

# ARTIFICIAL INTELLIGENCE, M.S.

## Program Description

This program provides comprehensive coverage of AI concepts, methodologies, and tools, equipping students with a deeper understanding of the field. Students develop skills in machine learning, deep learning, natural language processing, and data analytics. The program provides the chance to engage in emerging technologies linked to innovation and advancements in many areas. Students explore potential to solutions to complex problems with goal of improving quality of life through a positive contribution to society through technology. The program encompasses through all the course work a variety of factors, including ethical, environmental, and social implications central to use and adoption of artificial intelligence.

The M.S. Artificial Intelligence program is offered in an online format. It follows the traditional academic calendar of a fall and spring semester and a shorter summer semester. The fall and spring semesters are divided into two 8 week terms. A full-time graduate student carries a minimum of 6 semester credit hours. Some courses may require more hours per week in some areas of instruction. All courses are online and 3 credits in the length. The courses will meet both synchronously (optional) and asynchronously. Students are required to participate in chat sessions and/or discussion boards, which will take the place of classroom meetings. Synchronous sessions will be recorded for students who are not able to attend the actual session. Students who are not able to attend the synchronous sessions will be asked to complete a short assignment related to the recorded session. Depending on their personal schedules, students may elect to take courses every term or wait for the next term to continue studies. Courses in the summer are also 8 weeks in length. If a student decides to take two courses during the summer session, they will overlap in the time frame.

## Mission

Graduate education in Artificial Intelligence will provide a forum for the study, investigation, discussion, and presentation of how artificial intelligence solutions may be used to improve an individual's productivity and to enhance departmental and corporate systems with a focus on ethical and societal issues. In order to prepare computing professionals who will be able to keep pace with the dynamic nature of the discipline and contribute to its growth, this program will emphasize individual and group effort, as well as lecture and hands-on training. The approach will be consistent with the philosophy of graduate education at La Salle.

## Program Specific Information

### Progression through the Program

Ten courses (30 credits) are required for the degree. Each student is required to satisfy all ten required courses (which includes the capstone).

The design of this program assumes that the student has either a background in computer science or a related discipline or professional training involving programming.

### 4+1 Graduate Program Option

During their senior year, students with a GPA of at least 3.0 may apply for the 4+1 BS/BA Computer Science to MS Artificial Intelligence option. Students apply to graduate programs during their junior or senior year.

The student is expected to have an overall GPA of 3.0. If they are candidates for acceptance into the graduate program, they are able to take two graduate level courses (6 credits—2 courses) which will be counted towards their undergraduate 120 credit requirement. If the grades in the graduate courses are B or better, they will also be counted towards the graduate programs. Students will receive their bachelor's degree and once it is completed, the student will be enrolled in the master's program. Students will be required to complete the remaining 24 credits (8 courses) to earn the graduate degree. Students are required to complete a total of 8 additional classes (24 credits) for the M.S. in Computer Information Science. This degree can be completed in as few as four semesters after graduation (approximately 15 months)

## Degree or Certificate Earned

- Master's of Science (M.S.)

## Required for Program Completion

- Courses
  - 10
- Credits
  - 30
- GPA
  - 3.0

## Program Goals

### Student Learning Outcomes

- Illustrate the tool architectures
- Determine tool application for problem type
- Demonstrate appropriate tool use
- Compare and Analyze tool results
- Integrate tools into existing workflow
- Categorize AI tool usage and applications based on compliance and ethical frameworks.

## Academic Requirements

Students are required to complete 10 courses (30 credits) for this program. The final course is a capstone.

| Code    | Title                                       | Credits |
|---------|---------------------------------------------|---------|
| CIS 654 | Artificial Intelligence                     | 3       |
| AI 620  | AI Framework and Compliance                 | 3       |
| AI 656  | Deep Learning and Neural Networks           | 3       |
| AI 657  | Generative AI and Large Learning Models     | 3       |
| CIS 658 | Data Mining                                 | 3       |
| BSA 730 | Optimization and Simulation                 | 3       |
| BSA 735 | Machine Learning with Business Applications | 3       |
| BSA 740 | Data Visualization                          | 3       |
| COM 604 | Strategic Communication Research            | 3       |
| AI 880  | AI Capstone                                 | 3       |

| Course                | Title                       | Credits  |
|-----------------------|-----------------------------|----------|
| <b>First Year</b>     |                             |          |
| <b>First Semester</b> |                             |          |
| AI 620                | AI Framework and Compliance | 3        |
| CIS 658               | Data Mining                 | 3        |
| <b>Credits</b>        |                             | <b>6</b> |

|                        |                                             |           |
|------------------------|---------------------------------------------|-----------|
| <b>Second Semester</b> |                                             |           |
| CIS 654                | Artificial Intelligence                     | 3         |
| COM 604                | Strategic Communication Research            | 3         |
| <b>Credits</b>         |                                             | <b>6</b>  |
| <b>Third Semester</b>  |                                             |           |
| BSA 730                | Optimization and Simulation                 | 3         |
| AI 656                 | Deep Learning and Neural Networks           | 3         |
| <b>Credits</b>         |                                             | <b>6</b>  |
| <b>Second Year</b>     |                                             |           |
| <b>First Semester</b>  |                                             |           |
| AI 657                 | Generative AI and Large Learning Models     | 3         |
| BSA 735                | Machine Learning with Business Applications | 3         |
| <b>Credits</b>         |                                             | <b>6</b>  |
| <b>Second Semester</b> |                                             |           |
| BSA 740                | Data Visualization                          | 3         |
| AI 880                 | AI Capstone                                 | 3         |
| <b>Credits</b>         |                                             | <b>6</b>  |
| <b>Total Credits</b>   |                                             | <b>30</b> |

Course Sequence

Course Descriptions

CIS 654 Artificial Intelligence  
This course introduces students to the field of artificial intelligence (AI). Students will learn how big data and data mining techniques are utilized by machines to create the AI models used by autonomous aircraft and automobiles, personal assistants, IT security software, fraud investigations and credit bureaus. The course will review the history, present day use, and future of artificial intelligence. Through case studies and current events, students will examine the benefits and risks associated with AI. The course will cover issues related to AI and privacy, ethics, and machine bias. Neuromorphic computing, the Open Neural Network Exchange (ONNX), and data analytics will also be discussed.

AI 620 AI Framework and Compliance  
This course examines the intersection of regulatory compliance, providing students with an understanding of how to implement AI technologies responsibly within the bounds of laws and ethical standards. Participants will explore both the technical aspects of AI frameworks and the regulatory landscape affecting their deployment in various industries. Prerequisites: None

AI 656 Deep Learning and Neural Networks  
This course provides an in-depth exploration of deep learning, a subset of machine learning that focuses on neural networks with many layers (deep architectures). Students will learn the theory, methodologies, and practical implementations of deep learning model. Prerequisites: CIS 654

AI 657 Generative AI and Large Learning Models  
This course offers a comprehensive study of neural networks and large-scale learning models, emphasizing their architecture, training methodologies, and practical applications. Participants will explore advanced neural network designs, including their scalability and efficiency in processing large datasets. Prerequisites: CIS 654

CIS 658 Data Mining  
This course introduces the field of data mining, with specific emphasis on its use for Machine Learning algorithms. Techniques covered may include conceptual clustering, learning decision rules and decision trees, case-based reasoning, Bayesian analysis, genetic algorithms, and neural networks. The course covers data preparation and analysis of results. Skills in Microsoft Excel are useful. Prerequisite(s): CIS 523

BSA 730 Optimization and Simulation  
This course introduces students to decision making and problem solving with simulation and optimization tools and techniques. Students learn to formulate and construct a decision model with spreadsheets and use the optimization tools, Monte Carlo simulation, and sensitivity analysis to generate and interpret solutions. The course covers different types of optimization and simulation models, including linear programming, sensitivity analysis, integer linear programming, goal programming, multiple objective optimization, simulation modeling, and queuing theory. Prerequisite(s): MBA 693

BSA 735 Machine Learning with Business Applications  
This course covers the fundamentals of machine learning used to solve business problems and improve business decisions through supervised (predictive) and unsupervised (descriptive) methods and applications. The course starts with supervised learning methods, including Linear Regression and Logistic Regression, Decision Trees, Random Forest, Support Vector Machines (SVM), Gradient Boosting Algorithms, and K-Nearest Neighbors (KNN). The course will then focus on unsupervised methods, including K-Means Clustering, Hierarchical Clustering, and dimensionality reduction Prerequisite(s): MBA 693

BSA 740 Data Visualization  
One of the skills that characterize great business data analysts is the ability to communicate practical implications of quantitative analyses to any kind of audience member. In this course, students will learn how to visualize data, tell a story, and explore data by reviewing the core principles of data visualizing and dashboarding. The course aims to focus on effective and high impact visualizations of common data analyses to help them convey conclusions directly and clearly. Students will be able to get practiced in designing and persuasively presenting business "data stories" that use these visualizations, helping stakeholders make decisions and take action based on their business data capitalizing on design principles. Prerequisite(s): MBA 693

COM 604 Strategic Communication Research  
This course focuses on the essential knowledge and skills needed to engage in data-based strategic decision making in communication professions. The course focuses on the role of research in setting and achieving goals, understanding research concepts, as well as the skills needed to conduct surveys, interviews, and focus groups. The course addresses how to translate and report research.

AI 880 AI Capstone  
A capstone is a project in which students may culminate their learning by completing a research project under the supervision of a faculty adviser. In most cases, students work on a capstone either individually and students may partner with an external company, or work on a project associated with their employer as result that is provided to the company. For projects that work with an external organization, the student needs to review the Disclaimer requirements and receive permission from the external partner. A grade of "B" is required to complete the graduate degree. Prerequisites: COM 604, AI 620

Program Contact Information

Program Director: Yang Wang, Ph.D  
Associate Professors: Blum, Highley  
Assistant Professors: Waldron, Yin  
Lecturers: Guzman, McCoe, McGinley, Monaghan, Waldron

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