IS HIGHER EDUCATION GEARED UP FOR ADAPTING ARTIFICIAL INTELLIGENT SYSTEMS?

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Abstract - Although, Artificial Intelligent (henceforth termed as AI) systems existed for a century, its prominence was majorly observed during the 60s & the 70s. In the seminal research conducted by Stanford university on the 'past 100 years of AI', it was observed that institutions such as Carnegie Melon, Stanford, MIT, Northwestern University & the institute of theoretical & experimental physics at Moscow played a critical role in developing Artificially Intelligent chess playing programs. With continuous developments of such programs, eventually in 1997, IBM's "Deep Blue" program was able to beat reigning chess champion Gary Kasparov [1]. Over the years, AI has proliferated every aspect of our professional and personal lives. This paper looks into the advancements of AI expert systems in the area of higher education, its future and a suggested framework for higher education to adapt to the changing needs of AI.

Keywords – Artificial intelligence, Expert systems, Higher Education, curriculum.

INTRODUCTION

In the initial years of its applications, AI lacked a universal definition. Over the years, the field of AI evolved into a more formal discipline and along with it, the definition of AI also became more formalized. Today, a more acceptable definition of AI relates to an "activity devoted to making machines intelligent, & intelligence is that quality that enables an entity to function appropriately & with foresight in its environment". [2]

An operational definition of AI states that "AI is a branch of computer science that studies the properties of Intelligence by synthesizing intelligence". [3] In the last decade & a half, AI technologies has made serious inroads in our life, transitioning from simply establishing mechanized systems to creating intelligent systems that are "human aware and trustworthy". This AI revolution has been mainly propelled by the advances in large scale machine learning, deep learning, reinforcement learning, robotics, computer visions, natural language processing, collaborative systems, crowd sourcing & human computation, algorithmic game theory & computational social choice, internet of things (IoT, & neuromorphic computing).

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Relative to the advances of AI in several fields, its serious involvement in the field of higher education has been felt in the past couple of decades. AI innovations have developed in the form of massive online open courses (MOOC's), smart phones & smart classrooms have changed the way we look at teaching and learning. [4] Interdisciplinary subjects & Project Based Learning (PBL) has seen a rapid growth at K12 level [5] & studies conducted on AI practitioners revealed significant respondents "suggesting systems engineering as a learning outcome" [6]. Successive multiple researches have revealed an urgent need for exposing students to real world problem solving which reinstated the propositions of broadening the AI expertise an objective mentioned in Stanford's century long AI study. [7]

EVOLUTION OF AI IN ACCOUNTING AND FINANCE

A major objective of an expert system aims towards increasing accessibility of expertise that would result in "better & faster decision making". [8]. An increasing use of expert system primarily aim towards better decision making in certain areas of higher education, namely accounting & auditing [9].

The use of expert systems in accounting decision making has been there since 1980s. The domains included tax [10], auditing [11], & management accounting [12]. A study conducted by waterman in 1986 [13] revealed that the business community adapted only 10% of the established expert systems which by 1992 radically grew to 60% of usage [14]. Application of AI in the area of accounting dates back to the 80s. [15] Booker et.al [16] provided insights on the use of expert system in accounting classroom with an objective of improving education process. In the same year French et.al [17] addressed the outcome of expert system for tax practice & its consequent advantages & downsides in tax research & their implementation. In the following year Dorr et.al [18] suggested a method to develop an expert system that would lessen the time & cost of the instructor. In the same year Hatherley et.al. [19] used Mcgrohills master expert & developed an expert system that could categorize the investments of one company in another company's shares. In the very same year Jancuraet. al. [20] opined that expert system based training devices had the potential of offering a realistic & flexible learning atmosphere coupled with significant degree of customization in training in terms of location, approach & speed.

Boer et.al [21] examined the importance of expert system in teaching complex accounting problems that needed the usage of multiple rules to a specific set of economic transactions. In the same year Luthy et.al [22] vented their concern on the theoretical challenges of establishing "intelligent tutoring systems" & the lack of feeding complex knowledge to the computer that would eventually be needed for the system to simulate human, tutor like

characteristics. In the same year Mcarthy et.al [23] researched on the development of the expert system that included accounting transaction processing design. In the following year Einning et.al [24] established an expert system meant for "Internal Control Evaluation", which was subsequently used by students in a course related to accounting information system. In the same year King Et.al [25] described the application of expert system in teaching standard costing. The objective of the paper was to probe into the approach, insight & the experience of the participants & encourage accounting teachers to make more use of expert systems. Rosenthal et.al [26] explored the social psychology aspect of the human computer interaction. Their results revealed that "individuals showing negative attitude towards computers were more likely to comply with computer mediated influence".

In the following year Back [27] described an "expert system" that would enable planning of financial statements. The results of his work pointed towards significant help for novice accountants as a result of the use of "expert system". In the same year FederoWicz et.al [28] studied the effect of expert systems on inexperienced problem solving in the area of financial analysis. Their paper demonstrated how information technology can be integrated into quantitative methodology in financial analysis. Similarly, Knox-Quinn [29] observed six parameters from a sample of MBA students while establishing an expert system aim towards providing advice on tax accounting problems. Taking the study further Gold Water et.al [30] observed the application of expert system in generating "inexhaustible supply of accounting questions that can be used by students in an introductory managerial accounting class for self-study & self-testing". In the same year Lee et.al [31] observed the development & acceptance of an expert system that could categorize tax expenses into deductible & non-deductible categories in the context of Singapore tax system.

Steinbart et.al [32] observed how expert systems had valuable knowledge & how companies can leverage substantial benefits & at the same time facilitate novice learners gain additional acquaintance on the subject matter.

INTEGRATING AI SYSTEMS IN CURRICULUM CHANGES

Though much has been spoken about AI at higher education levels, not much has been done at the curriculum development stage as well as at students' assessment level. Though few universities across the globe are trying to bridge this gap that requires three levels of AI enabled pedagogical interventions namely aiding in practical, comprehensive & analytical skills this calls for simulation driven courseware, students' centric flipped classrooms & a significant focus on data analysis techniques across all subjects. Few universities such as Southwestern, Singapore management university, University of Waterloo, Queen Mary

University & Rutgers University has moved in this direction. Following Amelia and Baldwin model, one needs to incorporate curriculum level changes to suit AI needs, (Figure 1)

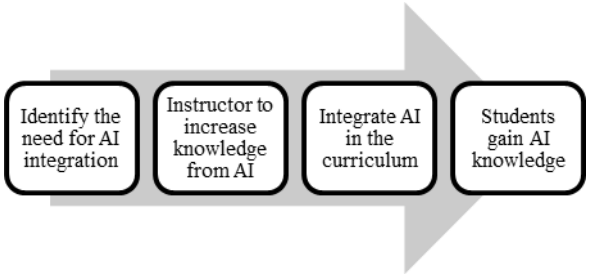

Fig. 1 - Steps for integrating AI into curriculum

Source: Amelia A. Baldwin-Morgan (1995). Integrating artificial intelligence into the accounting curriculum, Accounting Education

SUGGESTIVE FRAMEWORK

Taking the discussion further AI has made advent in areas of accounting & auditing in the form of automation & going by Zhang, et.al. most likely will result in significant job loss in these areas [33] recent disruptions in technologies such as robotic process automation (RPA), block chain, advanced analytics & smart contracts have redefined the existing business models & paved away for new ones where the repetitive tasks are been taking care by predictive AI interface [34] in a similar report Ernst & Young pointed out that audit work of the future would require skills beyond accounting & would require an innovative, questioning, challenging, & a global mindset. The focus would be more on asking better questions, a better emotional intelligence to communicate & connect with other & the knowledge of data analytics [35].

Today AI faces significant changes & challenges from all fronts. There is also a misconception about what defines AI & what it doesn't? It is extremely important to have regulations that encourage the progress of AI & not stifle its growth. Evidences from Spain & France suggest that strict regulations on AI can become counterproductive. One suggestion made in this regard relates to carefully drafted privacy protection law that can be internally processed. Evidences from US & Germany reveal strict transparency requirements with meaningful implementation yields better results. It should be born in mind that the goal of AI is to create a societal value. Therefore, caution must be taken to integrate, better human capabilities, their interaction & to minimize societal discrimination. Coming to the specifics of higher education the 21st century business leaders requires skill sets that are beyond their domain specific skills. Some of the existing analytical & personal skills such as enterprise resource planning (ERP), programming logic, analytic modelling, text mining, personal

agility & resilience, client connection & communication, & presentability needs to be augmented with AI disruptions such as robotic process automation, intelligent process automation, deep learning, cognitive computing tools, block chain technologies & smart contracting, cyber-security & understanding cyber-currencies.

ANALYSIS AND CONCLUSIONS

Rationally speaking we may be quite faraway from replacing a professor with a robot in the classroom but cannot ignore the success "Elmo" in Sesame that worked wonders in teaching kids. Also examples of "Professor Einstein" from Hanson robotics can answer questions in scientific subjects. Similarly, Google's Alexa throws open a world of possibilities of similar avenues in higher education. & to sum it up, "Sophia" the robot has brought in much seriousness in the ongoing discussion. Sophia has been a common name in the UN & many other talk shows.

With more advancements we will have co-bot that will help, do things with us such as if we are using twitter the bot can help us like all the people who re-twitted us, in higher education such bots can assist in grading students' paper, answer student's queries & act as a teaching assistant. For the 21st century student it is important that students can transition from being computer & date literate to AI literate with a good understanding of algorithms simply because the workplace would demand skills beyond STEM & beyond the hygiene requirements of math & science. Every discipline would require these skills in making an AI enhanced society.

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