Whatis, WhatisNot ML

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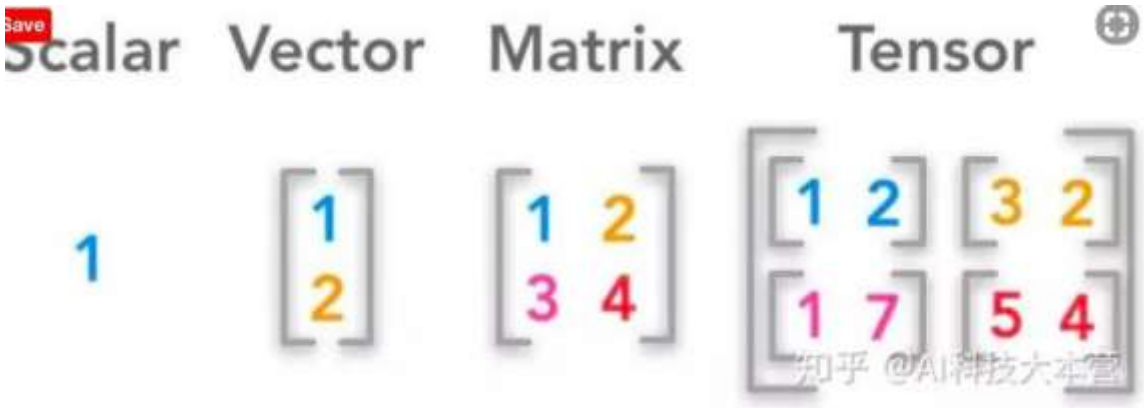
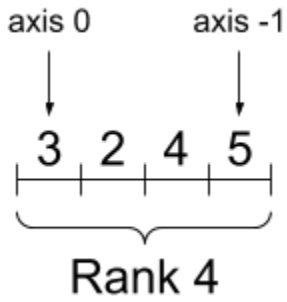
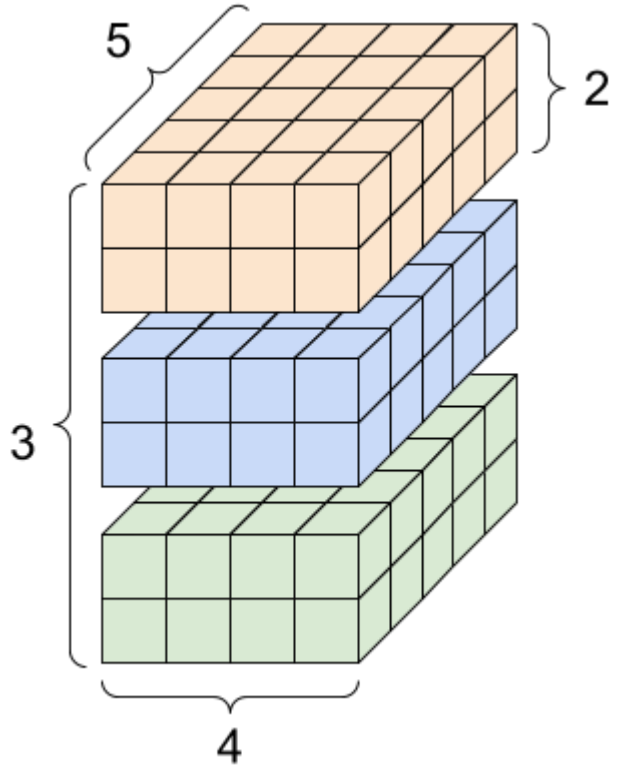
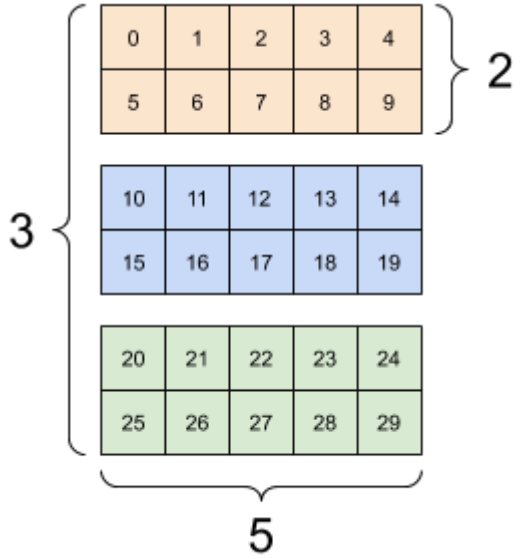
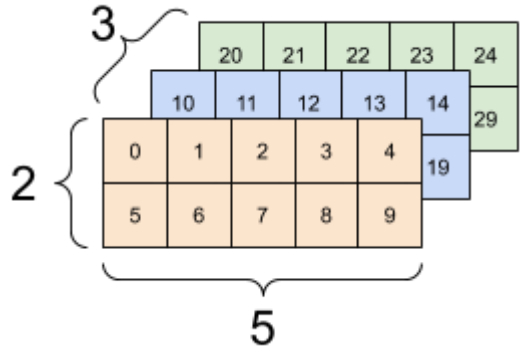


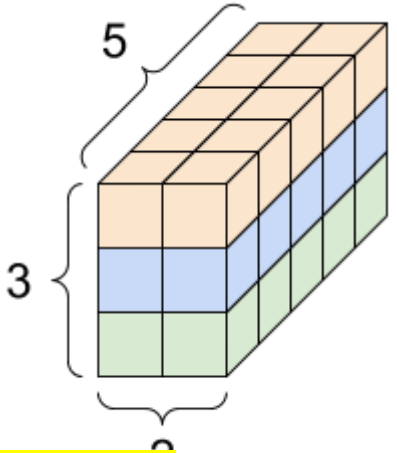






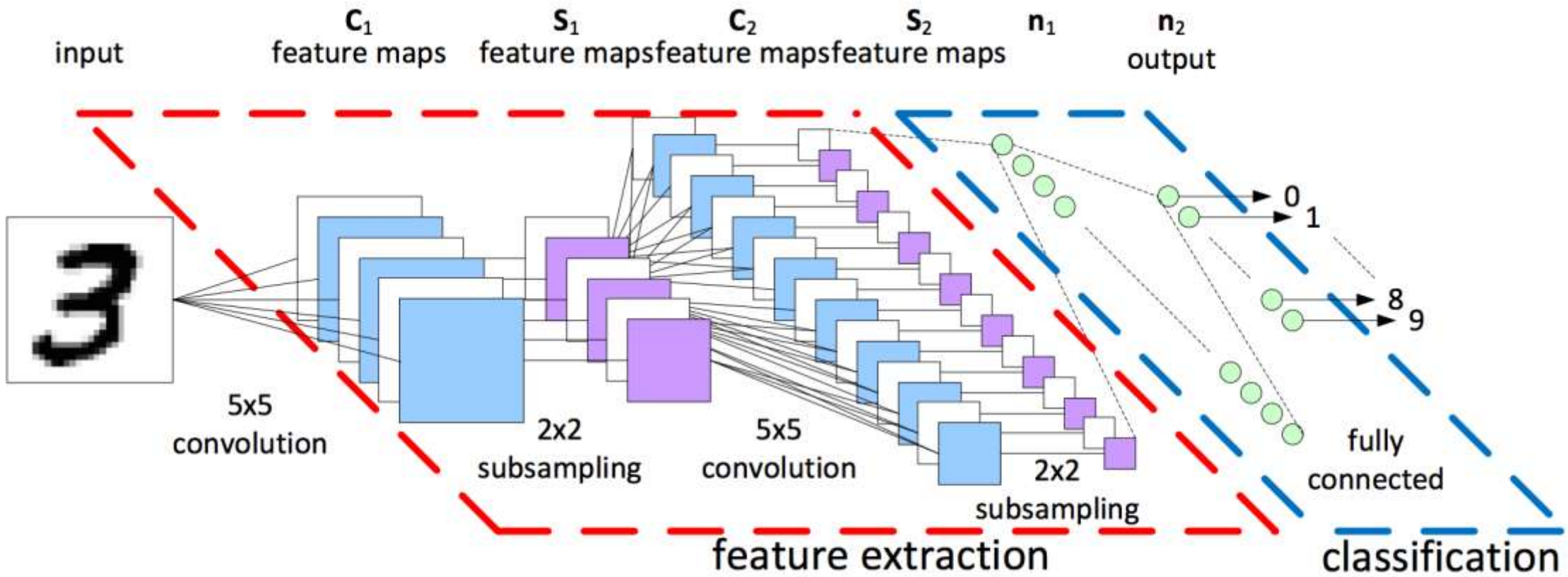
3x2x5 = 30 elements





STRUCTURE OF INDEX

Ref – link here and here.



Ref image here.

Intelligence

https://www.youtube.com/watch?v=6cAbgAaEOVE

Step	Operation
1	Input j1=5, j2=3, o=4
2	Fill j1 {j1 has 5}
3	Transfer j1 to j2 {j1 has 2, j2 has 3}
4	Empty j2 {j1 has 2,}
5	Trasnfer j1 to j2 {j2 has 2}
6	Fill j1 {j1 has 5, j2 has 2}
7	Transfer j1 to j2 {j1 has 4, j2 has 3}

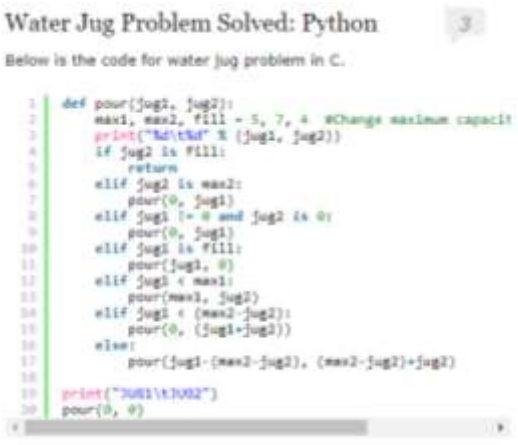
Step	Operation
1	Input j1=5, j2=3, o=4
2	Fill j2 {j2 has 3}
3	Transfer j2 to j1 {j1 has 3}
4	Fill j2 {j1 has 3, j2 has 3}
5	Transfer j2 to j1 {j1 has 5, j2 has 1}
6	Empty j1 {j2 has 1}
7	Transfer j2 to j1 {j1 has 1}
8	Fill j2 {j2 has 3}
9	Transfer j2 to j1 {j1 has 3}

Given 100000 such examples…

different combinations of input – 7 ltr and 12 ltr jugs, 9 ltr and 13 ltr jugs etc. several combinations

different output specifications – output 2 ltr, output 4 ltr, output 9 ltr etc.

Programatically these can be generated!!??



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Programatically these can be generated!!?? ***hundreds of programs in github :-D***

Inference – Resolution by refutation…

- (STEP 1) Pratijna: Goal: fire(mountain)
- (STEP 2) Hetu: smoke(mountain)
- (STEP 3) Udaharana:
  - haswood(x) -> iskitchen(x)
  - smoke(iskitchen(x)) -> fire(x)
- (STEP 4) Upanyana:
  - haswood(mountain)
  - smoke(iskitchen(z))

(STEP 5) Nigamana:

1. haswood(x) -> iskitchen(x)
2. smoke(iskitchen(x)) -> fire(x)
3. haswood(mountain)
4. smoke(iskitchen(z))
5. ~fire(mountain) ***[Negated goal]***
6. ~haswood(mountain) v iskitchen(mountain) [1, x=mountain]
7. iskitchen(mountain) ***[3,6 Resolution Rule]***
8. ~smoke(iskitchen(mountain)) v fire(mountain) [2, x=mountain]
9. ~smoke(iskitchen(mountain)) ***[5,8 Resolution Rule]***
10. smoke(iskitchen(mountain)) [4, z=mountain]
11. **Empty clause *[9,10 Resolution Rule]***

There exists x=mountain and z=mountain, such that ~(KB->Goal) is false -> For these values, **KB->Goal is true**.

Program evolution

https://www.youtube.com/watch?v=pgaEE27nsQw

field of signal processing, thereby inheriting a majority of techniques in the

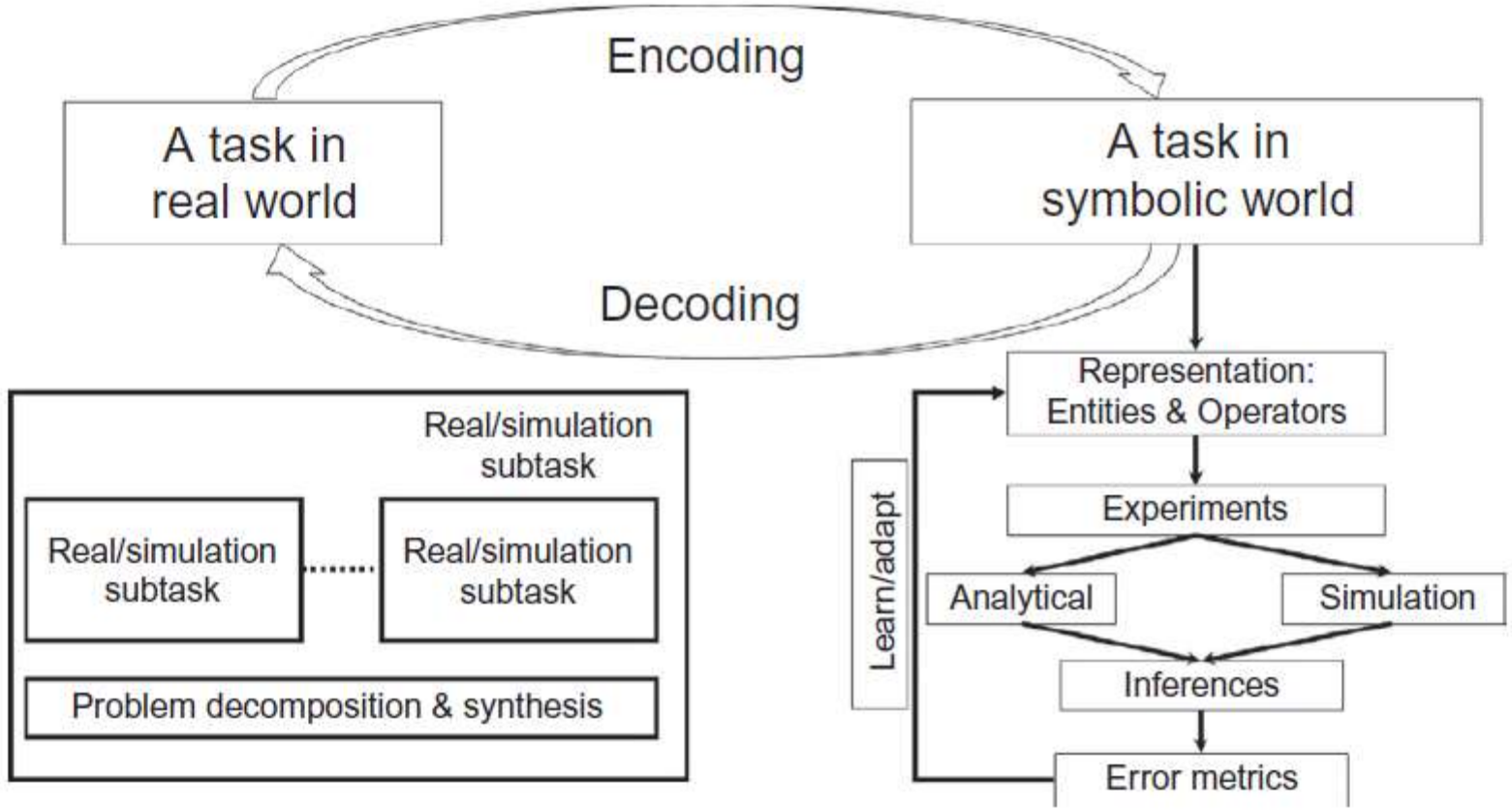

FIG. 1 Artificial intelligence framework—A real world problem or task is represented as a symbolic world problem or computer program composed of entities (e.g., data structures) and operations (e.g., algorithms). Encoding is the first step, identifying and formulating a problem statement. Experiments, inferences, and metrics are iterated at much lower costs in the symbolic world. The inferences are related back to the real world through decoding. A real world problem

Artificial Intelligence

- Dictionary: “the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.”

Theory of Logic

- Knowledge representation
- Reasoning
  - Deductive – Facts & Combinations of facts
  - Inductive – Interpolation, ***Machine Learning***
  - Abductive – Common sense, Exceptions

AI Types of solutions

- ANI – Artificial Narrow Intelligence
  - Machine solves specific problem
  - E.g.1 Chess game playing system
  - E.g.2 Medical diagnostic system
  - Etc

- AGI – Artificial General Intelligence
  - Machine solves diverse problems in different domains
  - System is adaptable to new environment
  - E.g. left handed driving in India → adapting quickly to a right handed system in West

- ASI – Artificial Super Intelligence
  - Automatic generation of optimization function
  - System exerting human like behaviour
  - And much more being capable of sensing trillions of sensor inputs

Simple example of state space & search..

- River crossing problems
  - One such – Man, Lion, Goat, Cabbage
  - Left to Right
  - Constraints
    - Lion eats Goat (if left alone)
    - Goat eats Cabbage (if left alone)

- C/Java program?
- MLGC,XXXX → XLXC,MXGX → MLXC,XXGX → XXXC,MLGX → MXGC,XLXX → XXGX,MLXC → MXGX,XLXC → XXXX,MLGC

More examples of state space and search..

- Example of clinical decision support system
  - Lab reports & physiology measurements
  - Current symptoms
  - Current medication
  - Key activities of the patient
  - Health score
- Example of a Dialog system that retrieve logical inferences from knowledge base

- States and transitions are represented as a Graph
- Nodes → Correspond to States
  - A snapshot of observations or readings
  - A snapshot of recorded facts
  - A node can be *goal* node
- Edges → Correspond to Transitions
  - Predefined actions or moves
  - Each edge may have associated *cost*

Artificial Intelligence topics

- State space & Search – Deterministic, Randomized, Path finding
- Planning algorithms – Action space, Goal planning
- Game playing algorithms – Goal trees, Optimal strategy, Bandits problem
- Knowledge representation and reasoning, First order logic
- Machine learning, Natural language processing, Speech processing

Discussion – Interpolation vs Counting problems!

- Plain multiplication (without log() function)?
- Parity learning?
  - (input = binary string)
  - Sum of number of bits is odd → 1
- Divisability learning?
  - (input = binary string)
  - Divisable by 2
  - Divisable by 3?
  - Divisable by general K?
- Histogram learning?
  - (input = an array of numbers)
  - Output is value range bins and number of elements in each bin

- Given an image of a face, you have to fill gaps, say fill eyes!
- Given an audio clip, you have to guess a missing part
- Given a vector you have to predict 'label'
- Learning from a set of pairs of vectors, you have to predict one given the other!