



MICHAEL
UNIVERSITY



Artificial Intelligence, Ph.D.

Introduction to Artificial Intelligence

Artificial Intelligence (AI) stands at the forefront of technological innovation, representing the pursuit of creating machines that can mimic human intelligence. This interdisciplinary field combines computer science, mathematics, engineering, and cognitive science to develop systems capable of performing tasks that typically require human intelligence. From enhancing productivity in various industries to revolutionizing how we interact with technology, AI has become an integral part of our modern world.

The roots of AI can be traced back to the mid-20th century when a group of visionary pioneers laid the foundation for this groundbreaking field. Among the notable founders of AI, some luminaries have left an indelible mark on its history:

1. Alan Turing (1912–1954): Often hailed as the father of computer science, Alan Turing's contributions to AI are monumental. His conceptualization of the Turing Machine and the idea of a universal machine laid the groundwork for computational theory, influencing the development of early AI models. Turing's seminal work, "Computing Machinery and Intelligence," introduced the famous Turing Test as a measure of a machine's ability to exhibit intelligent behavior indistinguishable from that of a human.

2. John McCarthy (1927–2011): John McCarthy coined the term "Artificial Intelligence" in 1956 and organized the Dartmouth Conference, which is considered the birthplace of AI as a field of study. McCarthy's pioneering efforts include the development of the Lisp programming language, a significant tool in AI research. His work laid the foundation for AI as a distinct discipline, fostering the growth of symbolic reasoning and problem-solving approaches.

3. Marvin Minsky (1927–2016) and Herbert A. Simon (1916–2001): Minsky and Simon made groundbreaking contributions to AI, particularly in the areas of cognitive science and problem-solving. Minsky co-founded the MIT Artificial Intelligence Project, and his book "Perceptrons," co-authored with Seymour Papert, played a crucial role in shaping the early discourse on neural networks. Simon, awarded the Nobel Prize in Economics, developed the concept of "bounded rationality" and introduced the idea of decision-making processes within AI.

4. Norbert Wiener (1894–1964): A mathematician and philosopher, Norbert Wiener's work in cybernetics, the study of communication and control in living organisms and machines, laid the groundwork for understanding the interplay between machines and human intelligence. His interdisciplinary approach influenced the development of AI by emphasizing the feedback and control mechanisms essential for intelligent systems.

These visionary figures paved the way for the dynamic and ever-evolving field of AI, shaping its trajectory from theoretical concepts to practical applications that continue to redefine the possibilities of human-machine collaboration. As we delve into the course on AI, we embark on a journey that explores the rich history, diverse methodologies, and transformative potential of this revolutionary field.

Welcome to the forefront of intellectual exploration and technological advancement. The Ph.D. Program in Artificial Intelligence is an immersive journey into the heart of cutting-edge research and innovation, building upon the legacy of visionaries who laid the foundation for this dynamic field.

As we embark on this intellectual odyssey, we recognize the indelible contributions of pioneers like Alan Turing, John McCarthy, Marvin Minsky, Herbert A. Simon, and Norbert Wiener, who ignited the spark of curiosity and set the stage for the evolution of Artificial Intelligence. This program represents an opportunity to delve into the depths of AI, engaging with the latest theories, methodologies, and applications that continue to shape the technological landscape.

Our distinguished faculty, comprised of leading researchers and experts in the field, will guide you through an interdisciplinary exploration of computer science, mathematics, engineering, and cognitive science. This program is designed for those who seek to push the boundaries of AI, to contribute novel insights, and to advance the frontiers of human-machine collaboration.

As a Ph.D. candidate, you will have the chance to immerse yourself in groundbreaking research projects, collaborating with peers and mentors to address complex challenges in AI. From developing innovative algorithms to exploring ethical considerations and societal impacts, your research will contribute to the ongoing narrative of AI evolution.

Join us in this transformative journey where intellectual curiosity meets real-world impact. The Ph.D. Program in Artificial Intelligence is not just an educational pursuit; it is a gateway to becoming a trailblazer, a thought leader, and a contributor to the ever-expanding realm of possibilities that AI unfolds. Together, let us shape the future of intelligence.

FEES & CHARGES: BAHAMIAN DOLLARS

Doctor of Philosophy Degree – Total Tuition Fees (3 years): \$177,000.00

Tuition per year: \$59,000.00

PhD in Artificial Intelligence Program runs for four (3) years unless student is exempted due to previous knowledge. Official transcripts are required.

Tuition can be paid annually or per semester. Each semester is 12 weeks).

Students who are accepted into Michael University may arrange for financing from various lending institutions.

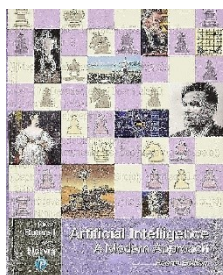
Ph.D. Program in Artificial Intelligence Curriculum

Year 1: Foundational Concepts and Theoretical Frameworks

1. AI 701: Introduction to Artificial Intelligence (3 credits)

- **Course Description:** An overview of the historical development and key concepts in AI. Covers foundational theories, approaches, and the ethical considerations in AI.
- **Course Objectives:**
 - Understand the historical evolution of AI and its interdisciplinary nature.
 - Analyze key AI concepts and methodologies.
 - Evaluate ethical implications in AI applications.

Recommended Book: "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig



Publisher : Pearson; 4th edition (April 28, 2020)

Language : English

Hardcover : 1136 pages

ISBN-10 : 0134610997

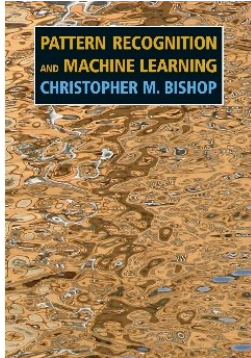
ISBN-13 : 978-0134610993

2. AI 702: Machine Learning and Pattern Recognition (3 credits)

- **Course Description:** In-depth exploration of machine learning algorithms, statistical modeling, and pattern recognition. Emphasis on supervised and unsupervised learning techniques.
- **Course Objectives:**
 - Master fundamental machine learning algorithms.

- Apply statistical models to real-world data.
- Develop expertise in pattern recognition techniques.

Recommended Book: "Pattern Recognition and Machine Learning" by Christopher M. Bishop



ASIN : 1493938436

Publisher : Springer; Softcover reprint of the original 1st ed. 2006 edition (August 23, 2016)

Language : English

Paperback : 798 pages

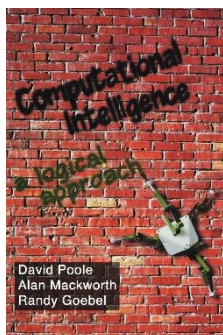
ISBN-10 : 0241973376

ISBN-13 : 978-1493938438

3. AI 703: Computational Intelligence (3 credits)

- **Course Description:** Examination of evolutionary algorithms, neural networks, and fuzzy logic. Practical applications in optimization, learning, and adaptive systems.
- **Course Objectives:**
 - Understand the principles of computational intelligence.
 - Implement and analyze evolutionary algorithms.
 - Apply neural networks and fuzzy logic to solve real-world problems.

Recommended Book: "Computational Intelligence: A Logical Approach" by David Poole and Alan Mackworth



ASIN : 0195102703

Publisher : Oxford University Press; 1st edition (January 8, 1998)

Language : English

Hardcover : 576 pages

ISBN-10 : 9780195102703

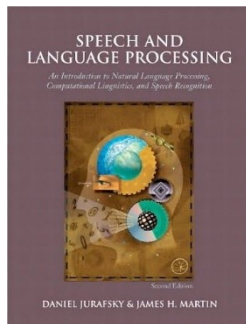
ISBN-13 : 978-0195102703

Year 2: Advanced Topics and Specialized Applications

4. AI 801: Natural Language Processing and Understanding (3 credits)

- **Course Description:** Focus on processing and understanding human language using computational methods. Covers sentiment analysis, language generation, and machine translation.
- **Course Objectives:**
 - Explore techniques for natural language processing.
 - Develop skills in sentiment analysis and language generation.
 - Understand challenges in machine translation.

Recommended Book: "Speech and Language Processing" by Dan Jurafsky and James H. Martin



ASIN : 0131873210

Publisher : Prentice Hall; 2nd edition (May 16, 2008)

Language : English

Hardcover : 1024 pages

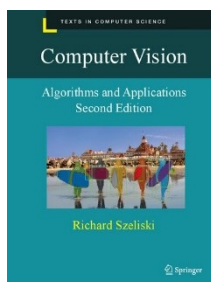
ISBN-10 : 9780131873216

ISBN-13 : 978-0131873216

5. AI 802: Computer Vision and Image Recognition (3 credits)

- **Course Description:** Exploration of algorithms for visual perception, image understanding, and object recognition. Practical applications in image and video analysis.
- **Course Objectives:**
 - Gain proficiency in computer vision algorithms.
 - Apply image recognition techniques to real-world scenarios.
 - Understand challenges in visual perception.

Recommended Book: "Computer Vision: Algorithms and Applications" by Richard Szeliski



Publisher : Springer; 2nd ed. 2022 edition (January 5, 2022)

Language : English

Hardcover : 947 pages

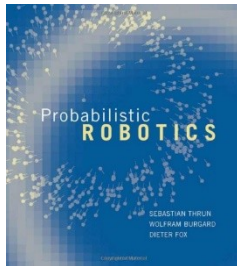
ISBN-10 : 3030343715

ISBN-13 : 978-3030343712

6. AI 803: Robotics and Autonomous Systems (3 credits)

- **Course Description:** Study of AI applications in robotics, including perception, motion planning, and control. Examination of autonomous systems and their integration with AI.
- **Course Objectives:**
 - Analyze AI applications in robotics.
 - Develop skills in perception and motion planning.
 - Understand principles of autonomous systems.

Recommended Book: "Probabilistic Robotics" by Sebastian Thrun, Wolfram Burgard, and Dieter Fox



Publisher : The MIT Press; 1st edition (August 19, 2005)

Language : English

Hardcover : 672 pages

ISBN-10 : 0262201623

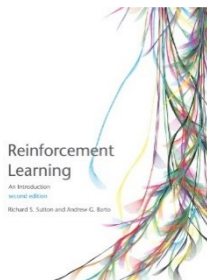
ISBN-13 : 978-0262201629

Year 3: Specialization and Research Modules

7. AI 901: Advanced Topics in Reinforcement Learning (3 credits)

- **Course Description:** In-depth exploration of reinforcement learning algorithms and their applications in decision-making and control.
- **Course Objectives:**
 - Master advanced reinforcement learning techniques.
 - Apply reinforcement learning to complex decision-making scenarios.
 - Investigate challenges and recent advancements in reinforcement learning.

Recommended Book: "Reinforcement Learning: An Introduction" by Richard S. Sutton and Andrew G. Barto



Publisher : Bradford Books; 2nd edition (November 13, 2018)

Language : English

Hardcover : 552 pages

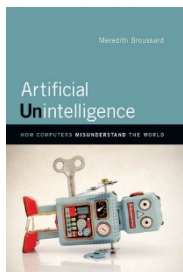
ISBN-10 : 0262039249

ISBN-13 : 978-0262039246

8. AI 902: Ethics and Responsible AI (3 credits)

- **Course Description:** Examination of ethical considerations in AI, including bias, fairness, accountability, and transparency. Strategies for developing responsible AI systems.
- **Course Objectives:**
 - Explore ethical challenges in AI applications.
 - Develop strategies for responsible AI development.
 - Understand the societal impact of AI technologies.

Recommended Book: "Artificial Unintelligence: How Computers Misunderstand the World" by Meredith Broussard



Publisher : Mit Pr (January 1, 2018)

Language : English

Hardcover : 237 pages

ISBN-10 : 0262038005

ISBN-13 : 978-0262038003

Research Module

9. AI 950: Research Seminar in Artificial Intelligence (6 credits)

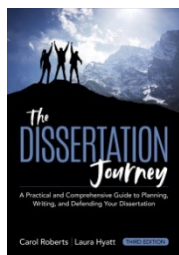
- **Course Description:** Engage in original research under the guidance of faculty mentors. Present and defend research findings in a seminar setting.
- **Course Objectives:**
 - Conduct original research in a specialized area of AI.
 - Present research findings effectively.
 - Receive and provide constructive feedback in a seminar setting.

Dissertation Proposal and Research

10. AI 999: Dissertation Proposal and Research (12 credits)

- **Course Description:** Develop and execute an original research project in a specialized area of AI. Regular meetings with the dissertation committee to review progress.
- **Course Objectives:**
 - Define and refine a research problem.
 - Conduct comprehensive literature reviews.
 - Demonstrate proficiency in research methodology and analysis.

Required Book: "The Dissertation Journey: A Practical and Comprehensive Guide to Planning, Writing, and Defending Your Dissertation (Updated)"



Publisher : Corwin; Third Edition (Revised Edition) (September 17, 2018)

Language : English

Paperback : 240 pages

ISBN-10 : 1506373313

ISBN-13 : 978-1506373317

Recommended Electives:

AI 910: Explainable AI and Interpretability (3 credits)

Course Description: This elective delves into the critical area of Explainable AI (XAI) and the interpretability of machine learning models. Students explore techniques for making AI systems more transparent, understandable, and accountable. Topics include model-agnostic interpretability methods, visualization techniques, and the ethical implications of building interpretable AI models.

Course Objectives:

1. Understand the importance of explainability in AI.
2. Explore and apply model-agnostic interpretability methods.
3. Analyze ethical considerations in building interpretable AI models.

Recommended Books:

1. "Interpretable Machine Learning: A Guide for Making Black Box Models Explainable" by Christoph Molnar

AI 920: Quantum Computing and AI (3 credits)

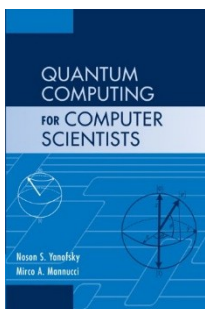
Course Description: This elective introduces the intersection of Quantum Computing and Artificial Intelligence. Students explore the principles of quantum mechanics, quantum algorithms, and their applications in machine learning. The course covers quantum machine learning models, quantum neural networks, and potential advancements in AI leveraging quantum computing.

Course Objectives:

1. Understand the principles of quantum computing.
2. Explore quantum algorithms and their applications in AI.
3. Investigate potential advancements and challenges in quantum-based AI.

Recommended Books:

1. "Quantum Computing for Computer Scientists" by Noson S. Yanofsky and Mirco A. Mannucci



Publisher : Cambridge University Press; Illustrated edition (August 11, 2008)

Language : English

Hardcover : 402 pages

ISBN-10 : 0521879965

ISBN-13 : 978-0521879965

AI 930: AI in Healthcare (3 credits)

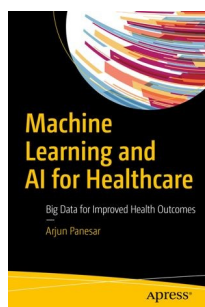
Course Description: This elective focuses on the application of AI techniques in healthcare. Students examine the role of AI in medical image analysis, predictive modeling for disease diagnosis, personalized treatment plans, and healthcare system optimization. Ethical considerations and privacy concerns in implementing AI in healthcare are also explored.

Course Objectives:

1. Explore AI applications in medical image analysis and diagnosis.
2. Develop predictive models for healthcare applications.
3. Understand ethical considerations and privacy concerns in AI healthcare applications.

Recommended Books:

1. Machine Learning and AI for Healthcare



Publisher : Apress; 2nd ed. edition (December 16, 2020)

Language : English

Paperback : 440 pages

ISBN-10 : 148426536X

ISBN-13 : 978-1484265369

AI 940: AI for Cybersecurity (3 credits)

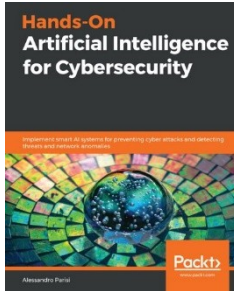
Course Description: This elective explores the intersection of AI and cybersecurity, addressing the evolving landscape of cyber threats. Students delve into the use of AI for anomaly detection, threat intelligence, and automated response systems. The course also covers ethical considerations and challenges in applying AI to enhance cybersecurity.

Course Objectives:

1. Analyze the role of AI in addressing cybersecurity challenges.
2. Develop skills in anomaly detection and threat intelligence using AI.
3. Investigate ethical considerations in applying AI to cybersecurity.

Recommended Books:

1. "Hands-On Machine Learning for Cybersecurity: Safeguard your system by making your machines intelligent using the power of machine learning" by Alessandro Parisi



Publisher : Packt Publishing (August 2, 2019)

Language : English

Paperback : 342 pages

ISBN-10 : 1789804027

ISBN-13 : 978-1789804027