CS 791 Topics: Mass Detection in Mammograms
Fall 2025

Prerequisites: CS 487/687 Deep Learning (or an equivalent course) and familiarity with Keras/Tensorflow or Pytorch. Background in the following areas would be very useful: image processing, computer vision, pattern, pattern recognition, and machine learning.

Credit hours: 3.0

Meets: MW 2:30PM - 3:45PM (WPEB 200)

Course Webpage: http://www.cse.unr.edu/~bebis/CS791/Fall2025

Instructor: Dr. George Bebis

Office: WPEB 411

E-mail: bebis@unr.edu

Office Hours: MW 4:00pm – 5:30pm and by appointment

Required Text

There is no required textbook for this course. Most of the material will be drawn from research papers, which will be provided throughout the course.

Optional Texts

- *Deep Learning,* by Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016. (available online at https://www.deeplearningbook.org/)
- *Dive into Deep Learning,* by Aston Zhang, Zachary C. Lipton, Mu Li, Alexander J. Smola, arXiv:2106.11342 **[cs.LG]**
- *Introduction to Deep Learning: From Logical Calculus to Artificial Intelligence,* by Sandro Skansi, Springer, 2018 (available on Canvas, under "Pages")
- *Neural Networks and Deep Learning: A Textbook,* by Charu Aggarwal, Springer, 2018 (available on Canvas, under "Pages")
- *Deep Learning With Python (2nd edition),* by Francois Chollet, Manning, 2021 (available on Canvas, under "Pages")
- *Computer Vision: Algorithms and Applications,* by Richard Szeliski, Springer, 2011

(available on Canvas, under “Pages”)

- *Probabilistic Machine Learning: An Introduction,* by K. Murphy, MIT Press, 2022.
- *Pattern Classification*, by Duda, Hart, and Stork, 2nd edition, John Wiley Inter-science, 2001.

Objectives

The course will focus on the problem of mass detection and classification in mammograms and possibly other modalities such as Ultrasound, MRI, and PET. The goal is to expose students to some of the main **problems** involved in this research area and to recent **methods** developed by the research community to address these problems. The course is primarily intended for **highly motivated** students who are interested in applying pattern recognition, machine learning, and deep learning techniques to a **practical** problem of **tremendous** importance. It will provide opportunities for students to choose a topic for an **MS thesis** or **PhD dissertation** and can lead to a **conference** and/or a **journal publication**.

Course Schedule: will be posted on the course’s webpage.

Student Learning Outcome (SLO)

Graduate Students will have: an ability to apply engineering and computer science research and theory to advance the art, science, and practice of the discipline.

Course Requirements

There will be no exams. Grading will be based on paper presentations, class participation, and a semester-long project.

Paper Presentations

Each student will be required to present **2-3** papers to the rest of the class. A list of papers for possible presentation will be posted on the course’s webpage. Students who might be interested in presenting a **different** paper (i.e., not in the list to be provided) are encouraged to discuss this with the instructor. Each presentation should be **30-45 minutes** long with **15-30 minutes** left for questions and discussion. All presentations are expected to be delivered in a professional manner, similar to talks given at academic conferences. Students are required to email their slides to bebis@unr.edu by **12pm** on the day of their presentation (will be posted on the course’s webpage).

Class Participation

The students who are responsible for presenting a paper are expected to have a **thorough understanding** of the ideas discussed in the paper. Everyone else should read the paper before class and **contribute** to the class discussion.

Course Project

See “Project Guidelines” for details.

Material Subject to Change

Course material, topics, schedule, assignments, and content are subject to change.

Course Policies

- Lecture/Presentation slides and other useful information will be posted on the course’s web page.
- All reports should be submitted on **Canvas**.
- Discussion of your work with others is allowed and encouraged. However, each student should do their own work.
- **No late** work will be accepted unless there is an extreme emergency. If you are unable to hand in your work by the deadline, you must discuss it with us **before** the deadline.
- **No incomplete** grades (INC) will be given on this course.
- Students are expected to attend all lectures and be on time. Students who miss a class and/or are late for a class may experience an impact on their grade by missing course activities. If you miss a lecture, **you are responsible** for all material covered or assigned.
- The instructor **reserves** the right to add to, and/or modify any of the above policies as needed to maintain an appropriate and effective educational atmosphere. If this happens, all students will be notified in advance of the new and/or modified policy.

Academic Dishonesty

Cheating, plagiarism or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated, and penalties can include filing a final grade of "F"; reducing the student's final course grade one or two full grade points; awarding a failing mark on the coursework in question; or requiring the student to retake or resubmit the coursework. The University Academic Standards Policy defines academic dishonesty, and mandates specific sanctions for violations. See the University Academic Standards policy: UAM 6,502.

Compliance with University Policies

In accordance with section 6,502 of the University Administrative Manual, a student may receive academic and disciplinary sanctions for failure to comply with policy, including this syllabus, for failure to comply with the directions of a University Official, for disruptive behavior in the classroom, or any other prohibited action. “Disruptive behavior" is defined in part as behavior, including but not limited to failure to follow course, laboratory or safety

rules, or endangering the health of others. A student may be dropped from class at any time for misconduct or disruptive behavior in the classroom upon recommendation of the instructor and with approval of the college dean. A student may also receive disciplinary sanctions through the Office of Student Conduct for misconduct or disruptive behavior, including endangering the health of others, in the classroom. The student shall not receive a refund for course fees or tuition.

Generative AI use is NOT allowed for any purpose

For the purposes of this course, any and all uses of generative artificial intelligence (AI)/large language model tools (such as ChatGPT, DALL-E, Gemini, Microsoft Copilot, etc.) will be considered a violation of the UNR Academic Integrity Policy (UAM 6,502), specifically the prohibition against cheating or submitting work that is not your own. This applies to all assessments in the course, including case studies, written assignments, discussions, quizzes, exams, and problem sets.

The following actions are prohibited:

- Submitting any part or all of an assignment statement or test questions as part of a prompt to a large language model AI tool.
- Incorporating any part of an AI-written response into a submitted assignment or assignment component.
- Using AI to summarize or contextualize reading assignments or source materials.
- Submitting your own work for this class to a large language model AI tool for iteration or improvement.

Disability Services

Any student with a disability needing academic adjustments or accommodations is requested to speak with the Disability Resource Center (Pennington Student Achievement Center, Suite 230) as soon as possible to arrange for appropriate accommodations.

Audio and Video Recording

Student-created Recordings
Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped, or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.

Instructor-created Recordings
Class sessions may be audio-visually recorded for students in the class to review and for enrolled students who are unable to attend live to view. Students who participate with

their camera on or who use a profile image are consenting to have their video or image recorded. If you do not consent to have your profile or video image recorded, keep your camera off and do not use a profile image. Students who un-mute during class and participate orally are consenting to have their voices recorded. If you do not consent to have your voice recorded during class, keep your mute button activated and only communicate by using the "chat" feature, which allows you to type questions and comments live.

Maintaining a Safe Learning Environment

The University of Nevada, Reno is committed to providing a safe learning and work environment for all. If you believe you have experienced discrimination, sexual harassment, sexual assault, domestic/dating violence, or stalking, whether on or off campus, or need information related to immigration concerns, please contact the University's Equal Opportunity & Title IX office at 775-784-1547. Resources and interim measures are available to assist you. For more information, please visit the Equal Opportunity and Title IX page.

Campus Closures or Delays

In the event of class cancelations or delays caused by inclement weather conditions, fire/smoke conditions, or other unforeseen emergencies, the safety and well-being of students are the University's top priority. Official notifications will be disseminated through the University website and other official channels with details related to any campus delays or closures. In the event of a campus closure, you will be informed as to whether the class will be offered remotely or if it will be canceled. If the class is cancelled, you will receive information on how to address any missed course content. Students facing significant impacts due to these events are encouraged to communicate with their instructor for potential accommodations.

Academic Success Services

Your student fees cover usage of the Math Center (784-443 or www.unr.edu/mathcenter/), Tutoring Center (784-6801 or www.unr.edu/tutoring/), and University Writing Center (784-6030 or http://www.unr.edu/writing_center/). These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign a responsible and successful student.

Please note that the Math Center is focused on helping students with mathematical and statistical concepts. While mathematics is used extensively in engineering, the Math Center does not have the resources to help students with engineering courses. Engineering students are encouraged to use the Math Center for help in their math classes, and they are welcome to use its computer lab and study area any time –regardless of course. However, Math Center tutors cannot answer questions regarding engineering courses.

Grading Scheme

Class Participation: **10%**

Paper Presentations: **30%**

Project Reports and Presentations: **60%** (Proposal: 10%, Interim Report: 20%, Final Report: 30%)

A	>=90
B	[80-90)
C	[70-80)
D	[60-70)
F	<60

Important dates

9/1 – Labor Day (no class)

10/28 – Final day to drop classes and receive a "W"

11/17 & 11/19 – ISVC'25 (no class)

12/10 – Prep Day

12/15 – (3pm – 5pm) reserved for final presentations