Applied Artificial Intelligence - CPS (AAI)

AAI 1990. Elective. (1-4 Hours)
Offers elective credit for courses taken at other academic institutions.

AAI 2990. Elective. (1-4 Hours)
Offers elective credit for courses taken at other academic institutions.

AAI 3990. Elective. (1-4 Hours)
Offers elective credit for courses taken at other academic institutions.

AAI 4990. Elective. (1-4 Hours)
Offers elective credit for courses taken at other academic institutions.

AAI 5015. Mathematical Concepts. (3 Hours)
Reviews the mathematical knowledge required to succeed in advanced artificial intelligence studies. Covers a wide range of mathematical concepts including introductory linear algebra, probability, statistics, and calculus. Beginning with basic linear algebra, introduces vectors, matrices, and linear transformations, which are crucial in understanding data representations and transformations in AI algorithms. Continues with probability and statistics, equipping students with the tools to analyze data, make predictions, and understand uncertainties in applied machine learning. Covers the essentials of calculus, which are fundamental to understanding optimization problems in AI algorithms.

AAI 5025. Python. (3 Hours)
Studies foundational programming and its significance in artificial intelligence applications, recognizing AI's growing influence in various fields. Emphasizes essential programming skills related to data structures and object-oriented programming, the skills crucial for efficiently implementing the applied machine-learning models. Offers students an opportunity to obtain the software skills necessary for conducting fundamental statistical analyses, predictive modeling, and data visualization.

AAI 5035. Research Methods and Scientific Writing. (3 Hours)
Examines the research methodologies and scientific writing techniques specific to the field of artificial intelligence. Offers students experience conducting, writing, and critically evaluating AI research, to discern groundbreaking studies from less impactful studies. Topics include a diverse array of research methodologies designed for AI and evaluation of the most appropriate methods aligned with student research questions. Reviews the processes of drafting research papers, including writing abstracts, literature reviews, methodologies, results, and discussions tailored to the AI community.

AAI 6600. Applied Artificial Intelligence. (3 Hours)
Introduces artificial intelligence, tracing its historical evolution and foundational principles. Delves into search algorithms for problem solving, knowledge representation, reasoning, planning, and decision making. Also covers probabilistic learning and the foundational aspects of machine learning. Emphasizes real-world applications to offer students an opportunity to obtain an in-depth understanding of AI's transformative potential, paving the way for more advanced studies in the field.

AAI 6610. Applied Machine Learning. (3 Hours)
Analyzes machine learning techniques, methodologies, and best practices tailored for advanced artificial intelligence applications. Covers advanced supervised and unsupervised learning, deep learning architectures, reinforcement learning, and domain-specific applications. Explores crucial topics of ethics, privacy, and fairness in machine learning.

AAI 6620. Applied Natural Language Processing. (3 Hours)
Provides hands-on instruction in natural language processing designed for applied AI. Offers students an opportunity to obtain real-world experience in crafting and refining NLP solutions in a project-based format and solving challenges that mirror industry and research scenarios. Emphasizes applied projects over pure theory.

Prerequisite(s): AAI 6610 with a minimum grade of C-

AAI 6630. Applied Computer Vision. (3 Hours)
Offers practical exposure to the field of computer vision. Explores deeply the essential techniques, tools, and uses of computer vision and applies them to real-world situations.

Prerequisite(s): AAI 6610 with a minimum grade of C-

AAI 6640. Applied Deep Learning. (3 Hours)
Offers an advanced exploration of the theoretical foundations, architectures, and techniques essential for the design and optimization of deep learning models. Broadly discusses convolutional and recurrent neural networks, attention mechanisms, generative models, and transformer networks. Offers hands-on experience in implementing, optimizing, and deploying deep learning solutions to real-world problems. Highlights current challenges and the latest trends in the field.

AAI 6650. Recommender System. (3 Hours)
Designed to provide a comprehensive understanding of recommender systems and hands-on experience in building personalized recommendation engines. Examines the fundamental concepts of recommendation algorithms, data preprocessing, model evaluation, and deployment strategies. Offers real-world projects, offering the opportunity to create effective and scalable recommendation systems catering to diverse application domains.

AAI 6655. Prompt Engineering. (3 Hours)
Provides instruction in essential knowledge and skills for prompt engineering in artificial intelligence and machine learning contexts. Studies effective communication with AI models, prompt design for diverse applications, and the evaluation and enhancement of AI outputs. Combines theory with practical exercises to enable application of prompt engineering techniques effectively in real-world situations.

Prerequisite(s): AAI 6600 with a minimum grade of C-

AAI 6660. Chatbot Architecture. (3 Hours)
Introduces the world of conversational artificial intelligence and chatbots. Blends theoretical concepts with practical hands-on projects to understand the foundations of chatbot development and deployment, examine tools and techniques, and implement chatbot solutions personalized for diverse industries.

Prerequisite(s): AAI 6600 with a minimum grade of C- ; AAI 6610 with a minimum grade of C-

AAI 6665. Generative Artificial Intelligence. (3 Hours)
Provides a fundamental introduction to generative artificial intelligence, integrating theoretical concepts with hands-on skills in this emerging field. Aims to empower students to grasp, value, and utilize the capabilities of generative AI in practical scenarios, with a strong focus on real-life applications. Highlights the versatility of generative AI in numerous areas.

Prerequisite(s): AAI 6600 with a minimum grade of C- ; AAI 6610 with a minimum grade of C- ; AAI 6620 with a minimum grade of C- ; AAI 6630 with a minimum grade of C- ; AAI 6640 with a minimum grade of C-

AAI 6670. Chatbot Application. (3 Hours)
Explores chatbots powered by artificial intelligence.Chatbots have become crucial in improving user interactions and streamlining operations in the fast-changing digital world. Begins with basic concepts and transitions to practical chatbot development, attempting real industry challenges.

Prerequisite(s): AAI 6600 with a minimum grade of C-

AAI 6680. AI for Cybersecurity. (3 Hours)
Offers a distinct viewpoint on utilizing advanced artificial intelligence methods in cybersecurity by promoting a deep understanding of AI in cybersecurity and encouraging research to improve security solutions in this critical field. Examines AI principles and approaches while directly tackling the persistent issues in the cybersecurity domain. Offers students an opportunity to obtain both theoretical knowledge and to develop practical expertise by implementing AI techniques in real-world cybersecurity scenarios. Explores research opportunities in cybersecurity to enhance security solutions and tackle emerging threats.

Prerequisite(s): AAI 6620 with a minimum grade of C- ; AAI 6630 with a minimum grade of C-

AAI 6690. Machine Learning for Cyberdetection. (3 Hours)
Applies machine learning techniques to solve complex cybersecurity problems. Explores threat detection, malware classification, and network security by leveraging the power of data-driven decisions.

Prerequisite(s): AAI 6680 with a minimum grade of C-

AAI 6710. Graph Signal Processing. (3 Hours)
Introduces the interdisciplinary field of graph signal processing and its pivotal role in 3D imaging. Begins with foundational concepts in graph theory and graph signals, progressing to their applications in 3D imaging. Explores specific fundamental machine learning applications of graph signal processing. Offers students an opportunity to acquire the skills to implement graph signal processing methods for various AI-driven applications.

Prerequisite(s): AAI 6600 with a minimum grade of C- ; AAI 6610 with a minimum grade of C-

AAI 6720. Graph Neural Networks. (3 Hours)
Explores graph neural networks, which have emerged as a powerful tool for machine learning on irregular structures, enabling novel applications across diverse fields within AI. Topics include essential neural network concepts, traditional neural networks' limitations when handling irregularly structured data, theoretical foundations, and practical applications of GNNs. Also covers advanced GNN architectures, generative models, dynamic graph networks, and transferability. Studies spectral-based and spatial-based GNN methods and evaluates models for various tasks through lectures, readings, assignments, and hands-on projects.

Prerequisite(s): AAI 6710 with a minimum grade of C-

AAI 6730. Deep Learning for 3D Point Cloud Analysis. (3 Hours)
Offers an in-depth exploration of graph neural networks for processing 3D point cloud data across various artificial intelligence fields. Beginning with the fundamentals of 3D point clouds and neural networks for 2D structures, transitions to the concepts of GNNs for 3D point cloud processing. Examines several basic and advanced GNN models. Provides instruction in common 3D point cloud processing tasks such as classification, segmentation, registration, and reconstruction. Covers implementing, optimizing, and evaluating GNN models for a variety of point cloud processing tasks.

Prerequisite(s): AAI 6710 with a minimum grade of C-

AAI 6740. Applied Reinforcement Learning. (3 Hours)
Introduces reinforcement learning, a subset of machine learning that focuses on training agents to make decisions with the aim of achieving specific objectives. Emphasizing practical experience, RL methods can be utilized to address real-world problems, including tasks related to design and optimization. At its core, RL revolves around agents interacting with their environments, learning from rewards and punishments, and continuously improving their decision-making skills. Emphasizes the adaptability of RL across various domains and how, with practical RL expertise and algorithms, RL can effectively address a wide array of industry challenges, ultimately enhancing its applicability and success in various professional settings.

AAI 6790. Applied Quantum AI. (3 Hours)
Introduces the integration of quantum computing and artificial intelligence. Explores the fundamentals of quantum algorithms and their applications to AI. Offers students an opportunity to obtain an understanding of the potential and challenges of quantum AI.

AAI 6850. Applied Blockchain AI. (3 Hours)
Explores extensively the integration of artificial intelligence and blockchain technologies. Offers students an opportunity to obtain a comprehensive understanding of blockchain fundamentals and the core principles of AI and to stay current with emerging trends in the ever-evolving field of blockchain AI. Underscores how these technologies complement each other, with blockchain enhancing security and trust while AI allows intelligent decision making. Examines crucial aspects such as security, privacy, and ethics using real-world case studies, ensuring a well-rounded AI approach.

AAI 6900. AI for Autonomous Systems. (3 Hours)
Explores the essentials of artificial intelligence and its practical applications in autonomous systems. Focuses on vital AI techniques such as machine learning, computer vision, and reinforcement learning. Offers students an opportunity to obtain expertise, to become independent decision makers, and to exercise innovation and control in such systems. Emphasizes hands-on learning involving real-world projects in perception, planning, control, and human-machine interactions while cultivating a deep understanding of AI technologies for autonomous systems. Projects in the course explore system efficiency and capabilities and study technology development across various industries.

AAI 6962. Elective. (1-4 Hours)
Offers elective credit for courses taken at other academic institutions.

AAI 6980. Integrated Experiential Capstone. (4 Hours)
Offers an immersive experience where students work in interdisciplinary teams, fostering collaboration, communication, and critical thinking while applying their artificial intelligence knowledge and skills to real-world problems. Examines thoroughly the methodologies associated with visualizing AI in practical situations. Investigates sophisticated visualization tools and techniques, while also researching the ethical considerations, interpretability, and real-world consequences of visually showcasing AI-based outcomes.

Prerequisite(s): AAI 6600 with a minimum grade of C- ; AAI 6610 with a minimum grade of C- ; AAI 6620 with a minimum grade of C- ; AAI 6630 with a minimum grade of C-

AAI 6983. Special Research Topics in AI. (1-4 Hours)
Covers special topics in artificial intelligence research. Topics vary by semester. May be repeated up to three times for a maximum of 15 semester hours.