Applied Machine Learning

Course Introduction

Tarbiat Modares University

Hossein Homaei
Department of Electrical & Computer Engineering
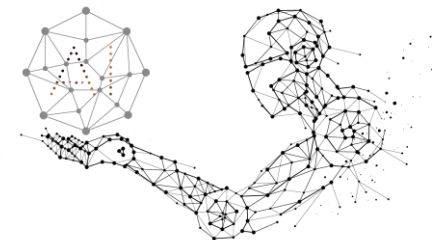
Welcome

Department of Electrical and Computer Engineering
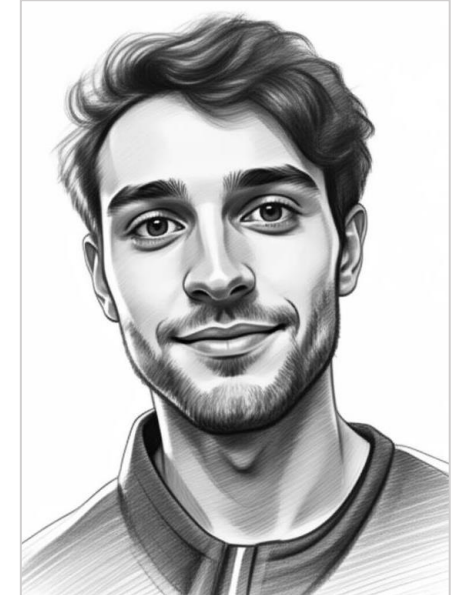Tarbiat Modares University

About me

Assistant professor in the Department of Electrical and Computer Engineering at Tarbiat Modares University since September 2020.

Feel free to contact me; It would be nice if I could help.

✉ homaei@modares.ac.ir   📞 +98(21) 82883905

📍 Room 6/55, 5th floor, End of the east corridor, Block 6

It's me

It's fake me!
AI generated

About Assistants

Ali Esmaeili
✉ a_esmaeili@modares.ac.ir
✅ @esmaeili1379

Ali (Sina) Lakzaei
✉ sinalakzaee@gmail.com
✅ @sinalkz

About the Course

- Title
  - <u>Applied</u> Machine Learning

- Description
  - Introduction to the fundamental concepts and algorithms of classical machine learning
  - A combination of <u>theory</u> and <u>practice</u>
   - Programming language: Python

Goals

- By the end of this course, students will be able to:
    - Explain key machine learning concepts and terminology
    - Translate real-world challenges into machine learning problems
    - Build a full pipeline—from raw data to a deployed model
        - Select appropriate ML algorithms
        - Implement, train, and evaluate models using Python
        - Interpret the results

- Note: By mastering the application of classical algorithms, students build a solid framework for understanding more advanced topics like deep learning and reinforcement learning in the future.
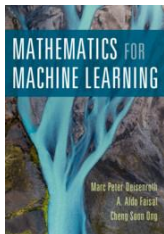
Main References

- Books
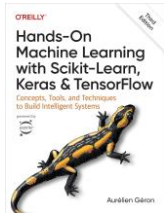
A. Geron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, 3rd ed. O'Reilly Media, 2023.

M. P. Deisenroth, A. A. Faisal, and C. S. Ong, *Mathematics for machine learning*. Cambridge University Press, 2020.

...Main References

- Online
  - Machine Learning- Coursera Specialization
    - Instructors: Andrew Ng, Geoff Ladwig, and Aarti Bagul
    - Stanford University and DeepLearning.AI
  - Mathematics for Machine Learning and Data Science- Coursera Specialization
    - Instructor: Luis Serrano
    - DeepLearning.AI

Grading Policy

- Exams

  Cheating = Zero point

  - Midterm: 8 points
  - Final: 8 points
- Project: 4 points
  - In-person delivery
  - Evaluated very carefully and rigorously
    - All documents and codes are asked in detail
      - No answer = No grade
  - Late Policy:
    - Incur a 10% deduction for <u>each</u> day past the deadline
    - Projects submitted more than three days late will not be accepted unless accompanied by a valid, documented excuse (such as a medical emergency)

Homework?

- Yes, we have
  - But, No point!

- If you want to learn, you MUST do them.
  - Do it for yourselves, not to get points

"Teachers open the door,
but you must enter by yourself."
–
Chinese Proverb
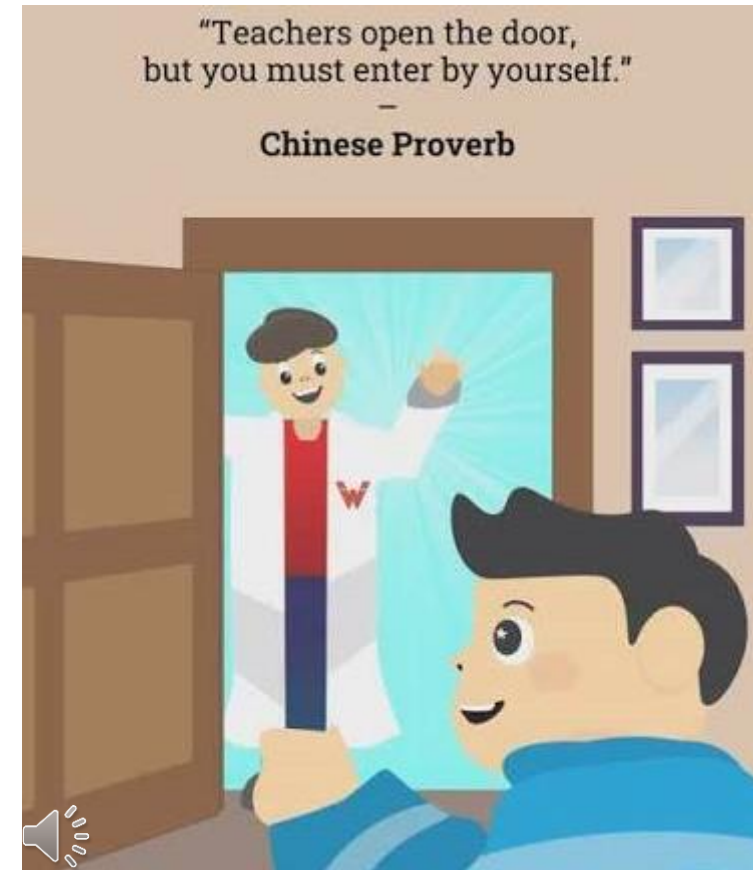
教师打开门但你必须自己走进去

Keynote Speakers

- SAML: Speeches on Applied Machine Learning
  - Extra topics
    - Large Language Models
    - Federated Learning
    - Zero-Shot Learning
    - Adversarial Machine Learning
    - ...

[In Persian]

سیمک: سخنرانی‌های یادگیری ماشین کاربردی

Student Expectations

- Active participation

- Collaborate with other students
  - Discuss concepts and general approaches with classmates
  - However, all submitted work (final project and exams) must be your own.
  - Plagiarism or any form of academic dishonesty, including copying code from another student, online sources, or chatbots, will result in a BIG zero.

- Spend 8-10 hours per week outside of class

🔔 SUBSCRIBE   @modares_applied_ml_1404 ✅

Importance of the Course

- Machine learning is increasingly popular among
  - Academia
  - Industry
  - Daily life

- This course would provide the <u>foundational</u> skills required for roles such as Data Scientist, Machine Learning Engineer,….

Success stories

- Machine learning powers modern innovations in fields ranging from healthcare and finance to entertainment and science.
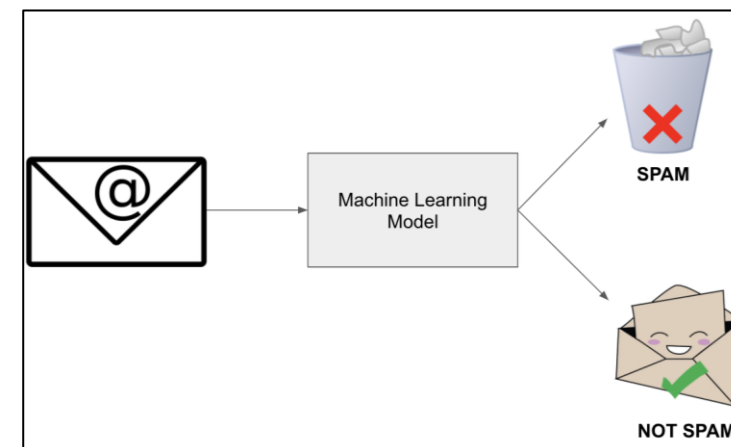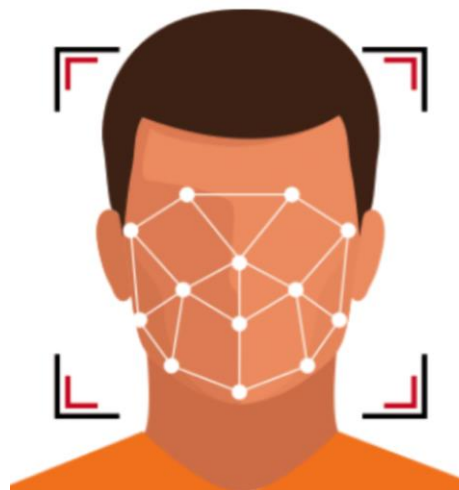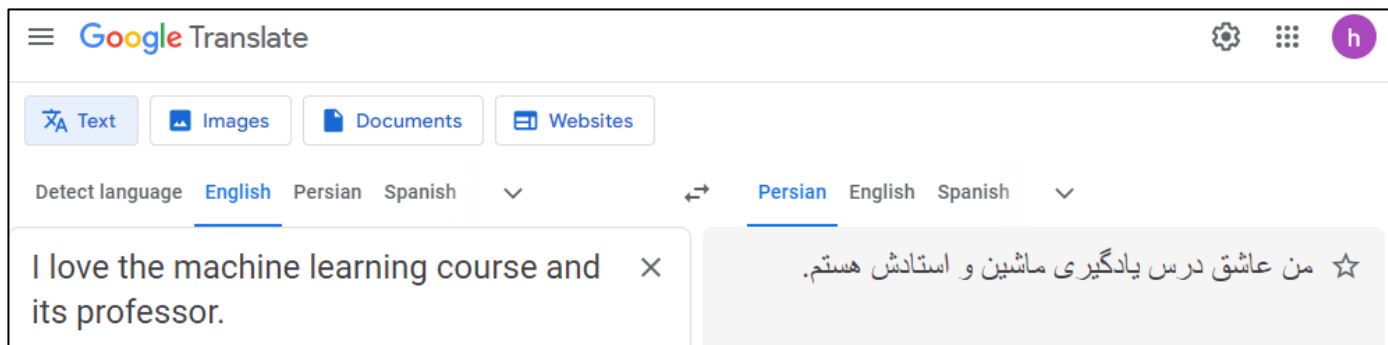
- Let's review a few of them…

...Success stories

- ImageNet- The image classification challenge
  - 1,000 object classes
  - 1,431,167 images
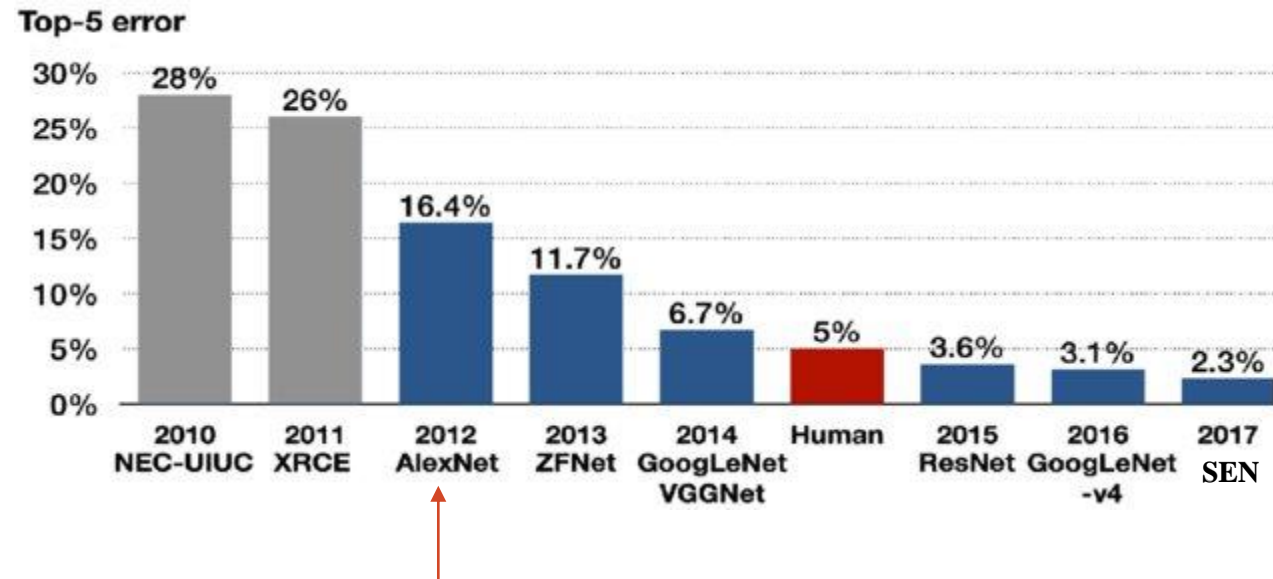
A Convolutional Neural Network (CNN)

...Success stories
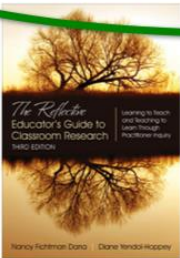
...Success stories
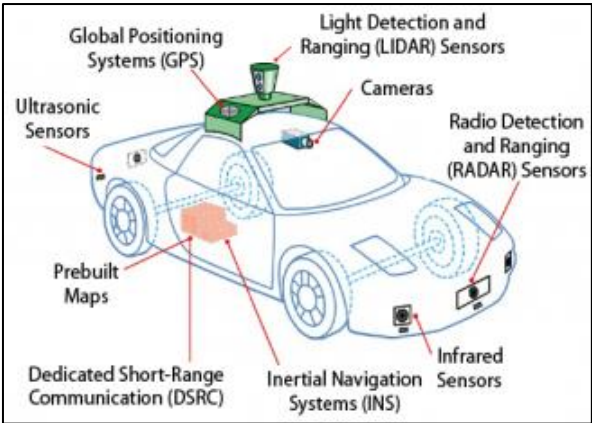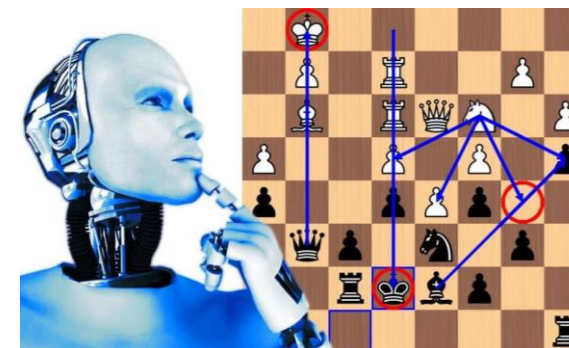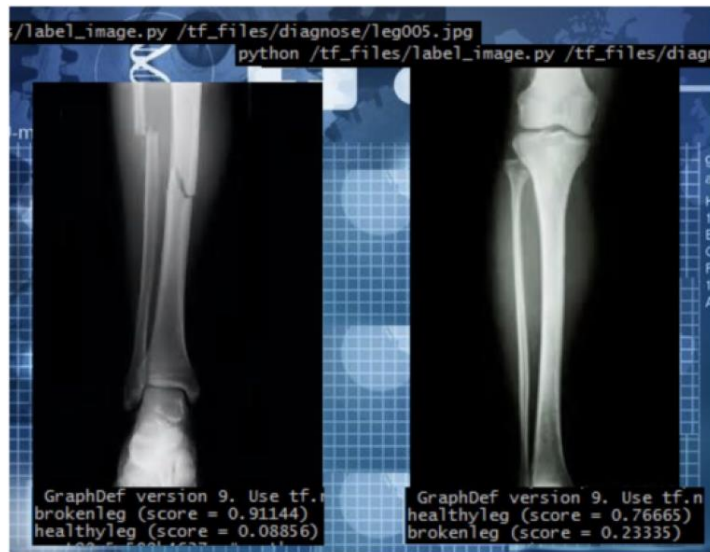
...Success stories

...Success stories

Probability of exceed 40 μg/m³

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

b:PR

N

Low
Moderate
Hight

0   160   320 km

Frequency of goals

1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
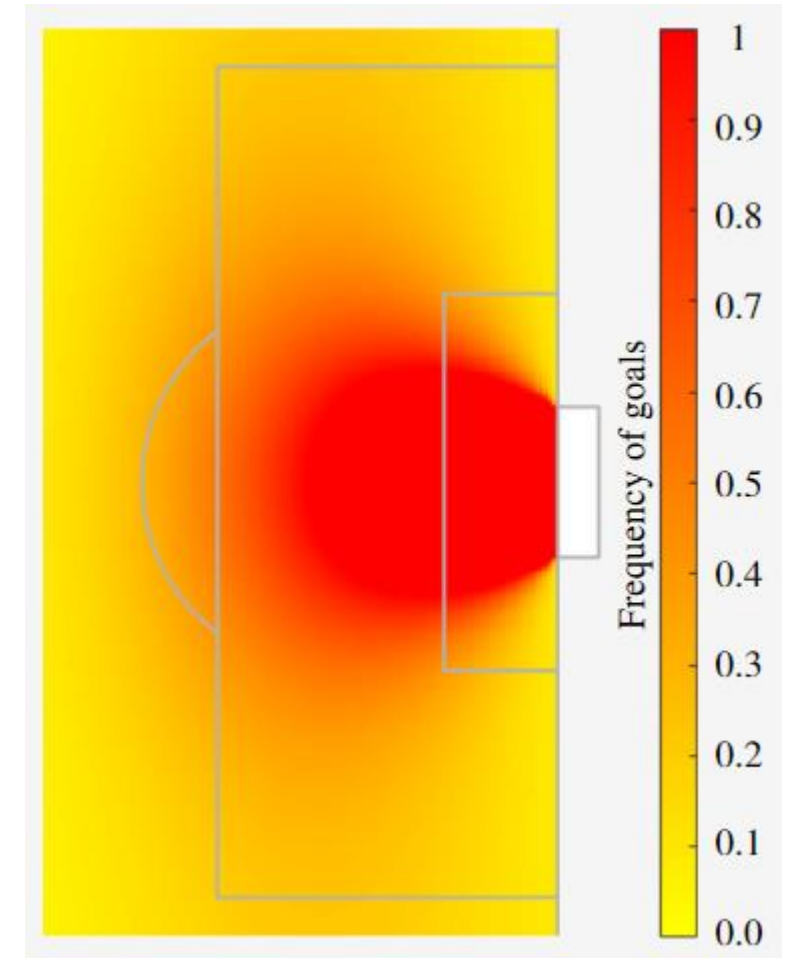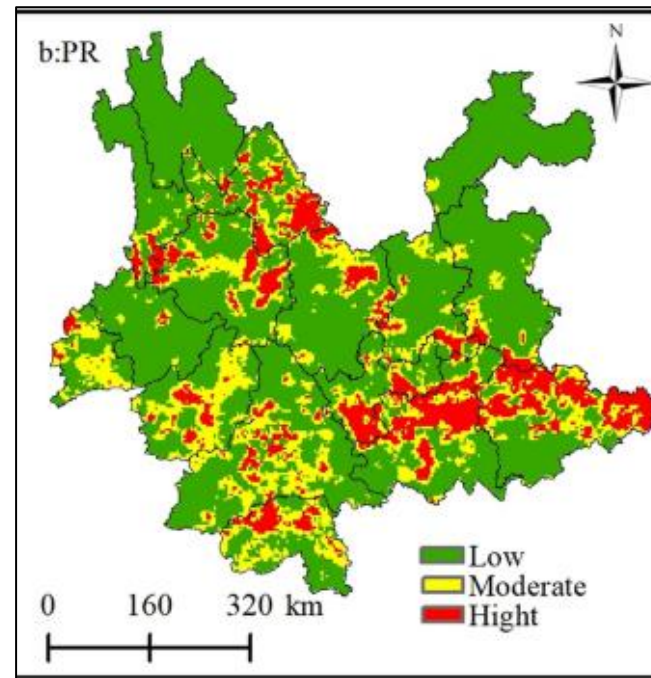
And Many More Applications…

- Article classification
- Flagging offensive comments on discussion forums
- Summarizing long documents
- Forecasting the company's revenue
- Fraud detection
- …

Ready to make this year amazing!