



# **DIP: Introduction**

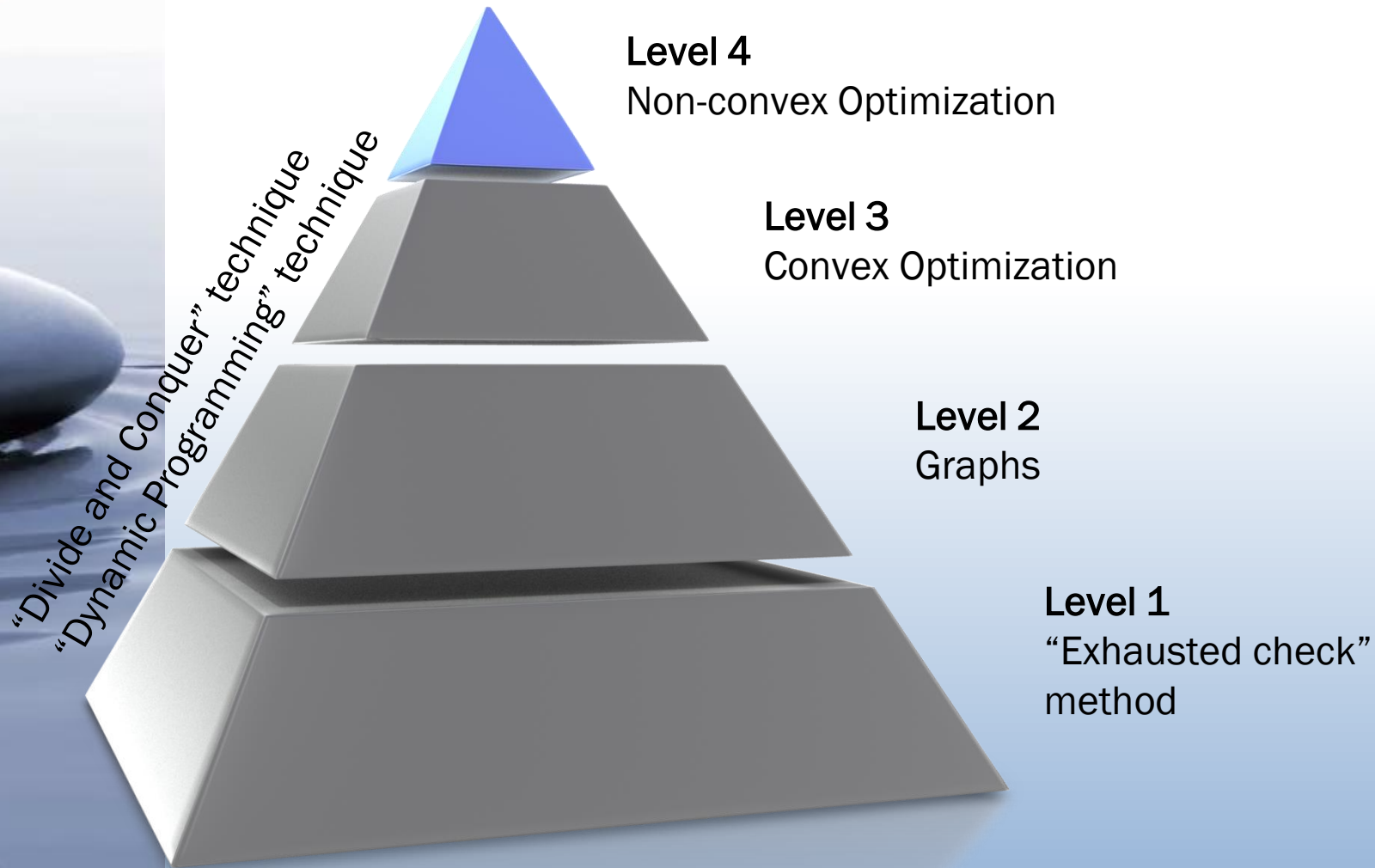
Presenter: Dr. Ha Viet Uyen Synh.



Part A

# **WHAT IS BIG DATA?**

# How to solve a problem in computer science?



# Example





# Example



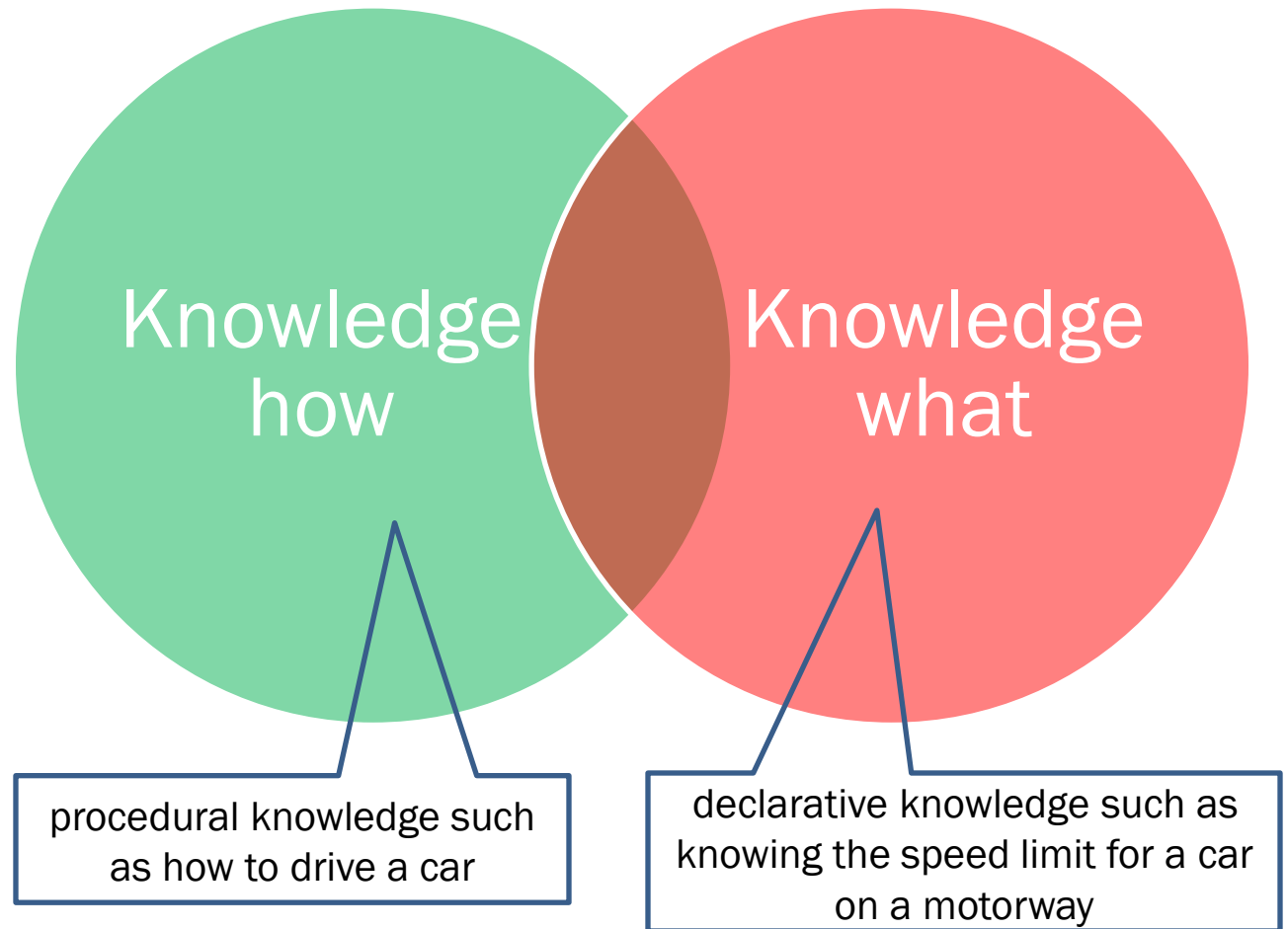
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49	49	99	40	17	81	18	57	60	87	17	40	98	43	69	45	04	56	62	00
81	49	31	73	55	79	14	29	93	71	40	67	58	08	30	03	49	13	36	65
52	70	95	23	04	60	11	42	68	14	68	56	01	32	56	71	37	02	36	91
22	31	16	71	51	67	33	59	41	92	36	54	22	40	40	28	66	33	13	80
24	47	33	60	99	03	45	02	44	75	33	53	78	36	84	20	35	17	12	50
32	98	81	28	64	23	67	10	26	38	40	67	59	54	70	66	18	38	64	70
67	26	20	68	02	62	12	20	95	63	94	39	63	08	40	91	66	49	94	21
24	55	58	05	66	73	99	26	97	17	78	78	96	83	14	88	34	89	63	72
21	36	23	09	75	00	76	44	20	45	35	14	00	61	33	97	34	31	33	95
78	17	53	28	22	75	31	67	15	94	03	80	04	62	16	14	09	53	56	92
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86	56	00	48	35	71	89	07	05	44	44	37	44	60	21	58	51	54	17	58
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01	70	54	71	83	51	54	69	16	92	33	48	61	43	52	01	89	19	67	48

What the computer sees

image classification

82% cat  
15% dog  
2% hat  
1% mug

# How do we represent what we know?





# Comparing Imperative and Declarative Languages

## Imperative Languages

- Procedural programming requires that the programmer tell the computer what to do.
- That is, *how* to get the output for the range of required inputs.
- The programmer must know an appropriate algorithm.

## Declarative Languages

- Declarative programming requires a more descriptive style.
- The programmer must know *what* relationships hold between various entities.
- Prolog provides a search strategy for free



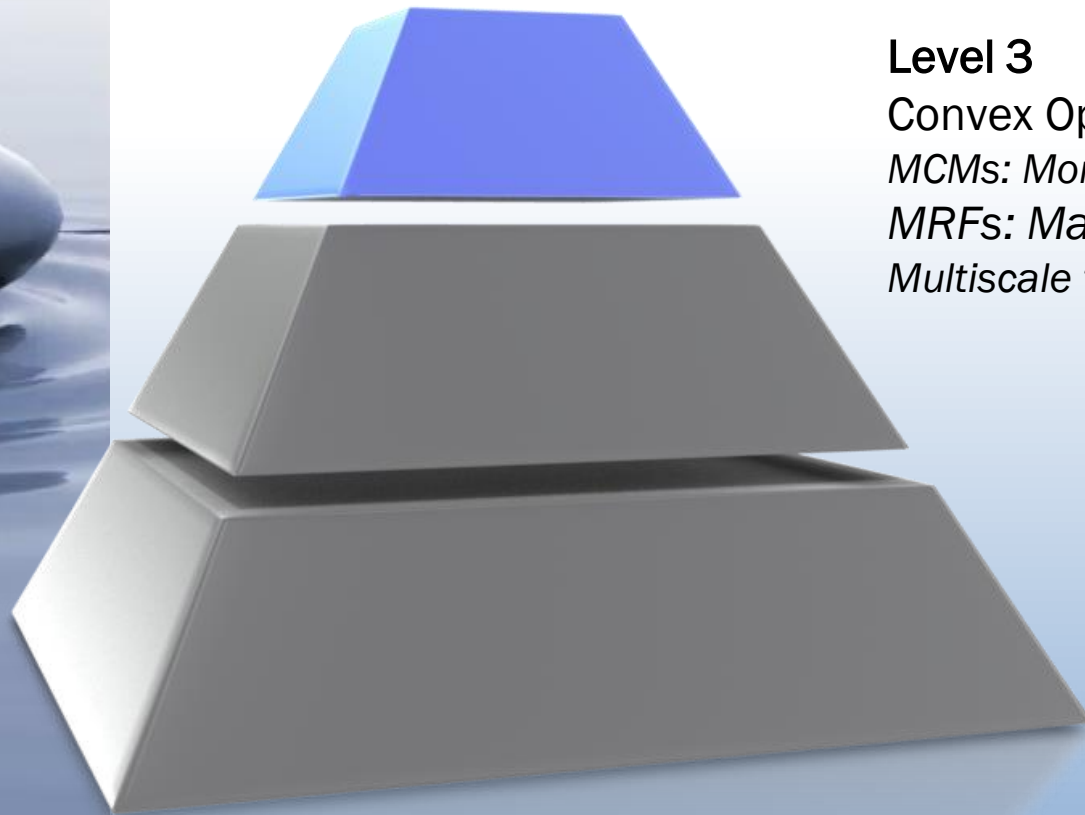
Part B

# **WHAT IS DEEP LEARNING?**



# How to solve a problem in computer science?

The number of states is huge, we can't check all of them. But there is a **mathematical model** for its domain.



## Level 3

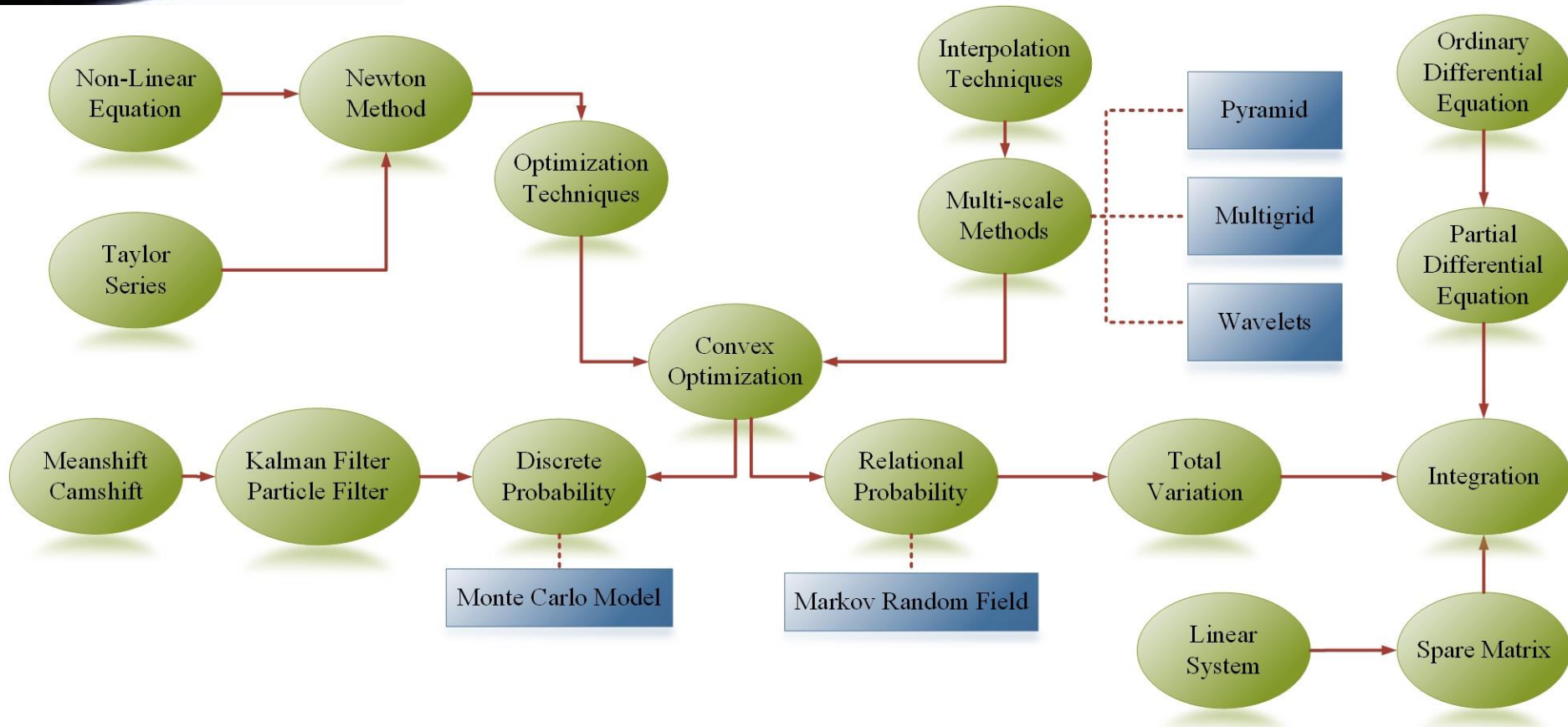
Convex Optimization

*MCMs: Monte Carlo Model*

*MRFs: Markov Random Field*

*Multiscale technique*

# The Mind map of Engineering Mathematics



# AI vs Machine Learning vs Deep Learning

**MASS**  
Density of the fluid

**ACCELERATION**  
How velocity experienced by a particle changes with time

**FORCE**  
All the forces that are acting on the fluid

$$\rho \left( \frac{\partial \mathbf{V}}{\partial t} + \mathbf{V} \cdot \nabla \mathbf{V} \right) = \nabla P + \rho \mathbf{g} + \mu \nabla^2 \mathbf{V}$$

Change in velocity over time

The speed and direction which the fluid is moving

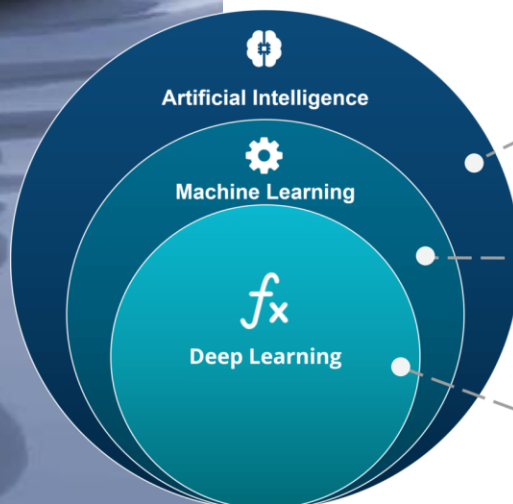
Internal pressure gradient of the fluid (the change in pressure)

External forces acting on the fluid (such as gravity)

Internal stress forces acting on the fluid (taking into consideration viscous effects)

## Navier-Stokes Equations

Describe the flow of incompressible fluids.



## ARTIFICIAL INTELLIGENCE

A technique which enables machines to mimic human behaviour

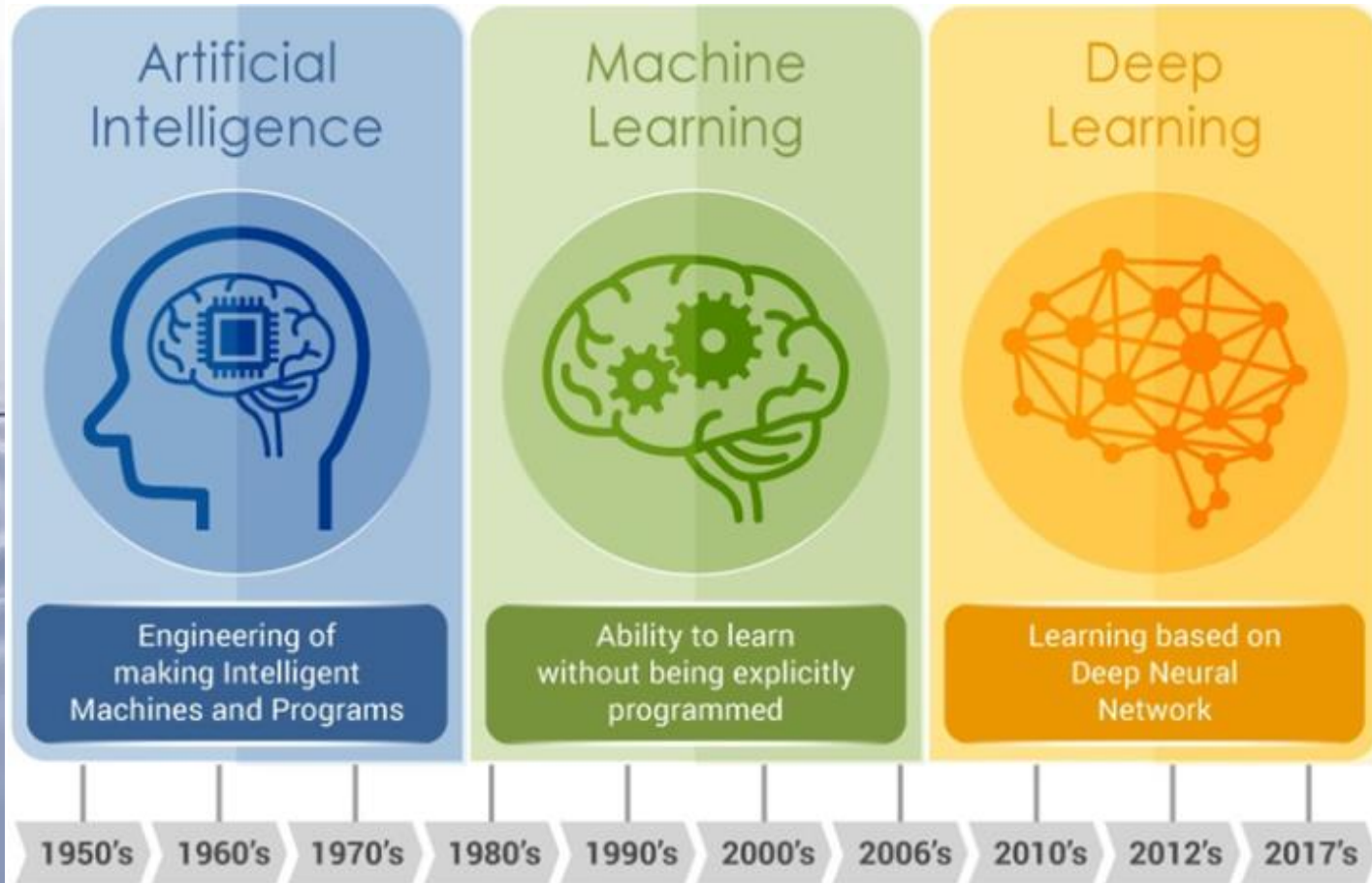
## MACHINE LEARNING

Subset of AI technique which use statistical methods to enable machines to improve with experience

## DEEP LEARNING

Subset of ML which make the computation of multi-layer neural network feasible

# AI vs Machine Learning vs Deep Learning



# Machine Learning vs Deep Learning

THIS IS YOUR MACHINE LEARNING SYSTEM?

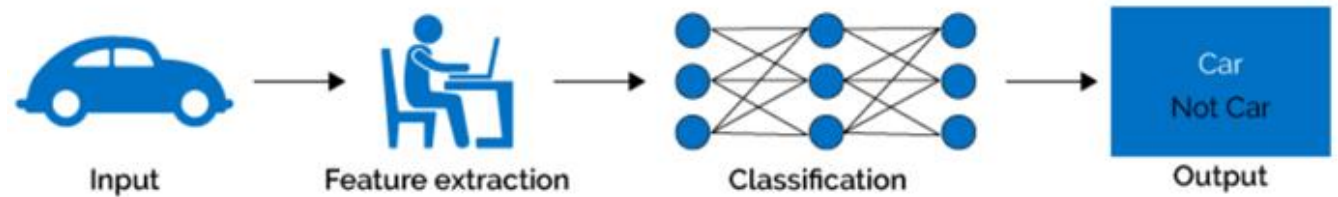
YUP! YOU POUR THE DATA INTO THIS BIG PILE OF LINEAR ALGEBRA, THEN COLLECT THE ANSWERS ON THE OTHER SIDE.

WHAT IF THE ANSWERS ARE WRONG?

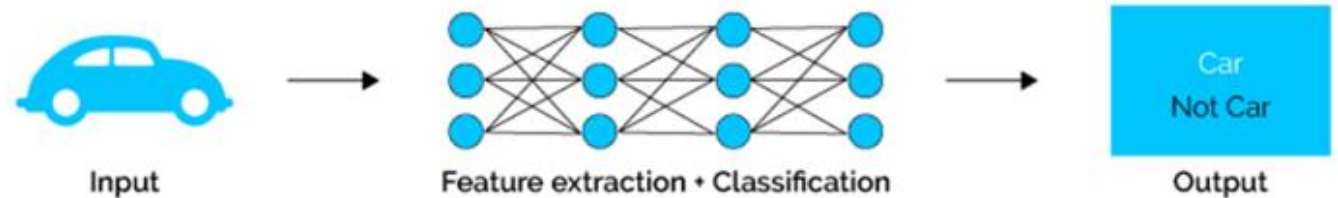
JUST STIR THE PILE UNTIL THEY START LOOKING RIGHT.



## Machine Learning

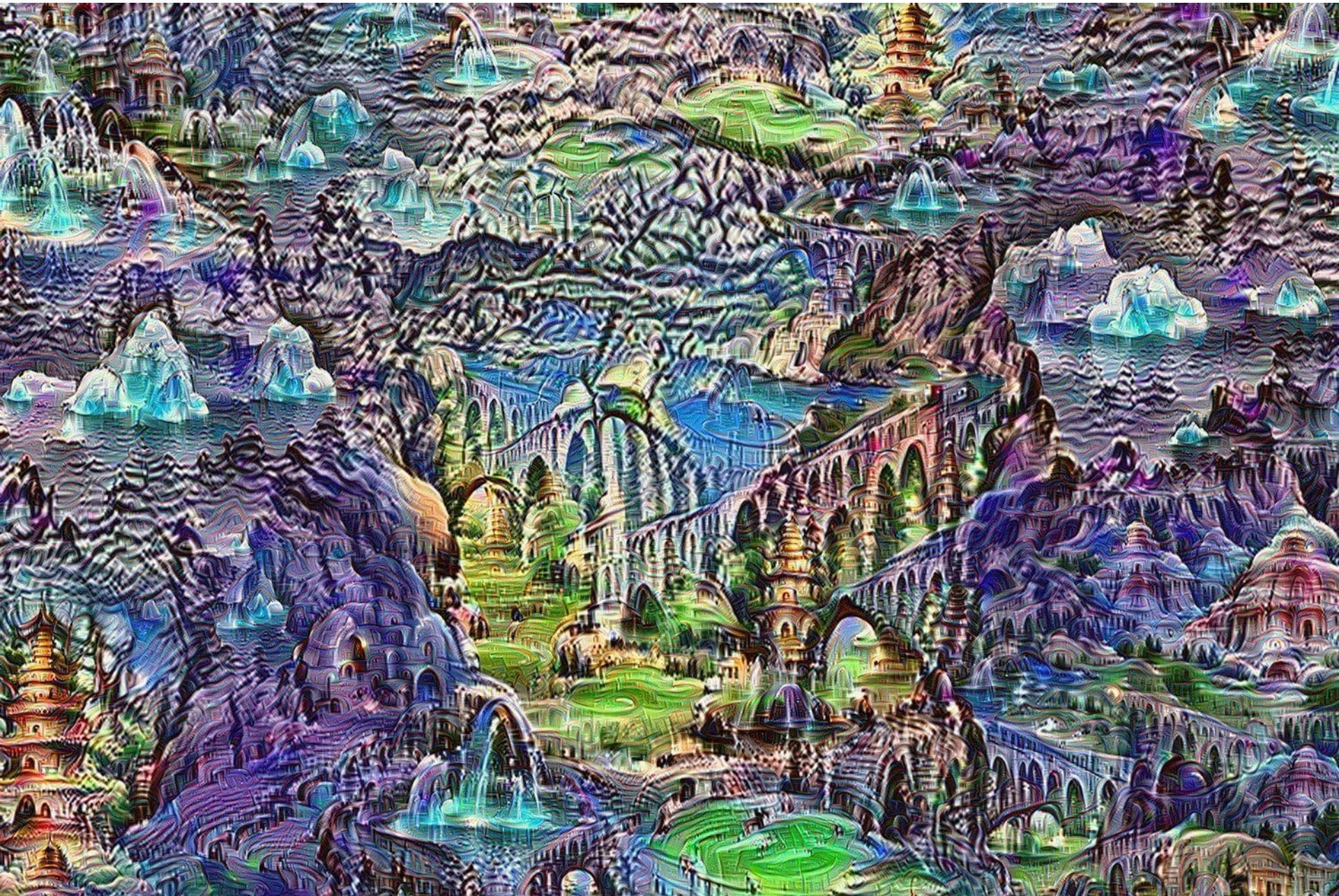


## Deep Learning



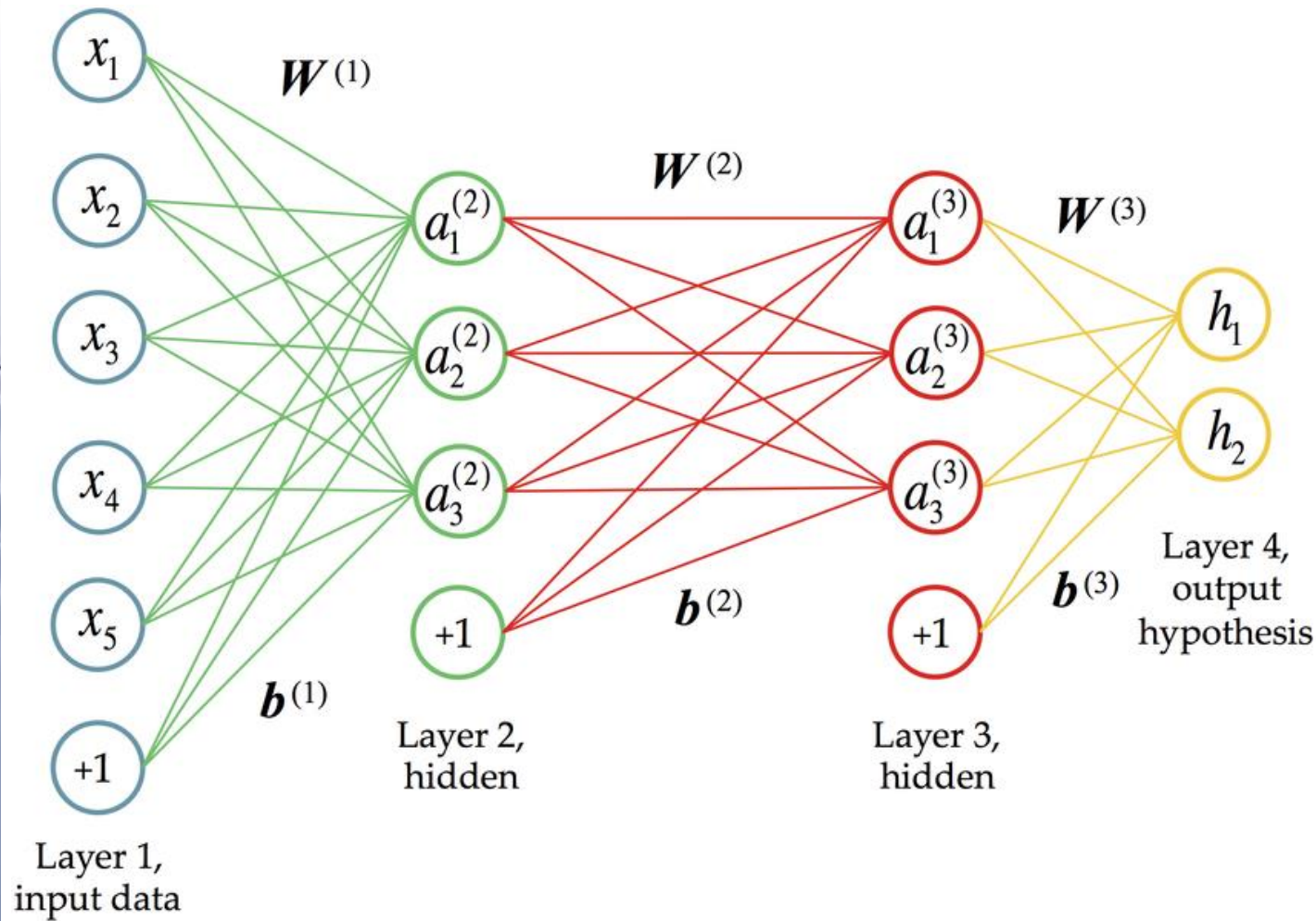


Check out art created with neural networks

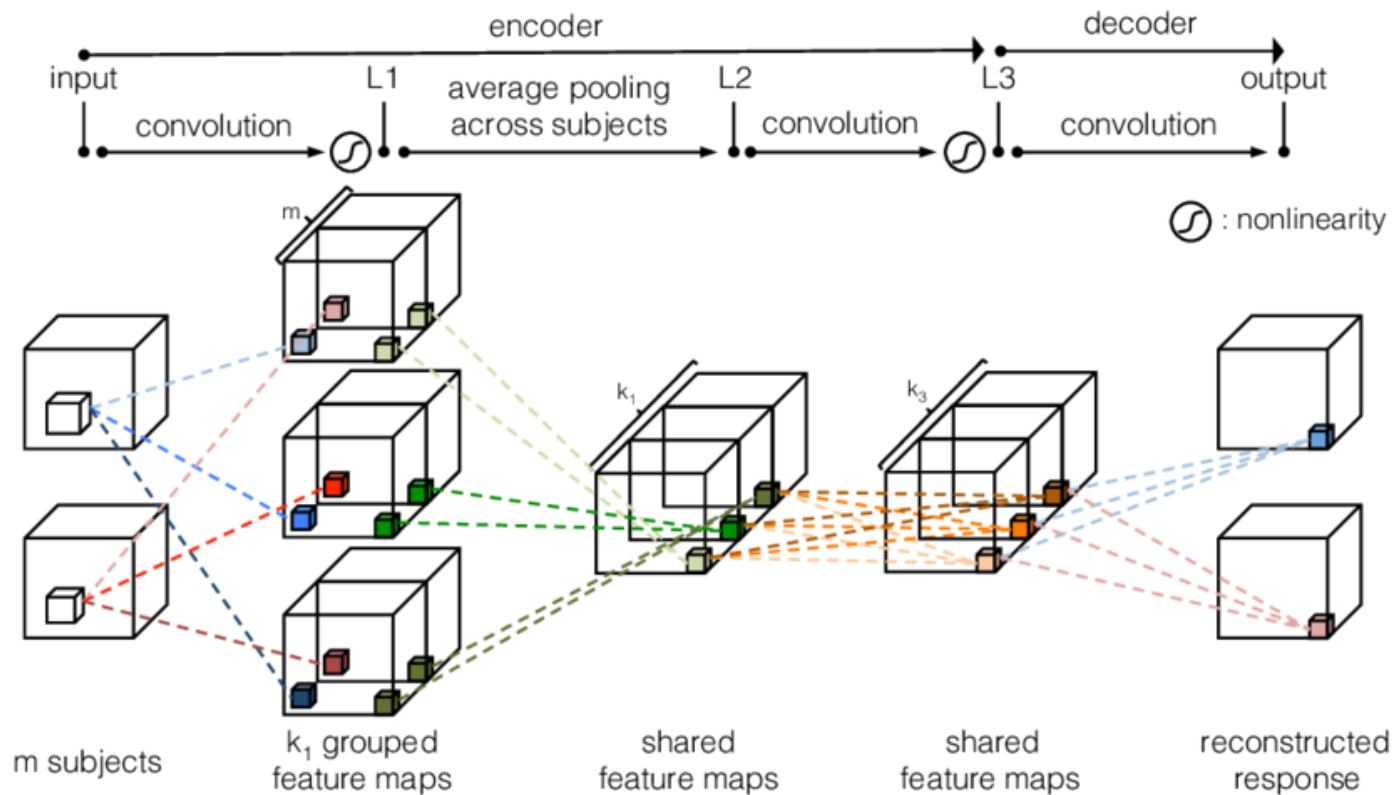




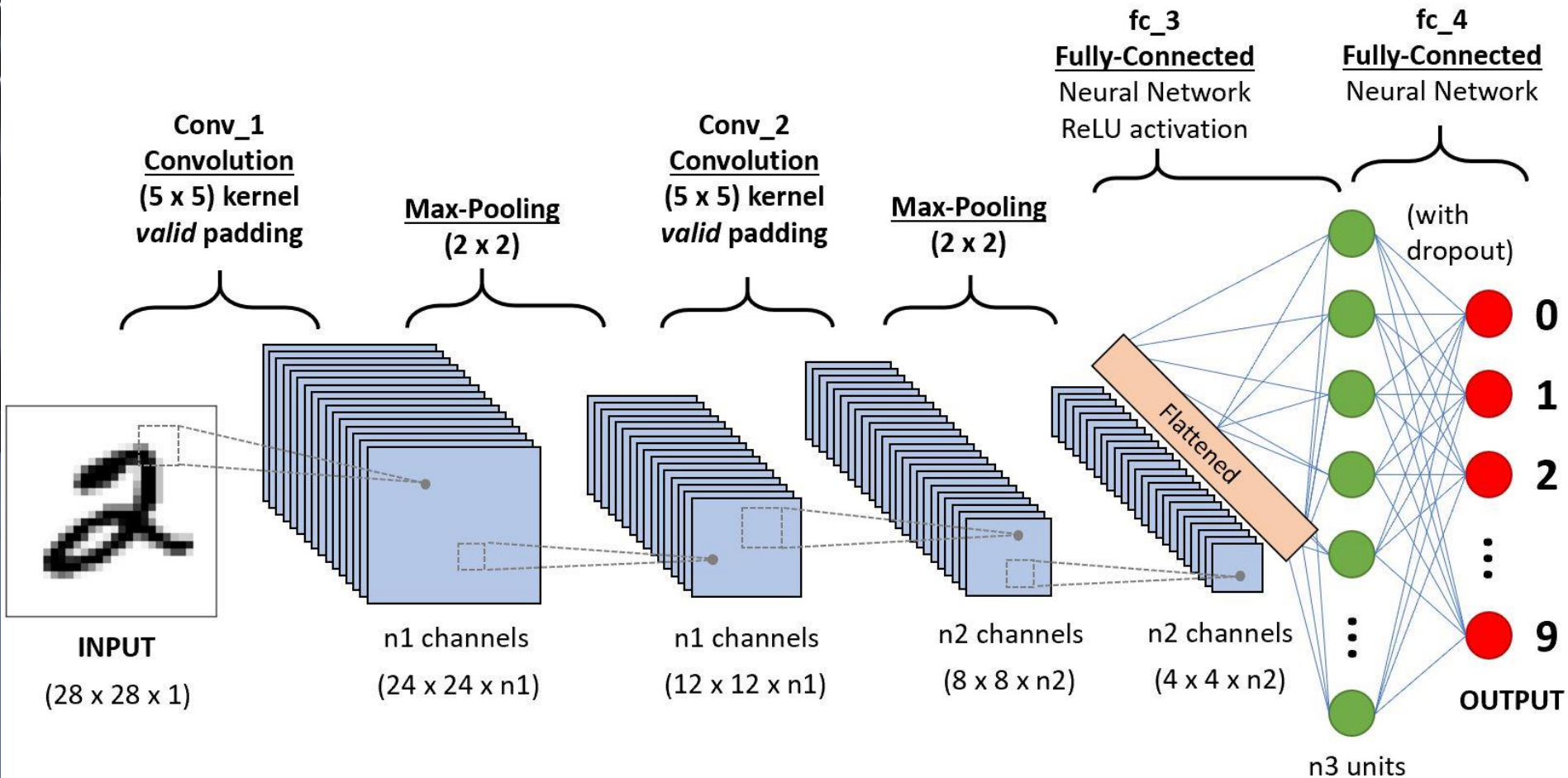
# Neural Network



# Deep Learning Network



# Deep Learning Network



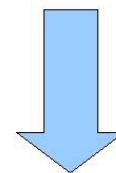
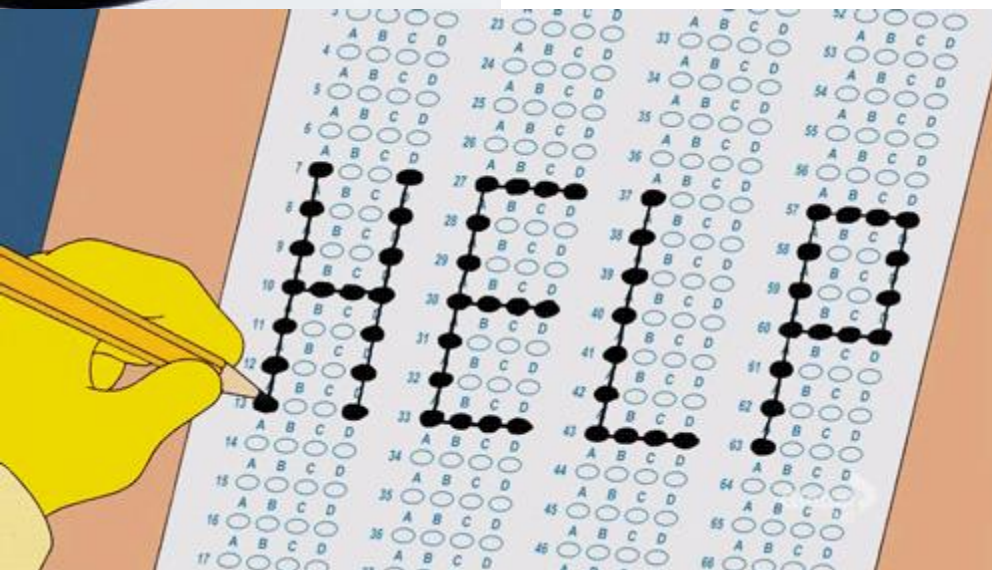


Part B

# **WHAT ARE YOUR LEARNING OUTCOMES??**



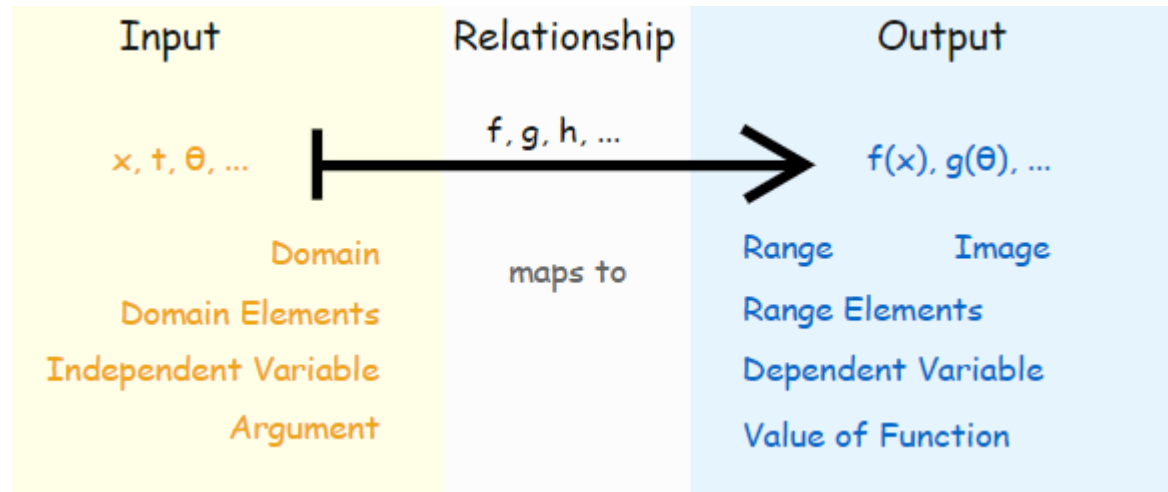
# Expected Results



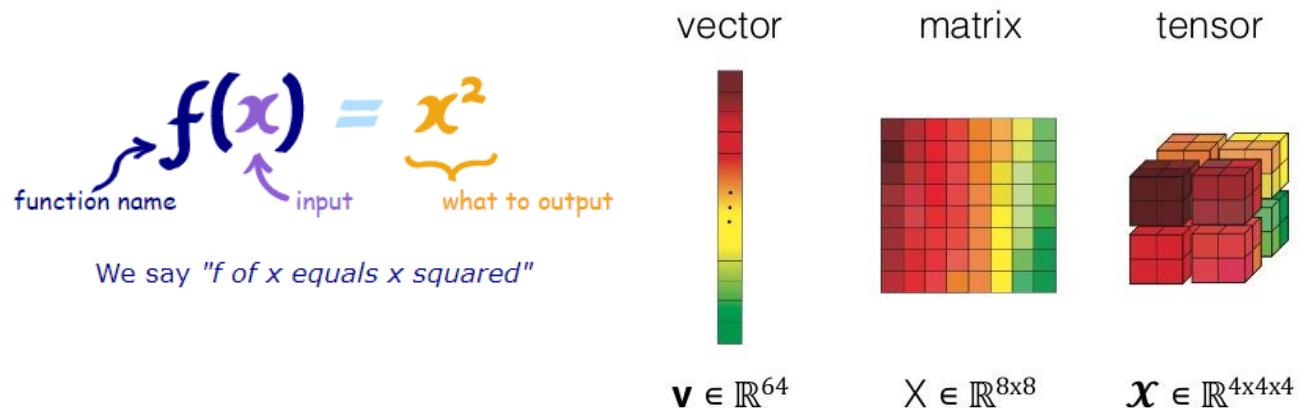
OCR

DL9CD5036

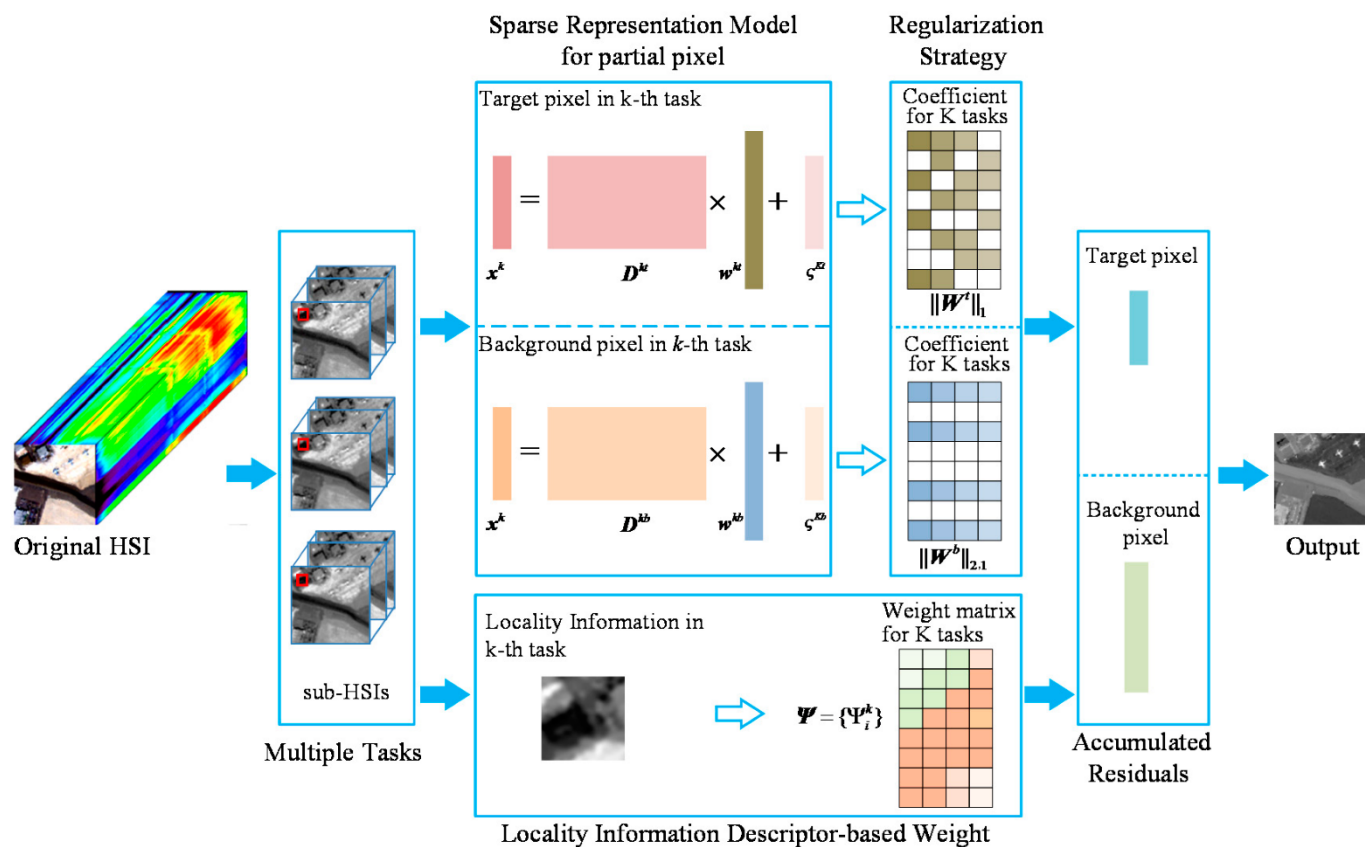
# Learning Outcomes



tensor = multidimensional array



# Learning Outcomes





# Grading

Quizzes: 10%

Lab. Assignments: 20%

Midterm Exam: 30%

Final Exam: 40%

# Questions? More Information?



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