

AI for Internet of Things (IoT) - Course Syllabus

Course Information

Course Title: AI for Internet of Things (IoT)

Course Number: CSCI 49000AIoT

Term: Fall 2025

Credit Hours: 3

Instructional Modality Face-to-Face

Prerequisites: Intro to AI/ML, Basic Programming (Python), Networking Fundamentals

Materials: Mostly lectures and Online

Textbook: (Optional) *Artificial Intelligence-based Internet of Things Systems*, Souvik Pal, Debashis De, Rajkumar Buyya, Springer, 2022

Supplementary book: Bengio, Yoshua, Ian Goodfellow, and Aaron Courville. *Deep learning*. Vol. 1. Cambridge, MA, USA: MIT press, 2017.

Thillaiarasu, N., Suman Lata Tripathi, and V. Dhinakaran, eds. *Artificial Intelligence for Internet of Things: Design Principle, Modernization, and Techniques*. CRC Press, 2022.

Instructor

Dr. Sayeed Shafayet Chowdhury

Visiting Assistant Professor, Purdue CS

Office Hours: Th 10:30-12:30, SL275, or online (by appointment)

TA: Dipam Patel, Office Hours: Tue 10:00-12:00, SL253

Course Description

This course explores the integration of Artificial Intelligence (AI) with the Internet of Things (IoT). Students will learn about IoT architectures, Different ML models, AI models for edge computing, and real-world applications across sectors including smart cities, agriculture,

transportation, and healthcare.

Learning Outcomes

By the end of the course, students will be able to:

- Describe the architecture and components of AI-enabled IoT systems.
- Apply machine learning and deep learning techniques to process IoT data.
- Design and implement AI algorithms.
- Evaluate challenges in AI/IoT system design including security, ethics, and scalability.
- Propose and present an end-to-end solution for a real-world AI + IoT problem.

Grading Policy

Homework Assignments: 25%

Project Proposal + Midterm Progress Report: 15%

Final Project Report: 25%

Final Project Demo + Presentation: 30%

Participation / Discussion: 5%

Weekly Schedule

Week	Topics	Readings & Assignments
1	Intro to AI & IoT, Industry 4.0 & 5.0	Ch. 1 – Intro
2	IoT Architecture & Knowledge Hierarchy	Ch. 2
3	Data Collection, Sensors, and Data Preprocessing for IoT: Types of IoT Sensors Sensor Data Acquisition and Preprocessing Techniques, Challenges in IoT Data, Feature Extraction	Slides
4	Intro to AI and ML: Regression – linear and logistic, Clustering, SVM,	Ch. 3, 4

5	Intro to Deep learning: DNN concepts, MLPs, activation functions, optimizers	Slides, Ch. 5
6	Project Proposal Presentations; Convolutional Neural Networks (CNNs)	Slides, Ch. 7
7	CNN applications; Frameworks for deep learning, Intro to PyTorch,	Slides, Online resources
8	RNNs, LSTMs, Autoencoders,	Slides,
9	AI on Edge Devices: Pruning, Quantization, Knowledge distillation; Midterm Project Progress Report due	Ch. 10, Slides
10	Advanced Models: Ensembles, PCA, OC-SVM, SNNs, Event-based applications	Ch. 6
11	Federated Learning, Trust & Security in IoT Systems	Slides
12	Real-World Applications: Parking Systems, Drone Navigation	Ch. 7, 16
13	Real-World Applications: Autonomous Driving, Food Systems, Final Project Presentations	Ch. 17, 18
14	Final Project Presentations, Project Report (due) & Wrap-up	

Potential Homeworks

HW#	Topic	Due
HW1	Future of AI in IoT (2-page essay)	Week 4
HW2	ML using IoT data	Week 7
HW3	DL : Train simple CNN on images / sensor data	Week 9
HW4	AI Compression Methods (Pruning, Quantization etc.)	Week 12

Final Project (Open-ended)

Objective: Design an AI-enabled IoT solution for a real-world problem, students propose the exact problem to tackle and provide a solution.

Teams: 2 students


Deliverables:

- Proposal (Week 8)
- Code + Dataset
- Demo
- Final Report (Week 14)
- Presentation (Week 14)

Honor Code and Academic Integrity

All students are expected to uphold the highest standards of academic integrity and ethical behavior in this course.

- **All assignments must be completed individually unless explicitly stated otherwise.**
- Use of code or text from the internet or generative AI tools (e.g., ChatGPT, Copilot) must be properly cited.
- Any detected plagiarism, unauthorized collaboration, or dishonesty will be reported to the academic integrity office and may result in a failing grade for the assignment or the course.

 *Remember: The purpose of each task is to help you learn and apply the concepts of AI and IoT. Integrity in your work reflects integrity in your future career.*

If you are unsure whether something is allowed, ask the instructor before proceeding.

Attendance Policy

This course follows the [University Academic Regulations regarding class attendance](#), which state that students are expected to be present for every meeting of the classes in which they are enrolled. Attendance will be taken at the beginning of each class and lateness will be noted. When conflicts or absences can be anticipated, such as for many University-sponsored activities and religious observations, you should inform me of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification is not possible, contact me as soon as possible by Purdue email or phone. For absences that do not fall under excused absence regulations (see below), this course follows the following procedures:

1. Do not come to class if you are feeling ill but DO email me at chowdh23@purdue.edu, with the subject line: xxx [course code] absence. I do not need details about your symptoms. Just let me know you are feeling ill and cannot come to class. If it is an emergency, please follow the University regulations on medical care (see below).
2. Unless it falls under the University excused absence regulations (see below), any work due should be submitted on time via our course Brightspace.
3. If that day's class involves assessed work such as a test or presentation, you and I will plan if and how you can make up the work, following the assignment guidelines. This plan must be done before the next class period, so again, email me immediately when you know that you will miss the class.
4. The most important consideration in any absence is how it will affect your achievement of the assignment objectives and the course learning outcomes.

Nondiscrimination Statement

Purdue University is committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her potential. A hyperlink to Purdue's full Nondiscrimination Policy Statement is included in the Academic Resources table on your Brightspace homepage.

Accessibility

Disability-related accommodations syllabus statement

Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247, as soon as possible.

If the Disability Resource Center (DRC) has determined reasonable accommodations that you would like to utilize in my class, you must release your Course Accommodation Letter to me. Instructions on sharing your Course Accommodation Letter can be found by visiting: <https://www.purdue.edu/drc/students/course-accommodation-letter.php>. Additionally, you are strongly encouraged to contact me as soon as possible to discuss implementation of your accommodations.

Mental Health/Wellness Statement

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try [Therapy Assistance Online \(TAO\)](#), a web and app-based mental health resource available courtesy of Purdue Counseling and Psychological Services (CAPS). TAO is available to all students at any time by creating an account on the [TAO Connect website](#), or downloading the app from the App Store or Google Play. It offers free, confidential well-being resources through a self-guided program informed by psychotherapy research and strategies that may aid in overcoming anxiety, depression and other concerns. It provides accessible and effective resources including short videos, brief exercises, and self-reflection tools.

If you need support and information about options and resources, please contact or see the [Office of the Dean of Students](#). Call 765-494-1747. Hours of operation are M-F, 8 a.m.- 5 p.m.

Emergency Preparation

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

See Purdue's Information on [Emergency Preparation and Planning](#). This website covers topics such as Severe Weather Guidance, Emergency Plans, and a place to sign up for the Emergency Warning Notification System. I encourage you to download and review the [Emergency Preparedness for Classrooms document](#).

The first day of class, I will review the **Emergency Preparedness plan for our specific classroom**. Please make note of items like:

- The location to where we will proceed after evacuating the building if we hear a fire alarm.
- The location of our Shelter in Place in the event of a tornado warning.
- The location of our Shelter in Place in the event of an active threat such as a shooting.