Habib University
shaping futures

Introduction to Deep Learning

CS 316 L1
Fall Semester 2021

[… What we want is a machine that can learn from experience. Alan Turing 1947]

Course Information

Class Location: GF-E121
Class Meeting Time(s): Mon Wed (08:30 AM-09:45 AM)
Course Prerequisites: MATH 102,MATH 205,MATH 310
Hardware/Software Prerequisites (if any): Laptop, headphones with mic, Internet connectivity (support live stream of video), Canvas, Zoom, MS teams, Acrobat Reader, MS office, Internet browser, any video recording & editing software, Python with related libraries including tensorflow, Jupyter Notebook , HackerRank, etc
Content Area: Covers CS- Elective

Instructor Information

Instructor: Abdul Samad
Office Location: E-117
Email: abdul.samad@sse.habib.edu.pk
Office Hours: Friday 5:20-6:20 PM or any other time by appointment

Course Description

Deep learning is a key enabler of AI powered technologies being developed across the globe, and it is opening immense economic opportunities in the field of intelligent systems. We need to equip our students to understand and develop these systems. This course will provide a practical introduction to deep learning.

Course Aims

The goal of this course is to give learners understanding of modern neural networks, their applications in different domains such as computer vision, natural language processing, etc. This course aims to provide expertise to develop intelligent systems using deep learning from scratch, using best practices to solve real world problem.

Course Learning Outcomes (CLOs)

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

SLO/CLO	**Description**	**Learning-Domain Level**
CLO 1	Understand some basic theory behind deep Neural Networks	Cog-2
CLO 2	Exploring the design choices for different parameters of Neural Networks	Cog-4
CLO 3	Developing appropriate deep model, for real world scenarios/problems.	Cog-5
CLO 4	Coding in deep learning framework	Cog-1

Mode of Instruction

a. Two synchronous lectures per week will be held during each week. All classes will be of 75 minutes duration. Whenever, classes resume in-person, these two sessions will be held in-person while students could choose to come to the class-room or participate online. Synchronous sessions will be also be used for groups discussions, problem solving etc. Attendance is compulsory (check attendance policy) for these classes and students are expected to participate mandatorily both through audio, video during the online mode. Your class participation during these live sessions will also be Noted. We will also meet once during each week for the lab session of 2 Hour 50 minutes. The policy for the lab is same as that of the lectures.

b. Student Engagement Level (SEL). Student engagement will be gauged. SEL is coming from attendance (check attendance policy).

c. Details of work-hours. Overall, in-class & outside class work-hours (per week) are as follows:

No	Type of activity	Hours/ week	Total hours (15 weeks)
1	**Lectures:** Synchronous (online or in-person) – contact hours	2.5	37.5

2	**Labs:** Synchronous (online or in-person) – contact hours	2.85	42.75
2	Outside classroom preparation	5.65	84.75
	Total Hours	**11**	**165**

Engagement, Net-etiquettes and Participation Rules

a. Norms for online teaching will be mutually decided during the first lecture.

b. For all synchronous lectures' students need to keep their microphones on. The camera shall be on too whenever there is a discussion in the class. In case if you did not respond using mic and camera and during attendance, you will be considered absent for that session.

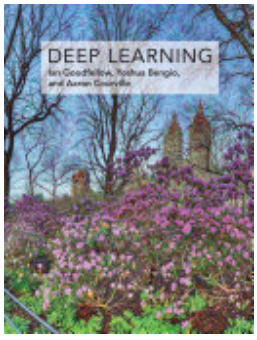
c. As mentioned above course participation is an important aspect for this course – therefore, one key guide is to give 100% attention to the synchronous lectures. This means if the instructor asks to participate in a poll, break-out rooms or question to the whole class then not participating is not an option. There will be multiple engagement opportunities during the course in the form of breakout rooms, live polls and surveys, social bookmarking and open questions. For synchronous sessions, you are expected to participate in all of these activities.

d. Do's and Don'ts - would be collectively developed in the first two weeks of classes.

Required Texts and Materials

Dive into deep learning
Authors: Aston Zhang, Zachary C.Liton, Mu Li, and Alexander J.Smola

Optional Materials



Deep Learning
ISBN: 9780262035613
Authors: Ian Goodfellow, Yoshua Bengio, Aaron Courville
Publisher: MIT Press
Publication Date: 2016-11-18

Neural Networks and Deep Learning
Authors: Michael Nelson

Assessments

Assessment type	Frequency	Weight (%)	Remarks
Short 20-30 minutes quiz (best 4 out of 6)	6	16	These will be held almost every alternate week starting from week No 2. These will mostly be based on the lectures and practice questions from synchronous sessions. Any student can be picked for random viva for the solutions he has submitted. Failure to explain the solution will result in the file of conduct case and failure of the course.
Project	1	40	Project (40%) [Rubrics for project will be shared on LMS] • Part 1: Team formation and topic selection (2 %) (max=3, min =2) • Part 2: Midterm presentation (8 %) • Part 3: Written project , format will be provided (15%) • Part 4: Final presentation (10%) • Part 5: Peer evaluation (5%) Students (in group of three) has to submit a course project, i.e., research paper. Please choose your peer wisely as this assignment will be group graded i.e. each member will get the same marks. Rubrics will shared later.
Mid-term Exam (written + viva-based)	1	10%	Questions in exam may ask the student to code a particular situation using python and will be graded using hackerRank or any other tool. Please note that it will be fixed time activity. Any student can be picked for random viva for the solutions he has submitted. Failure to explain

			the solution will result in the file of conduct case and failure of the course.
Lab Exam	1	10%	Will be online or offline depending on the situation.
Lab Assessments	9	21%	Each lab is worth either 3%.
Attendance	1	3%	If attendance is satisfactory. Check attendance policy.

Late Submission Policy

• Quizzes,Exam: No late submission is allowed in QUIZ and EXAM. All the quizzes will be during the class timings.

• Lab assessments and Lab Exam will be taken during Lab timing.

• Project (below policy applies to all the component of the project)

i. 1 Hour Late Submission: 30% penalty.

ii. 12 Hours Late Submission: 50% penalty.

iii. Within 24 Hours: 70% penalty

iv. No marks will be given in case if the submission more than 24 Hours late.

Academic Integrity

Each student in this course is expected to abide by the Habib University Student Honor Code of Academic Integrity. Any work submitted by a student in this course for academic credit will be the student's own work.

Scholastic dishonesty shall be considered a serious violation of these rules and regulations and is subject to strict disciplinary action as prescribed by Habib University regulations and policies. Scholastic dishonesty includes, but is not limited to, cheating on exams, plagiarism on assignments, and collusion.

a. Plagiarism: Plagiarism is the act of taking the work created by another person or entity and presenting it as one’s own for the purpose of personal gain or of obtaining academic credit. As per University policy, plagiarism includes the submission of or incorporation of the work of others without acknowledging its provenance or giving due credit according to established academic practices. This includes the submission of material that has been appropriated,//

bought, received as a gift, downloaded, or obtained by any other means. Students must not, unless they have been granted permission from all faculty members concerned, submit the same assignment or project for academic credit for different courses.

b. Cheating: The term cheating shall refer to the use of or obtaining of unauthorized information in order to obtain personal benefit or academic credit.
c. Collusion: Collusion is the act of providing unauthorized assistance to one or more person or of not taking the appropriate precautions against doing so.

All violations of academic integrity will also be immediately reported to the Student Conduct Office.

You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e-mail, an e-mail attachment file, a diskette, or a hard copy.

Should copying occur, the student who copied work from another student and the student who gave material to be copied will both be in violation of the Student Code of Conduct.

During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

Penalty for violation of this Code can also be extended to include failure of the course and University disciplinary action.

Final Exam Policy

Final Exam is not included in assessments.

Grading Scale

Letter Grade	GPA Points	Percentage
A+	4.00	[95-100]
A	4.00	[90-95)
A-	3.67	[85-90)
B+	3.33	[80-85)
B	3.00	[75-80)

Letter Grade	GPA Points	Percentage
B-	2.67	[70-75)
C+	2.33	[67-70)
C	2.00	[63-67)
C-	1.67	[60-63)
F	0.00	[0, 60]

Note: [a, b) is a range of numbers from a to b where a is included in the range and b is not.

Week-Wise Schedule (Tentative)

Fall 2021 Weekly Schedule*

Week	Description	Topic(s)	Readings	Assessments	Labs
Week - 1 August 30 – September 3	Sessions & Add / Drop period	Logistics, Introduction to deep learning, Linear Algebra primer	Chapter 1,2		Lab assessment-1
Week - 2 September 6 – 10	Sessions Last day to Drop Course(s): **September 18, 2021** Last day to Add Course(s): **September 10, 2021**	Gradient, Chain rule, Probability primer	Chapter 2		Lab assessment-2
Week - 3 September 13 – 17 & 18	Sessions	Linear Regression, Model Prediction and Evaluation 9/18/2021: Extra Class	Chapter 3	Quiz -1	Project Proposal Working

Week	Description	Topic(s)	Readings	Assessments	Labs
Week - 4 September 20 – 24	Sessions	Multilayer perceptron, Model Selection	Chapter 4		Lab assessment-3
Week - 5 September 27 – October 1 & 2	Sessions Arbaeen/Chehlum Imam Hussain†‡: **September 28, 2021**	Vanishing gradient, Exploding gradient, generalization problem	Chapter 4	Quiz-2	Lab assessment-4
Week - 6 October 4 – 8	Sessions	Convolution networks, Basic convolution networks	Chapter 6		Lab assessment-5
Week - 7 October 11 – 15	Sessions & Mid Term Examinations	Residual networks and advanced architectures	Chapter 7		Lab assessment-6
Week - 8 October 18 – 22	Sessions & Mid Term Examinations 12th Rabi-ul-Awwal†‡: October 19, 2021	Review + mid term		MidTerm	Mid Evaluation of the Project
Week - 9 October 25 – 29	Sessions	Image augmentation, Fine tuning, Neural Style	Chapter 13		Lab Assessment-7
Week - 10 November 1 – 5 & 6	Sessions	Object Detection Sequence models and language 11/6/2021: Extra Class	Chapter 13, Chapter 8	Quiz-3	Lab assessment-8

Week	Description	Topic(s)	Readings	Assessments	Labs
Week - 11 November 8 – 12	Sessions	Recurrent neural networks	Chapter 8		Lab assessment-9
Week - 12 November 15 – 19 & 20	Sessions Last Day to Withdraw from Course(s): **November 19, 2021**	Modern Recurrent Neural Networks	Chapter 9	Quiz-4	TensorFlow-1
Week - 13 November 22 – 26	Sessions	Optimization algorithms	Chapter 11	Quiz-5	TensorFlow-2
Week - 14 November 29 – December 3 & 4	Sessions	Attention Mechanism 12/4/2021: Extra Lab	Chapter 10	Quiz-6, Final Submission of the Paper.	Lab Exam Extra Lab: Project Presentation
Week - 15 December 6 - 10	Sessions				
December 7 – 11 & 13 – 15, 2021	End Term Examinations Days§				

Notes:

* The University reserves the right to correct typographical errors or to adjust the Academic Calendar at any time it deems necessary.

† Subject to the sighting of the new moon.

‡ No Class(es).

Attendance Policy

- During each class attendance will be taken at random time. This type of attendance is termed as synchronous attendance.
- Student is expected to have 70% synchronous attendance and failure to maintain this will result in failure of the course.

- Student will be only able to appear in the final presentation if 70% of overall attendance in the course is coming from in-class attendance

Program Learning Outcomes (For Administrative Review)

Upon graduation, students will have the following abilities:

- PLO 1: Analysis: Analyse a given situation and reduce it to one or more problems that can be solved via computer intervention.
- PLO 2: Design: Design one or more computer-based solutions of a given problem and select the solution that is best under the circumstances.
- PLO 4: Implementation: Design and implement software systems of varying complexity.
- PLO 6: Self-learning: Research, learn, and apply requirements needed to implement a solution for a given high level problem description.

Program Learning Outcomes (PLOs) mapped to Course Learning Outcomes (CLOs)				
	CLOs of the course are designed to cater following PLOs: PLO 1: Analysis PLO 2: Design PLO 4: Implementation PLO 6: Self learning			
	Distribution of CLO weightages for each PLO			
	CLO 1	**CLO 2**	**CLO 3**	**CLO 4**
PLO 1				
PLO 2				
PLO 4				
PLO 6				

Mapping of Assessments to CLOs

Assignments	**CLO #01**	**CLO #02**	**CLO #03**	**CLO #04**
Quiz No 01				
Quiz No 02				

Quiz No 03				
Quiz No 04				
Quiz No 05				
Quiz No 06				
Lab Exam				
Course Project				
Midterm Exam				
Lab 1				
Lab 2				
Lab 3				
Lab 4				
Lab 5				
Lab 6				
Lab 7				
Lab 8				
Lab 9				

Recording Policy

As per HU's teaching policy during Covid-19, all synchronous and synchronous sessions will be recorded and uploaded on our Video Management System (Panopto). Link to the folder of recordings will be available to all students.

Accommodations for Students with Disabilities

In compliance with the Habib University policy and equal access laws, I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first two weeks of the semester, except for unusual circumstances, so arrangements can be made. Students are encouraged to register with the Office of Academic Performance to verify their eligibility for appropriate accommodations.

Inclusivity Statement

We understand that our members represent a rich variety of backgrounds and perspectives. Habib University is committed to providing an atmosphere for learning that respects diversity. While working

together to build this community we ask all members to:

- share their unique experiences, values and beliefs
- be open to the views of others
- honor the uniqueness of their colleagues
- appreciate the opportunity that we have to learn from each other in this community
- value each other's opinions and communicate in a respectful manner
- keep confidential discussions that the community has of a personal (or professional) nature
- use this opportunity together to discuss ways in which we can create an inclusive environment in this course and across the Habib community

Office Hours Policy

Every student enrolled in this course must meet individually with the course instructor during course office hours at least once during the semester. The first meeting should happen within the first five weeks of the semester but must occur before midterms. Any student who does not meet with the instructor may face a grade reduction or other penalties at the discretion of the instructor and will have an academic hold placed by the Registrar's Office.

Office Hours

Office hours are your chance to meet the instructor for closer personalized interaction. This may be to discuss specific queries on particular course work, for a general discussion on the course, your overall performance in the course, or any other course related aspects. Instructors are also happy to discuss more general academic matters, e.g. your eventual career goals, the state of the art in their research area, ideas for research projects, and so on.

While instructors welcome interaction with the students, office hours are time that they dedicate in their schedule for the above interaction.