



# Topic: Advanced Deep Learning

STP 598

## Instructor Info —

	Shiwei Lan
	Office Hrs: TuTh 1:30 - 2:30PM
	WXLR 544; Zoom: 8055899886
	<a href="https://math.la.asu.edu/~slan">https://math.la.asu.edu/~slan</a>
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## Course Info —

	Prereq: STP598 MLDL or equiv
	TuTh 12:00 – 1:15 PM
	Tempe WXLRA102
	<a href="https://slan-teaching.github.io/STP598adl/">https://slan-teaching.github.io/STP598adl/</a>

## Grader Info —

	TBD
	Office Hrs: TBD
	MC <sup>2</sup> (WXLR A303)
	TBD

## Description

This course focuses on more advanced AI/ML topics than standard deep neural networks such as CNN and RNN. The topics will include recently developed techniques including residual networks, U-Net, general adversarial networks, diffusion models, transformers, graph neural networks, and large language models. Students should be familiar with Python programming language and know PyTorch very well.

## Objective

Students will be introduced to more recently developed AI/ML techniques and prepared with foundation for relevant research.

## Textbooks & Materials

### Optional Reading

DL - Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville  
PDL - The Principles of Deep Learning Theory by Daniel A. Roberts, Sho Yaida, Boris Hanin

FDL - Mathematical Foundations of Deep Learning Models and Algorithms by Konstantinos Spiliopoulos, Richard Sowers, Justin Sirignano

### Software

Python, TensorFlow and PyTorch.

### Github Resources

Hugging Face

## Grading Scheme

Homework	40 %
Presentations	30 %
Final Project	30 %
Total	100 %

A+	[97%, 100%]	A	[93%, 97%)	A-	[90%, 93%)
B+	[87%, 90%)	B	[83%, 87%)	B-	[80%, 83%)
C+	[77%, 80%)	C	[70%, 77%)		
D	[60%, 70%)			E	[0%, 60%)

## Homework

There will be about 4 written assignments to be submitted on canvas. There will also be about 4 computer assignments to be completed on nbgrader. Written homework report should be submitted in either Word or PDF format, no other formats accepted. Late home will NOT be accepted by email. Coding homework will be automatically graded on Python Jupyter notebook. No partial credit within a code cell will be given.

## Paper Presentations

There will be 2 paper presentations required on two of 02/19, 03/19, 04/09 that you will sign up. Choose two AI/ML papers of related topics from top conferences (NIPS, ICLR, ICML etc.) and present them on days you sign up. Each student will be given 5 ~ 7 minutes and should be prepared to answer follow-up questions.

## Final Project

The final project will consist of a data analysis using the learnt techniques. The student should submit a 1-2 page plan for their project including a description of the data set by 03/15/2026. Students are encouraged to work in groups of size (2~3) on projects. Each group would submit code, the outcome of the code, and give a presentation in the class. The final written report must be submitted to canvas by 05/04/2026 midnight.

# FAQs

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Where can I find help?

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You can go to my virtual office hours and the grader's office hours. In addition, you can go to Discussion Forum to post your questions and help others.

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How do I keep track of the class?

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Constantly check canvas and the course website. I will make announcements, post homework solutions, etc..

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Do we have incentives?

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I will give bonus points through the semester for e.g. extra-credit homework problems, most helpful discussion participants, etc..

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When shall I drop if I choose to?

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Last Day to Register or Drop/Add Without College Approval is 01/18/2026. Tuition & Fees Refund Deadline is 01/25/2026 for session C. Course Withdrawal Deadline (without 'W' on your transcript) is 04/05/2026 for session C. Refer to <https://students.asu.edu/academic-calendar> for more deadlines.

## Disability Accommodations

Qualified students with disabilities are encouraged to make their requests at the beginning of the semester to get disability accommodations. Disability information is confidential. *Note: Prior to receiving disability accommodations, verification of eligibility from the Disability Resource Center (DRC) is required.* Therefore, you should contact DRC immediately. Their office is located on the first floor of the Matthews Center Building. DRC staff can also be reached at: 480-965-1234 (V), 480-965-9000 (TTY). For additional information, visit: [www.asu.edu/studentaffairs/ed/drc](http://www.asu.edu/studentaffairs/ed/drc). Their hours are 8:00 AM to 5:00 PM, Monday through Friday.

## Make-up Policy

In case of valid absence (such as serious illness, going to court, etc.) during scheduled exam, you must notify the instructor BEFORE the exam, if the circumstances allow. To be eligible for make-up exam, valid excuse has to be supported by valid documentation (such as doctor's note, letter from court, etc.). Also, please follow Academic Affairs Manual, ACD 304-04, for appropriate University policies about requesting an accommodation for religious practices, in case you have to miss an assignment due to religious practice.

## Cell phones and Electronic Devices

Picture taking, talking or texting on your cell phone or any electronic device during class is prohibited. If you bring a cell phone and/or any other electronic equipment to the class, make sure they are turned off before class begins. Any sounds produced by such devices are disruptive to the class and, as such, will not be tolerated and may be reported to the Office of the Dean of Students.

## Academic Honesty

ASU expects and requires all its students to act with honesty and integrity, and respect the rights of others in carrying out all academic assignments. For more information on academic integrity, including the policy and appeal procedures, please visit <http://provost.asu.edu/academicintegrity>.

## Inclusion

The School of Mathematical and Statistical Sciences encourages faculty to address and refer to students by their preferred name and gender pronoun. If your preferred name is different than what appears on the class roster, or you would like to be addressed using a specific pronoun, please let me know.

## Sexual Violence and Harassment

Both Title IX federal law and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at <https://sexualviolenceprevention.asu.edu/faqs>. As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, <https://eoss.asu.edu/counseling>, is available if you wish to discuss any concerns confidentially and privately. ASU online students may access 360 Life Services, <https://goto.asuonline.asu.edu/success/online-resources.html>.

## Syllabus Disclaimer

This syllabus is tentative and should not be considered definitive. The instructor reserves the right to modify it (including the dates of the tests) to meet the needs of the class. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. It is the student responsibility to attend class regularly and make note of any change.

## Class Schedule (tentative)

Week	Date	Topic	Assignments
1	01/13 - 01/15	Introduction	
2	01/20 - 01/22	Overview	Written 1 out
3	01/27 - 01/29	Residual Networks	Written 1 due; Coding 1 out
4	02/03 - 02/05	U-Net	Coding 1 due
5	02/10 - 02/12	General Adversarial Networks	Written 2 out
6	02/17 - 02/19	GANs	Written 2 due; <a href="#">Paper Presentation I</a>
7	02/24 - 02/26	Transformer	Coding 2 out
8	03/03 - 03/05	Transformer/BERT	Coding 2 due
9	03/08 - 03/15	Fall break	<a href="#">project proposal: due 03/15/2026</a>
10	03/17 - 03/19	BERT	Written 3 out; <a href="#">Paper Presentation II</a>
11	03/24 - 03/26	Diffusion Models	Written 3 due
12	03/31 - 04/02	Diffusion Models	Coding 3 out
13	04/07- 04/09	Graph Neural Networks	Coding 3 due; <a href="#">Paper Presentation III</a>
14	04/14 - 04/16	GNNs	Written 4 out
15	04/21 - 04/23	Language Models	Written 4 due; Coding 4 out
16	04/28 - 04/30	Final Presentation	Coding 4 due; <a href="#">Project Presentation</a>
Final	05/04 - 05/11	Final Exam	<a href="#">final project report: due 05/04/2026</a>