

ARTIFICIAL INTELLIGENCE TOOLS IN SPECIALIZED MBA COURSEWORK FOR MEDICAL PROFESSIONALS

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Abstract

We report on active and engaged learning with collaborative inquiry in the AI enhanced, MBA professional track coursework. In this coursework, we utilize a teaching approach that requires students to derive knowledge by engaging collaboratively with medical center partners, and it has proven more effective than traditional didactic approaches in developing innovative thinking, knowledge creation capacity, and professional skills. With this approach, dubbed, Nexus Learning, students learn by designing and constructing actual solutions to real-life medical problems. AI enhanced, MBA course projects outcomes are tied to curriculum and learning goals, and are based on authentic real-world issues that students care about, and exhibit empathy for patients who go through those issues. Simulated exercises utilizing IBM® Business Analytics Enterprise software that provides a single entry no-code content hub to discover, personalize and recommend business analytics content, is utilized. It is an analytics platform that combines predictive analytics, reporting, data analytics and data integration capabilities natively out-of-the-box to help students navigate real data healthcare challenges. In addition, AI Trilogy package is employed to provide students with actionable recommendations based on the data. It provides analysis of independent variables (inputs) to help determine which ones are most important in the healthcare models. At Jefferson Center for Digital Health, we seek to provide answers and explore the processes, actions, challenges, and outcomes of learning, teaching, and research. The goal is to provide a platform for professors, students, researchers, from a range of academic fields, interested in exploring and giving their contribution to educational issues that impact health and wellbeing of communities. The International Conference on Education and New Developments (END) provides an avenue to promote growth in research methods intimately related to teaching, learning, and applications in Education. It aims to illustrate developments and new ways of thinking in Projects and Trends, as well as Teaching, Learning, and Research, and their impact on healthy and thriving communities.

Keywords: *Higher education, Artificial Intelligence, MBA professional track coursework.*

1. Changes in educational theory and learning

Noteworthy, Thomas Jefferson University (TJU) was an academic medical center with a campus in the center of Philadelphia that has a long history rooted in the graduate health sciences. Philadelphia University, on the city's outer edge, had a long history rooted in undergraduate education, particularly in design, engineering, and business. In 2017 these two universities merged and are now known as Thomas Jefferson University. The East Falls campus, formerly Philadelphia University, has a long history of student research and scholarship, and had experienced success with a signature pedagogy known as Nexus Learning. Nexus Learning actively engages all learners in a collaborative approach to solving real-world problems and uses a humanistic approach to designing effective solutions (Frisby and Sztandera, 2020).

Educational theories of learning have changed as well. Professors encourage group learning activities following constructivist models. Students work in teams to solve real world problems. Thomas Jefferson University has captured these components and integrated them into Nexus Learning "with a little help of your friend" Artificial Intelligence (Sztandera and DiSantis, 2024).

2. Active and engaged learning with empathetic inquiry

Active and engaged learning, along with empathetic inquiry, as well as use of health and social issues and experiences, supported by the strong integration of life sciences with professional disciplines, has defined Nexus Learning approach. As reported before by Mathews and Soistmann (2016) as well as Frisby and Sztandera (2020), campus learning spaces, including libraries and team meeting places, had to be re-designed to represent innovative rethinking of the classroom space that allowed the learning facilitator to be less encumbered by the physical constraints of space, furniture and technology. Those spaces ultimately enhanced student learning and creative teaching.

For example, Nexus Learning classrooms allowed for seamless transitions to different modes of active and engaged learning. The knowledge hubs also optimized collaborative involvement for all students through movable furniture and appropriate technologies that fosters co-creation and sharing of ideas. Our students self-reported significant gains in class participation, ability to focus, Professor feedback opportunities, learning through multiple means, physical movement, stimulation, and comfort level in Nexus Learning classrooms compared to traditional classrooms on campus, as indicated in Frisby and Sztandera (2020).

3. Artificial Intelligence focus

Data scientists are in high demand, with employment in industries ranging from business, engineering, health and medicine expected to increase by more than a third until 2033, according to the U.S. Bureau of Labor Statistics (2024). Under an exemplary leadership of Thomas Jefferson University President, Dr. Susan Aldridge, Jefferson is meeting this demand for data-savvy professionals who can make sense of vast troves of information with courses and degree programs in academic schools and colleges across the University. Now faculty experts from diverse disciplines who teach and research on data are coming together in the new programs in the School of Business, School of Design and Engineering, as well as Computational Medicine program in the Jefferson College of Life Sciences. The three new graduate Data Science programs are expected to infuse fresh energy into existing data-centric programs and support the students, as well as foster increased collaboration among faculty. Starting Fall 25 semester, new graduate Data Science initiatives provide a platform under which Jefferson students and faculty can engage in innovative approaches to the use of data in modern society to have community impacts, develop cutting-edge educational outcomes, and initiate interdisciplinary research projects.

As Universities and Colleges update their classrooms to enable active learning methodologies, adjust their student-centered teaching approaches, Artificial Intelligence aided curricula could provide meaningful support to teaching and research communities in academia to affordably educate professional students. Large amount of data are collected through clinical trial processes, including multimodality imaging/treatment planning/verification digital data, associated pre- and post-treatment (quantitative) imaging data, and associated metadata, including outcomes. The most impactful data are focused on the “self-seeding” of prostate cells with metastatic properties back to the site of origin, contributing to disease progression. As the capabilities of Artificial Intelligence (AI) surge, the healthcare sector is rapidly finding new ways to use Genetic Algorithms and Machine Learning for patient care. Specialized, AI enhanced, professional track MBA courses aid medical professionals in that mission. In particular, MBA Competitive Intelligence course provides a comprehensive hands-on exposure to Data Analytics through IBM® Analytics software.

The IBM® Analytics software and Artificial Intelligence (AI) Trilogy package have been utilized to provide students with actionable recommendations based on real-life data. The software packages provide in-depth analysis of independent variables (inputs) to help determine which ones are the most significant and differentiating in the models. In our cases, in research supported by Jefferson Center for Digital Health, the power of Artificial Intelligence approaches in the specialized graduate coursework for medical professionals, students discuss the experiences with AI in processing Prostate Cancer data, for example, AI highlights and advantages, as well as ethical issues associated with its use. The MBA students, many of them practicing physicians and professional staff, work in teams to solve real medical problems and design new medical equipment with solid business models. All of it with a little help from their friend, AI. Students work on development of models to discover and prioritize data patterns to provide information and actionable knowledge to stakeholders as well as public health policy decision makers. Artificial Intelligence is used: 1. To explore data to find new patterns and relationships (data mining); 2. To evaluate and test previous decisions (randomized controlled experiments, multivariate testing); 3. To explain why a certain outcome happened (statistical analysis, descriptive analysis); and 4. To venture into the future (forecast) results (predictive modeling, predictive analytics). All four research avenues capture very well the significance and impact of Artificial Intelligence to discover hidden and actionable outcomes. These packages listed below are part of the AI Trilogy business and scientific Artificial Intelligence software that was highlighted previously in (Sztandera and DiSantis, 2024).

NeuroShell Predictor

The NeuroShell Predictor contains state-of-the-art algorithms that train extremely fast, enabling you to effectively solve prediction, forecasting, and estimation problems in a minimum amount of time without going through the tedious process of tweaking neural network parameters. Designed to be extremely easy to use, this product contains our most powerful neural networks, it reads and writes text files for compatibility with many other programs. The prediction algorithms are the crowning achievement of several years of research. Gone are the days of dozens of parameters that must be artistically set to create a good model without over-fitting. Gone are the days of hiring a neural network expert or a statistician to build your predictive models.

The two training models available to the students are:

1. The first training method, which is called the “neural method” is based on an algorithm called Turboprop2, a variant of the famous Cascade Correlation algorithm invented at Carnegie Mellon University by Fahlman and Lebiere (1990), TurboProp2 dynamically grows hidden neurons and trains very fast. TurboProp2 models are built (trained) in a matter of seconds compared to hours for older Neural Networks.
2. The second method, the “genetic training method”, is a genetic algorithm variation of the General regression neural network (GRNN) invented by Specht (1991). It trains everything in an out-of-sample mode; it is essentially doing a "one-hold-out" technique, also called "jackknife" or "cross validation". If you train using this method, you are essentially looking at the training set out-of-sample. This method is therefore extremely effective when you do not have many patterns on which to train. The genetic training method takes longer to train as more patterns are added to the training set.

NeuroShell Classifier

The NeuroShell Classifier was crafted from the beginning to help optimization of classification and decision-making problems. NeuroShell Classifier can detect categories in new data based upon the categories it learned from case histories. Outputs are categories such as {cancer, benign}, {buy, sell, hold}, {acidic, neutral, alkaline}, {highly qualified, qualified, unqualified}, {winner, loser}, {product 1, product 2, ... , product N}, {decision 1, decision2, ... , decision N}. Like the NeuroShell Predictor, it has the latest proprietary Neural and Genetic Algorithms classifiers with no parameters to set. It also reads and writes text files, which is of the highest importance to process data from patient interviews.

The classification algorithms are the crowning achievement of several years of research of software development. Gone are the days of dozens of parameters that must be artistically set to create a good model without over-fitting. Gone are the days of hiring a neural network expert or a statistician to build the predictive models.

There are two training models to select from:

1. The first training method, which is called the “Neural Method” is based on an algorithm Turboprop2, a variant of the famous Cascade Correlation algorithm invented at Carnegie Mellon University by Scott Fahlman (1991). TurboProp2 dynamically grows hidden neurons and trains very fast. TurboProp2 models are built (trained) in a matter of seconds compared to hours for older Neural Networks types.
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GeneHunter

The Genetic Method provides an analysis of independent variables (inputs) to help determine which ones are dominant, most contributing ones in the selected approach. GeneHunter is a powerful software solution for optimization problems which utilizes a state-of-the-art Genetic Algorithm Methodology. GeneHunter includes an Excel Add-In which allows the user to run an optimization problem from Microsoft Excel, as well as a Dynamic Link Library of Genetic Algorithm functions that may be called from programming languages such as Microsoft® Visual Basic or C.

Genetic Algorithms (GAs) seek to solve optimization problems using the methods of evolution, specifically survival of the fittest. In a typical optimization problem, there are a number of variables which control the process, and a formula or algorithm which combines the variables to fully model the process.

The problem is then to find the values of the variables which optimize the model in some way. If the model is a formula, then we will usually be seeking the maximum or minimum value of the formula. There are many mathematical methods which can optimize problems of this nature (and very quickly) for fairly "well-behaved" problems. These traditional methods tend to break down when the problem is not so "well-behaved", or when it is a real-life medical domain problem.

The power of Artificial Intelligence approaches, as related to increasing the efficiency of medical image processing, is explored in the MBA Professional Track coursework. In terms of pattern recognition, essential for proper medical diagnosis, development of models to discover and prioritize data patterns, to provide information and actionable knowledge stakeholders as well as public health policy decision makers, is explored. Artificial Intelligence is used: 1. To explore data to find new patterns and relationships (data mining); 2. To evaluate and test previous decisions (randomized controlled experiments, multivariate testing); 3. To explain why a certain outcome happened (statistical analysis, descriptive analysis); and 4. To venture into the future (forecast) results (predictive modeling, predictive analytics). All four research avenues capture very well the significance and impact of Artificial Intelligence to discover hidden and actionable outcomes.

4. Conclusions

As the capabilities of Artificial Intelligence (AI) surge, the healthcare sector is rapidly finding new ways to use Neural Networks, Genetic Algorithms and Machine Learning for patient care. Specialized, AI enhanced, professional track MBA courses aid medical professional in that mission.

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