

Course name	ECE59500 Efficient Artificial Intelligence
Credit hours	(3 cr.) Class 3
Course Coordinator	Qingxue Zhang
Textbook	<p>Recommended: Mariette Awad, <i>Efficient Learning Machines: Theories, Concepts, and Applications for Engineers and System Designers</i>. Springer Nature, 2015. ISBN 9781430259909, 9781430259893 (print). (Available from IU Library)</p> <p>Other references: Robert Schapire, <i>The design and analysis of efficient learning algorithms</i>. MIT press. (Available from IU Library)</p>
Course information	<p>Course Description: ECE59500 Efficient Artificial Intelligence P or C: Graduate standing or consent of instructor.</p> <p>This course covers efficient artificial intelligence techniques for power-efficient, time-efficient machine learning model implementation. Key technologies, such as efficient pattern extraction, efficient pattern determination, efficient AI model design, and model execution analysis and evaluation, as well as their applications, will be covered.</p> <p>Prerequisites/Co-requisite: ECE30200 Probabilistic Methods in Electrical & Computer Engineering ECE35900 or CSCI36200 Data Structures</p>
Goals of the course	<p>Upon successful completion of the course, students should be able to:</p> <ol style="list-style-type: none"> 1. Analyze major efficient pattern extraction methods. [1, 2, 6] 2. Evaluate the performance of major efficient pattern determination approaches. [1, 2, 6] 3. Design and simulate efficient AI models with model complexity and efficiency in mind. [1, 2, 5, 6] 4. Design and simulate AI models to optimize both time and power efficiency. [1, 2, 5, 6] 5. Apply data efficient AI methods to a selected application through a course project. [1, 2, 5, 6]
List of topics to be covered	<ol style="list-style-type: none"> 1. Introduction of efficient AI (1 week) <ul style="list-style-type: none"> Computation efficiency Power efficiency Engineering design for efficiency 2. Efficient pattern extraction (2 weeks) <ul style="list-style-type: none"> Data types Patterns in the data Define Pattern efficiency Engineering pattern efficiency 3. Efficient pattern determination (3 weeks) <ul style="list-style-type: none"> Pattern evaluation Pattern ranking Pattern determination for efficiency optimization 4. Efficient AI model design (4 weeks) <ul style="list-style-type: none"> Model complexity Model efficiency Model optimization for efficiency optimization Model training and testing 5. Model execution (2 weeks) <ul style="list-style-type: none"> Time efficiency Power efficiency 6. Project method (1 week) 7. Exams and demo demonstration (1.5 week)

<p>Evaluation methods</p>	<p>Distribution:</p> <p>Worksheet 20%</p> <p>Midterm Exam 15%</p> <p>Mini-projects and Presentation 30%</p> <p>Final Exam 15%</p> <p>Final Project and Presentation 20%</p> <table border="0"> <thead> <tr> <th>Letter grade</th> <th>Percentage</th> <th></th> </tr> </thead> <tbody> <tr> <td>A = 4.0</td> <td>95-100</td> <td>98% work completed</td> </tr> <tr> <td>A- = 3.7</td> <td>90-94</td> <td>90% work completed</td> </tr> <tr> <td>B+ = 3.3</td> <td>86-89</td> <td>85% work completed</td> </tr> <tr> <td>B = 3.0</td> <td>84-85</td> <td>83% work completed</td> </tr> <tr> <td>B- = 2.7</td> <td>80-83</td> <td>80% work completed</td> </tr> <tr> <td>C+ = 2.3</td> <td>76-79</td> <td>75% work completed</td> </tr> <tr> <td>C = 2.0</td> <td>74-75</td> <td>73% work completed</td> </tr> <tr> <td>C- = 1.7</td> <td>70-73</td> <td>70% work completed</td> </tr> <tr> <td>F:</td> <td><70</td> <td>Unacceptable work</td> </tr> </tbody> </table> <p>Grades above C- will be considered a passing grade.</p>	Letter grade	Percentage		A = 4.0	95-100	98% work completed	A- = 3.7	90-94	90% work completed	B+ = 3.3	86-89	85% work completed	B = 3.0	84-85	83% work completed	B- = 2.7	80-83	80% work completed	C+ = 2.3	76-79	75% work completed	C = 2.0	74-75	73% work completed	C- = 1.7	70-73	70% work completed	F:	<70	Unacceptable work
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<p>Policy Academic Integrity Statement</p>	<p>This course will follow the rules of Academic Misconduct in: Academic Handbook and Code of Student Rights, Responsibilities Conduct. The student code of conduct website can be accessed at: <u>Academic Handbook and Code of Student Rights, Responsibilities, and Conduct</u> http://www.iu.edu/~code/</p> <p>ADA (American with Disabilities Act) compliance: If you need any special accommodations or assistance due to a disability, contact Adaptive Educational Services (AES) at (317)-274-3241. The office is located in Joseph T. Taylor Hall (UC), Room 100. AES website: http://aes.iupui.edu/services.html. No qualified individual with a disability shall, by reason of such disability, be either excluded from participation in or be denied the benefits of the services, programs, or activities IUPUI Policy on Disability Accommodations</p> <p>Students needing accommodations because of disability will need to register with Adaptive Educational Services and complete the appropriate forms issued by AES before accommodations will be given. The AES office is located in Taylor Hall, UC 100. You can also reach the office by calling 274-3241.</p> <p>IUPUI Policy on Religious Holidays</p> <p>IUPUI respects the right of all students to observe their religious holidays and will make reasonable accommodation, upon request, for such observances. Students seeking accommodation for religious observances must submit a request in writing to the course instructor by the end of the second week of the semester and should use the Request for Course Accommodation Due to Religious Observance Form. More information on the IUPUI Policy on Religious Holidays is available here: http://registrar.iupui.edu/religious.html.</p> <p>IUPUI Policy on Sexual Misconduct</p> <p>As your instructor, one of my responsibilities is to help create a safe learning environment on our campus. Title IX and our own Sexual Misconduct policy prohibit sexual misconduct. If you have experienced sexual misconduct, or know someone who has, the University can help.</p> <p>If you are seeking help and would like to speak to someone confidentially, please visit http://stopsexualviolence.iu.edu/help/index.html (Links to an external site.) for contact information.</p> <p>It is also important that you know that federal regulations and University policy require me to promptly convey any information about potential sexual misconduct known to me to our campus' Deputy Title IX Coordinator or IU's Title IX Coordinator. In that event, they will work with a small number of others on campus to ensure that appropriate measures are taken and resources are made available to the student who may have been harmed.</p> <p>Protecting a student's privacy is of utmost concern, and all involved will only share information with those that need to know to ensure the University can respond and assist.</p> <p>I encourage you to visit stopsexualviolence.iu.edu (Links to an external site.) to learn more about available resources on campus and in the community.</p> <p>Education and Title VI</p> <p>Title VI of the Civil Rights Act of 1964 protects people from discrimination based on race, color or national origin in programs or activities that receive Federal financial assistance.</p> <p>Programs and activities that receive ED funds must operate in a non-discriminatory manner. These may include, but are not limited to: admissions, recruitment, financial aid, academic programs, student treatment and services, counseling and guidance, discipline, classroom assignment, grading, vocational education, recreation, physical education, athletics, housing and employment, if it affects those who are intended to benefit from the Federal funds.</p> <p>http://www2.ed.gov/about/offices/list/ocr/docs/hq43e4.html"</p>																														
<p>Syllabi prepared by</p>	<p>Qingxue Zhang</p>																														
<p>Date</p>	<p>August, 22nd, 2022</p>																														

RUBRIC - Mini-projects and Presentation, Final Project and Presentation

	Unsatisfactory	Satisfactory	Good	Excellent
Final Written Report (75%)	<ul style="list-style-type: none"> Completed less than 70% of the requirements. Not delivered on time or not in correct format (online via canvas.) 	<ul style="list-style-type: none"> Completed between 70-80% of the requirements. Delivered on time, and in correct format (online via canvas.) 	<ul style="list-style-type: none"> Completed between 80-90% of the requirements. Delivered on time, and in correct format (online via canvas.) 	<ul style="list-style-type: none"> Completed between 90-100% of the requirements. Delivered on time, and in correct format (online via canvas.)
One-one examination (10%)	<ul style="list-style-type: none"> Does not execute due to errors. 	<ul style="list-style-type: none"> Executes without errors. User prompts contain little information, poor design. Some testing has been completed. 	<ul style="list-style-type: none"> Executes without errors. Thorough testing has been completed 	<ul style="list-style-type: none"> Executes without errors. Thorough and organized validation test has been completed.
Student Evaluation and discussion (5%)	<ul style="list-style-type: none"> A difficult and inefficient summary of results and discussions. 	<ul style="list-style-type: none"> A logical summary of results and discussion that is easy to follow but it is not the most efficient. 	<ul style="list-style-type: none"> Summary of results and discussion is efficient and easy to follow. 	<ul style="list-style-type: none"> Summary of results and discussion is efficient, easy to understand.
Instructor Evaluation Presentation (10%)	<ul style="list-style-type: none"> Not show up for in-class presentation No presentation files are submitted. 	<ul style="list-style-type: none"> Somewhat knowledgeable of content Information included in the presentation was poorly researched with many inaccuracies 	<ul style="list-style-type: none"> Knowledgeable of content, but not easy to follow Information included in the presentation was well researched with some inaccuracies 	<ul style="list-style-type: none"> Knowledgeable of content, clearly and easy to follow Information included in the presentation was very well researched and accurate