個系統理性與專業的推理能力，以大力提昇其品質；賦予一個系統事前規劃及線上模擬的能力以確切掌握其可能的行為偏差；賦予一個系統診斷與學習能力，並透過與環境的互動隨時修正其行為並增強其整體效應。本科技已深切影響了眾多相關領域在提升系統智慧程度方面的成效。產業界中有關智慧型系統的發展，緣於善用此資源而致有所成者，例示頗多。日本最是個成功活用人工智慧科技於各式輕、重工業及日常用品的範例。歐美在航太、醫療及企管方面更是大量引用人工智慧科技來提昇系統智能。美國電腦學會 1995 年把電腦界的最高獎杜寧獎(Turing Award)，頒給了人工智慧領域的兩位傑出教授，除指出了未來產品系統智慧化的趨勢外，更彰顯與祈盼人工智慧科技在此趨勢中所扮演的重要腳色。

本學會結合了國內大學、研究單位及產業界眾多實際從事人工智慧科技的研發人才，堪稱是國內最具將本項科技成功研發並應用於產業界以全面提升產品系統智能的人才庫。為了能確實發揮結合人力、成立學會的宗旨，僅簡述本學會盱衡產官學研各界的需求，所擬定的工作策略如下：

- 一、產業界：國內部分產業界對人工智慧科技抱持著懷疑態度，部分原因根源於國內學術、研發及產業的上中下游關係一直沒有確切建立起來所造成的「冷漠斷層」現象，但也部份根源於人工智慧在國外的應用歷史尚不足以「取信」產業界所致。本學會針對此現象，將組成「產業界訪談小組」，收集產業界在提昇及改善產品智能方面所遭遇到的問題，以本學會充沛的人力做後盾來提出解決方案，期望逐步建立起產業界的信心。本會也希望藉此將以往學界普遍認為業界的問題不是「研究」題目，而業界也一直認為學界「不切實際」的迷思打破。
- 二、政府及相關機構：本學會的宗旨之一為推展人工智慧科技，此與全民資訊智能化的方向，息息相關。本學會樂於為政府、人民團體或財團法人等相關機構進行與智慧型系統相關的前瞻性或可行性計畫之評估、審核、甚至執行的工作，以及相關標準的起草、訂定、及認證等工作。
- 三、學研界：國內學研界的合作情形，近來雖有改善，但真正具「整合」效果的計畫並不多見。我們將透過學會的運作，使學研界在人工智慧科技的研發上能找到值得集中火力、互補互成的研發方向，並在以本土化之科技應用為本位的理念下，做出國際水準的研究。另外，我們也擬藉此推動到一個「產業界一有問題馬上會想到到學研單位來找救兵的階段」(韓國近年已走上了這

個地步)，一來可解決國內中小企業眾多，無力獨立研究以提昇產品品質的困窘現象，再者逐步培養出學研各界「研究不脫離實務」的傳統，將學研主要的貢獻從偏重出產論文到出產實務產品。

本學會有一個全球資訊網的本頁，歡迎各界蒞臨瀏覽。從該本頁上可以連到本學會各會員的本頁，提供會員個人更深入的專長說明。我們也將在本學會本頁上開闢交流管道，歡迎各界隨時在上面寫下意見或問題，本會將代為尋找合適人才來回函或解決問題。本學會的壯大，可以使國內人工智慧科技的研發與推廣更為確實，因此我們竭誠盼望各界的參與。加入為學會個人會員或團體會員(可以在本學會本頁上線上加入)，除享有參加本學會舉辦的研討會的減價優待，及訂閱本學會出版刊物的減價優待外，藉這個機會認識更多志同道合的同儕，擴充自己的人脈，並且與之一齊合作將國內的人工智慧科技推向更燦爛的未來，則更是最大的成就。我們也亟盼各界的大力捐助(可以免稅)，一齊為國內智慧化社會的未來作最寶貴的貢獻。

本學會相關聯絡資料如下，有任何疑問，歡迎您以最方便的方式聯繫：

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郵政劃撥：戶名：中華民國人工智慧學會

帳號：19597311

本學會統一編號：92020144

本學會組織如下：

理事會：

理事長	陳錫明	台灣科技大學資訊工程系教授
常務理事	許永真	台灣大學資訊工程系教授
常務理事	許鈞南	中央研究院資訊科學研究所副研究員
常務理事	陳錫明	台灣科技大學資訊工程系教授
常務理事	曾新穆	成功大學資訊工程系教授
常務理事	劉昭麟	政治大學資訊科學系教授
理事	吳志宏	高雄大學電機系教授
理事	李建興	長榮大學資訊管理系教授
理事	林正堅	朝陽科技大學資訊工程系教授
理事	洪宗貝	高雄大學電機工程系教授
理事	張嘉惠	中央大學資訊工程系教授
理事	許舜欽	長榮大學資訊管理系教授
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理事	潘正祥	高雄應用科技大學電子工程系教授
理事	蔣榮先	成功大學資訊工程系教授
理事	簡立峰	中央研究院資訊科技研究所研究員

監事會：

常務監事	項 潔	台灣大學資訊工程系教授
監事	李漢銘	台灣科技大學資訊工程系教授
監事	許聞廉	中央研究院資訊科學研究所研究員
監事	黃一元	中網科技公司總經理
監事	錢炳全	台南大學資訊工程系教授

秘書處：

秘書長	李育杰
兼任助理	黃雪芬
網站管理	許毓珊

2005 AI Forum 系列報導



- 時間：2005年5月14日—15日
- 地點：中華大學國際會議廳
- 地址：新竹市香山區東香里五福路二段
- 主辦單位：中華大學資工系、
中華民國人工智慧學會
- 協辦單位：教育部、國科會工程中心、
中央研究院資訊科學研究所



議程內容

第一天 5/14 (星期六)

- 12:30~17:00 報到註冊
- 14:00~14:10 開幕致詞
中華大學 鄭芳炫 代校長
中華民國人工智慧學會 陳錫明 理事長
- 14:10~15:10 專題演講
中央研究院資訊科學研究所研究員 許聞廉博士
- 15:10~15:30 Coffee Break
- 15:30~17:30 專題討論 I
資料探勘與生物資訊

第二天 5/15 (星期日)

- 08:30~10:00 專題討論 II
人工智慧在居家安全與醫療照顧之應用
- 10:00~10:15 Coffee Break
- 10:15~12:20 專題討論 III
人工智慧與數位內容

演講摘要

專題演講

講 題	AI techniques in bioinformatics and e-learning
演講者	許聞廉 博士《中央研究院資訊科學所》
摘 要	<p>As cross-disciplinary research is becoming more popular, many AI techniques have been widely applied to related applications such as bioinformatics and e-learning.</p> <p>Vast amount of biological data has been generated; scientists need sophisticated computational techniques to make sense of it. Important AI techniques in bioinformatics include: machine learning and data mining, cluster analysis, pattern recognition, and knowledge representation. We shall talk about a few examples utilizing these techniques.</p> <p>With the advancement of computing hardware and software, intelligent tutoring systems are revived and growing well. We shall discuss how to adopt ontological techniques in simulating student problem solving behavior, analyzing student errors, and integrating curriculum. Finally, we shall introduce our newly developed MSN agent for collaborative learning on the Internet.</p>

專題討論 I：資料探勘與生物資訊

主持人：唐傳義 教授

講 題	Computational Enzyme Function Exploring
演講者	唐傳義 教授《清華大學資訊工程系》
摘 要	<p>Enzymes are proteins forming by chains of amino acids and enzymes are the major working horses (ex. Metabolism and signaling) in living cells. In order to perform their functions, enzymes fold into three-dimensional structures. It is interesting to study the functional mechanisms at molecular level. It is also interesting and important to clarify the relationships in sequence, structure and functions of enzymes. A major challenge in computational biology today is to predict the function of unknown proteins or enzymes without structural information. In this talk, several strategies for doing such works would be introduced. We will talk about how a constraint multiple sequence alignment could be used in exploring the enzyme functional residues. The other strategy is adapted the concepts of evolution, named “evolutionary trace” it is useful method to detect the functional residues when the enzyme phylogenetic tree is parallel to their function. Finally, a <u>F</u>eature <u>A</u>mplified <u>V</u>oting <u>A</u>lgorithm (FAVA) will also be introduced, with proper sequence clustering the desired feature of target enzyme or protein was revealed by voting. Functional residues of a target protein can then be extracted following FAVA analysis. All these strategies are the beginning for study enzyme function exploring, this problem is worthy for deeply approaching in computing science.</p>

講 題	Text Mining-based Bioinformatics Platform
演講者	蔣榮先 教授《成功大學資訊工程系》

講 題	Sequence Composition
演講者	趙坤茂教授《台灣大學資訊工程系》

講 題	Data mining in microbial genome
演講者	呂平江 教授《清大生科系》

摘 要

The rapidly generated whole genome sequence data, especially for microbial organisms, provide a great opportunity to explore the microbial diversity. More and more comparative genomic methods have been developed to investigate the differences between similar species. Besides the 16S rRNA-based phylogenetic analysis, whole genome comparison based on particular features, like GC content and amino acid composition, are widely used to account for extreme environmental organisms. Quarrying the genome-wide information may shed light on biodiversity of microbe. A microbial Genome Profile DataBase (GPDB) has been constructed to provide information of the whole genome profile, including basic information (taxonomy, genome size, orf number...), nucleotide composition (GC/AT content, N-nucleotide frequency, codon usage...), and amino acid composition (N-peptide frequency distribution, proteome length/Mw/pI/charge distribution...). The current version of GPDB contains 145 microbial genomes including both bacteria and archaea. GPDB perform a hierarchical clustering to compare genome-wide profile of the fully sequenced microbial organisms in a graphical way. A virtual 2D gel for each microbe is also included to provide a quick method to search the size and pI of proteins. A perl program called "Genome Profile Pipeline" has been developed to automatically mirror data from NCBI ftp site and continue to analyze data, which can be downloaded from our website (<http://gpdb.life.nthu.edu.tw>).

專題討論 II：AI 在居家安全與醫療照顧之應用 主持人：廖弘源 教授

講 題	Human Behavior for Homecare Applications
演講者	廖弘源 教授《中央研究院資科所》

摘 要

多媒體資料擷取，尤其是視訊片段擷取，是近來最熱門的課題。它可以被應用於娛樂、醫療看護及智慧型監控系統。本演講主要是談如何利用視訊片段分析人類行為，並利用擷取到的行為模式去做相類似行為的擷取。這個結果可用於老人或殘障人士之居家照護。

講 題	Human Behavior Analysis Using Deformable Triangulations
演講者	謝君偉 教授《元智大學電機工程系》
摘 要	<p>This paper presents a new method to analyze various human behaviors from videos using deformable triangulations. This method first uses the technique of triangulation to divide a human shape into different polygons. Then, two complementary methods are proposed to represent and compare human behaviors based on the result of triangulations. The first method takes advantages of the set of polygons to find important skeleton features for making a coarse search between different human behaviors. Since each human shape has been triangulated, much simplicity and effectiveness can be obtained for find all desired skeleton features. In the second method, we define a new shape descriptor, i.e., centroid context, to represent and compare human postures in more details. The centroid context is a set of feature vectors which can be easily found from the results of triangulations, and has extreme abilities to represent different human postures. Since the two methods are complement to each other, all desired human behaviors can be compared and retrieved very accurately. Experimental results have proved that the proposed method is robust, accurate, and powerful in human behavior analysis.</p>

講 題	Content and Channel Aware Video Streaming for Home Surveillance
演講者	林嘉文 教授《中正大學資訊工程系》
摘 要	<p>The explosive growth of compressed multimedia contents and repositories available and accessible worldwide, the recent addition of new video-related standards , and the ever-increasing prevalence of heterogeneous, video-enabled devices such as have multiplied the need for efficient and effective techniques for adapting compressed videos to suit better the different constraints, capabilities, and requirements of heterogeneous networks, applications, and end users. This talk will first give a brief overview of considerations and techniques for video streaming over heterogeneous networks. We will then summarize our recent research results on adaptive video streaming for video surveillance over wireless networks, including content-aware transcoding schemes for adapting bit-rates, error robust streaming over heterogeneous networks using content analysis and channel estimation.</p>

講 題	The Scalable Hand Posture Analysis for Homecare Applications
演講者	連振昌教授《中華大學資訊工程系》
摘 要	<p>Recently, the model-based hand posture analysis researches have become increasingly popular for many applications, such as hand gesture recognition, intelligent human-machine interface, virtual reality, and computer animation. However, the main problems that make the conventional marker-based hand posture analysis system inapplicable are inefficient calculation of the inverse kinematics, unable to scale the size of the hand model, and unable to analyze the hand posture when some markers are occluded. In this paper, a scalable hand posture analysis system is proposed to overcome these problems.</p>

專題討論 III：人工智慧與數位內容

主持人：陳良弼 教授

講 題	AI and It's Applications to Digital/Multimedia Contents
演講者	陳良弼 教授《政治大學資訊工程系》
摘 要	<p>在本文中我們將簡短介紹數位典藏在台灣的發展情形，及在使用層面與人工智慧可能的互動。</p>

講 題	Learning in Digital Era
演講者	陳德懷 教授《中央大學資訊工程系》
摘 要	<p>Learning companion, a concept proposed in 1988, was originally intended to be an alternative model of intelligent tutoring systems. This concept has recently drawn a rapid growth of interest while the research has been going along with generation of a variety of names such as virtual character, virtual peer, pedagogical agent, trouble maker, teachable agent, animal companion, and so forth. A number of research and technological advancements, including affective learning, social learning, human media interaction, new views on student modeling, increase of storage capacity, Internet, wireless and mobile technologies, ubiquitous computing, digital tangibles, and so forth, are driving learning companion research to a new plateau. This tutorial intends to give an account of these new perspectives, which can hopefully shed light to a possible research agenda on the ultimate goal of learning companion research – building lifelong learning companion.</p>

講 題	Attentive User Interface in a Smart Home Environment
演講者	廖文宏 教授《政治大學資訊科學系》
摘 要	<p>資訊科技發展與應用的重心逐漸由辦公室延伸至家庭，人機介面的設計也朝新型態、多模式的方向發展，在數位家庭的環境中，互動式內容的種類更趨多樣化，其遞送與呈現的方式也應具備更大的彈性。然而在嶄新的應用情境下，使用者與計算裝置的關係，由於數量、距離、環境以及人類心理等因素的影響，產生與過去截然不同的改變。人們一方面希望擁有更舒適的生活，一方面卻又對這些先進的技術能夠帶來的效益抱持懷疑，更對它們可能帶來的副作用充滿恐懼。處於這樣一個動輒得咎的發展階段，介面研究毫無疑問的必須扮演一個將科技平順的引入家庭的重要角色。</p>

講 題	Introduction to AI and Digital Contents
演講者	簡立峰 教授《中央研究院資科所》
摘 要	<p>Digital archives/libraries are widely recognized as a crucial component of a global information infrastructure for the new century. Research and development projects in many parts of the world are concerned about using advanced information technologies for managing and manipulating digital information, ranging from data storage, preservation, indexing, searching, presentation, and dissemination capabilities to organizing and sharing of information over networks. In this panel discussion, I would like do address some research topics that AI technologies can be applied to and benefit the development of Digital archives.</p>

講 題	Introduction AI and Digital Music
演講者	劉志俊 教授《中華大學資訊工程系》

AI 相關研究報導



服務機關單位	中央研究院資訊科學研究所研究員		
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研究描述

我的研究可分為兩個方面。主要的研究項目為網際網路上的自然語言人機介面，另外也涉獵計算生物學上的 DNA 序列分析，希望能結合演算法以及語言序列分析上的經驗對 DNA 解讀的意義有所著墨。

在網際網路上，我們目前的研究著重於自然語言的『理解』。舉凡網路上的語意搜尋，中文語音輸入、輸出以及校稿、翻譯系統都需要某種程度的理解模擬，才能達到令人滿意的正確率。這種理解模式可以和許多不同的知識表達方法結合，應用無窮。我們小組所發展的注音自動轉國字的軟體—自然輸入法，正確率接近 96%，曾獲得 1993 年傑出中文資訊產品獎，已經普遍受到大眾的歡迎與接受。


我們從自然語言理解的研究逐漸衍伸到網際網路上的智慧型代理人(intelligent Internet agent)的研究，特別是那些能以自然語言溝通的資料庫代理人。這些代理人軟體未來將在網路的語意查詢以及電子商務上扮演舉足輕重的角色。另一個研究方向是，利用系統模擬人類理解的能力來扮演教學助理的角色。目前已經可以處理小學三年級的數學應用題自動作答以及一部分的自動教學。我們正將這套系統應用到生物資訊的自動答詢以及自動代替使用者執行 script 的代理人上。

研究成果

- 演算法**：早期在西北大學的研究偏重於圖形演算法的理論，主要的貢獻在完美圖以及一些具有幾何性質的圖形上面，作品大多在 JACM 以及 SIAM J. Computing 發表。在平面完美圖上的兩篇論文是這個領域的經典之作。此外，在許多特殊圖形上都設計了精闢的演算法。最近，在平面圖的辨認以及極大平面子圖建構的線性演算法上，利用「PC -- 樹」資料結構獲得了突破性的進展。
- 生物資訊**：生物資訊是一門跨領域的學問。我們實驗室經常與不同的生物學家合作，以獲得一手資料。我們和中研院化學所合作 MS Spectrometry 的資料分析，目前在 ICAT 以及 ITRAQ 實驗分析上都有最先進的發展；和中研院生醫所合作 NMR 蛋白質結構分析，作品被計算生物學最重要的會議 RECOMB' 05 接受，是國內多年來的第一篇。此外，我們並與所內宋定懿老師合作蛋白質結構預測以及生物知識管理，文獻搜尋等研究。我們在蛋白質二級結構以及區域結構的預測上也領先全球。目前正在進行蛋白質三級結構的預測。
- 知識管理**：我們實驗室從 1998 年開始自然語言知識表達系統的研究，開發了 InfoMap 系統，能夠整合各種概念知識與進行簡單的框架推論，並作為其他自然語言應用系統的知識共享架構。我們在 InfoMap 上發展中文問答系統，做為自然語言理解的基礎，並以此進行企業內部知識管理以及生物知識管理系統的建構。
- 數位學習**：InfoMap 的另一個重要的應用方向，在於發展學生模型以及教學內容的概念整理。其目的不但要能建立學生錯誤自動偵測系統，並提供教師撰寫相應的解題步驟以及連結到相關教材內容的工具。兩者皆牽涉到靜態以及動態解題知識的表達與管理。利用 InfoMap 框架推論的機制，可以很容易地在自然語言幾何問題上建立了一個雛形系統。我們並在智慧型助教代理人的研究上，將自動問答機制建立在 MSN Messenger Agent 上，可自動協助上網的學生，支援網路共同學習的機制。

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研究描述				
<p>My research interests include analysis and design of algorithms, computational molecular biology, parallel processing and computer aided engineering. Fifty of my papers are published in prestigious journals of computer science. In the past years, I have developed tools for multiple sequence alignments and evolutionary trees by using the concept of compact set and the technologies of approximation. Recently, I am developing tools that help enzyme biologist to search active sites. The functions of the new tools cover the sequence alignment and the consensus finding with structure information. For the comparative genomics, I design several different algorithms to predict exons and alternative splicing.</p>				
研究成果				
<p>In the past years, Professor Tang has developed the approximation and exact algorithms of constructing evolutionary tree and used the concept of compact set to evaluate the constructed evolutionary trees. He also used parallel techniques to construct evolutionary tree with a large number of species. One journal article¹ (Journal of Combinatorial Optimization, 1999) and three international conference papers²⁻⁴ have published regarding this topic. He also generated a Constrained Multiple Sequence Alignment (CMSA) tool to analyze several members of the RNase family and provide a useful method to correlate the primary sequences with structural and functional features. For this topic, one journal article⁵ (Journal of Bioinformatics and Computational Biology, 2003) and two international conference papers^{6,7} have published. Based on the analysis of sequence similarity and function variations, Professor Tang developed a Feature Amplified Voting Algorithm (FAVA) to successfully identify critical residues in imidases and other related enzymes. One international conference paper has been published⁸. Recent progress in plentiful sequencing of species and comparative genomics raises new challenges in studies of genome rearrangements. The traditional phylogenetic tree reconstruction is based on the analysis of individual genes. In contrast, genome rearrangement studies are based on genome-wide analysis of gene orders rather than individual genes. From theoretical viewpoint, Professor Tang has explored the minimum number of rearrangement scenarios to the transformation between two relative species. Two journal articles^{9,10} (Journal of Computational Biology, 2005; Bioinformatics, 2005) have published. For other bioinformatics problems, he also developed some algorithms to solve them. Some results have published in journals^{11,12} (Information Processing Letters, 2000; Theoretical Computer Science, 2003) and international conferences¹³⁻²⁰. Professor Tang has plentiful experiences to lead the cooperation of computer scientists and biologists. All of his research acquires awards in grade-A or high-class over the years in NSC. In 2000 and 2003, he obtained the award of outstanding research of NSC.</p>				
未來方向				
<p>I hope to develop tools for pathway verification by using the technologies of computing theory and computer aided engineering. I have plentiful experiences to lead the cooperation of computer scientists and biologists.</p>				

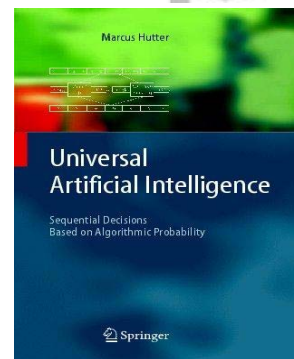
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研究描述				
<p>中央研究院資訊所多媒體技術研究群(Multimedia technologies group)主要研究的內容為多媒體信號處理、保護、抗誤編碼及擴增實境；如下：</p> <ol style="list-style-type: none"> 1. Wavelet-based Image Analysis 2. Multimedia Signal Processing 3. Multimedia Protection 4. Content-based Multimedia Retrieval 5. 2D/3D Object Recognition 6. Intelligent Transport Systems 				
研究成果				
<p>中研院不能招收學生，因此在研究上講求品質，不重數量。目前本研究群涵蓋八位成員，有二位研究員、四位副研究員及二位助研究員。在過去五年中(1999-2004)，本研究群計發表了 IEEE Transactions on PAMI (4 篇)、Image Processing (8 篇)、Circuits and systems for Video Technology (2 篇)、Signal Processing (4 篇)、Systems, Man, and Cybernetics (3 篇)、Multimedia (4 篇)、Neural Networks (1 篇)、Information Theory (1 篇)、Vehicular Technologies (1 篇) 以及 International Journal of Computer Vision (1 篇)、Computer Vision and Image Understanding (3 篇)。在最具代表性的會議上面，計發表了 CVPR (2 篇)、ICCV (3 篇)、ECCV (3 篇)、ICIP (15 篇)、ICPR (9 篇)、ICME (7 篇)、Globecomm (2 篇)。為了整合本研究群的研發能量，成員以參與大型計畫的方式達成操練的目標。本研究群成員廖弘源、劉庭祿及陳祝嵩三位教授參與了交通大學電腦視覺研發中心(Computer Vision Research Center)的經濟部學界科專四年計畫。其中，陳祝嵩教授參與了第一分項的計畫，從事以電腦視覺為基礎的入侵偵測方面的研究。另外，廖弘源老師及劉庭祿老師兩位教授則參與了分項三「以視覺為基礎的行為分析於看護服務之應用」。分項三的研究主要是以視訊資料為輸入，透過電腦視覺的相關技術加以分析。在經過一段時間的行為分析及學習之後，能針對受照護的對象(可能是老人家或殘障人士)不正常的行為加以辨識並發出通知給家人或地區醫院。透過這個計畫，我們必須發展一些基本模組，包括背景重建、前景追蹤、前景目標物的行為分析、行為比對等等。中研院資訊所多媒體技術研究群秉持著要做就做最好的研究精神，夙夜匪懈，期盼能為台灣在全球的學術界爭得一席之地。</p> <p>已取得之專利：</p> <ol style="list-style-type: none"> 1. Hong-Yuan Mark Liao and Chun-Shien Lu, "Cocktail Watermarking on Images", Taiwan's patent no. 139691. 2. Hong-Yuan Mark Liao and Chun-Shieh Lu, "Cocktail Watermarking on Images"(1), US Patent, US6,654,479, Date of Patent Nov. 25 2003. 3. Hong-Yuan Mark Liao and Chun-Shieh Lu, "Cocktail Watermarking on Images"(2), US Patent, US6,788,801, Date of Patent Sept. 7, 2004. 4. Chun-Shieh Lu and Hong-Yuan Mark Liao, "數位化浮水印", Taiwan's patent no. 220,232, 2004.8.11-2023.2.6 				

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研究描述				
Data Stream Management, Data Mining, Multimedia Databases				
研究成果				
Research Publication :				
1. C.H. Lin and A.L.P. Chen, "Indexing and Matching Multiple-Attribute Strings for Efficient Multimedia Query Processing," IEEE Transactions on Multimedia (EI,SCI)(to appear).				
2. N.H. Liu, Y.H. Wu and A.L.P. Chen, "Efficient kNN Search in Polyphonic Music Databases Using a Lower Bounding Mechanism," ACM Multimedia Systems Journal (EI,SCI)(to appear).				
3. H.C. Chen and A.L.P. Chen, "A Music Recommendation System based on Music and User Grouping," Intelligent Information Systems, Kluwer Academic Publishers (to appear).				
4. C.W. Cho, Y.H. Wu and A.L.P. Chen, "Effective Database Transformation and Efficient Support Computation for Mining Sequential Patterns," Proc. International Conference on Database Systems for Advanced Applications.				
5. N.H. Liu, Y.H. Wu and A.L.P. Chen, "An Efficient Approach to Extracting Approximate Repeating Patterns in Music Databases," Proc. International Conference on Database Systems for Advanced Applications.				
6. .H. Lin, D.Y. Chiu, Y.H. Wu and A.L.P. Chen, "Mining Frequent Itemsets from Data Streams with a Time-Sensitive Sliding Window," Proc. SIAM International Conference on Data Mining.				
Patents :				
1. Efficient Shot Change Detection on Compressed Video Data, 5900919, 5/4/99, USA				
2. Video Database Indexing and Query Method and System, 5819286, 10/6/98, USA				
3. Fast Discovery of Repeating Patterns in Music Databases, 134411, 90/5/16 – 107/10/8, ROC				
4. Communications Services System and its Location Management Strategy, 117149, 89/6/21 – 107/10/8, ROC.				
5. Methods and System for Indexing and Processing Video Data, 090454, 86/10/1 – 105/4/11, ROC				
6. Detection of Digital Data, 086436, 86/4/21 – 105/8/7, ROC				
7. Strategies for Processing Inserts, Deletes and Updates in Multi-Database Systems, 071141, 84/3/21 – 103/7/25, ROC				
8. An Efficient Method for Retrieving Repeating Patterns from Music Databases (submitted), USA				
9. A Region-Based Location Management Strategy in PCS Systems (submitted), USA				

新書介紹



Title: Universal Artificial Intelligence
Subtitle: Sequential Decisions based on
Algorithmic Probability
Publisher: Springer
ISBN: 3-540-22139-5
Date: October 2004
Pages: 300



The book can be ordered from springeronline.com, or amazon.com, or amazon.de, or most other bookshops.

Introduction

Motivation. The dream of creating artificial devices which reach or outperform human intelligence is an old one. What makes this challenge so interesting? A solution would have enormous implications on our society, and there are reasons to believe that the AI problem can be solved in my expected lifetime. So, it's worth sticking to it for a lifetime, even if it takes 30 years or so to reap the benefits.

What is (Artificial) Intelligence? The science of *Artificial Intelligence (AI)* might be defined as the construction of intelligent systems and their analysis. A natural definition of *systems* is anything that has an input and an output stream. Intelligence is more complicated. It can have many faces like *creativity, solving problems, pattern recognition, classification, learning, induction, deduction, building analogies, optimization, surviving in an environment, language processing, knowledge* and many more. A formal definition incorporating every aspect of intelligence, however, seems difficult. Further, intelligence is graded, there is a smooth transition between systems, which everyone would agree to be not intelligent and truly intelligent systems. One simply has to look in nature, starting with, for instance, inanimate crystals, then come amino-acids, then some RNA fragments, then viruses, bacteria, plants, animals, apes, followed by the truly intelligent homo sapiens, and possibly continued by AI systems or ET's. So the best we can expect to find is a partial or total *order relation* on the set of systems, which orders them w.r.t. their *degree of intelligence* (like intelligence tests do for human systems, but for a limited class of problems). Having this order we are, of course, interested in large elements, i.e. highly intelligent systems. If a largest element exists, it would correspond to *the most intelligent system* that could exist.

No Intelligence without Goals. Most, if not all known facets of intelligence can be formulated as *goal driven* or, more precisely, as *maximizing some utility* function. It is,

therefore, sufficient to study goal driven AI. E.g. the (biological) goal of animals and humans is to survive and spread. The goal of AI systems should be to be useful to humans. The problem is that, except for special cases, we know neither the utility function, nor the environment in which the system will operate, in advance. The mathematical theory, coined AIXI, is supposed to solve these problems.

Mathematical AI. Assume the availability of unlimited computational resources. The first important observation is that this makes the AI problem not trivial. Playing chess optimally or solving NP-complete problems become trivial, but driving a car or surviving in nature don't. The reason being, that it is a challenge itself to well-define these problems, not to mention to present an algorithm. In other words: The AI problem has not yet been well-defined. One may view AIXI as a suggestion for such a mathematical definition of AI.

The universal algorithmic agent AIXI. AIXI is a universal theory of sequential decision making akin to Solomonoff's celebrated universal theory of induction. Solomonoff derived an optimal way of predicting future data, given previous observations, provided the data is sampled from a computable probability distribution. AIXI extends this approach to an optimal decision making agent embedded in an unknown environment. The *main idea* is to replace the unknown environmental distribution in the Bellman equations by a suitably generalized universal Solomonoff distribution ξ . The state space is the space of complete histories. AIXI is a universal theory without adjustable parameters, making no assumptions about the environment except that it is sampled from a computable distribution. From an algorithmic complexity perspective, the AIXI model generalizes optimal passive universal induction to the case of active agents. From a decision theoretic perspective, AIXI is a suggestion of a new (implicit) "learning" algorithm that may overcome all (except computational) problems of previous reinforcement learning algorithms.

Computational AI. There are strong arguments that AIXI is the most intelligent unbiased agent possible in the sense that AIXI behaves *optimally in any computable environment*. The book outlines for a number of *problem classes*, including *sequence prediction, strategic games, function minimization, reinforcement and supervised learning*, how they fit into the general AIXI model and how AIXI formally solves them. The major drawback of the AIXI model is that it is incomputable. The book also presents a preliminary *computable AI theory*. We construct an algorithm *AIXI_{tl}*, which is superior to any other time t and space l bounded agent. The computation time of *AIXI_{tl}* is of the order $t \cdot 2^l$. The constant 2^l is still too large to allow a direct implementation, but can be reduced in various ways. An algorithm is presented that is capable of solving all well-defined problems as quickly as the fastest algorithm computing a solution to this problem, save for a factor of $1+\epsilon$ and lower-order

additive terms.

Discussion. The discussion in the final book chapter includes less technical remarks on various philosophical issues, including mortal embodied agents, the future of AI, the free will paradox, the existence of true randomness, the Turing test, non-computable physics, the number of wisdom, and consciousness.

Link

<http://www.idsia.ch/~marcus/ai/uaibook.htm#buy>