

# Welcome to PY599 Applied Artificial Intelligence

## Session 1: Course Introduction

**Fall 2018**

**NC State University**

**Instructor: Dr. Behnam Kia**

**Course Website: <https://appliedai.wordpress.ncsu.edu/>**

# Session 1: Course Introduction

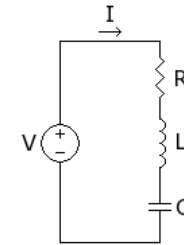
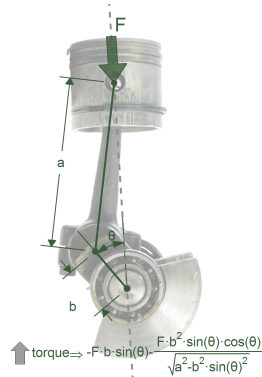
- In this session we introduce the course
- Our mission and what this course is and what is not!
- Classroom and grading policy
- No technical discussion about AI itself
  - Session 2: Demystifying AI, the Big Picture.

# Hands-on Exercise

- What is an AI problem and what is not?

# What is an AI problem?

- If the problem is described by a set of formal mathematical rules (coming from Math, Physics, Chemistry, Biology, etc.), and there are known methods to solve it, develop a conventional computer program and solve it. Usually this is **not** an AI problem – unless it has exponential complexity.



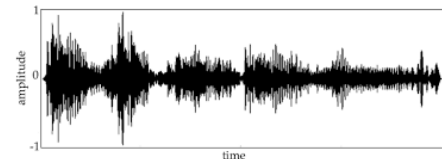
$$RI(t) + L \frac{dI(t)}{dt} + V(0) + \frac{1}{C} \int_0^t I(\tau) d\tau = V(t).$$

- If there is no formal mathematical description to the problem, but the problem is easy for humans to solve (intuitively), then this is an AI problem.

Classification  
Dog/Cat?



Speech Recognition



# What is Artificial Intelligence

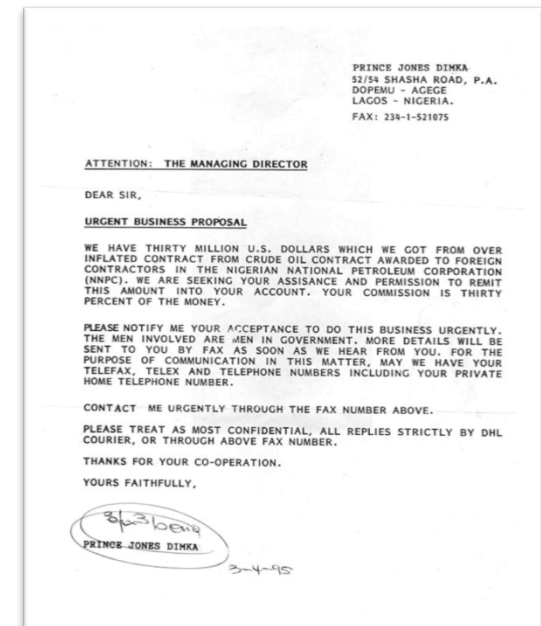
- Artificial intelligence “tries” to mimic human intelligence.
- So far AI methods have been problem-specific, and we have no general-purpose, human-like General AI system.
- In this course we focus on these problem-specific AI methods, also known as Narrow AI.



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# New Additions to AI (Machine Learning) Problems

- Extracting knowledge from Big Data
  - And usually there is no formal, solution.
- Solving dynamic and varying problems.
  - The static version of the problem may or may not have a formal solution. But when the problem changes, so should the solution. This is not trivial.



Spam email list  
Aug 23, 2018

# AI Problems

- Problems simple for humans, but not for computers.
- Extracting knowledge from Big Data.
- Solving dynamic, varying problems.

# AI Problems

## Another Common Definition

- Problems that have no formal method to solve.
  - This is correct, but there are limitations.



# AI: Solving problems that have no formal solution

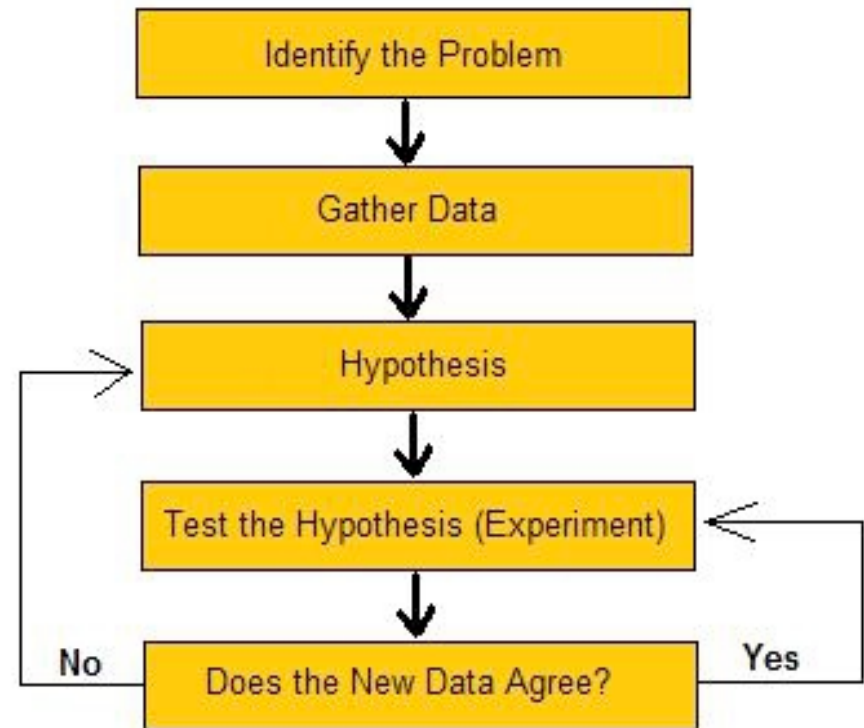
## Caveat

- So can we expect AI to solve problems such as:
  - What is on the dark side of the moon?
  - What color are aliens?
  - What happens after death?
  - ...

# AI Problems: Problems with no formal solution

## Caveat

- Artificial Intelligence is not black magic!
- AI follows scientific method and requires observation, data collection, experimentation, etc.



### Scientific Method

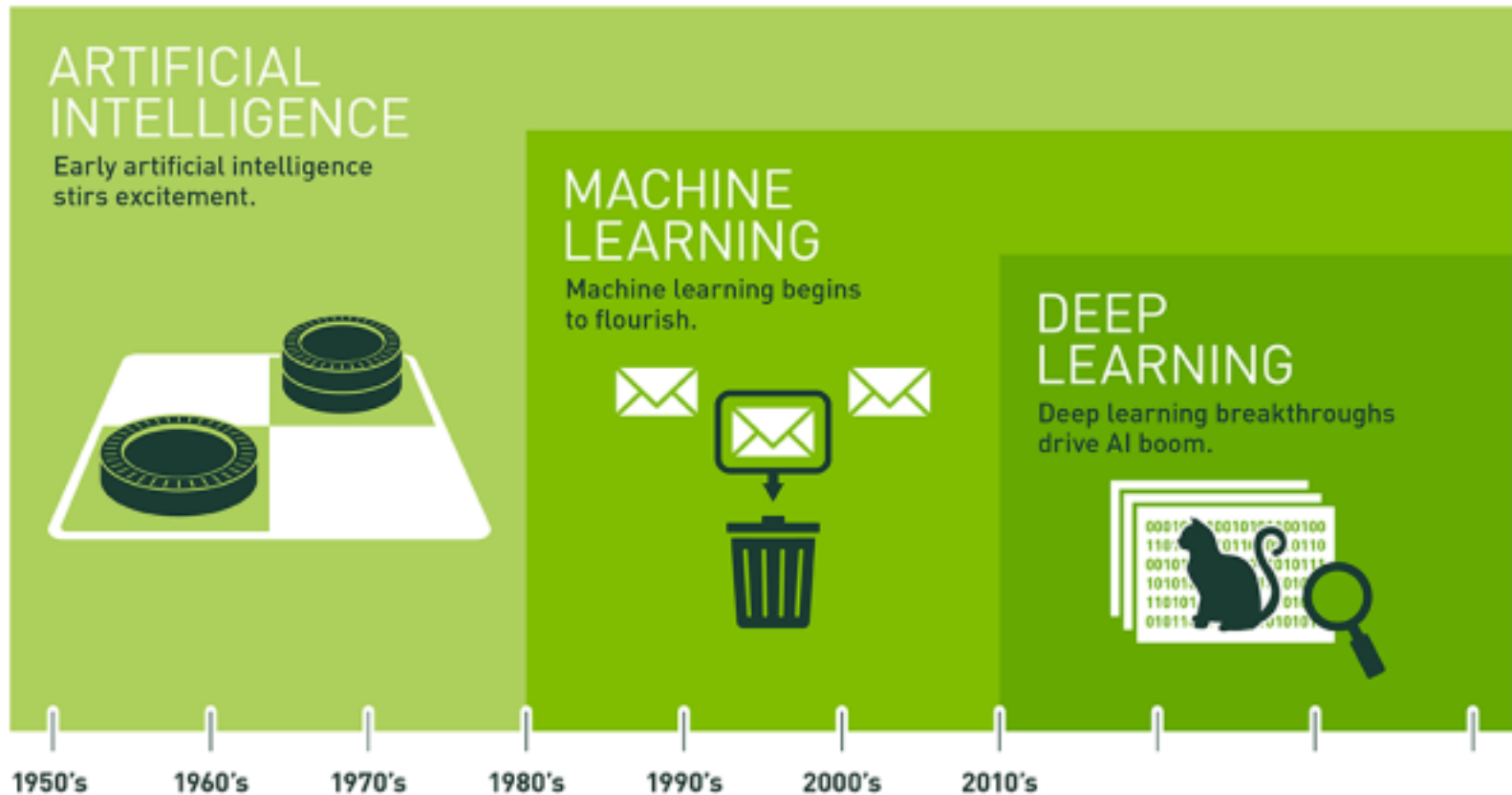
# Plan for Session 2

**Aug 28, 2018**

## **Session 2: Demystifying AI, the Big Picture**

We will be discussing AI methods and AI solutions.

# Artificial Intelligence

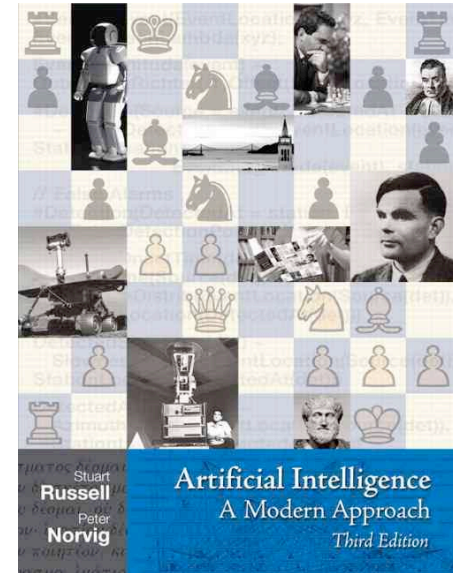


Picture from NVIDIA's deep learning institute

# **What this course is and what it is not!**

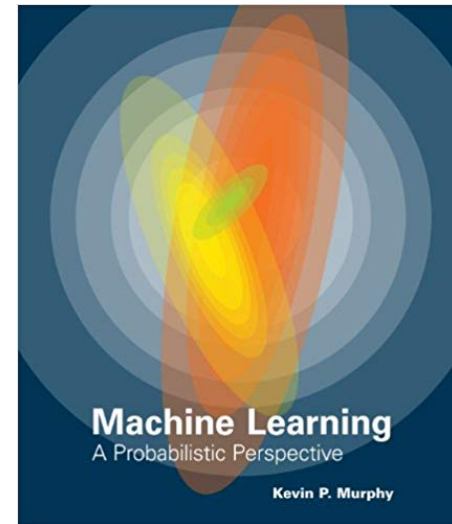
# What this course is not!

- This is not a classic course on old-fashioned Artificial Intelligence.
  - But we will briefly review old-fashioned AI with a few examples, and will compare it with modern machine learning and deep learning.



# What this course is not!

- This is not a classic course on Probabilistic Machine Learning.
  - But we will briefly review it, and will compare it with Deep Learning.



# What this course is not!

- This is not an advanced deep learning course on Image Processing, Natural Language Processing, etc.
  - But we will introduce the foundation and will have a few introductory examples from different fields.



# What this course is not!

- This is not a programming course on Python, TensorFlow, Keras,.....
  - But this is a hands-on course and we will have many programming examples and projects.

# What this course is not!

- This is not a theoretical course on AI
  - But we will study the main theories, though mostly intuitively.

# What this Course Is About?

- An introductory, hands-on course to Applied AI, with main focus on modern deep learning.

# What can you expect from this course?

At the end of the semester you will:

- Know what an AI problem is and what is not!

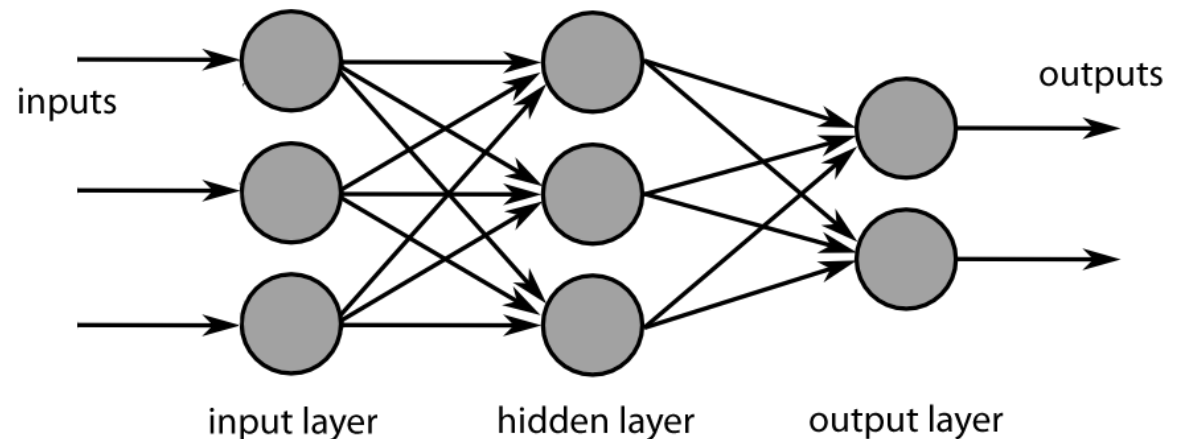


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# What can you expect from this course?

At the end of the semester you will know:

- What is an AI problem and what is not!
- You will learn the basic foundations of deep learning and how to apply it to AI problems.



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At the end of the semester you will know:

- What an AI problem is and what is not!
- You will learn the basic foundations of deep learning and how to apply it to AI problems.
- You will gain basic hands-on experience with AI development tools and software.

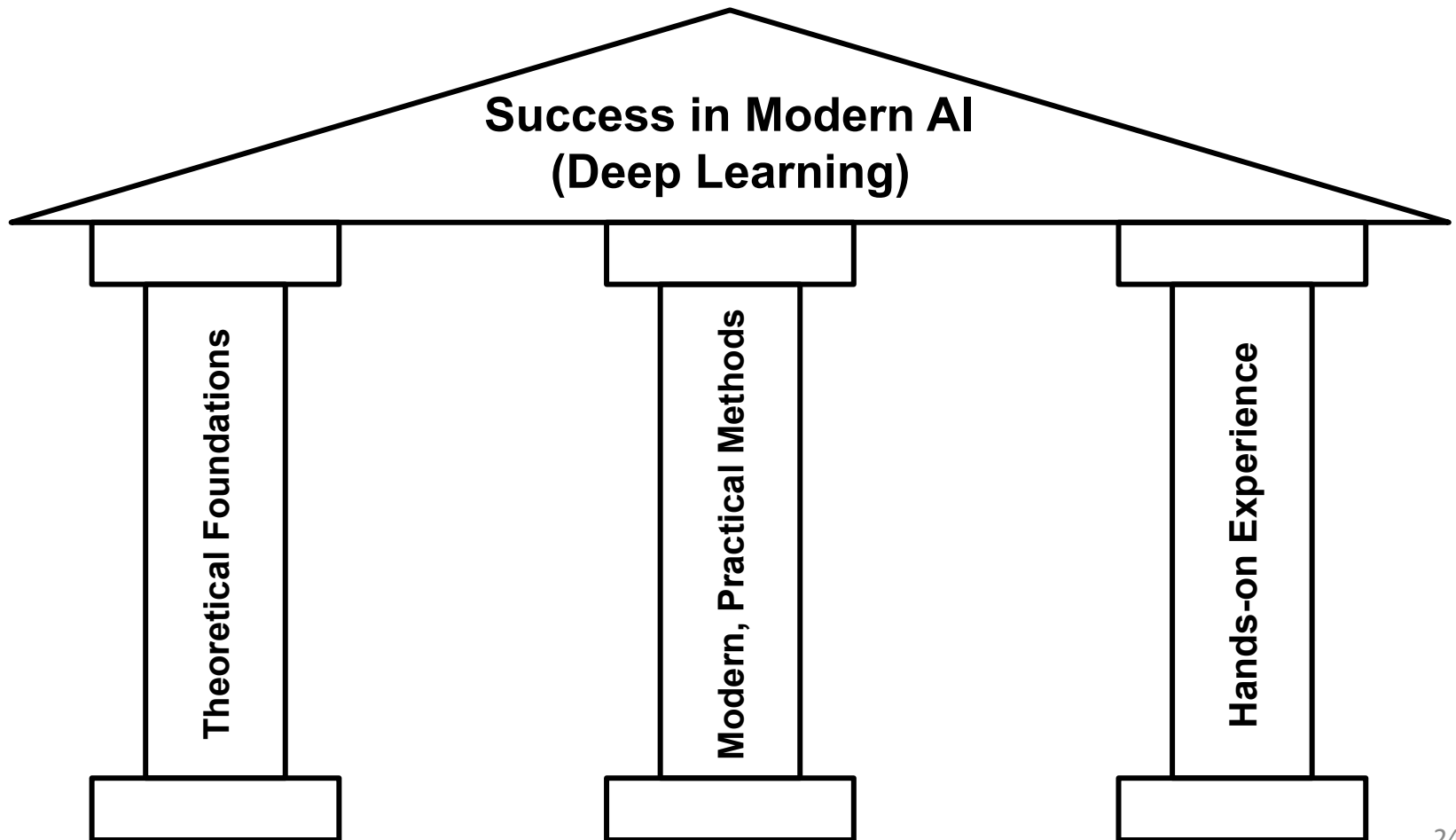


# What you can expect from this course?

At the end of the semester you will:

- know what an AI problem is and what is not!
- learn the basic foundations of deep learning and how to apply it to AI problems.
- gain basic hands-on experience with AI development tools and software.
- get enough experience, knowledge, and confidence to pursue on your own and learn more advanced topics.

# Three Pillars to Success in Modern AI (Deep Learning)



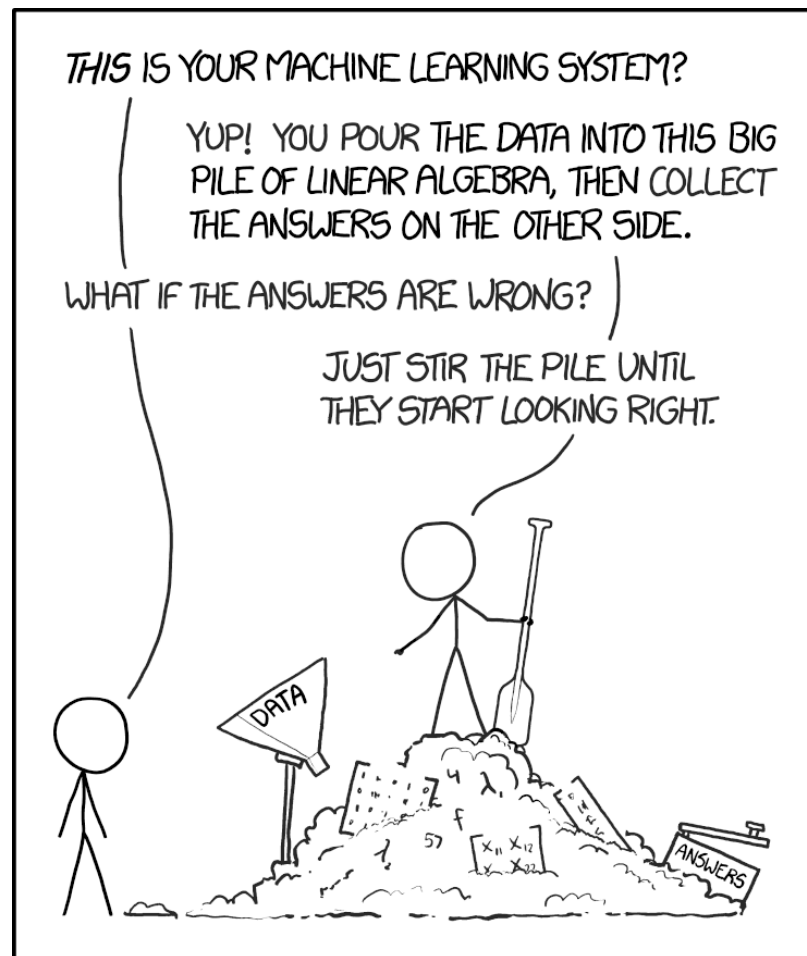


# Theoretical Foundations

- Without a basic understanding of modern AI (deep learning) concepts, we will learn nothing more than a cook book of ad hoc techniques!
- These cook-book recipes will expire and will be outdated sooner or later, leaving us with nothing!

# Theoretical Foundations

- A basic understating of the inner mechanism of deep learning enable the practices to apply and tune these methods better.



# Theoretical Foundations

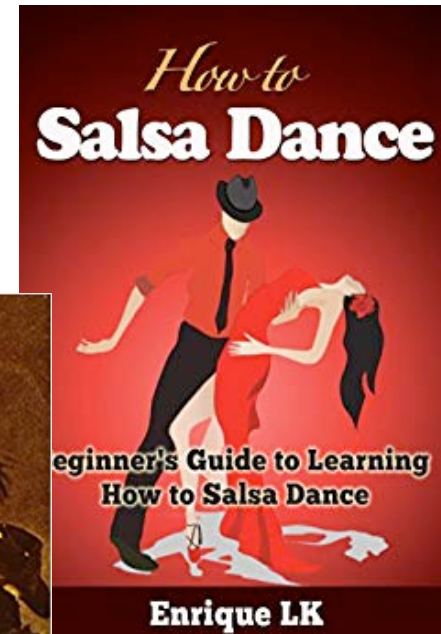
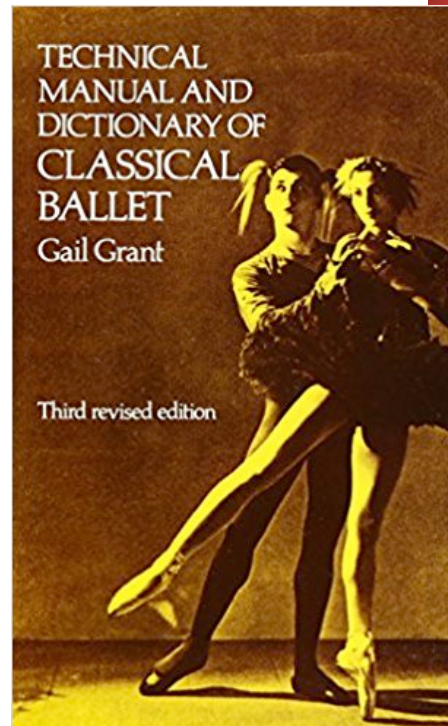
## Caveat

- Gap between theory and practice.
- Limited theoretical understanding of complex deep learning systems
- Will we ever gain a complete understanding?
- AI models that we can theoretically understand have limited performance, high performance models lack solid theoretical basis.

# Modern, Practical Methods

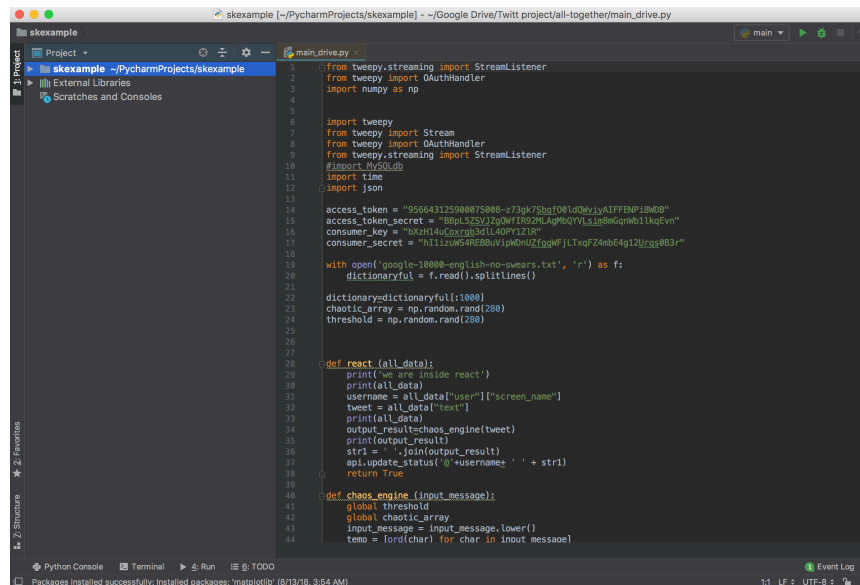
# Practice and Execution of Techniques

- Can you learn how to dance by just reading books?



# Practice and Execution of Techniques

- Can you learn how to dance by just reading books?
- Similarly, you will not learn AI and machine learning until you practice it and put it to use!



```
1 from tweepy.streaming import StreamListener
2 from tweepy import OAuthHandler
3 import numpy as np
4
5
6 import tweepy
7 from tweepy import Stream
8 from tweepy import OAuthHandler
9 from tweepy.streaming import StreamListener
10 #imports from @
11 import time
12 import json
13
14 access_token = "956643125900875008-z73qk75bgf00LdQvYiyAIFFNp18MBD"
15 access_token_secret = "88pL52SjZgqWfR92MLAgMbQVVsIm8mQmB1kqEvn"
16 consumer_key = "8kxrt46Coxz28j1L40Nf1Z1W"
17 consumer_secret = "H11izwS4RE888v1p0dN1ZlgqWFjLTxFZ4ebE4g12jras0E3r"
18
19 with open('google-10000-english-no-swears.txt', 'r') as f:
20     dictionary = f.read().splitlines()
21
22 dictionary = dictionary[1:1000]
23 chaotic_array = np.random.rand(280)
24 threshold = np.random.rand(280)
25
26
27
28 def react(all_data):
29     print('we are inside react')
30     print(all_data)
31     username = all_data["user"]["screen_name"]
32     tweet = all_data["text"]
33     print(all_data)
34     output_result = chaos_engine(tweet)
35     print(output_result)
36     str1 = '\n'.join(output_result)
37     api.update_status('@' + username + ' ' + str1)
38     return True
39
40 def chaos_engine(input_message):
41     global threshold
42     global chaotic_array
43     input_message = input_message.lower()
44     temp = [ord(char) for char in input_message]
```

# Practice and Execution of Techniques

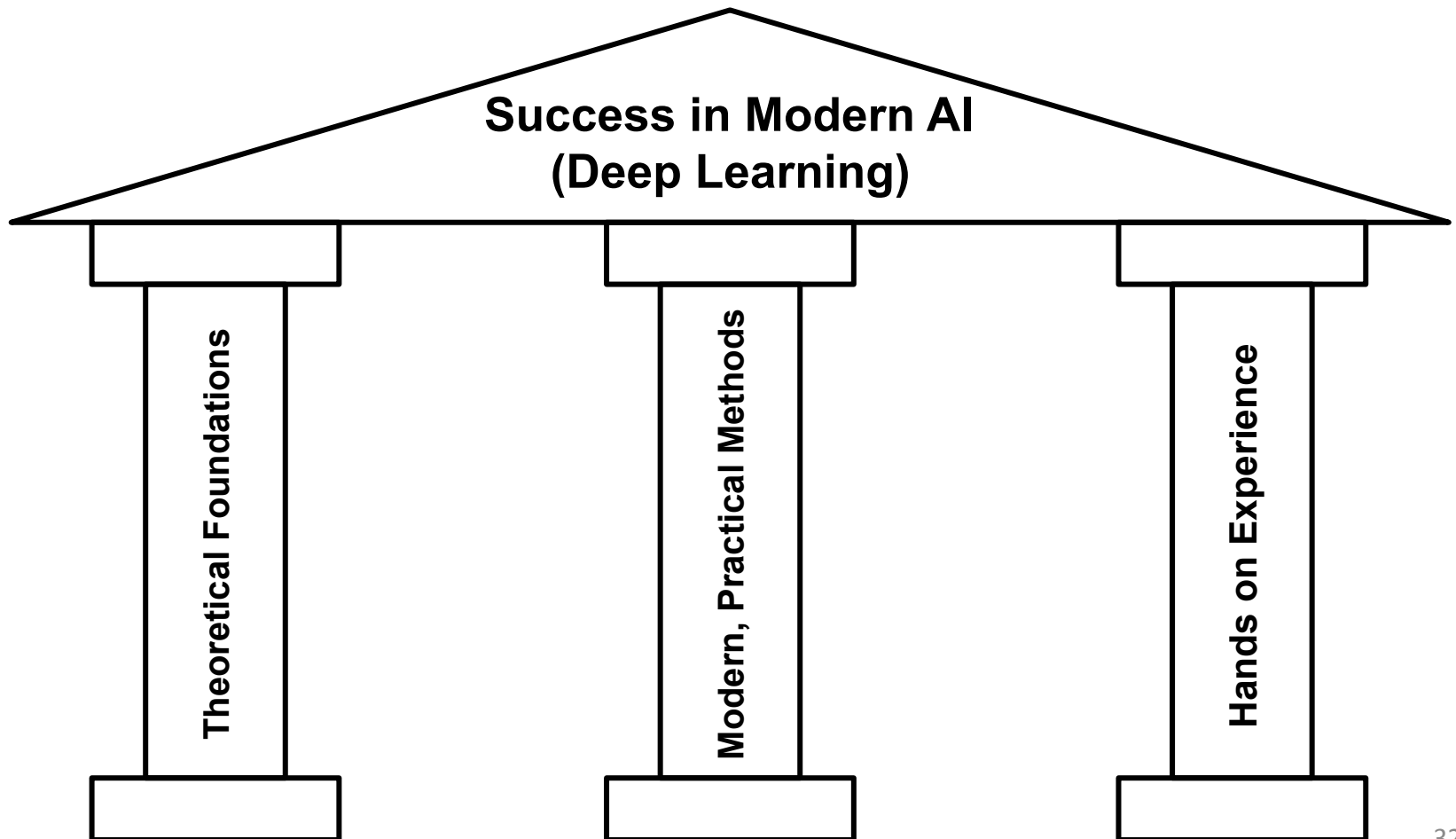
- Machine learning practitioner and developer are the same person!
- Usually you have to program and develop your own solutions.

```

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5
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10 #imports numpy
11 import time
12 import json
13
14 access_token = "956643125900875008-z73qk75bgf00LdQvYiAIFFNp18MBD"
15 access_token_secret = "88pL523Uz9qNfR92MLAgM0YV1sIn8mQmB1kqEvn"
16 consumer_key = "8kxrt46Cox2B31L40PFI2W"
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```

# Three Pillars to Success in Modern AI (Deep Learning)





# Grading: Attendance

- Attendance (10%)
- A few Grace Sessions

# Grading: Homework

- Homework (30%)
- Many of them will be computational and programming.
- Around 10 homework assignments.

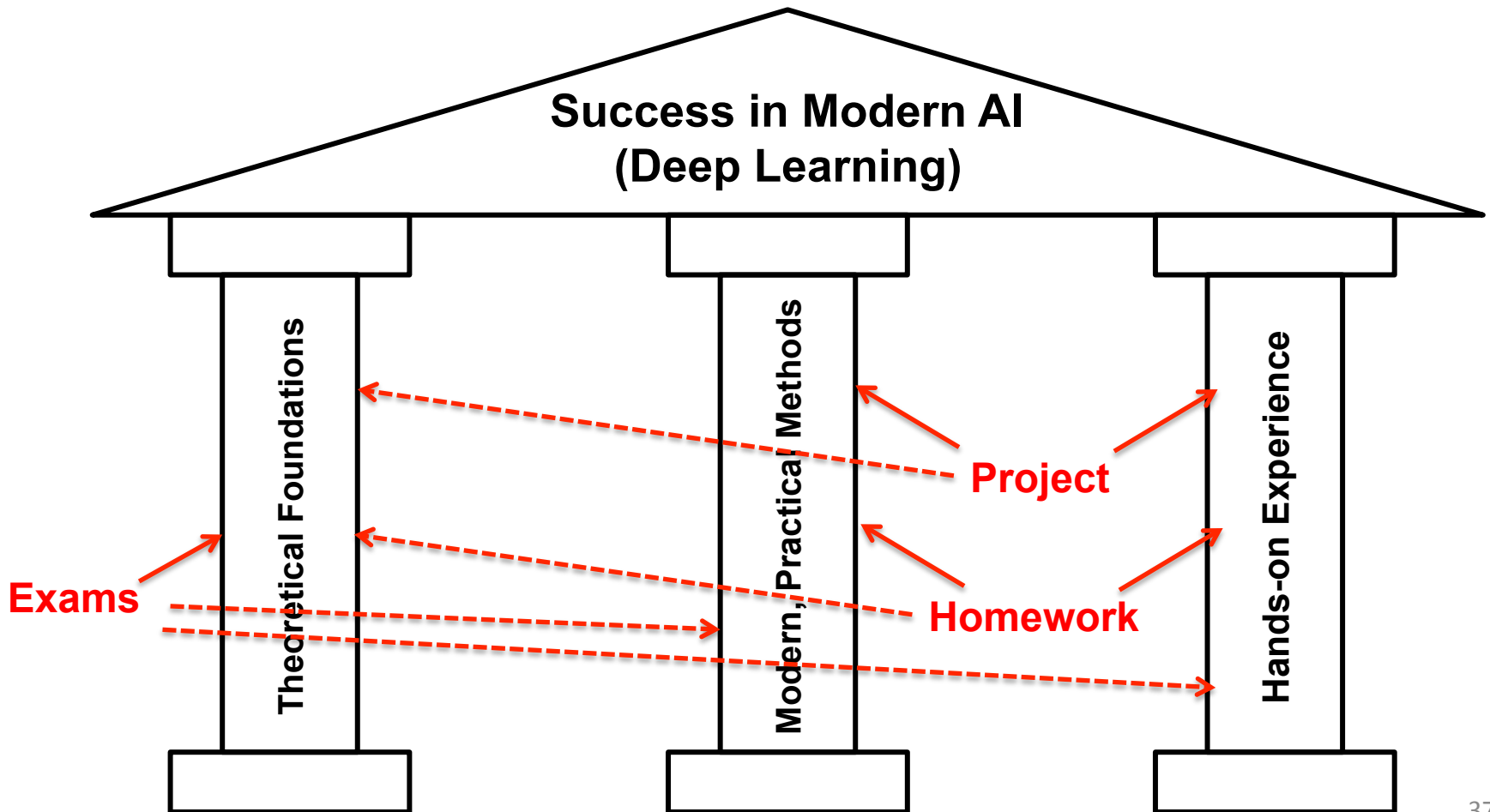
# Grading: Final Project

- 3-Person Group Projects (30%)

# Grading: Exams

- Two exams: midterm and final (30%, 15% each)
- There will be review sessions.
- Both review sessions and exams are a learning experience.

# Student Activities and Grading



# COS's Policies for Interactive Classes



These computers belong to you and the rest of NC State people. The College is not funded to replace equipment damaged by spills. A new MacBook Pro costs more than \$1,000 and the microphones on the tables cost \$500 to replace. So please be careful!

<https://sciences.ncsu.edu/intranet/college-offices/information-technology-it/cox-105110-active-learning-classrooms-scale-up/>

# COS's Policies for Interactive Classes

- When you are leaving, please just log out from the computers; do not shut down!
- And leave the lead open.



These computers receive updates remotely and regularly. When they are shutdown or closed, they will not receive the updates in a timely manner. And the students in the next class may encounter issues.

# Class Survey



# Class Survey

- Not an exam, there is no right or wrong answer.
- Please answer honestly. This will help me to adapt course curriculum to meet your needs.
- Your identity and your answers will remain anonymous. Some statistics will be shown in the class.
- This is not a prerequisite for PY-599!

- **Course website:** <https://appliedai.wordpress.ncsu.edu/>
- **Instructor's email address:** [bkia@ncsu.edu](mailto:bkia@ncsu.edu)

Please remember to include "PY599" in the subject line.

For example: "PY599: a question about..."

**Office:** Riddick Hall 224B

2401 Stinson Dr,  
Raleigh, NC, 27607

**Office hours:** Friday 3:00-4:15 (starting Aug 31st).

Additional office hours will be scheduled as we move forward.