|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| primaryBlackWhite | | | | **ICPE 639** SYLLABUS | | | | |
|  | | | | | | | | |
|  | | | | | | | | |
| *Course title and number* | | | **ICPE 639 – Introduction to Machine Learning for Energy** | | | | | |
| *Section*  *Term* | | | 600 and 700  Fall 2021 | | | | | |
| *Meeting times and location* | | | 09-22-2021 to 10-02-2021  Lecture dates and times (09-22, 09-23, 09-24, 09-27, 09-28; 12:30—05:00 PM CST) | | | | | |
| *Credit Hours* | | | 1.5 CH | | | | | |
|  | | | | | | | | |
| **Course Description and Prerequisites** | | | | | | | | |
|  | | | | | | | | |
| This is an introductory course discussing machine learning fundamentals and methods commonly seen in data science with potential applications in energy and power systems. Machine learning methods to be discussed include basic supervised and unsupervised learning methods, performance evaluation, neural networks and other advanced predictive models, as well as an introduction to reinforcement learning. | | | | | | | | |
| *Prerequisite*: Graduate Classification | | | | | | | | |
| |  | | --- | | **Course Delivery** | |  | | The course is offered online in either a fully synchronous or partially asynchronous manner, based on the student’s preference. Students have 20 days to complete the course, including viewing live video (through Zoom) or recorded lectures (through Mediasite), case preparations, presentations, and assessments. Students will complete the same case preparations, presentations, and assessments, and a minimum of 45 hours of out-of-class student work is assigned and expected for each student. Discussion platforms will be utilized to increase interactions within and between the in-person and distance student cohorts. | | | | | | | | | |
| **Instructor Information** | | | | | | | **Textbook and/or Resource Material** | |
|  | | | | | | | | |
| *Name* | | Xiaoning Qian, Ph.D. | | | *Textbook*: No textbook.  All course materials and assignments, including the final exam, will be provided on CANVAS in the Content folder. | | | | |
| *Telephone number* | | 979-845-6268 | | |
| *Email address* | | xqian@ece.tamu.edu | | |
| *Office hours* | | By appointment | | |
| *Office location* | | WEB 205J | | |
|  | | | | | | | | |
| **Learning Outcomes** | | | | | | | | |
|  | | | | | | | | |
| By the end of the course students should be able to:   * Develop basic understanding of concepts of machine learning. * Apply basic regression and classification methods and evaluate their performance, with potential energy applications. * Apply feature engineering and clustering methods and evaluate their performance, with potential energy applications. * Apply prediction methods, including neural networks, with potential energy applications. * Develop understanding of dynamic models and reinforcement learning. | | | | | | | | |
|  | | | | | | | | |
| **Grading Policies** | | | | | | | | |
|  | | | | | | | | |
| **Graded Assignment Weights**  Quizzes based on homework assignments 40%  Final project 60%  Total 100% | | | | | | **Grading Scale**  Out of 100 total assignable points  A = 90-100 points  B = 80-89 points  C = 70-79 points  D = 60-69 points  F = <60 points | | |
| **Homework Assignments and Quizzes**  You will be given homework assignments you will need to complete prior to class. No submission is required; however, you will take an in-class CANVAS quiz based on each homework assignment. The purpose of the assignment is to prepare you for the quiz. The effort you put in to the preparation before class will directly impact your learning experience in class.  **Final Project**  The *Final Project* will be due by the last day of the course duration (Day 10) with potential extensions if approved by the instructor. Students shall propose the project topics after the first class and are welcome to discuss the projects with the instructor during the course. Grading polices conform to Student Rule 10, found at <http://student-rules.tamu.edu/rule10>  **Late Work Policy:**  A late work penalty of 10 points per day will be issued to all deliverables with a specific submission deadline. | | | | | | | | |
|  | | | | | | | | |
| **Course Schedule** | | | | | | | | |
| There will be five major sessions to be discussed during the 5 teaching days of the course. Additional readings will be provided. | | | | | | | | |
| **Session** | **Topic** | | | | | | | **Deliverables before each session** |
| 1 | Introduction to machine learning | | | | | | | None |
| 2 | Supervised learning methods and their evaluation | | | | | | | Homework #1 |
| 3 | Unsupervised learning methods and their evaluation | | | | | | |  |
| 4 | Prediction methods for energy and their evaluation | | | | | | | Homework #2 |
| 5 | Introduction to dynamic models and reinforcement learning | | | | | | |  |
|  | | | | | | | | |

|  |
| --- |
|  |

|  |
| --- |
| **Changes to the Syllabus** |
|  |
| This syllabus was created based on a planned schedule. The instructor reserves the right to change the syllabus when it will benefit students’ learning, or in situations beyond the control of the instructor (weather/school closures). |
| **UNIVERSITY POLICIES** |
|  |
| **Attendance Policy** |
|  |
| The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments. Please refer to [Student Rule 7](https://student-rules.tamu.edu/rule07/) in its entirety for information about excused absences, including definitions, and related documentation and timelines. |
|  |
| **Makeup Work Policy** |
|  |
| Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student’s grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor. Please refer to [Student Rule 7](https://student-rules.tamu.edu/rule07/) in its entirety for information about makeup work, including definitions, and related documentation and timelines.  Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor” ([Student Rule 7, Section 7.4.1](https://student-rules.tamu.edu/rule07)). “The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence” ([Student Rule 7, Section 7.4.2](https://student-rules.tamu.edu/rule07)). Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See [Student Rule 24](https://student-rules.tamu.edu/rule24/).) |
|  |
| **Americans with Disabilities Act (ADA) Policy** |
|  |
| Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit <http://disability.tamu.edu>. Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible. |
|  |
| **Title IX and Statement on Limits to Confidentiality** |
|  |
| Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.  With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](https://rules-saps.tamu.edu/PDFs/08.01.01.M1.pdf)):   * The incident is reasonably believed to be discrimination or harassment. * The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.   Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, you will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University’s goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.  Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services](https://caps.tamu.edu/) (CAPS).  Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University’s [Title IX webpage](https://titleix.tamu.edu/). |
| **Statement of Mental Health and Wellness** |

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student’s academic success and overall wellbeing. Students are encouraged to engage in proper self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at [suicidepreventionlifeline.org](https://suicidepreventionlifeline.org/).

|  |
| --- |
| **Academic Integrity Statement and Policy** |
|  |
| *“An Aggie does not lie, cheat or steal, or tolerate those who do.”*  *“Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one’s work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case” (*[*Section 20.1.2.3, Student Rule 20*](https://aggiehonor.tamu.edu/Rules-and-Procedures/Rules/Honor-System-Rules)*).*  *You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at* [*aggiehonor.tamu.edu*](https://aggiehonor.tamu.edu/)*.* |
| **I Promise To** |
|  |
| 1. Lead by being a content expert 2. Organize the course effectively and guide time on task 3. Communicate by being responsive to questions and responding quickly 4. Facilitate learning through active engagement 5. Demonstrate genuine interest in your learning 6. Assess fairly and quickly 7. Provide challenge with support 8. Emphasize relevance using real-world examples 9. Reflect and adapt appropriately based on your feedback 10. Provide a reasonable amount of work outside of class with clear guidance\*   \*I reserve the right to sometimes incorporate uncertainty into in class assignments, since I will be there to give you immediate feedback and additional instruction. In summary, I promise no fluff, no boredom, and practical application. If I ever fail to fulfill this promise at any point I expect you to make me aware of it. |
|  |