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Electronic Commerce, the Next Frontier for AI Research

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Objective:

This paper seeks to outline existing developments and future directions in the field of artificial intelligence applications to business decision making.

A journey down memory lane:

The history of AI minitrack is almost as old as the AIS conference itself. In 1996, we timed the creation of the first AI minitrack with guarded (yet robust) optimism. We were pleasantly surprised by the enthusiasm displayed by all stakeholders of the minitrack – the seed participants, authors, reviewers and the program chair contributed immensely to the success of the first AI minitrack. The firm foundations of the Phoenix meeting provided impetus to enlarge and reinforce the experiment. Over the years, the minitrack has progressively graduated both in quality and quantity, providing an ideal fit with the demands of the market. Each milestone traversed allowed us to guide the minitrack to its current focus that is more fine-tuned to changing business environment.

The contemporary emphasis of the minitrack allows us to more strategically serve our stakeholders providing sufficient leverage for the sharing and interaction of ideas and research findings across disciplines. The secondary objective of this re-engineering has been to allow the freedom for the ancillary areas to be organized as separate forums. It is our objective and endeavor to consistently fine-tune the AI minitrack to make it evermore relevant and timely. In this vein of thought, we discuss in this paper the opportunities and challenges for the AI research as posed by the emerging business model of Internet enabled electronic commerce.

EC, the New Business Model:

The uncertainty and change are interleaved in the current business environment presented by the electronic commerce. Organizations are focusing on the re-design of their information systems using AI based concepts (such as agent orientation) to deal with large volume of data. Open system IT architecture holds promise for reducing IS inflexibilities due to poor performance, incompatibilities and constraints to change. Cross border competition and EC require companies to reinvent their IS by deploying new technology that are flexible, robust and responsive to the rapid change and un-structured ness of the market place.

In this new global economy, the successful organizations are the ones that are better able to manage the flow of information. For some companies, this means completely revamping their existing supply chain – while for others this translates into a whole new way of looking at their customers. So, what is different? The web provides a lot more data. The question for most e-tailers is how best to massage it and derive meaningful patterns. However, it has also generated new unstructured planning problems. This includes problems such as the prediction of optimal infrastructure requirements (page views etc.) for managing traffic during peak times. Another related problem is the estimation of demand requirements for planning purposes. AI can play a unique role in this Internet driven economy by providing solutions/support to address these problems.

The Role of AI Research in Business

Exhibit I presents a framework of issues critical to the application of AI based tools in business cycles. Business applications of AI are governed by four concerns: the underlying decision or cognitive theory, the learning algorithm used, the application or fundamental business problem that is being solved, and finally, the nature of deployment and testing.

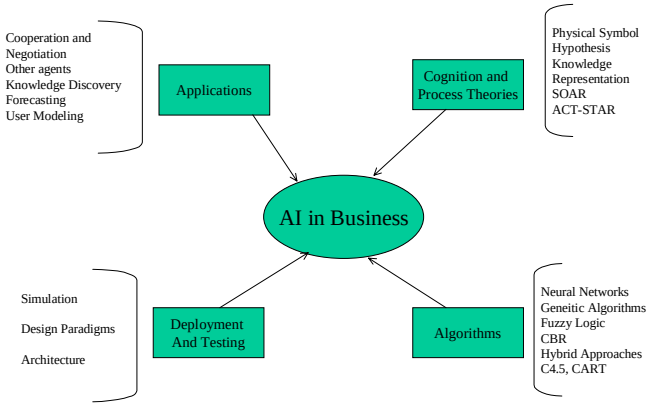

Exhibit I: AI Research Framework

Over the last four years, the type of papers we have received reflect the evolution of research in the development of AI based business applications. Initial research was primarily focused on exploring the feasibility of AI techniques for business problems. This

was followed by attempts to create hybrid approaches. This set the stage for applying these AI techniques to business examples. Indeed, several organizations have taken the initiative to develop AI based commercial applications. We are now at the crossroads where we have a set of validated proven AI techniques that have spurred both business and user confidence.

Several new research themes are emerging. The new economy is not only unique in that it has created the need for new applications but also has generated new requirements for implementation. AI researchers not only have to establish the feasibility and superiority of their designs but also need to take into account implementation considerations. Given that most applications now have to be deployed in an Internet based client server environment possibly on a real time basis, there is also a need for robustness and scalability considerations. This is particularly true for applications like fraudulent credit card usage. Hence, the new set of requirements include the need to customize or re-design AI algorithms for efficiency purposes. The boom in business-to-business exchanges has now created the need for intelligent sophisticated agents that can monitor changing price dynamics and accordingly bid in auctions.

We are also finding that the successful e-tailers are the ones that are paying meticulous attention to customer relationship management. This requires the need to identify customer tastes and preferences, and then customize content, promotions, and other rules with data mining techniques. The success of these enabling technologies depend however on data collection and data warehousing strategies. This includes the need to be able to integrate and correlate online sales data with offline sales data along with data gathered from customer surveys and other behavior patterns from server log files. Another customer related area is that of service on the web. While most companies generate as many as thousand e-mail inquiries in a week, very few have intelligent approaches to responding to those e-mails in an efficient manner. While auto responders have been used for a long time, we are now beginning to see the emergence of tools which script answers based on customer queries. This in addition to dynamic self-updating frequently asked questions (FAQ) files will become a requirement for service on the web.

Web security is another area where AI based technologies can play a unique role. This includes improved firewall security provisions through intelligent packet filtering mechanisms. Also, technologies like XML offer the opportunity to parse documents in an intelligent manner. For example, financial documents can have security features that authorize the modification of only certain types of data elements.

An Impressive Array!!

A reflection of the research direction outlined above can be gleaned from an impressive set of carefully selected papers in this years' AI minitrack. These papers are focused, timely and appropriated diversified to provide an ideal blend of theoretical perspectives and practical applications.

Using a heuristic learning algorithm called Search and Learning A* (SLA*), Lau and Shu address the traveling salesman problem. The neural networks session presents three timely papers that have implications for web-enabled systems. Nguyen and Kira provide results of an integrated ANN/ES system that performed well with an initial knowledge base designed with the orthogonal plan and holistic assessments. The results provide empirical validity to the concept of hybrid intelligent systems conceptualised by earlier scientists including Medsker (1995). Kim et. al. report the details of a web ad selection model for one-to-one advertisement using neuro-fuzzy systems. The findings are relevant in the context of emerging CRM strategies being followed by most companies in the customer-centric business model. Various studies have suggested integrating the power of ambiguity inherent in fuzzy systems with the precision of ANN to model web-based marketing systems (Altrock 1997; Dewan et. al. 1999; Raghu et. al. 2000). Reduced life-cycle times, and the dynamic nature of Internet exposes organizations to fraud from internal and external sources. Hwang and Lin address this issue by proposing a neural fuzzy system to detect management fraud.

Finally, the intelligent decision support session offers a set of four application oriented studies designed to improve user's judgment in the new economy. Two papers deal with data mining. Zhu investigates project scheduling by filtering through the mass of data in data warehouses using FILM (fuzzy inductive learning method) popularized by Jeng and Jeng (1993) and Jeng et. al. (1997). Lin and Chen use the data mining tool to segment customer according to their behavior. The results have implications for both retailers and e-tailers. Raggad and Zaghdoud introduce a new design for the executive information system (EIS) technology that grants them adequate but feasible computational freedom. Sun and Newton present the MITAIS approach to articulate unstructured-ness in strategic decision environment. Their approach allows the user to describe a decision problem interactively and assists articulation of the problem into a presentation in a decision space, by prompting possible patterns of decision dimensions.

Conclusions:

Advances in technology and decision makers' sophistication (fueled in turn by technical innovation!) are foddering the need to develop innovative decision aids that supplement contemporary decision making tools.

The ubiquitous nature of Internet and the consequent evolution of e-business as the new model provide exciting opportunities and challenges for the AI based research. Opportunities include wider market reach in Internet time, higher earnings, and diffusion of ideas amongst competitors. The traditional form of competition has given way to collaborative efforts across industries for adding value to business processes. However, the untested nature of this emerging business model present challenges in converting these opportunities to tangible gains.

Already, the recent volatility on Wall Street has sown seeds of doubts in the promise held out by the technology sector. Almost all venture capitalists have become quite discerning in financing projects based solely on promise and business plans that are not backed up by tangible bottom line results. Currently, not a single Internet grocery company is profitable. Even the grandfather of the e-business model, Amazon.com, is struggling to attain positive bottom line results. According to a recent estimate, more than 85% of the internet-based companies will not survive by the end of next year. This a grim forecast indeed. Stakeholders are getting less tolerant and more discerning of the gap between the promise and the realization of promise.

Never before have businesses had so much of information freely available, yet never before has the risk of failure been so high. This is the challenge that AI based research, in our opinion, must live up to by adding tangible value to decision making. In the e-business environment, AI tools are needed to generate, filter, collect and transform information as per user's information requirements in a timely manner from disparate databases stored in global networks. To a great extent the success or failure of e-business will depend on building effective AI tools.

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