



Machine Reasoning Day 1

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Machine Reasoning

Day 1

DAY 1 AGENDA

1.1 Machine Reasoning Overview

- 1.1.1 From Human Intelligence to Machine Intelligence
- 1.1.2 Subfields of Artificial Intelligence (AI)
- 1.1.3 AI Application Framework
- 1.1.4 Exercise

1.2 Reasoning System Architectures

- 1.2.1 Model View of Intelligent System
- 1.2.2 Cognitive Functions/Models: Learn, Reason, Perceive, Act
- 1.2.3 Data-driven vs. Goal-driven Systems
- 1.2.4 Exercise

1.3 Rule/Process Reasoning System [Workshop]

- 1.3.1 Machine Memory & Query
- 1.3.2 Textual Knowledge Processing

1.1 Machine Reasoning Overview

1.1.1 From Human Intelligence to Machine Intelligence

1.1.2 Subfields of Artificial Intelligence (AI)

1.1.3 AI Application Framework

1.1.4 Exercise

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What's intelligence?

“Intelligence measures a human/AI’s **ability** to achieve **goals** in a wide range of **environments**.”

A Universal Measure of Intelligence for Artificial Agents, Legg & Hutter 2007

Examples?

- Goals in school environment?
- Goals in work environment?
- Goals in home environment?

how to pass exams |

X



how to pass exams **without studying**

how to pass exams **with top grades**

how to pass exams **with flying colours**

how to pass exams **last minute**

how to pass exams **in high school**

how to pass exams **pdf**

how to pass exams **in primary school**

how to pass exams **easily**

how to pass exams **with top grades without studying**

how to pass exams **without reading**

Report inappropriate predictions

**Ability to pass
exam(goal) in
school
environment**

how to improve customer satisfaction



All

Images

News

Videos

Maps

More

Settings

Tools

About 272,000,000 results (0.51 seconds)

How to improve customer satisfaction.

1. Listen to **customers**. In order to give **customers** what they want, you have to know what they want. ...
2. Be proactive. ...
3. Practice honesty and manage expectations in marketing. ...
4. Understand your **customers**.

www.salesforce.com › service-cloud › best-practices › ho...

People also ask

How can you improve customer service?

What are the four tips to ensure customer satisfaction?

How can customer satisfaction and loyalty be improved?

What are the remedies to provide consumer satisfaction?

**Ability to
perform in
workplace**

how to please partner without spending money



All

Videos

Images

News

Maps

More

Settings

Tools

About 4,000,000,000 results (0.56 seconds)

www.theadventurouswriter.com › Relationships › Love ▾

80 Ways to Show Your Love Without Spending Money

How do you show your love **without spending money** you don't have? ... Don't take her for granted; show your love by saying “**please**”, “thank you”, and “you're welcome” often. 7. ... Learn the signs a **boyfriend** is in love with a girlfriend. 36.

People also ask

How do you prove you love someone without spending money?



How can I be in a relationship without spending money?



How can I surprise my boyfriend without money?



Can a man without money make a woman happy in a relationship?



**Ability to
harmonize at
home**

We all are intelligent agents in daily life...

- The **environment** is analogical to **industry domain**:

E.g. Retail; Education; Finance;

- The **goal** is analogical to perform **job role**:

E.g. Salesperson; Lecturer; Ah Long (Loan shark);

- The **ability** is analogical to **KPI (for the job role)**:

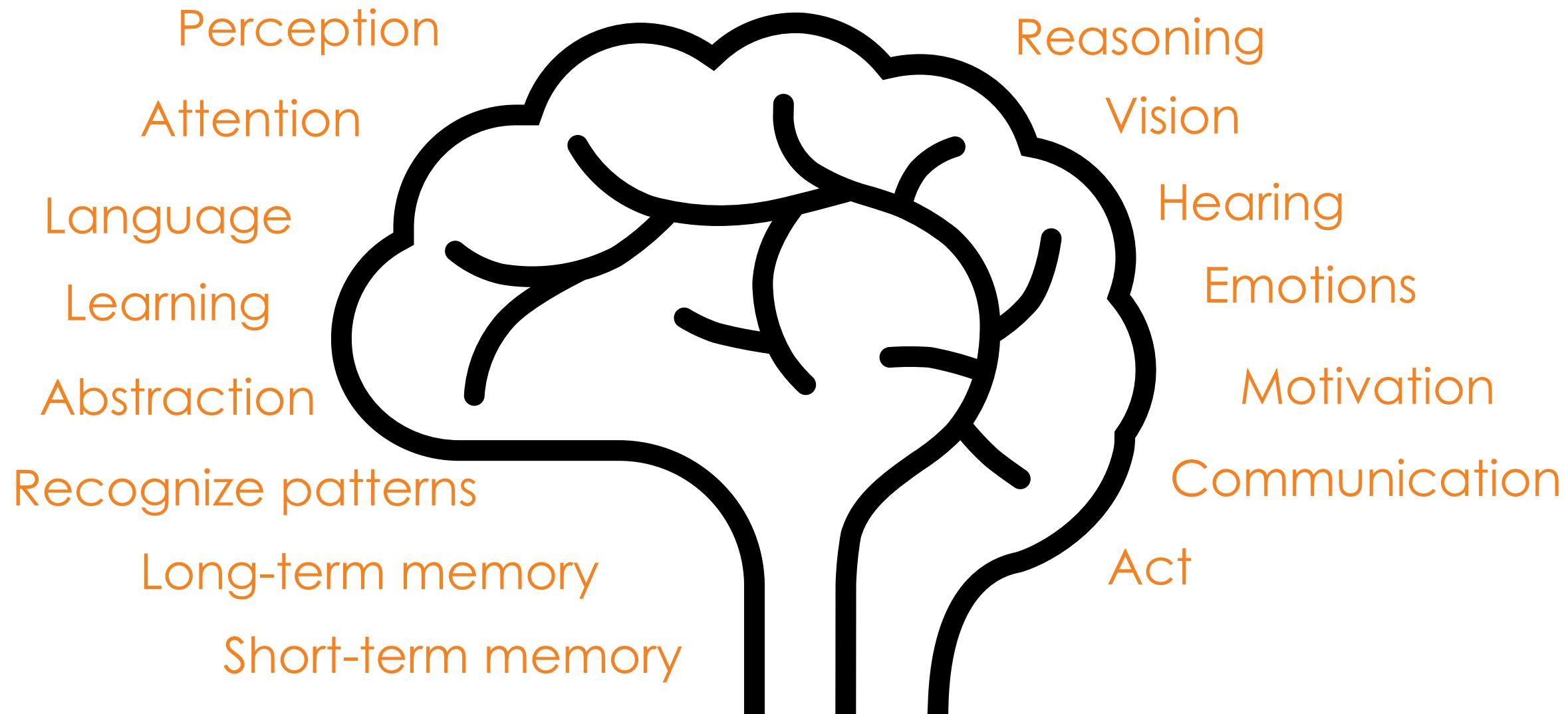
E.g. Larger sales volume; Better student feedback; More graffiti & interest \$;

This part on KPI needs to be elaborated.

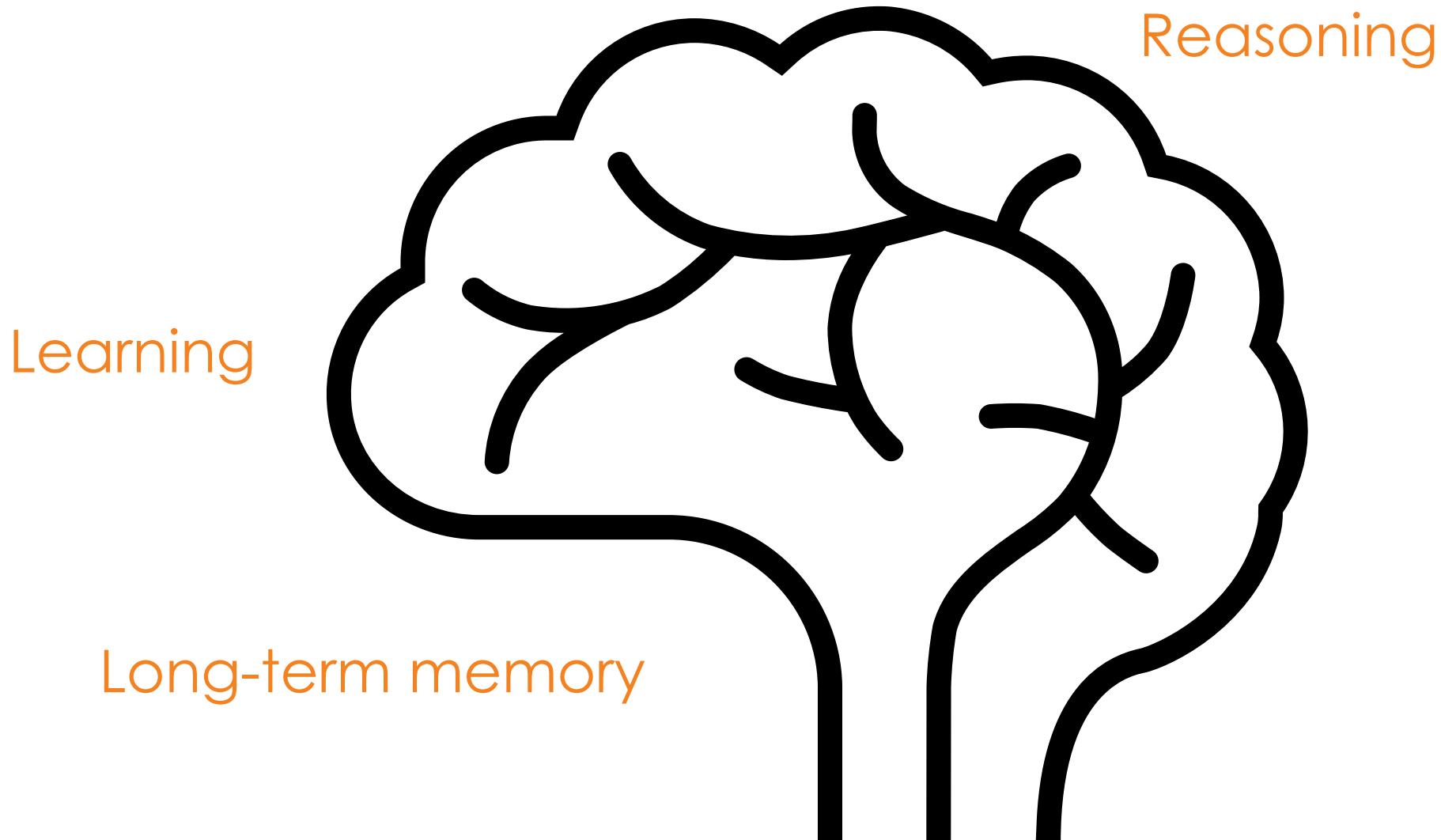


Creating an AI is analogical to **defining goal & designing KPIs** for an employee to **behave autonomously** (through learning and reasoning using domain knowledge) **without** the boss/designer's **micro-management** (explicitly programmed).

Cognitive Abilities (Functions)

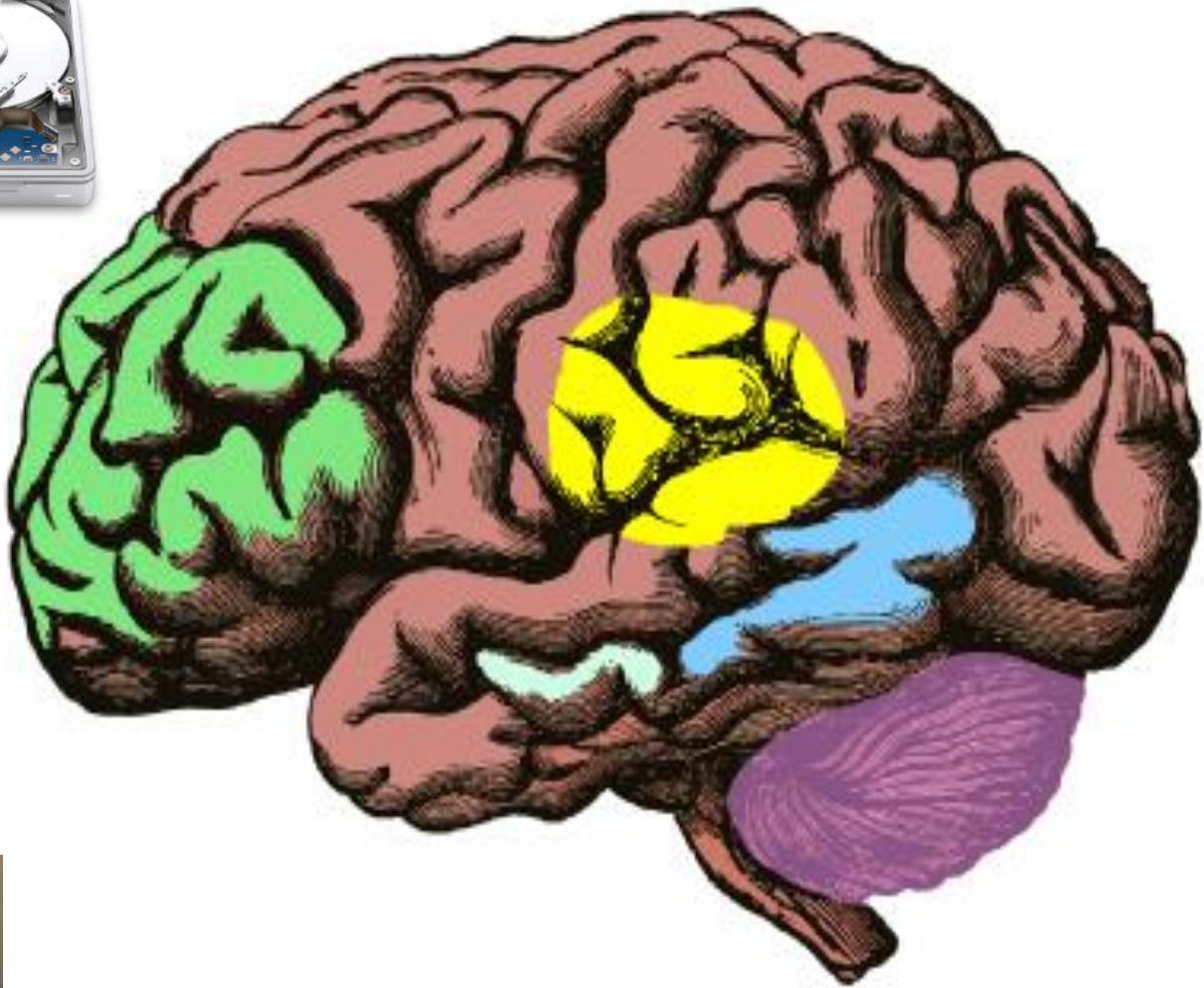
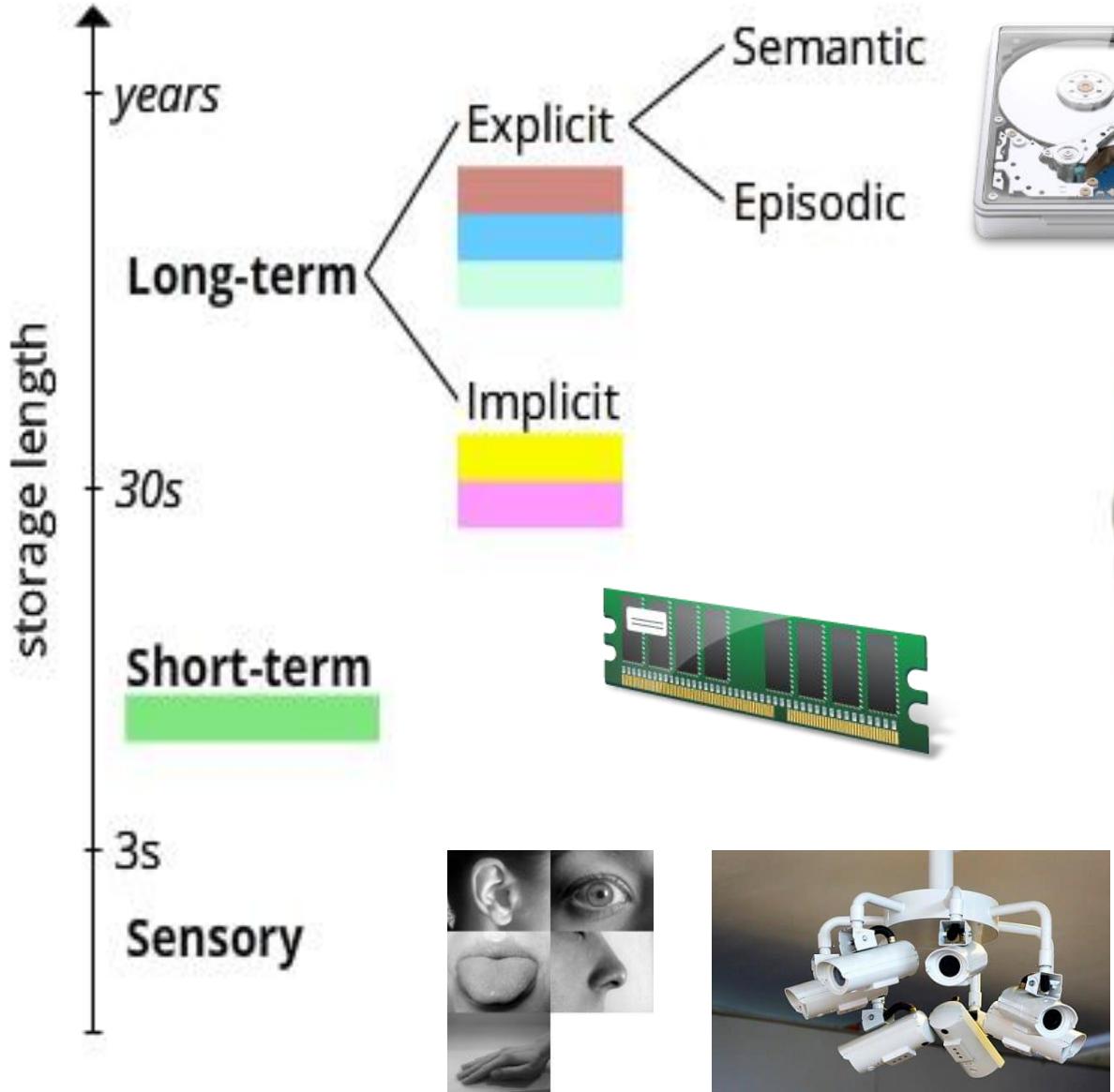


Core Cognitive Abilities (Functions)



Human Memory

to store data, e.g. abstract knowledge, sensory information, experiences, etc. and this ISS learning session as well.



Human Learning

to **generate new** knowledge

E.g. acquired understanding, behaviours, skills, values, useful to memorize & reuse

Model:
Learn

Model:
Recognize

Common Forms of Learning

1. Habituation

Note that its meant to target bird. Getting more experience.

- Unsupervised Learning; Anomaly Detection



Crows present in corn field



Introduction of scarecrow



Prolonged exposure to scarecrow

- Bird learned the knowledge/behaviour to ignore the fake threat;

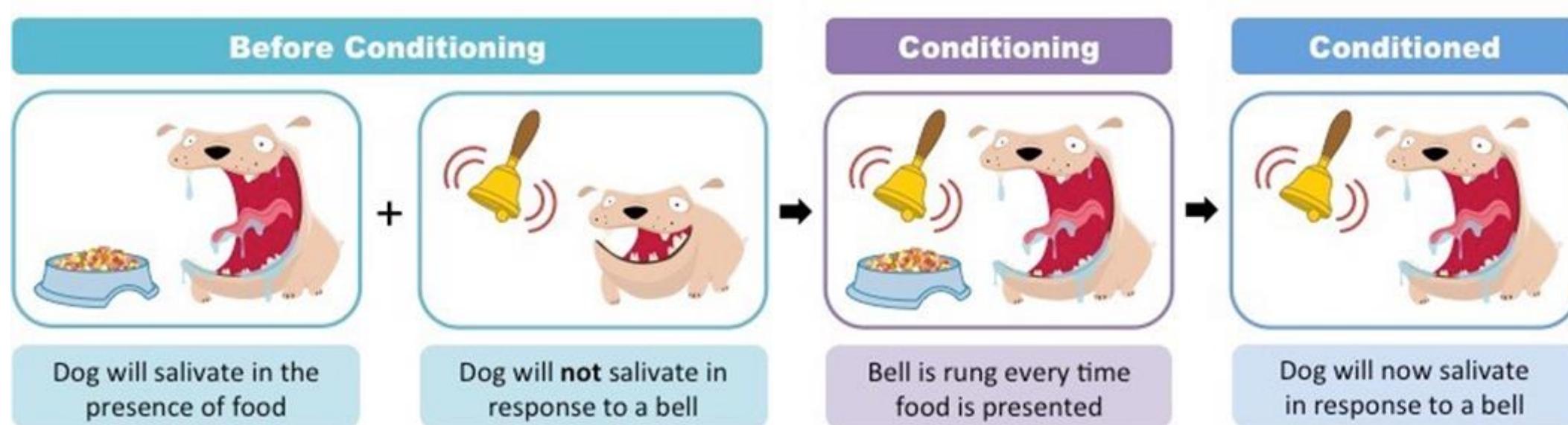
Source <https://ib.bioninja.com.au/options/option-a-neurobiology-and/a4-innate-and-learned-behav/habituation.html>

Common Forms of Learning

2. Classical (Reflex) conditioning

Supervised learning usually based on this. Labelled data associated with this.

- Association (between stimuli or events); Supervised Learning

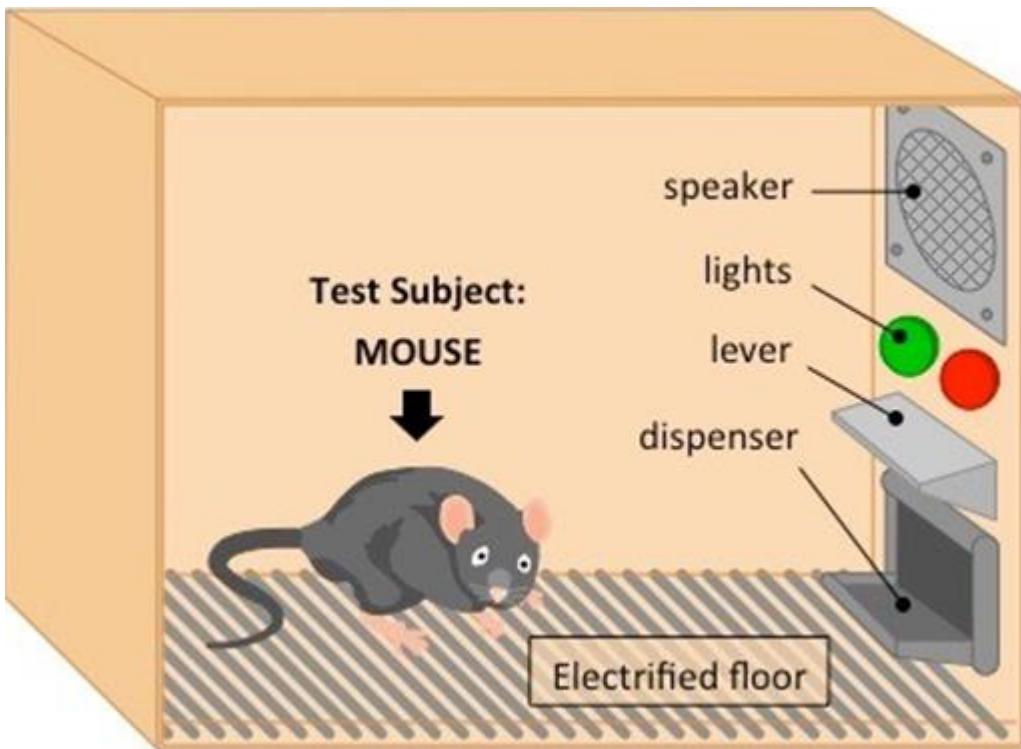


- Dog learned the knowledge of association/correlation: between food & bell ring;
- Dog learned the knowledge/behaviour of causation: food/bell ring → saliva

Common Forms of Learning

3. Operant conditioning

- Reinforcement Learning; Generate & Test; Simulation



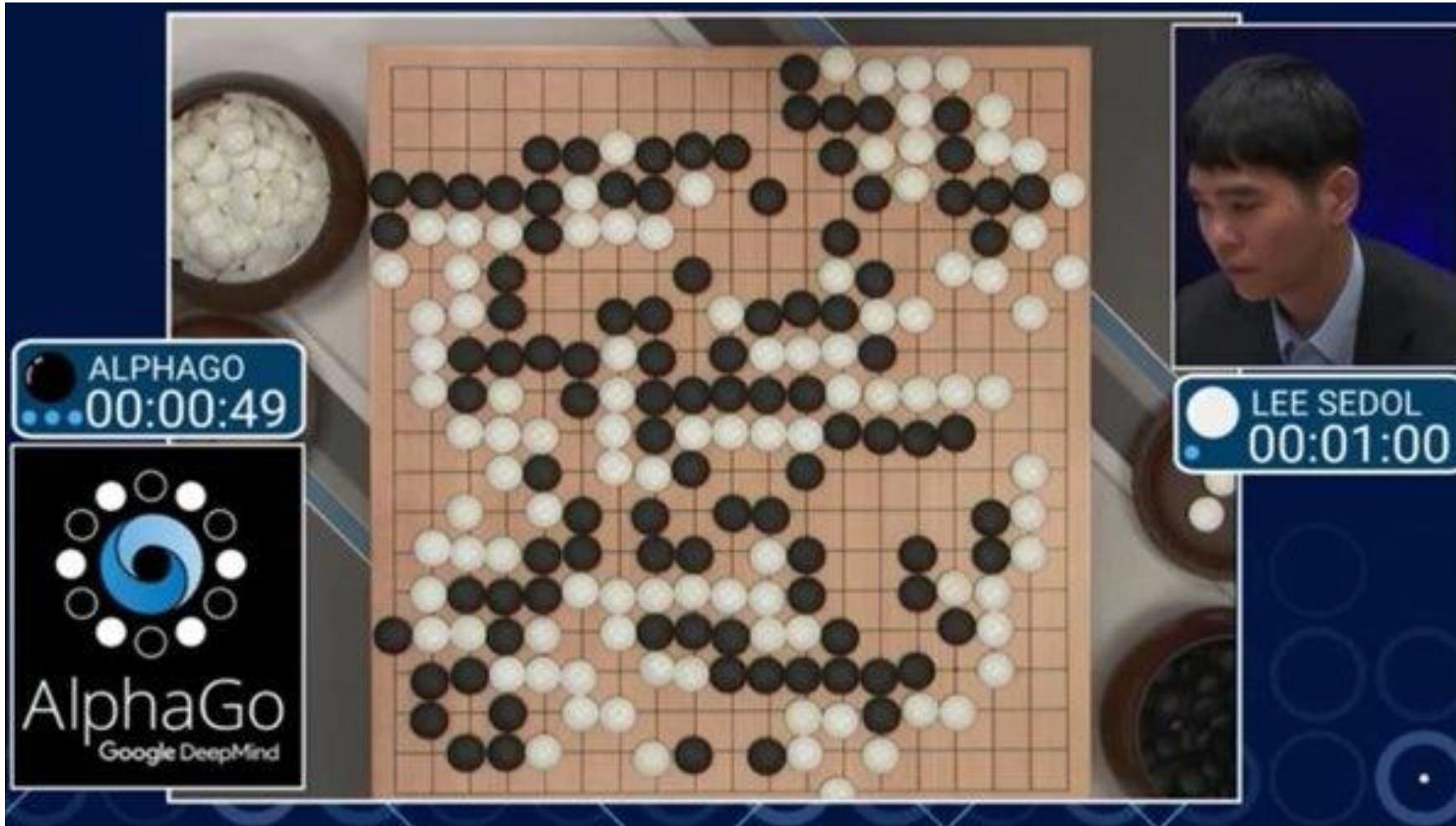
Subject / Reinforcement Learning Agent

- **Agent:** Mouse
- **Environment:** Cage
- **Goal:** Survive longer
- **Random Series of Actions**
- **Best Series of Actions** leading to survival & welfare

- Mouse learned the knowledge of button functions & steps to obtain food;

Common Forms of Learning

3. Operant conditioning



AlphaGo
from
Google/DeepMind

Generate & Test
during self playing:
AlphaGo vs.
AlphaGo

Common Forms of Learning

3. Operant conditioning



DiDi :
A Reinforcement
Learning Agent

- **Agent:** DiDi
- **Environment:** NUS
- **Goal:** Unblock/Move scooter
- **Random Series of Actions**
- **Best Series of Actions** leading to goal

Common Forms of Learning

4. Observational learning

- Imitation Learning; Unsupervised Learning;



Source <https://courses.lumenlearning.com/wsu-sandbox/chapter/observational-learning-modeling/>

Human Reasoning

to use existing knowledge

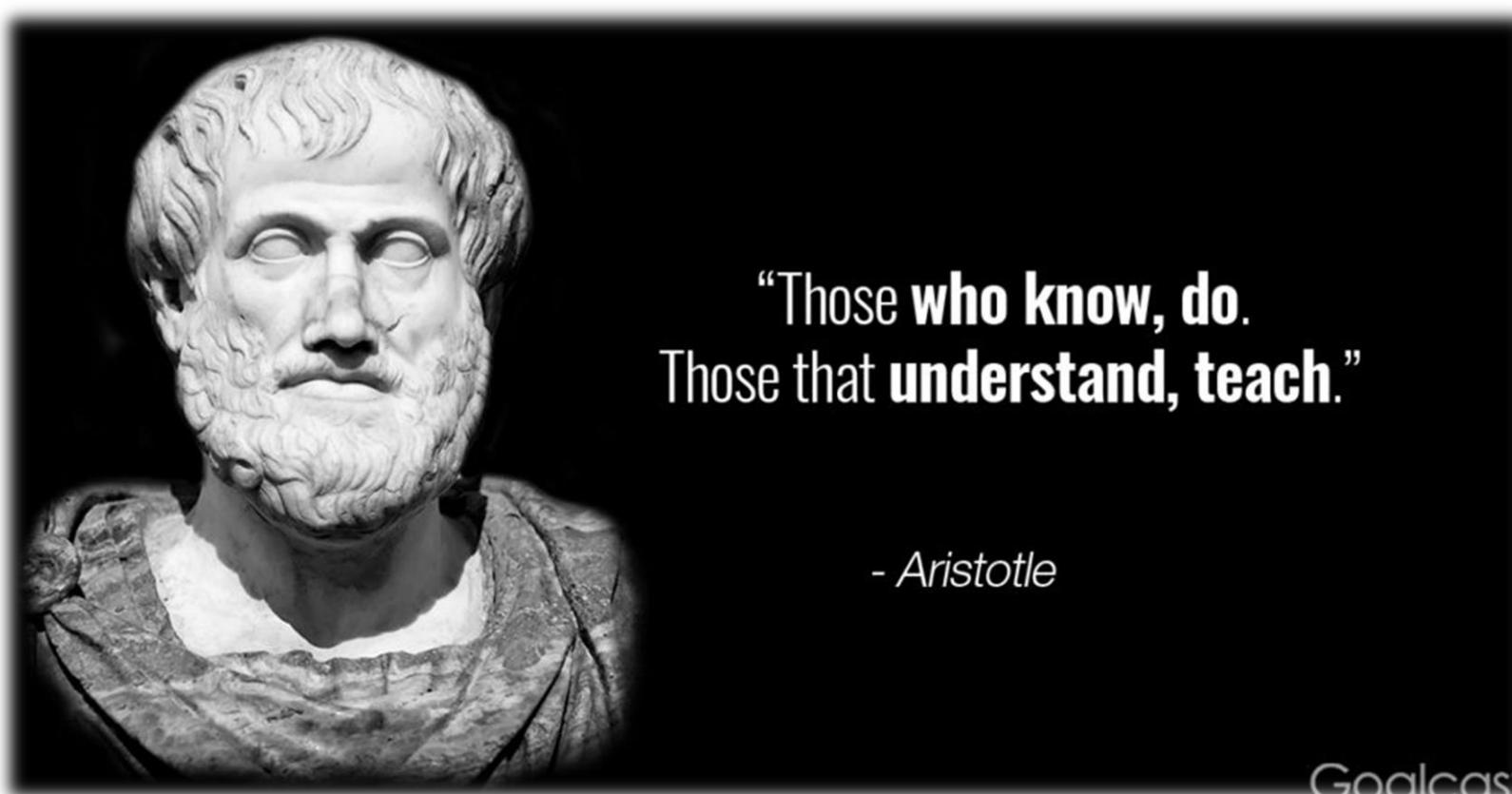
Model:
Reason/Think

can you use example on what is a knowledge?
Eg. on Didi

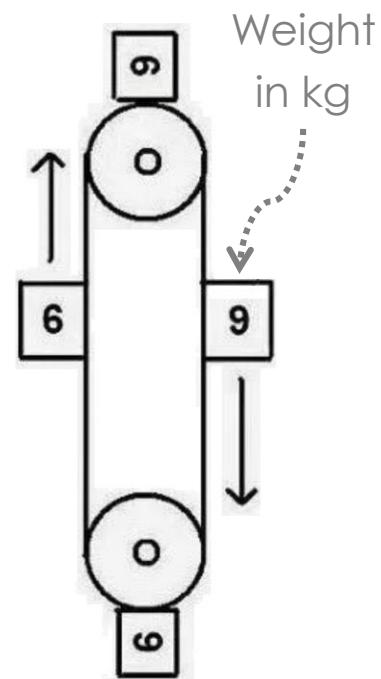
Common Forms of Reasoning

1. Deductive Reasoning

- Aristotle's syllogism; Formal logic; Knowledge Graph; If-Then business rules; Declarative programming language like SQL; (Universal → Individuals)



Goalcast



Sam's perpetual motion machine on sale! \$0.99 only!

Common Forms of Reasoning

2. Inductive Reasoning (aka. learning)

- Use meta knowledge to generate new knowledge using statistical method: learning / pattern recognition algorithms; central limit theorem; regression; (Individuals → Universal)

**Black Swans and the Limits
of Inductive Reasoning**

Not so much for exams.
Overlap with learning

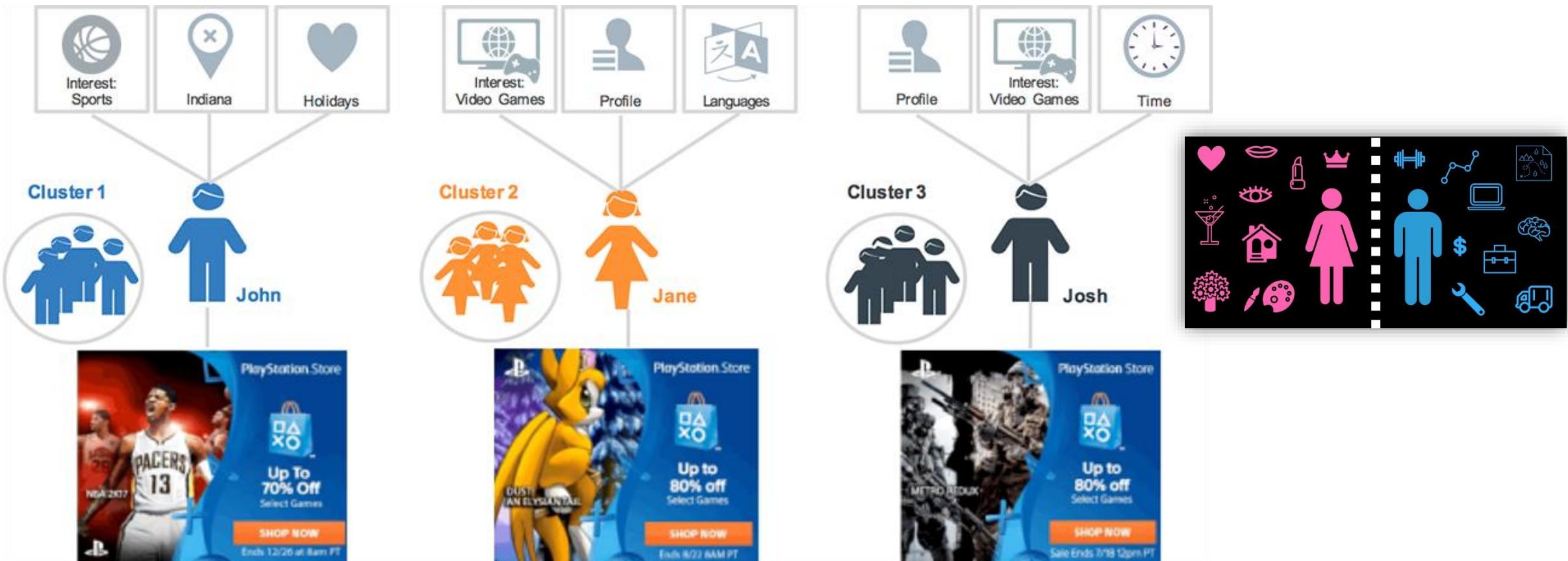


Common Forms of Reasoning

3. Analogical Reasoning

Why humans like to categorize/stereotyping? Eg. profiling for simplification

- Similarity based reasoning; Case based; K nearest neighbour; (including customer profiling for recommendation; even stereotyping)



Common Forms of Reasoning

4. Abductive Reasoning

- Probabilistic calculation; Prior/Conditional/Joint probability; Bayesian network; (Hypothesis ~ Evidence)

model is considered knowledge.



Would you prefer a **reasoning doctor** or a **learning doctor** during your medical consultation?

Common Forms of Reasoning

Other Reasoning Forms, e.g. Fuzzy Reasoning/Logic

- Lack of precise definition of vocabulary; Subjective to individuals



This is a human.



human or cat?



This is a cat.

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1.1.2 Subfields of Artificial Intelligence (AI)

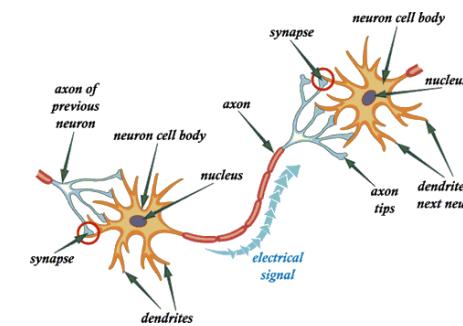
1.1.3 AI Application Framework

1.1.4 Exercise

Machine / Artificial Intelligence

Major Sub-fields

- **Artificial Neural Networks**



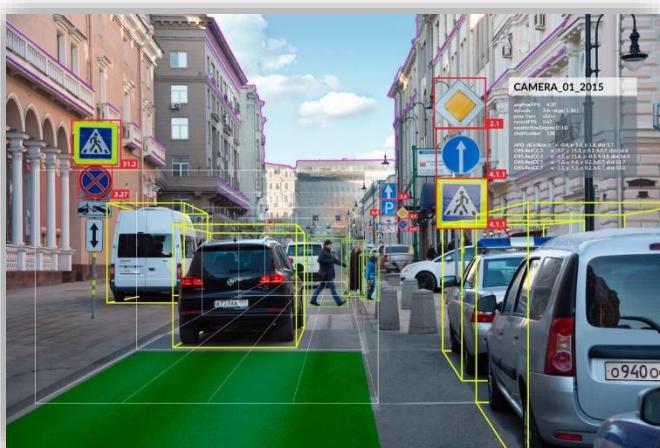
Neuron in our brain.

- **Evolutionary Computation**



usage of many neural networks instead of complex ones

- **Vision**



- **Robotics**



Machine / Artificial Intelligence

Major Sub-fields

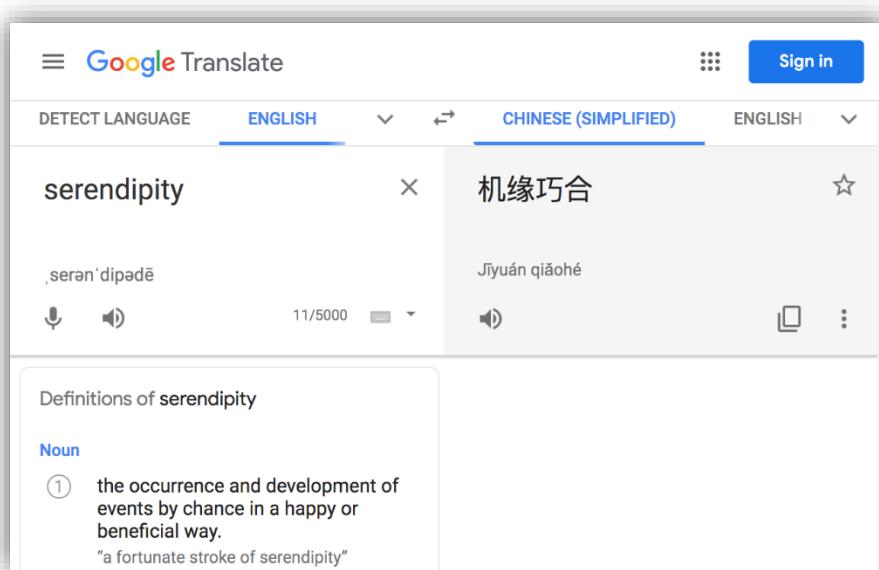
- Expert/Diagnostic Systems; Recommender



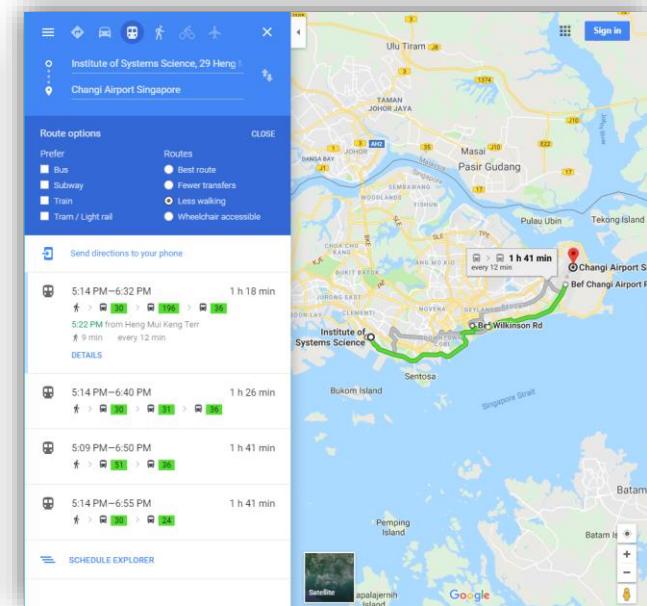
- Speech Processing



- Natural Language Processing



- Planning/Optimization



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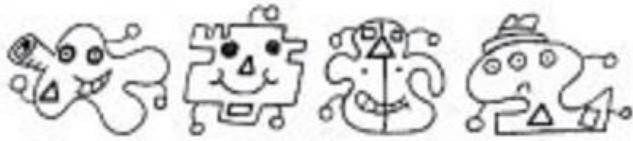
1.1.2 Subfields of Artificial Intelligence (AI)

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Cognitive Processes To Solve Problem

Aliens



Non Aliens



Which one is alien?

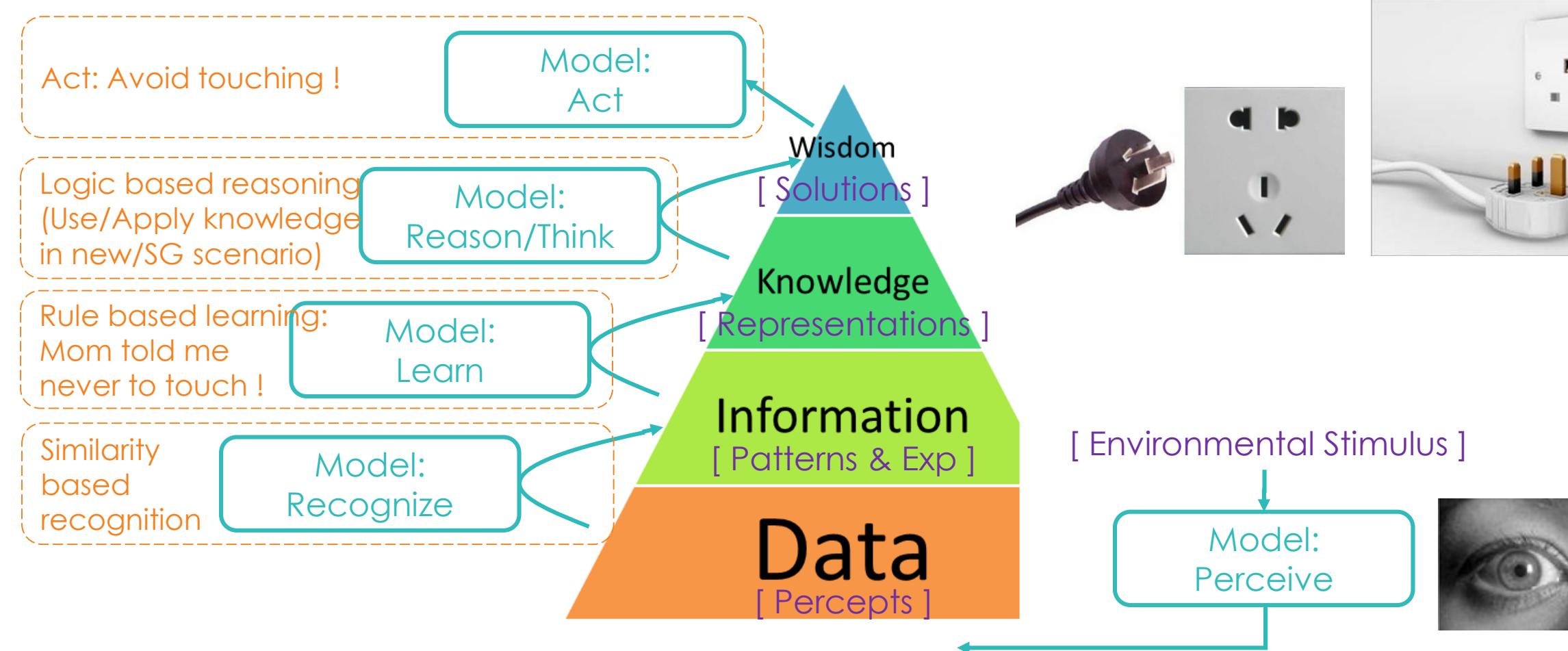


A B C D E

1. Perceive: Gather raw observable information, e.g. problem goal, type of known creatures, test creatures, decision/action required.
2. Recognise: Recognise patterns and decomposed relevant information, e.g. different colours, triangle#, teeth#, and any more you can recognise?
3. Learn: Invent hypothesis / candidate theories, e.g. hypothesis 1: alien must has eyes ≥ 2 & not in grey & no horn. (From 8 individual creatures, their recognised features & target types to generalize/create new rules, which must be correct for the 8 creatures' types, using supervised learning method.)
Invent more hypothesis example. need at least 3 antennas
4. Reason: Use test data to evaluate all hypotheses / candidate theories to obtain correct knowledge. (Use A-E test creatures to filter out correct knowledge/rules which can classify 5 creatures into 1 alien 4 non-aliens. As well as the single predicated alien based on newly learnt knowledge considered correct.)
5. Act: Make choice, observe/bear consequences (scores).

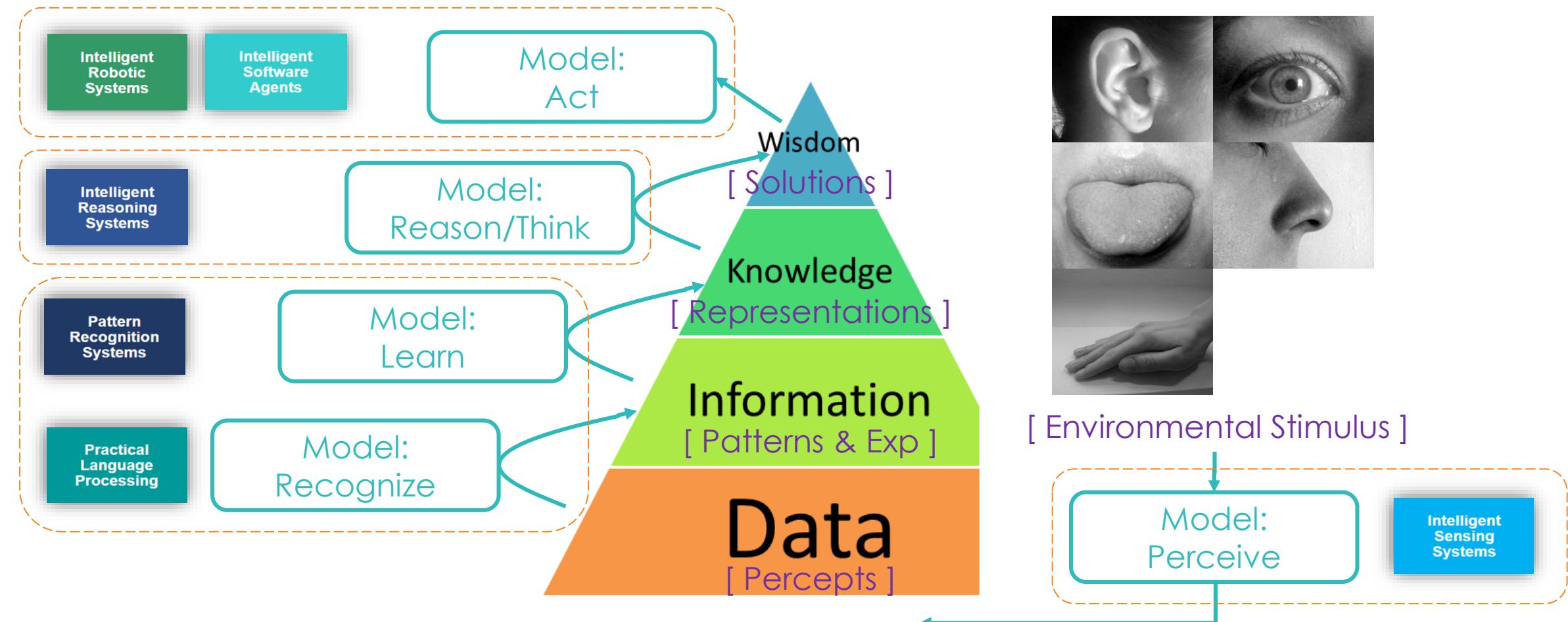
Cognitive Processes/Functions/Models

Functions/Models: Perceive; Recognize/Learn; Reason/Think; Act;

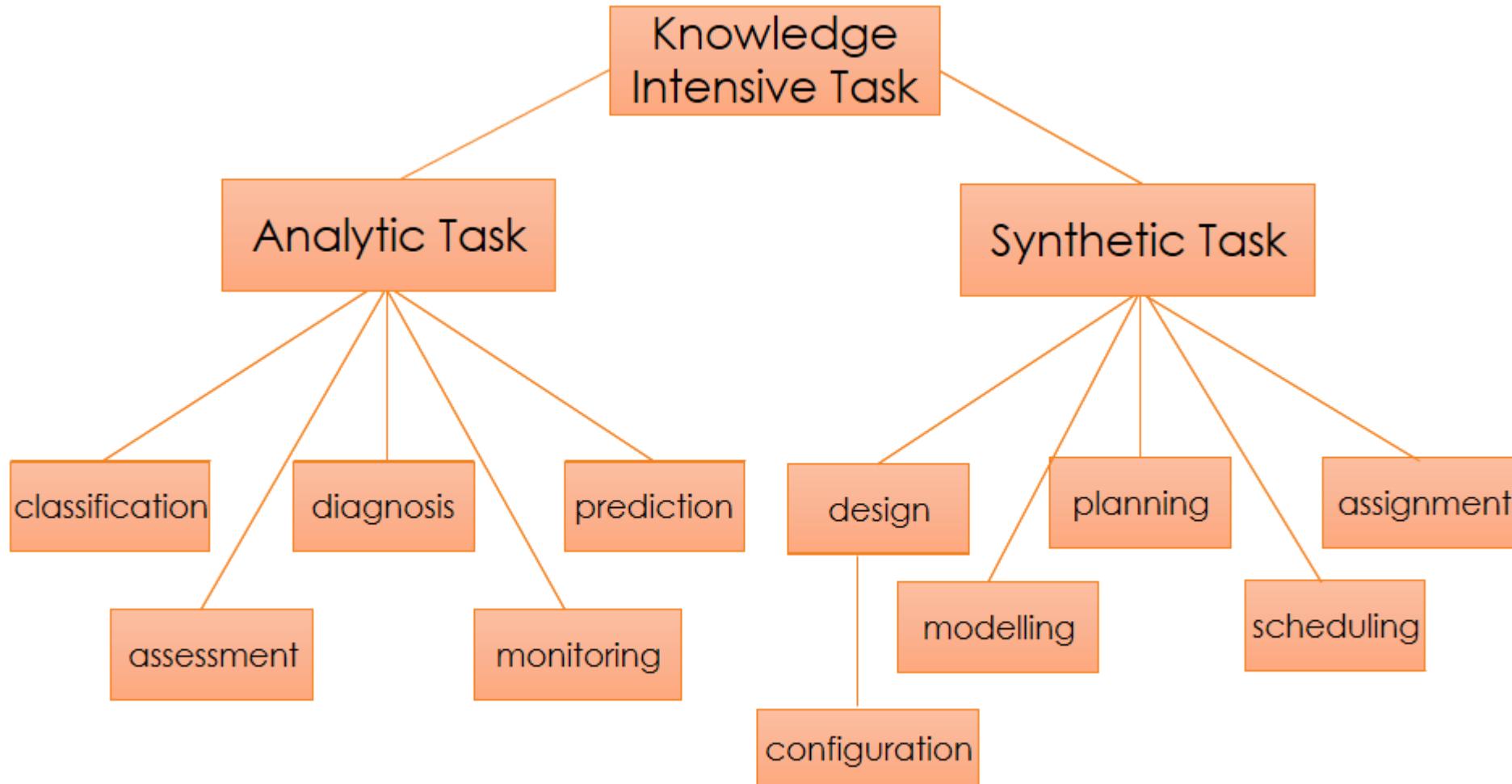


Cognitive Processes/Functions/Models

Functions/Models: Perceive; Recognize/Learn; Reason/Think; Act;



AI for Knowledge Intensive Task



AI for Knowledge Intensive Task

- **Analytic Tasks** **E.g. Coronavirus (COVID-19) diagnosis**
 - System/Solution to be analysed pre-exists, but usually not completely "known".
 - Input: some data to trigger the system (e.g. patient symptoms)
 - Output: some characterization or behaviours about the system (e.g. cause of illness)
 - - E.g. Medical diagnosis
- **Synthetic Tasks** **E.g. Coronavirus (COVID-19) vaccination creation**
 - System/Solution does not yet exist.
 - Input: requirements about system to be constructed
 - Output: constructed system description

AI for Knowledge Intensive Task

- **Analytic Tasks**

Identification, Classification, Prediction, Clustering/Grouping, ...

- **Techniques (S-MR Machine Reasoning)**

Heuristic Business Rules

Decision Trees

Case Based Reasoning

Fuzzy Logic

Rule Induction

Machine Learning

AI for Knowledge Intensive Task

- **Synthetic Tasks**

Planning, Scheduling, Optimisation, Design, ...

- **Techniques (S-RS Reasoning Systems)**

Uninformed (brute force / blind) Search

Informed (heuristic) Search

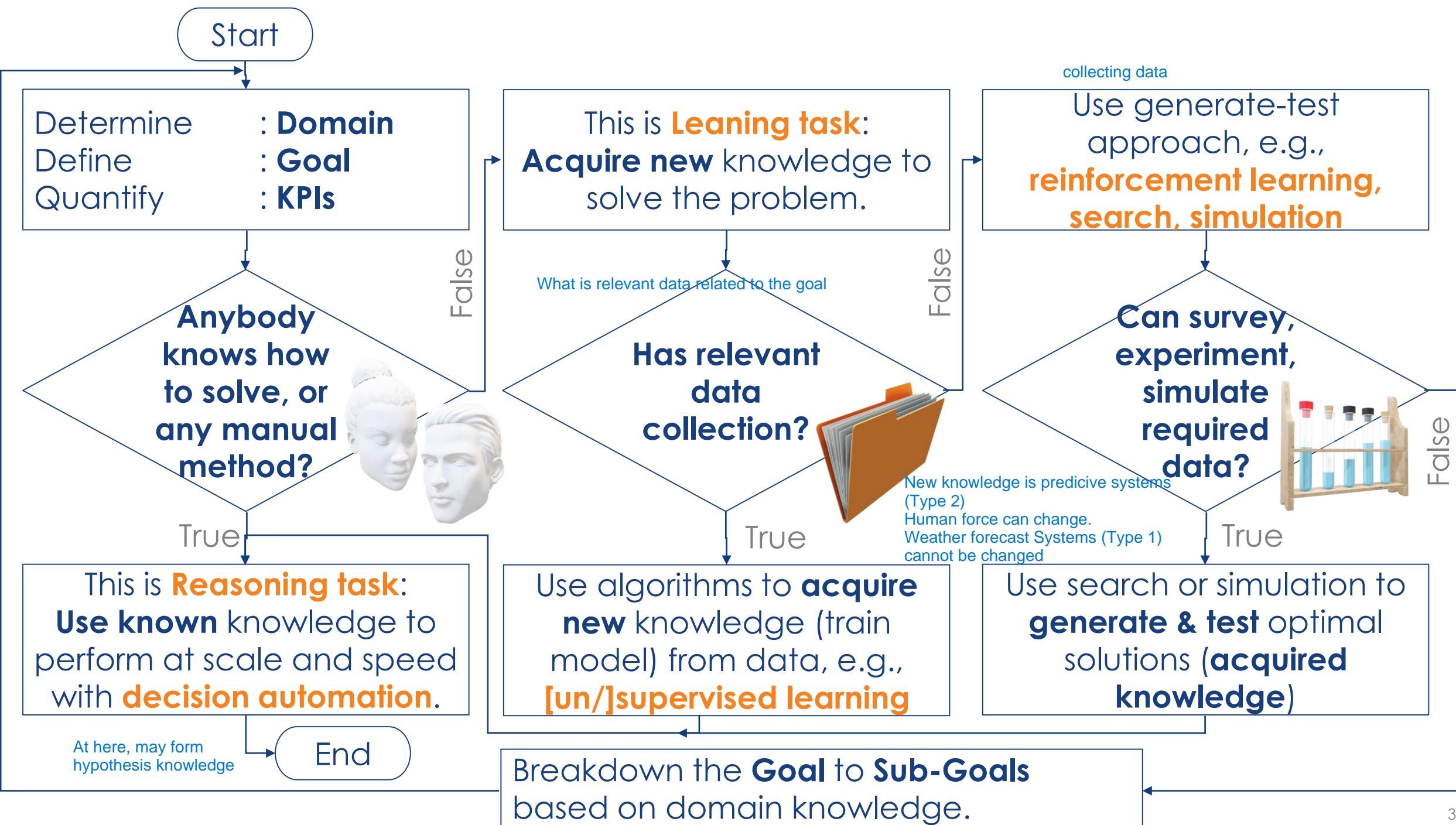
Simulations

Genetic Algorithms

Reinforcement Learning

Data Mining

...



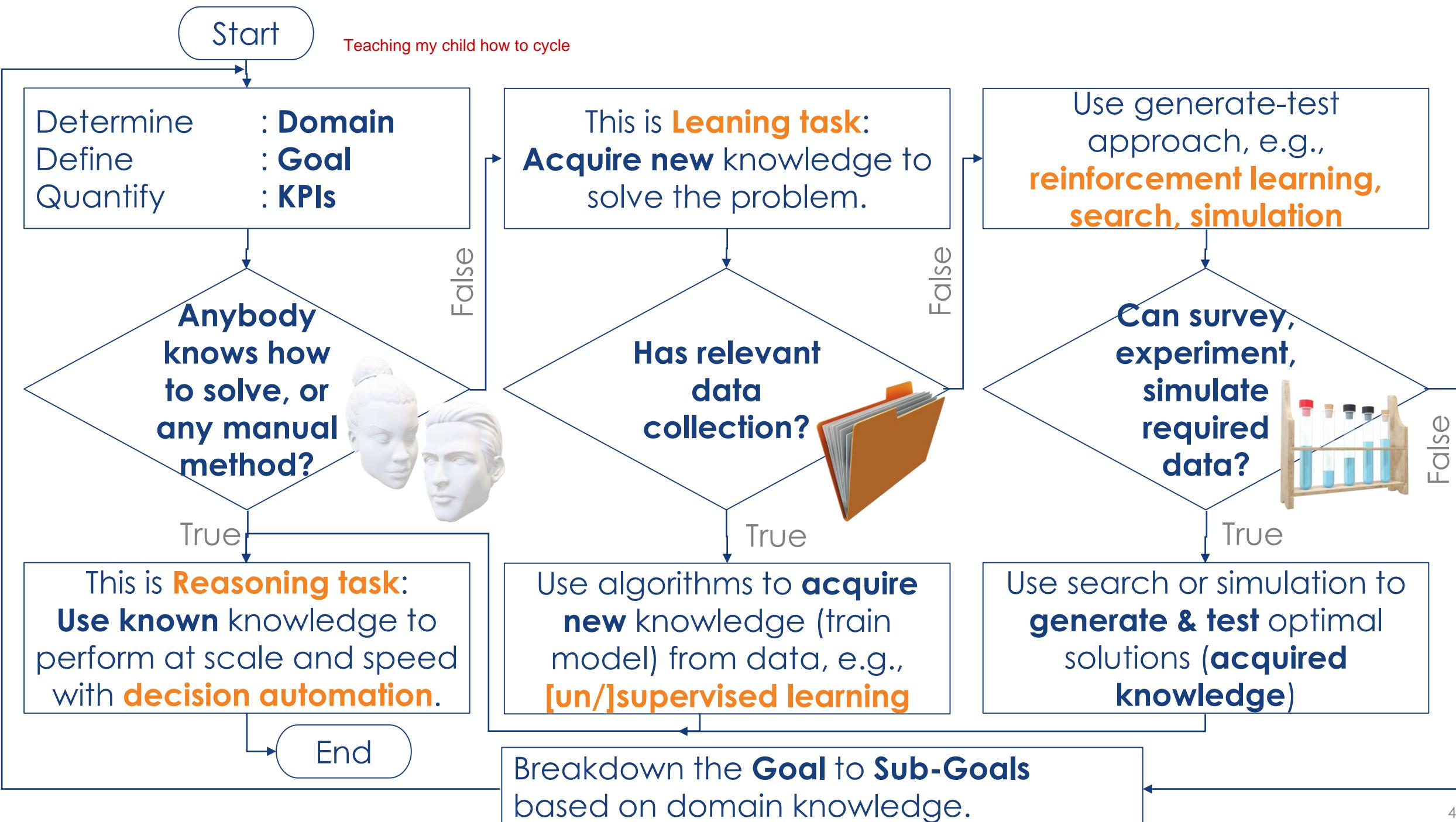
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1.2 Reasoning System Architectures

1.2.1 Model View of Intelligent System

1.2.2 Cognitive Functions/Models: Learn, Reason, Perceive, Act

1.2.3 Data-driven vs. Goal-driven Systems

1.2.4 Exercise

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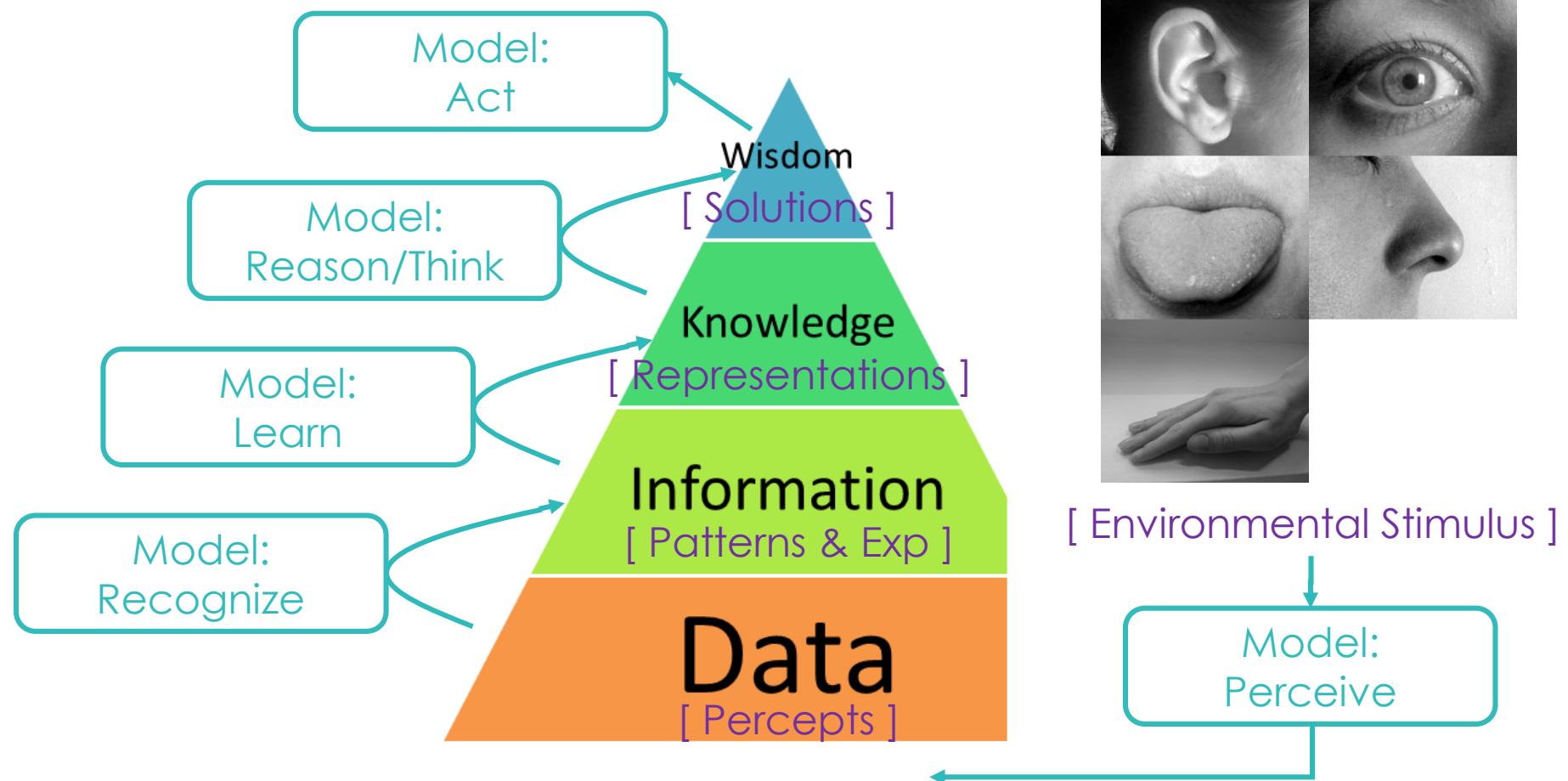
1.2.2 Cognitive Functions/Models: Learn, Reason, Perceive, Act

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What's a “model”?

What's a “model”?



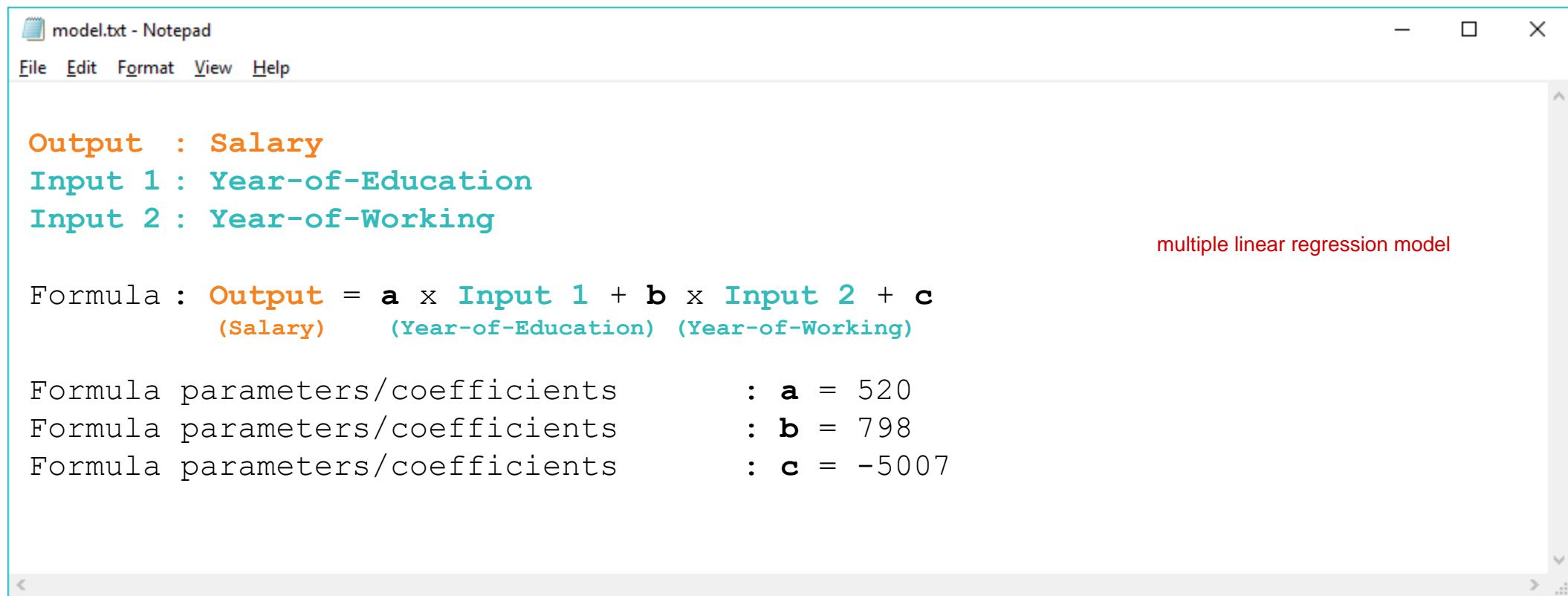
What's a conceptual model?

A *model* is a piece of organized & represented knowledge (our understanding of the world/domain), which can be (re)used to generate/predict **outcome results** based on **input observations**. Technically, it's a *function* (white or black box), which maps **input(s)** to **output(s)**



What's a physical model?

A model could be considered just as a tangible text file stored in computer/server, e.g. model.txt



model.txt - Notepad

File Edit Format View Help

Output : Salary
Input 1 : Year-of-Education
Input 2 : Year-of-Working

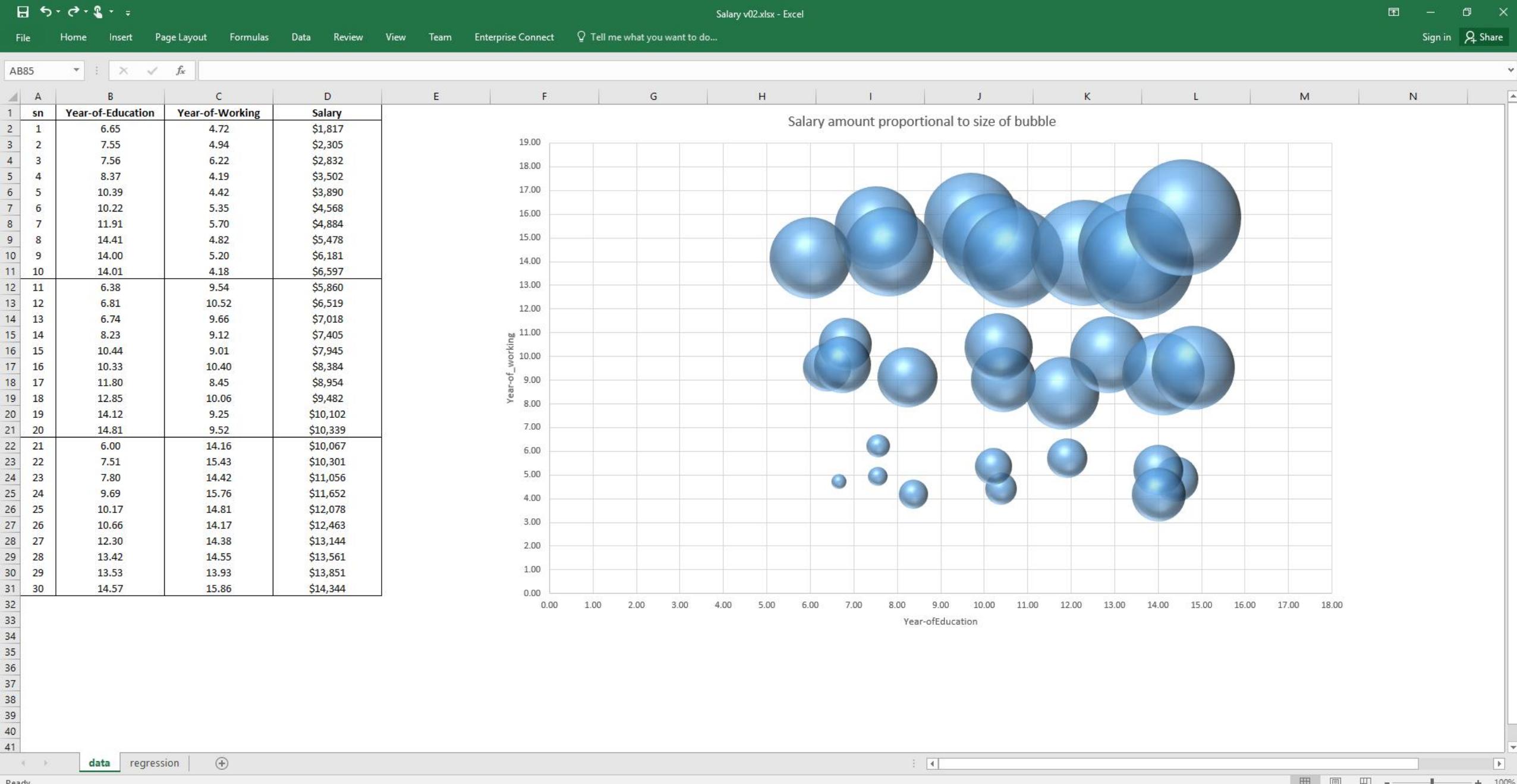
multiple linear regression model

Formula : Output = a x Input 1 + b x Input 2 + c
(Salary) (Year-of-Education) (Year-of-Working)

Formula parameters/coefficients : a = 520
Formula parameters/coefficients : b = 798
Formula parameters/coefficients : c = -5007

Salary.xlsx





Salary v02.xlsx - Excel

File Home Insert Page Layout Formulas Data Review View Team Enterprise Connect Tell me what you want to do... Sign in Share

AZ92 X ✓ fx

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	SUMMARY OUTPUT																						
2																							
3	Regression Statistics																						
4	Multiple R	0.984375561																					
5	R Square	0.968995246																					
6	Adjusted R Square	0.966698597																					
7	Standard Error	667.5580743																					
8	Observations	30																					
9																							
10	ANOVA																						
11	df	SS	MS	F	Significance F																		
12	Regression	2	376041022.2	188020511.1	421.9170953	4.30806E-21																	
13	Residual	27	12032112.13	445633.7825																			
14	Total	29	388073134.3																				
15																							
16	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%															
17	Intercept	-5007.776515	551.1804093	-9.085548816	1.06587E-09	-6138.705299	-3876.847731	-6138.705299	-3876.847731														
18	Year-of-Education	520.7382643	42.89431991	12.14002846	1.90221E-12	432.7263898	608.7501389	432.7263898	608.7501389														
19	Year-of-Working	798.286873	30.15824157	26.46994093	7.53819E-21	736.4072726	860.1664733	736.4072726	860.1664733														
20																							
21																							
22																							
23	RESIDUAL OUTPUT																						
24	PROBABILITY OUTPUT																						
25	Observation	Predicted Salary	Residuals	Standard Residuals	Percentile	Salary																	
26	1	2227.378049	-410.3780489	-0.63710672	1.666666667	1817																	
27	2	2865.1592	-560.1591999	-0.869640059	5	2305																	
28	3	3897.843043	-1065.843043	-1.654707816	8.333333333	2832																	
29	4	2696.024781	805.9752188	1.251266313	11.666666667	3502																	
30	5	3934.190757	-44.19075715	-0.06860559	15	3890																	
31	6	4582.710338	-14.71033805	-0.022837613	18.333333333	4568																	
32	7	5745.008025	-861.0080251	-1.336704047	21.666666667	4884																	
33	8	6348.358938	-870.3589379	-1.351221221	25	5478																	
34	9	6439.491245	-258.4912447	-0.401304382	28.333333333	5860																	
35	10	5626.422479	970.5775209	1.506809301	31.666666667	6181																	
36	11	5932.578944	-72.57894434	-0.112677891	35	6519																	
37	12	6933.034306	-414.0343056	-0.642783012	38.333333333	6597																	
38	13	6208.28567	809.7143298	1.257071236	41.666666667	7018																	
39	14	6555.942708	849.057292	1.318150686	45	7405																	
40	15	7624.171392	320.8286079	0.498082348	48.333333333	7945																	
41					51.666666667	8284																	

data regression

Normal Probability Plot

Year-of-Education Residual Plot

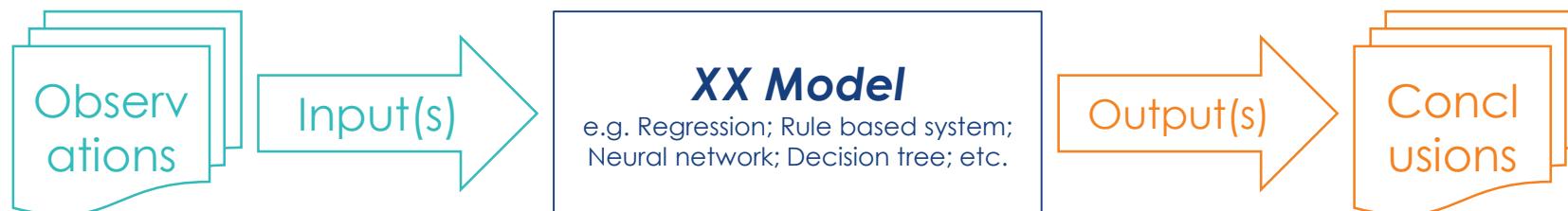
Year-of-Working Residual Plot

Year-of-Education Line Fit Plot

Year-of-Working Line Fit Plot

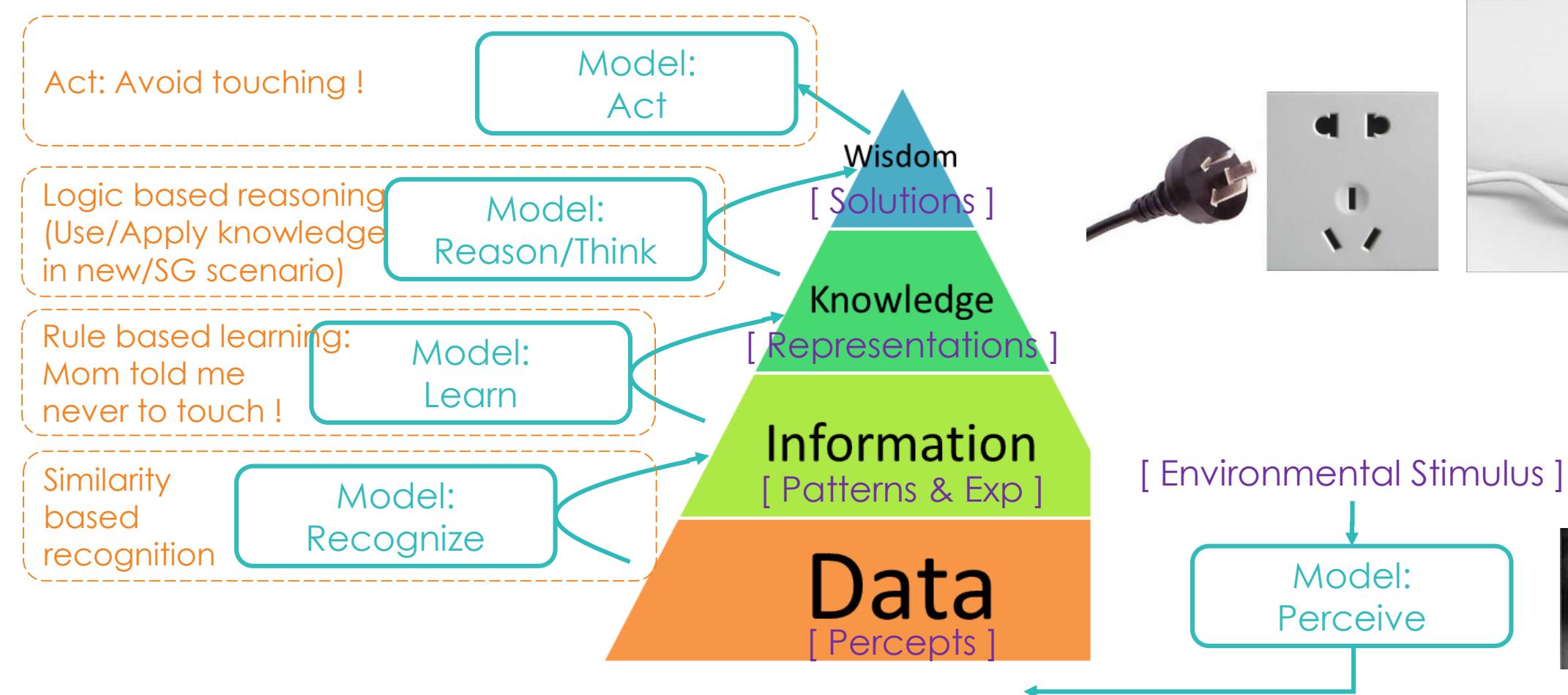
What are differences between models?

Different (learning/reasoning) model (applied mathematical algorithm, which is capable of min/max an objective function's value/KPIs, e.g. Regression; Neural network; Decision tree, etc.) extracts, organizes and represents knowledge in different ways/forms, e.g. different math formula and coefficients.



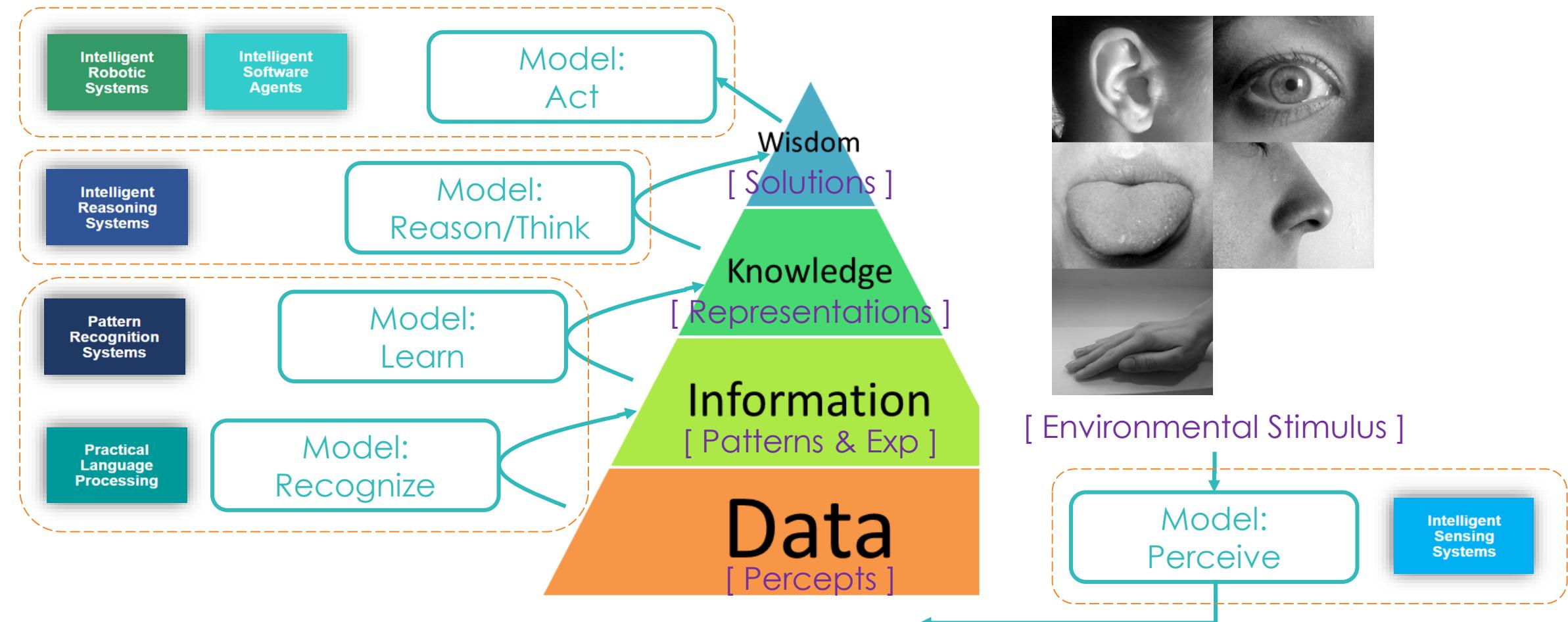
Cognitive Processes/Functions/Models

Functions/Models: Perceive; Recognize/Learn; Reason/Think; Act;



Cognitive Processes/Functions/Models

Functions/Models: Perceive; Recognize/Learn; Reason/Think; Act;



Intelligent Reasoning Systems	Pattern Recognition Systems	Intelligent Sensing Systems	Intelligent Software Agents	Practical Language Processing	Intelligent Robotic Systems
NICF - Machine Reasoning (SF)	NICF - Problem Solving using Pattern Recognition (SF)	NICF - Vision Systems (SF)	NICF- RPA and IPA - Strategy and Management (SF)	NICF - Text Analytics (SF) 3 Days	NICF - Robotic Systems (SF) 5 Days
4 Days	5 Days	5 Days	2 Days		
NICF - Reasoning Systems (SF)	NICF - Intelligent Sensing and Sense Making (SF)	NICF - Spatial Reasoning from Sensor Data (SF)	NICF- Software Robots - Best Practices (SF) 2 Days	NICF - New Media and Sentiment Mining (SF) 4 Days	Autonomous Robots & Vehicles* 5 Days
5 Days	4 Days	3 Days			
NICF - Cognitive Systems (SF)	NICF - Pattern Recognition and Machine Learning Systems (SF)	NICF-Real Time Audio-Visual Sensing and Sense Making (SF)	NICF- Intelligent Process Automation (SF) 3 Days	NICF - Text Processing using Machine Learning(SF) 5 Days	Human-Robot System Engineering* 4 Days
3 Days	5 Days	4 Days			
Practice Module (10 man days)	Practice Module (10 man days)	Practice Module (10 man days)	Practice Module (10 man days)	Practice Module (10 man days)	Practice Module (10 man days)
Graduate Certificate in Intelligent Reasoning Systems	Graduate Certificate in Pattern Recognition Systems	Graduate Certificate in Intelligent Sensing Systems	Graduate Certificate in Intelligent Software Agents	Graduate Certificate in Practical Language Processing	Graduate Certificate in Intelligent Robotic Systems

Artificial Intelligence Intelligent Systems

<https://www.iss.nus.edu.sg/graduate-programmes/programme/detail/master-of-technology-in-intelligent-systems>

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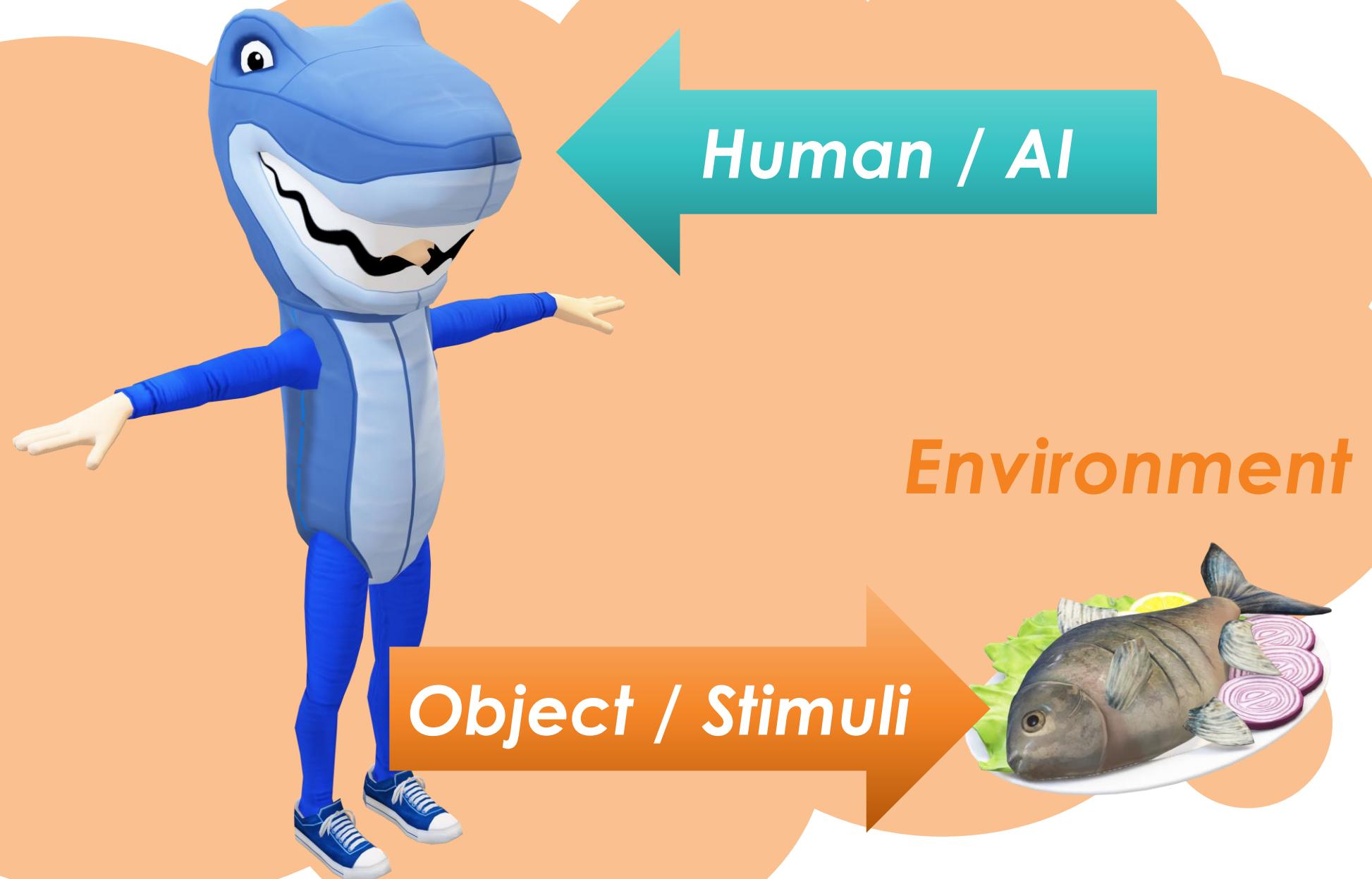
1.2.4 Exercise

Revisit Cognition – One Definition:

Cognition is "the mental action or process of **acquiring knowledge and understanding** through **thought** (recognition, learning, computation, reasoning & thinking), **experience** (information & data), and the **senses** (perceptions & sensors)". It encompasses many aspects of **intellectual functions** and processes such as attention, the formation of knowledge, memory and working memory, judgment and evaluation, reasoning and "computation", problem solving and decision making, comprehension and production of language.

Cognitive processes **use existing knowledge** (computation, reasoning & thinking) and **generate new knowledge** (learning supported by pattern recognition using experience/information from data/perceptions/sensors)

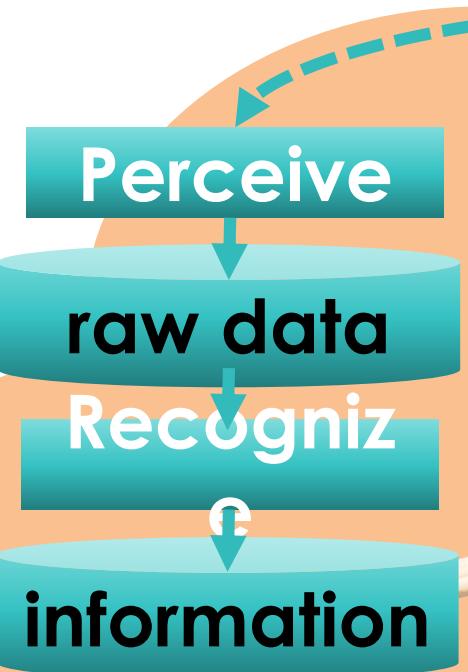
Example:
Model View of Cognitive Functions:
Reasoning

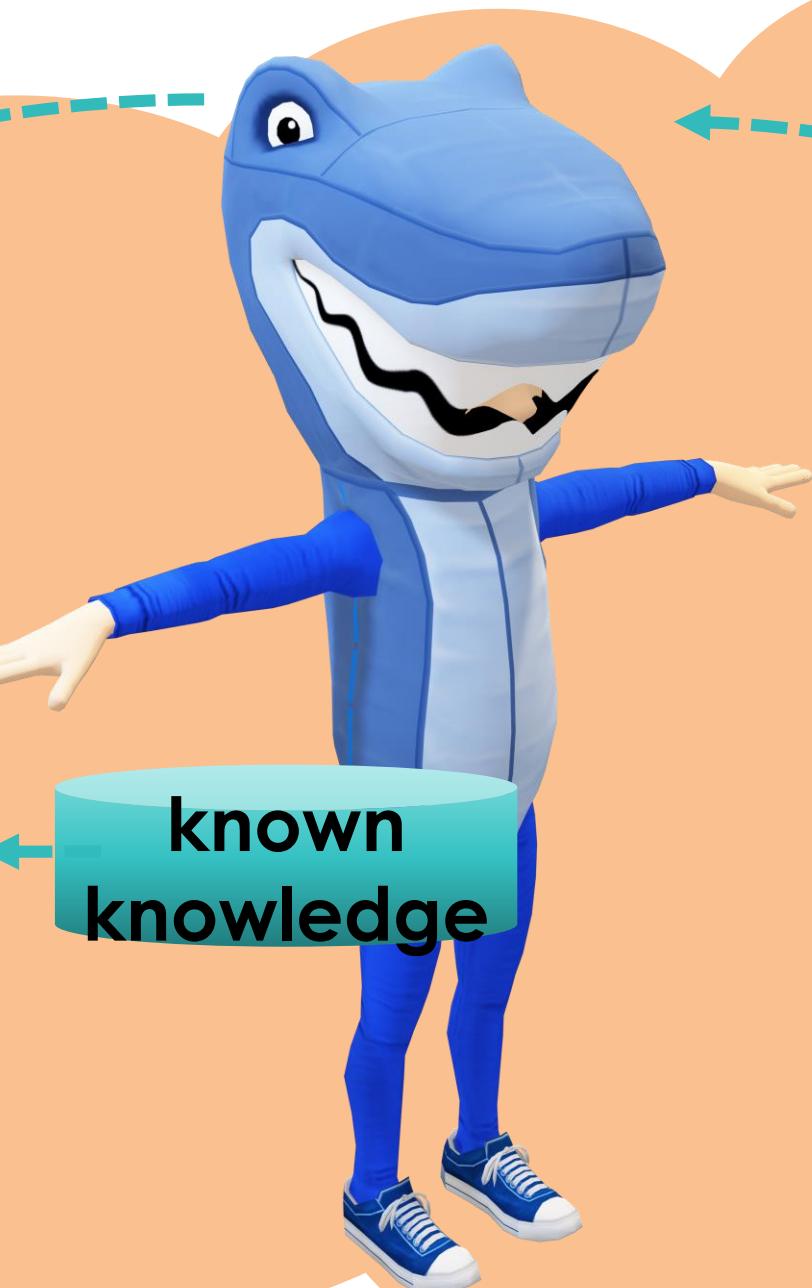
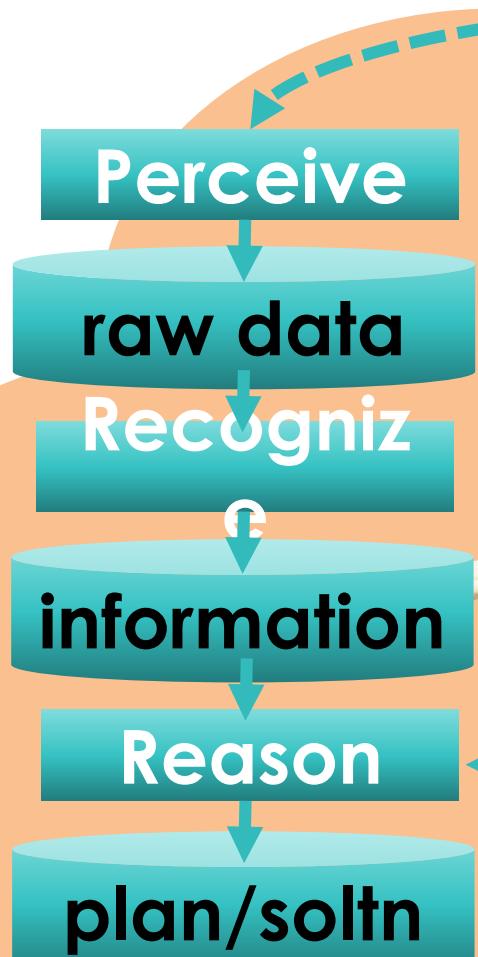


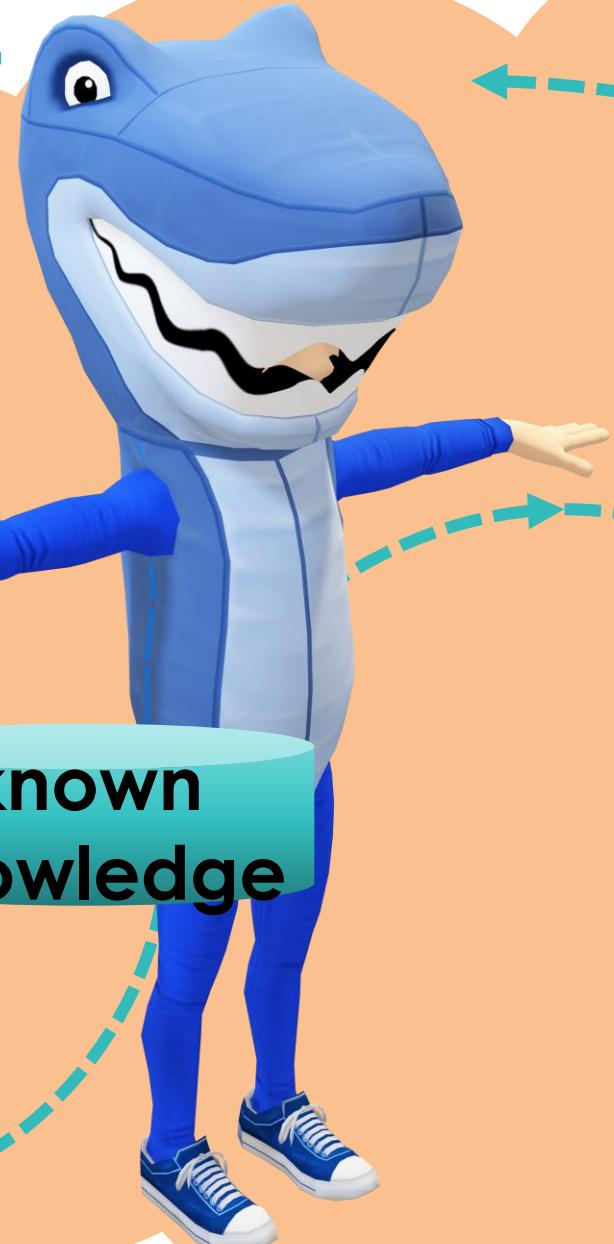
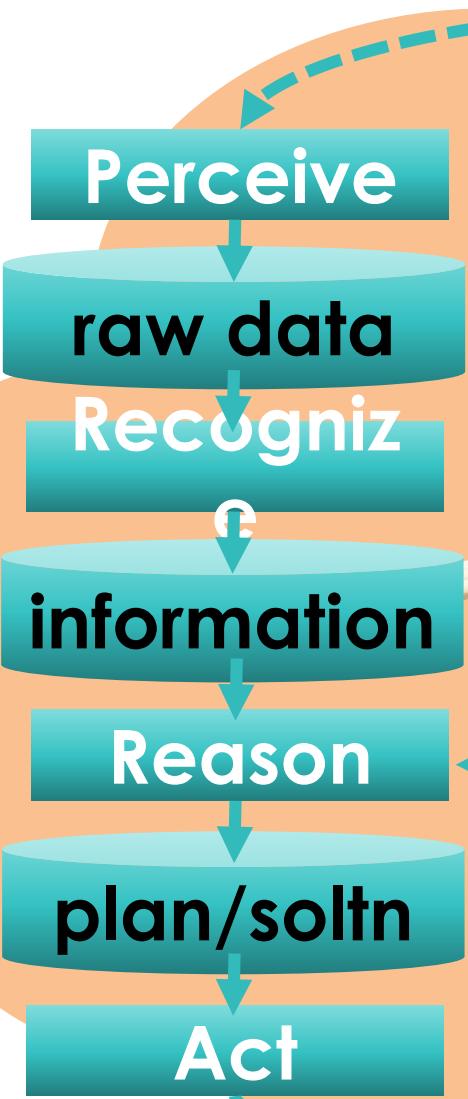
Perceive

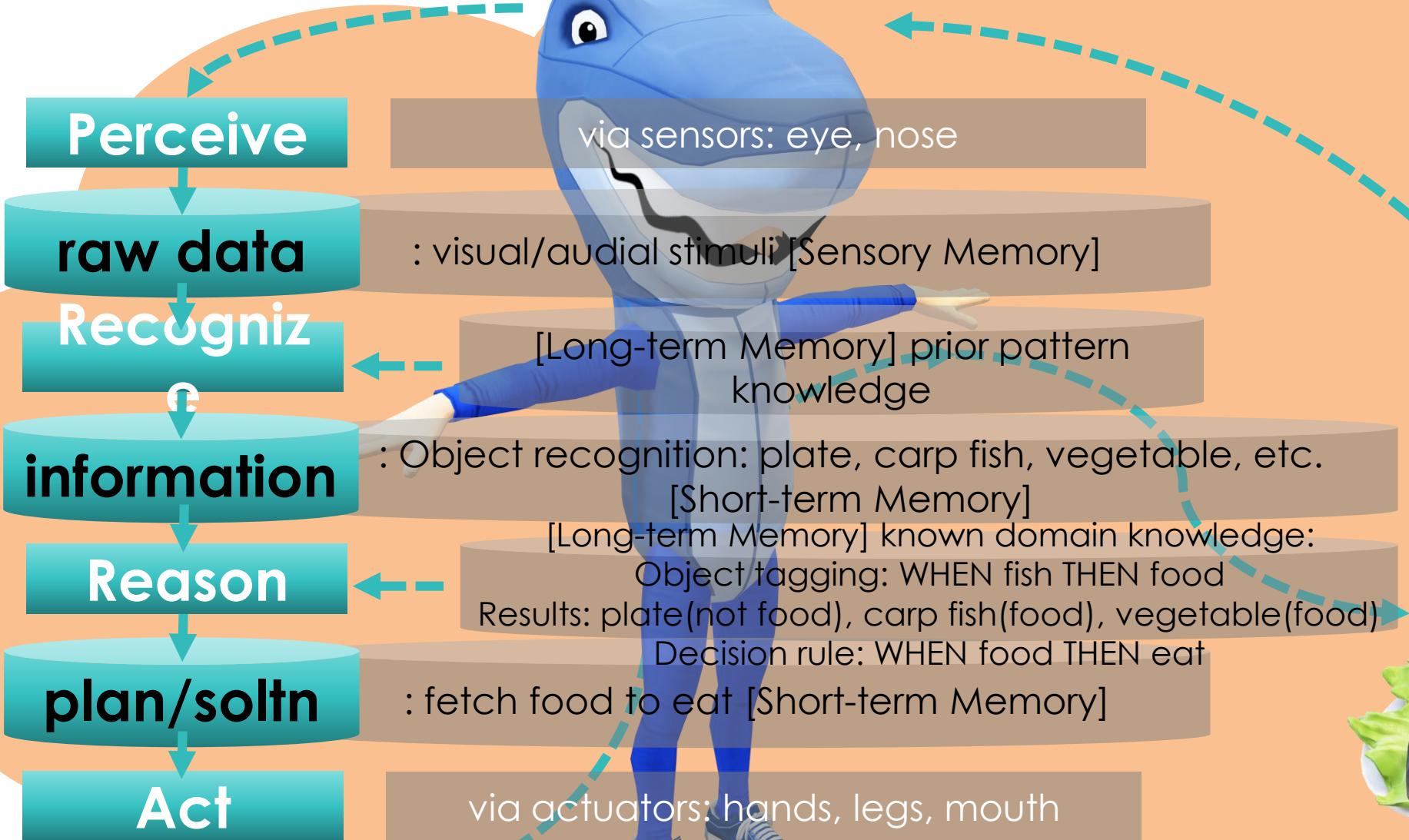
raw data



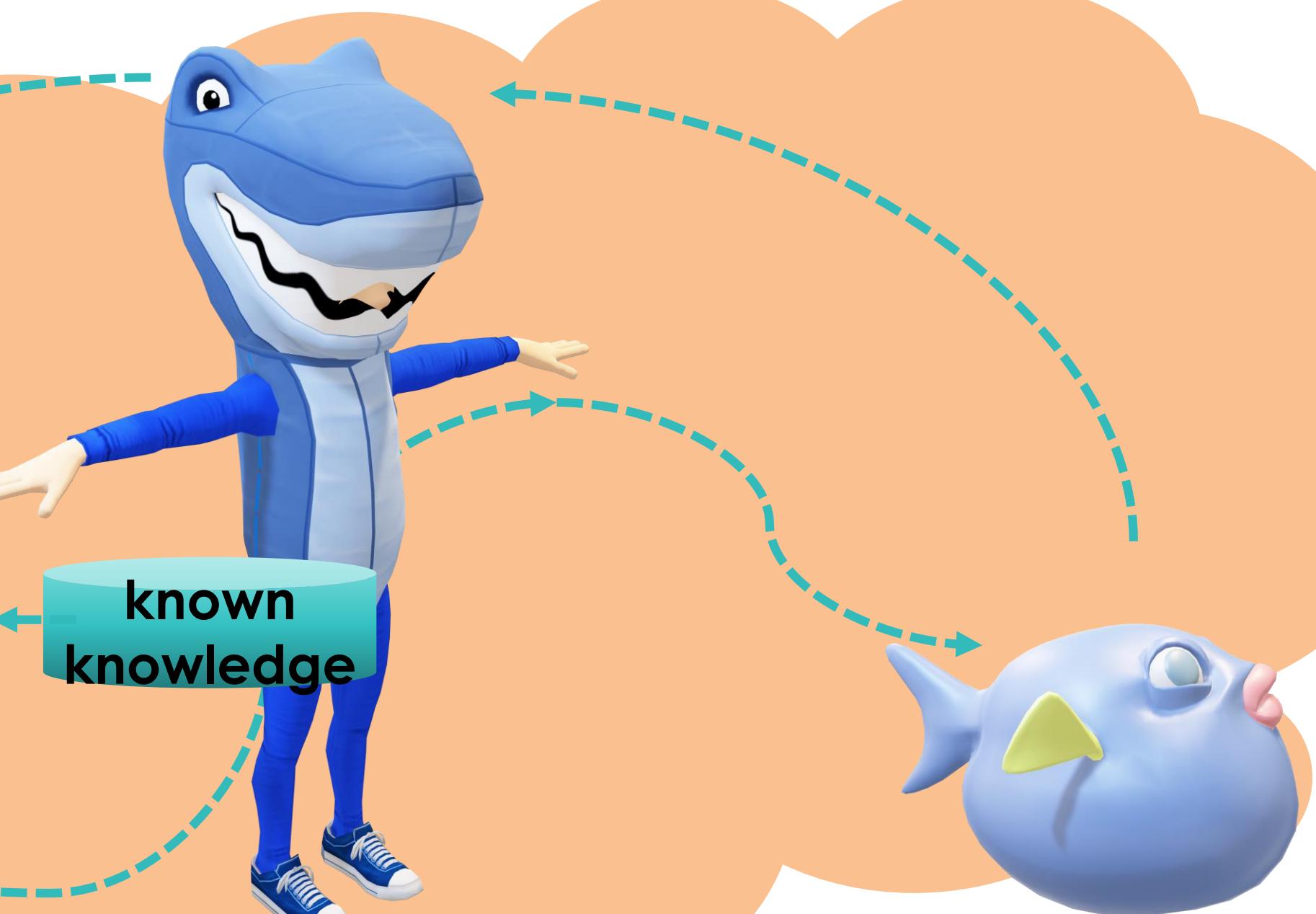
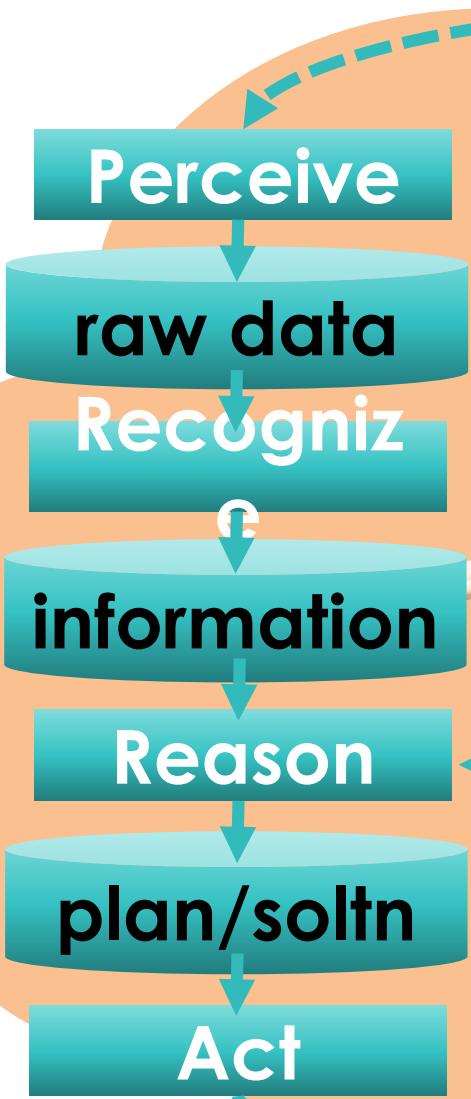


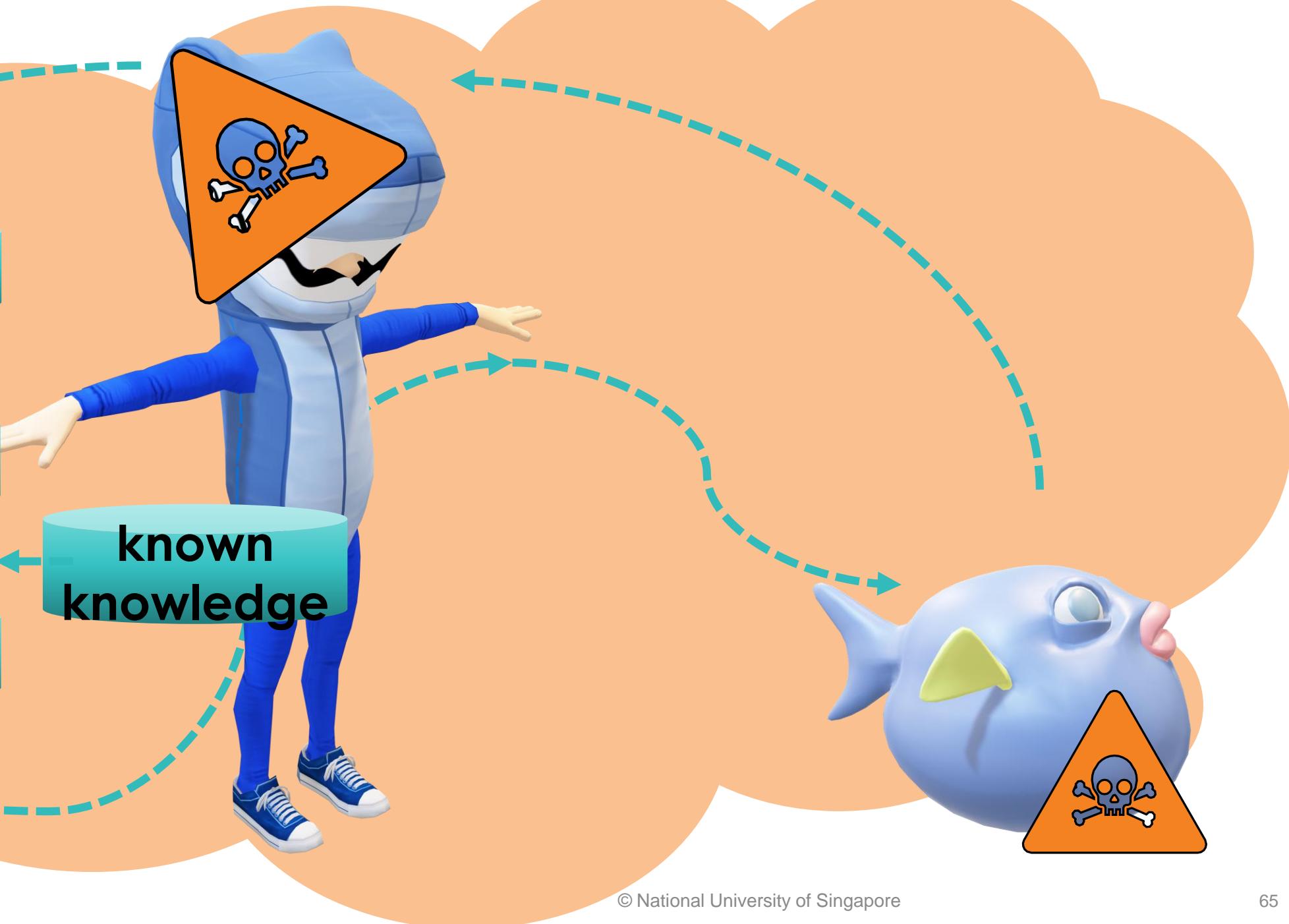
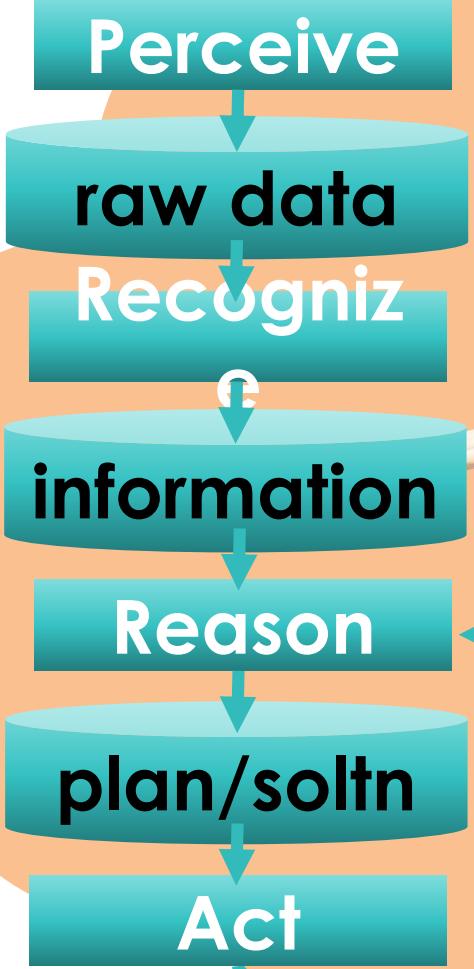


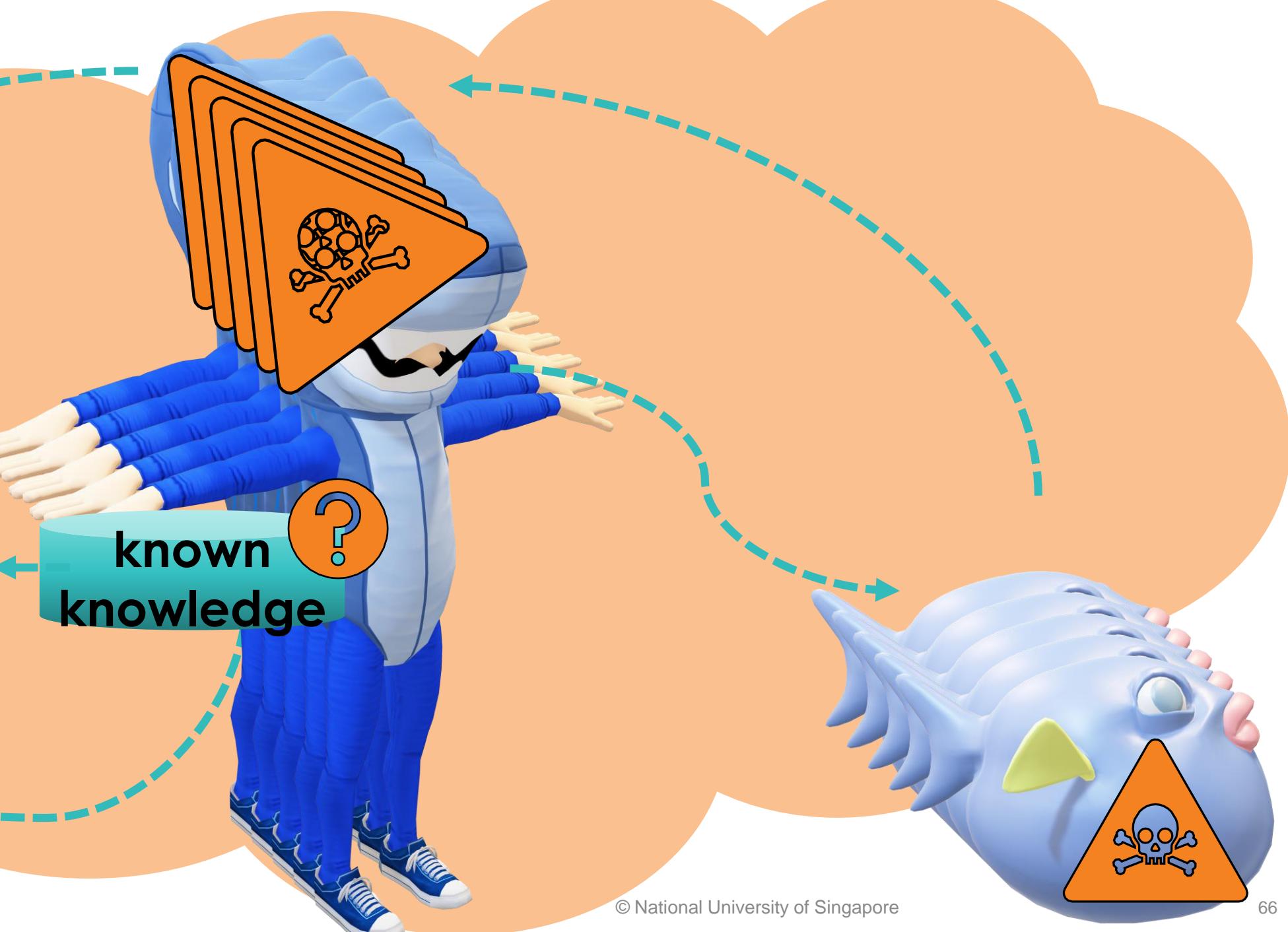
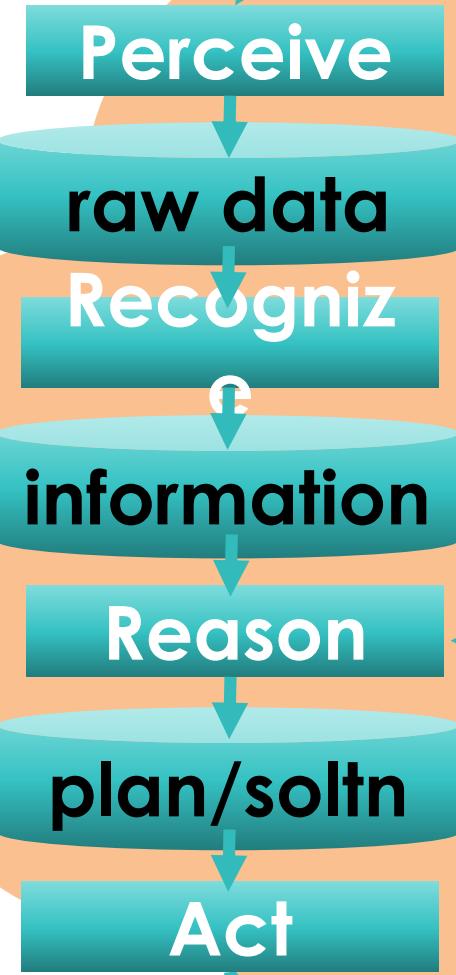


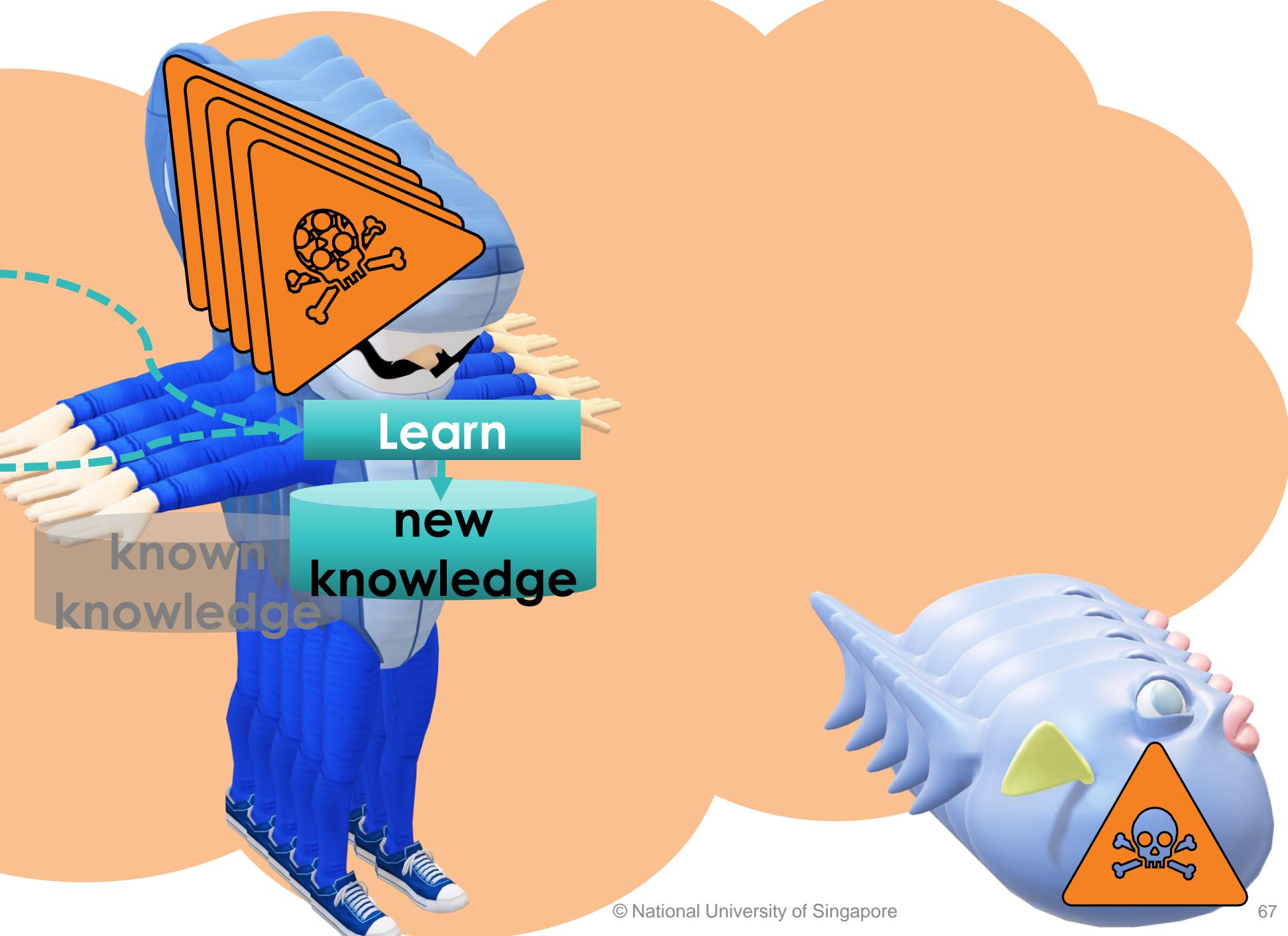


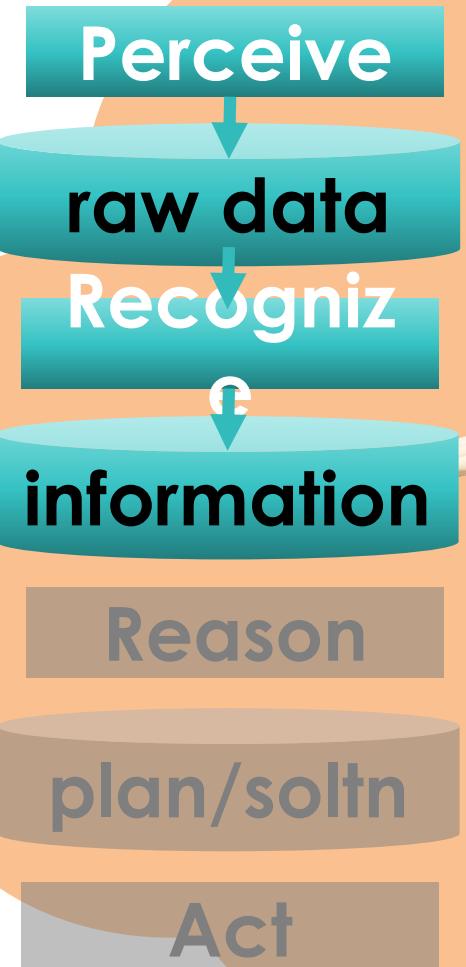
Example:
Model View of Cognitive Functions:
Learning + Reasoning

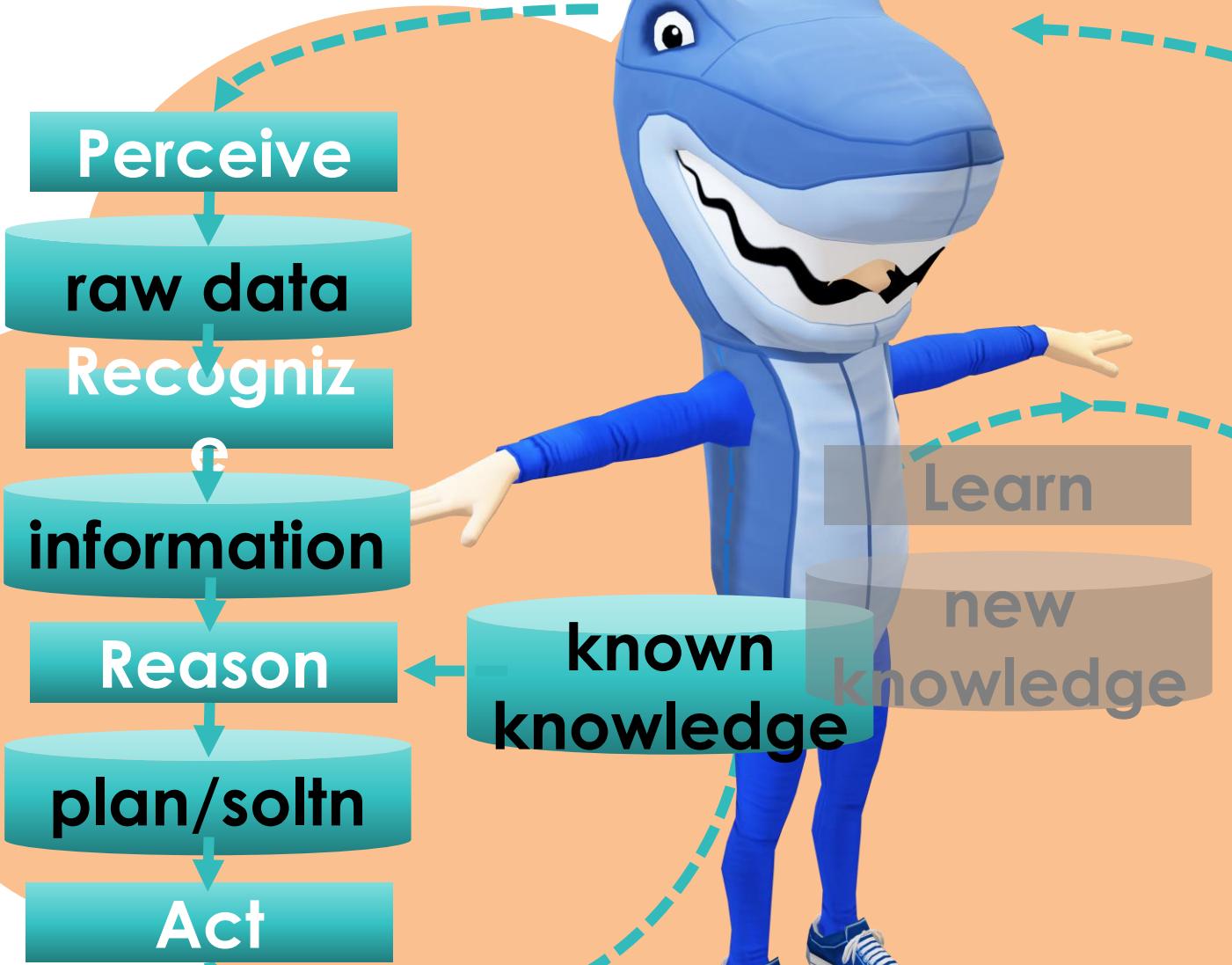












1.2 Reasoning System Architectures

1.2.1 Model View of Intelligent System

1.2.2 Cognitive Functions/Models: Learn, Reason, Perceive, Act

1.2.3 Data-driven vs. Goal-driven Systems

1.2.4 Exercise

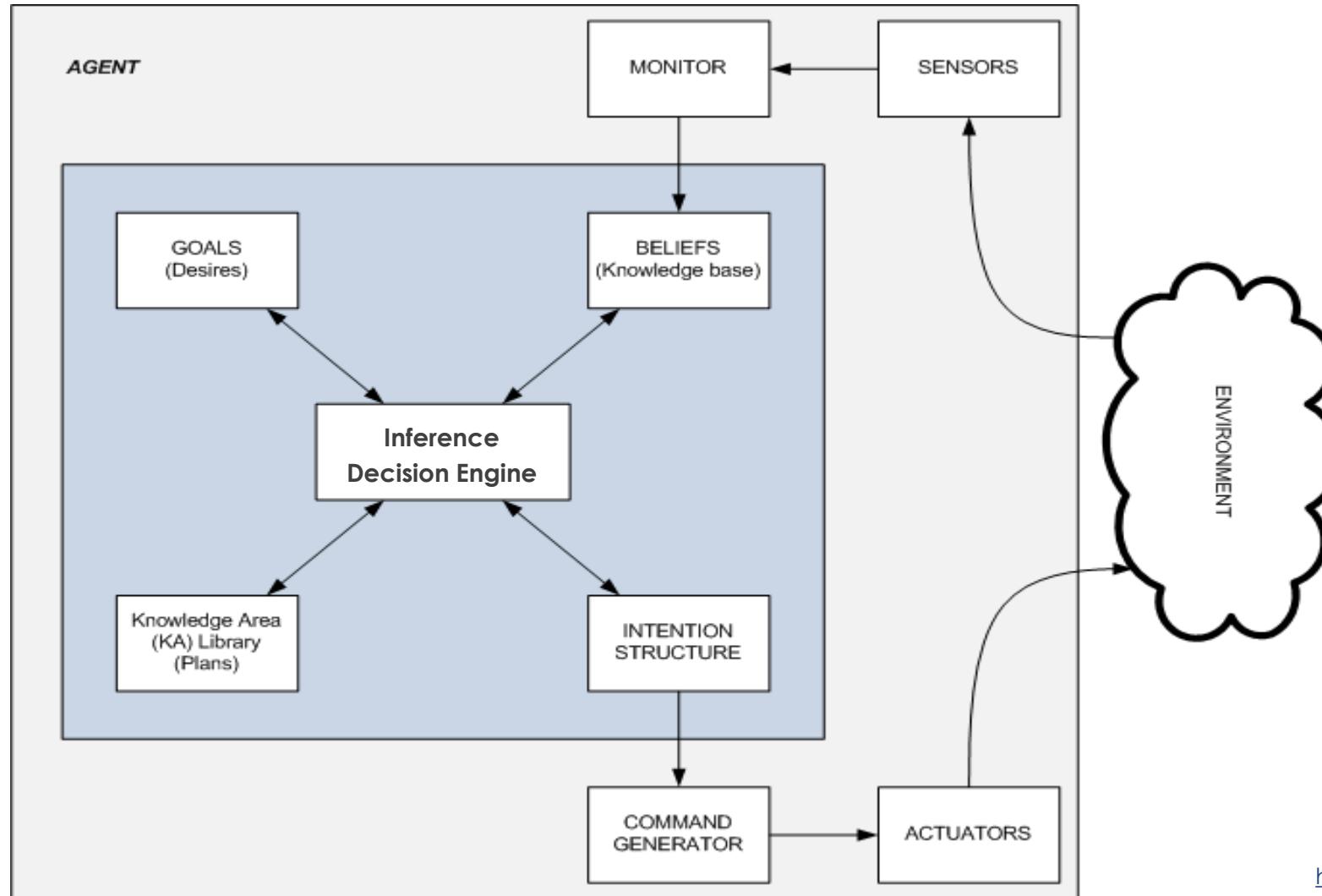
Data-driven vs. Goal-driven Systems

- **Proactive Reasoning Systems (Goal Driven)**
 - Autonomous Software System (Sales Chabot, Robotic Process Automation)
 - Multi Agent Cooperative System (Warehouse Robotic Swarm, Coordinated Robotic Vacuum Cleaners)
 - Constrain Solver (Real-time Delivery Scheduler)
- **Reactive Reasoning Systems (Data/Event Driven)**
 - Business Rule Management System (BRMS)
 - Business Process Management System (BPMS)
 - Constrain Solver (Travel Planner)

[Leave application system](#)

Data-driven vs. Goal-driven Systems

Goal Driven Systems

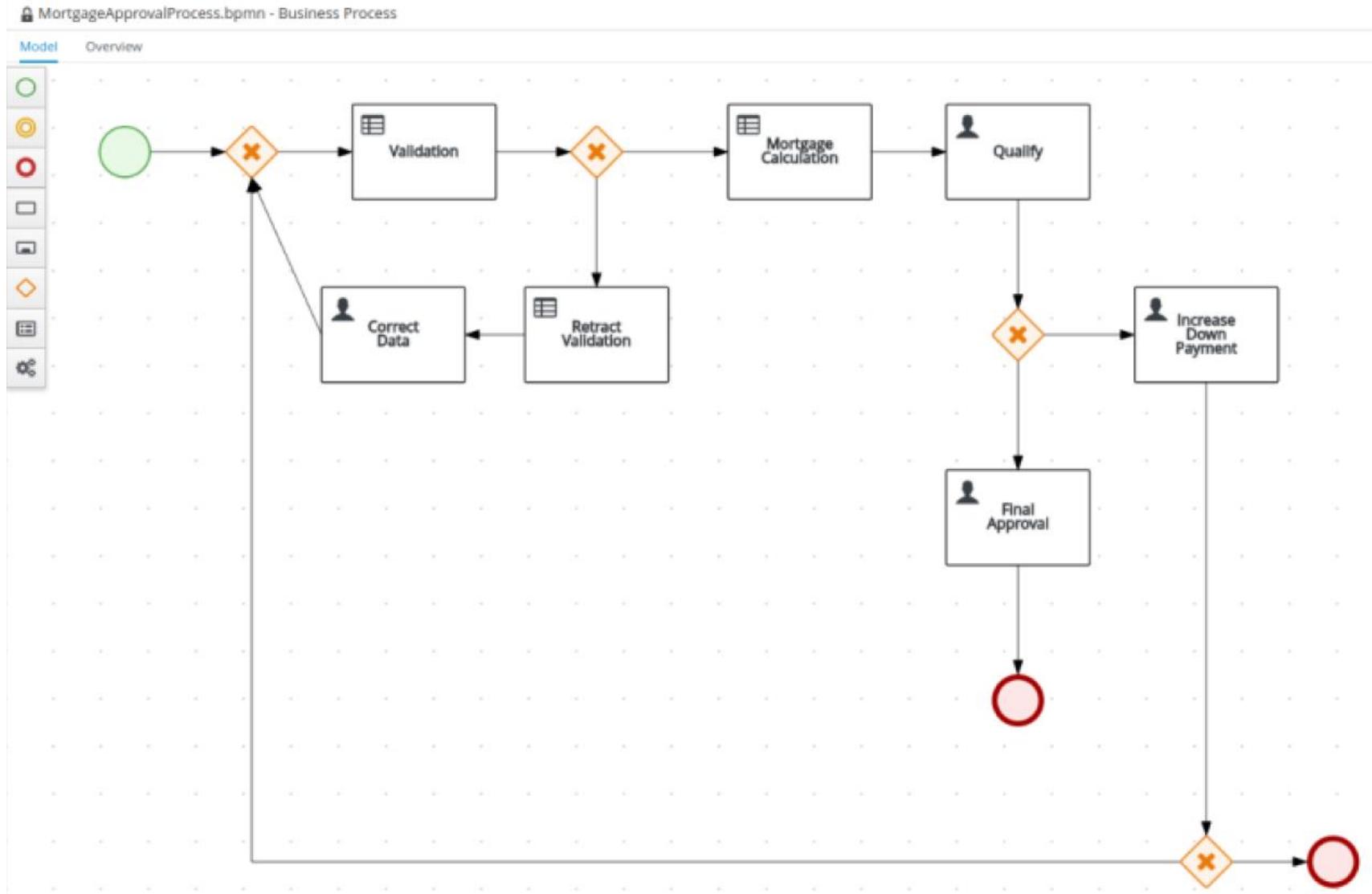


<https://upload.wikimedia.org/wikipedia/commons/f/f5/PRS.gif>

<https://static1.squarespace.com/static/57c8a68a20099ef23fb19e90/t/5a32a9804192022be97f9d10/1513269668629/Atlas.png>

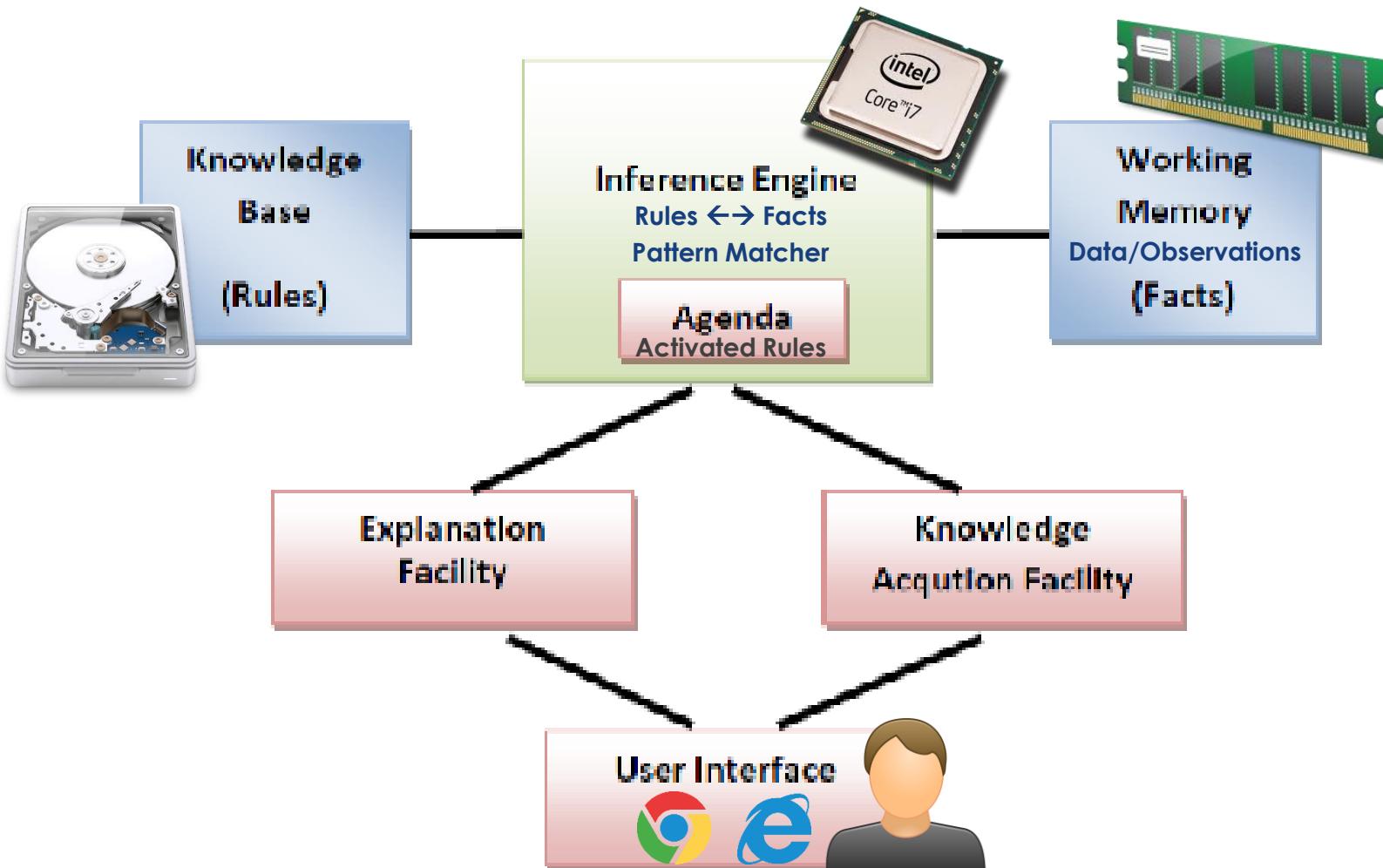
Data-driven vs. Goal-driven Systems

Knowledge (Fact/Rule/Process) Driven Systems

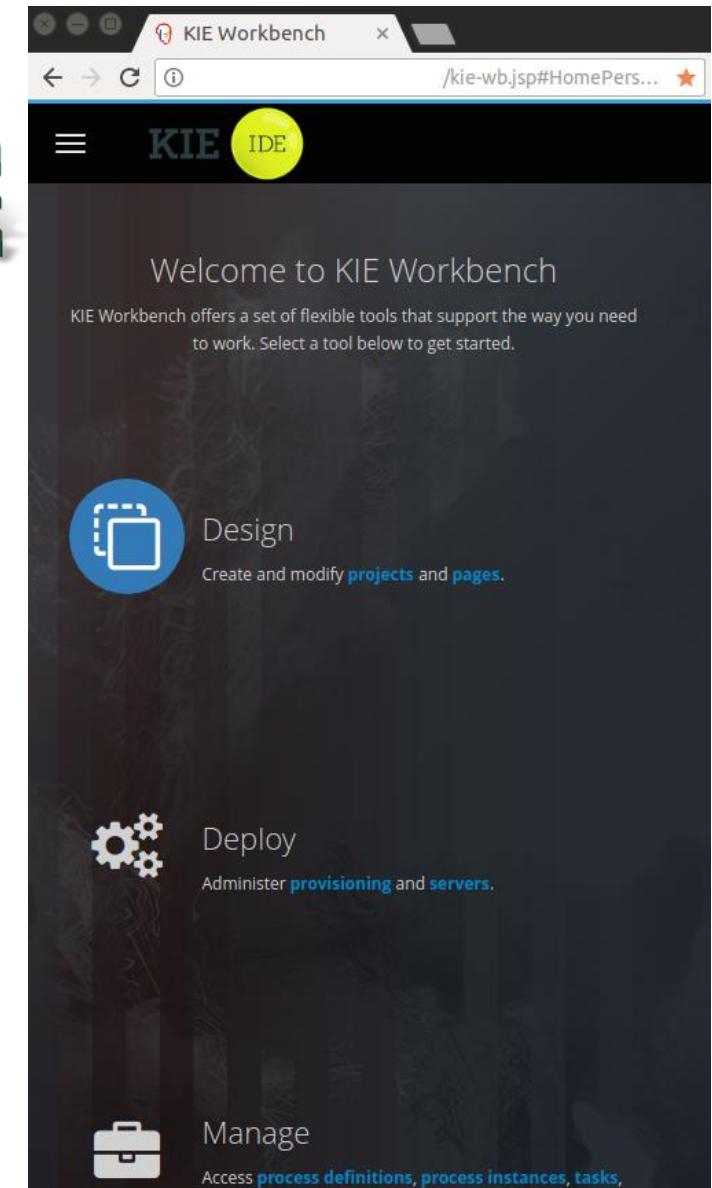


Data-driven vs. Goal-driven Systems

Knowledge (Fact/Rule/Process) Driven Systems



https://www.researchgate.net/profile/Bhavani_Panda/publication/232707515/figure/fig2/AS:33960734338665_7@1457980108974/Fig2-Structure-of-a-rule-based-expert-system.png



REGULATION Explainable AI and Counterfactuals

Published on January 6, 2019



Dr. Finn Macleod | [Follow](#)
Director, Beautiful Data



20



2



4

Explainable AI is a *legal* requirement in modern business. The EU GDPR clearly states the right to challenge algorithmic decisions that have been made without human intervention.

More importantly the EU GDPR requires the data controller to prevent algorithmic bias arising from the basis of race, gender, religion or other sensitive data.

“In any case, such processing should be subject to suitable safeguards, which should include specific information to the data subject and the right to obtain human intervention, to express his or her point of view, to obtain an explanation of the decision reached after such assessment and to challenge the decision”

Technical toolsets are not used to be solve non-technical problems

Data sampling fairness. Eg. 20% Africans 80% whites. If we are unable to get sufficient data for Africans, if we artificially inject more data. Is this fair?

*Explainability - Extracts from recital 71,
GDPR*

1.2 Reasoning System Architectures

1.2.1 Model View of Intelligent System

1.2.2 Cognitive Functions/Models: Learn, Reason, Perceive, Act

1.2.3 Data-driven vs. Goal-driven Systems

1.2.4 Exercise

[Exercise] Is this model a white box or black box?

- knowledge-discovery-based (white box) or function-approximation-based (black box)? Justify your choice.

The screenshot shows a Windows Notepad window titled "model.txt - Notepad". The menu bar includes File, Edit, Format, View, and Help. The content of the file is as follows:

```
Output : Salary
Input 1 : Year-of-Education
Input 2 : Year-of-Working

Formula : Output = a × Input 1 + b × Input 2 + c
          (Salary)   (Year-of-Education) (Year-of-Working)

Formula parameters/coefficients : a = 520
Formula parameters/coefficients : b = 798
Formula parameters/coefficients : c = -5007
```

Annotations in red text are present on the right side of the window:

- "If we can explain the context of business its whitebox."
- "I think no right or wrong."

1.3 Rule/Process Reasoning System [Workshop]

1.3.1 Machine Memory & Query

Special thanks to Geet Jethwani (A0215395B) for his contribution.

1.3.2 Textual Knowledge Processing

Special thanks to Yan Wei Quan (A0215498U) for his contribution.

1.3.3 Workshop Submission

1.3 Rule/Process Reasoning System [Workshop]

1.3.1 Machine Memory & Query

Special thanks to Geet Jethwani (A0215395B) for his contribution.

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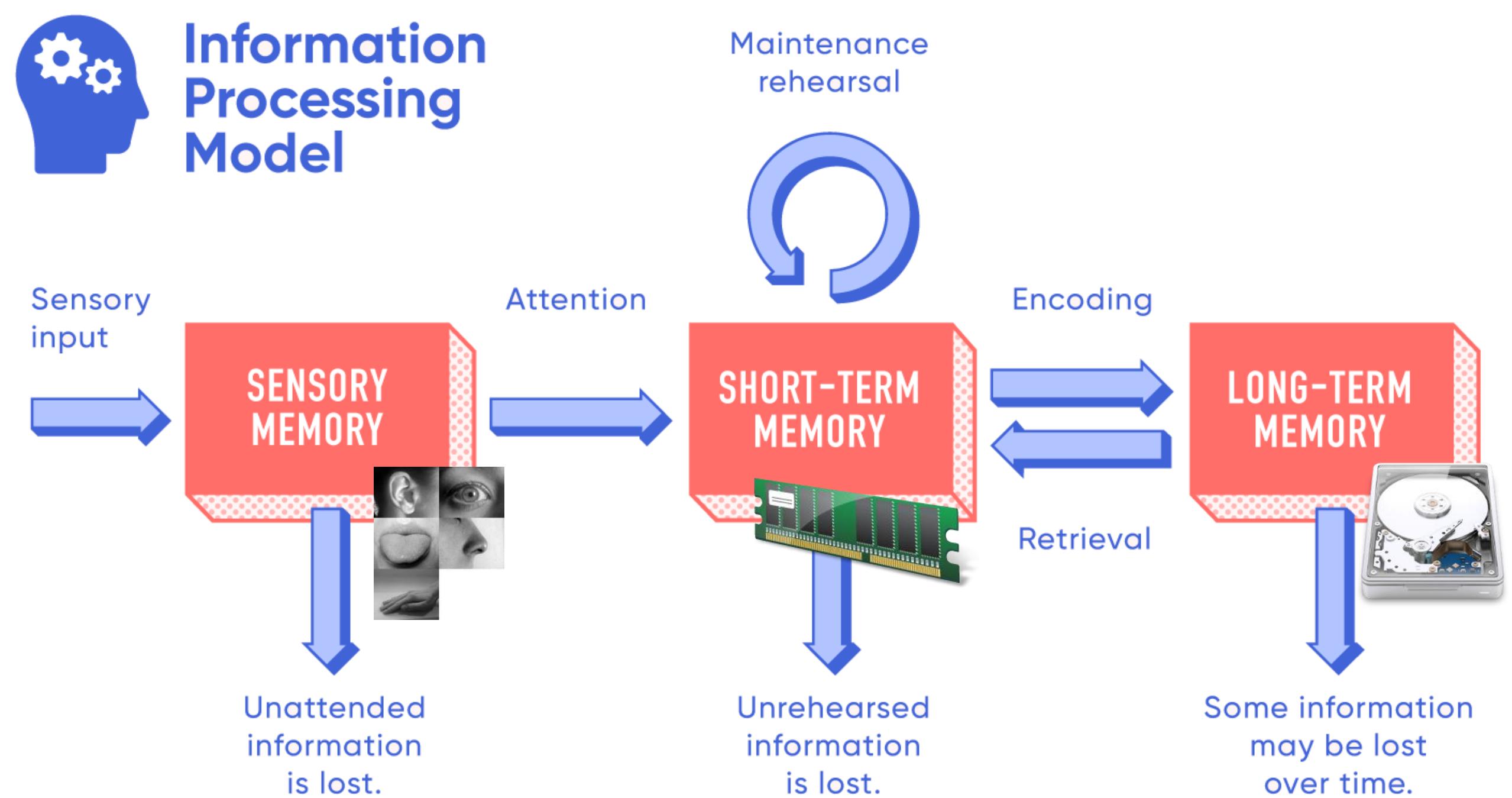
1.3.3 Workshop Submission

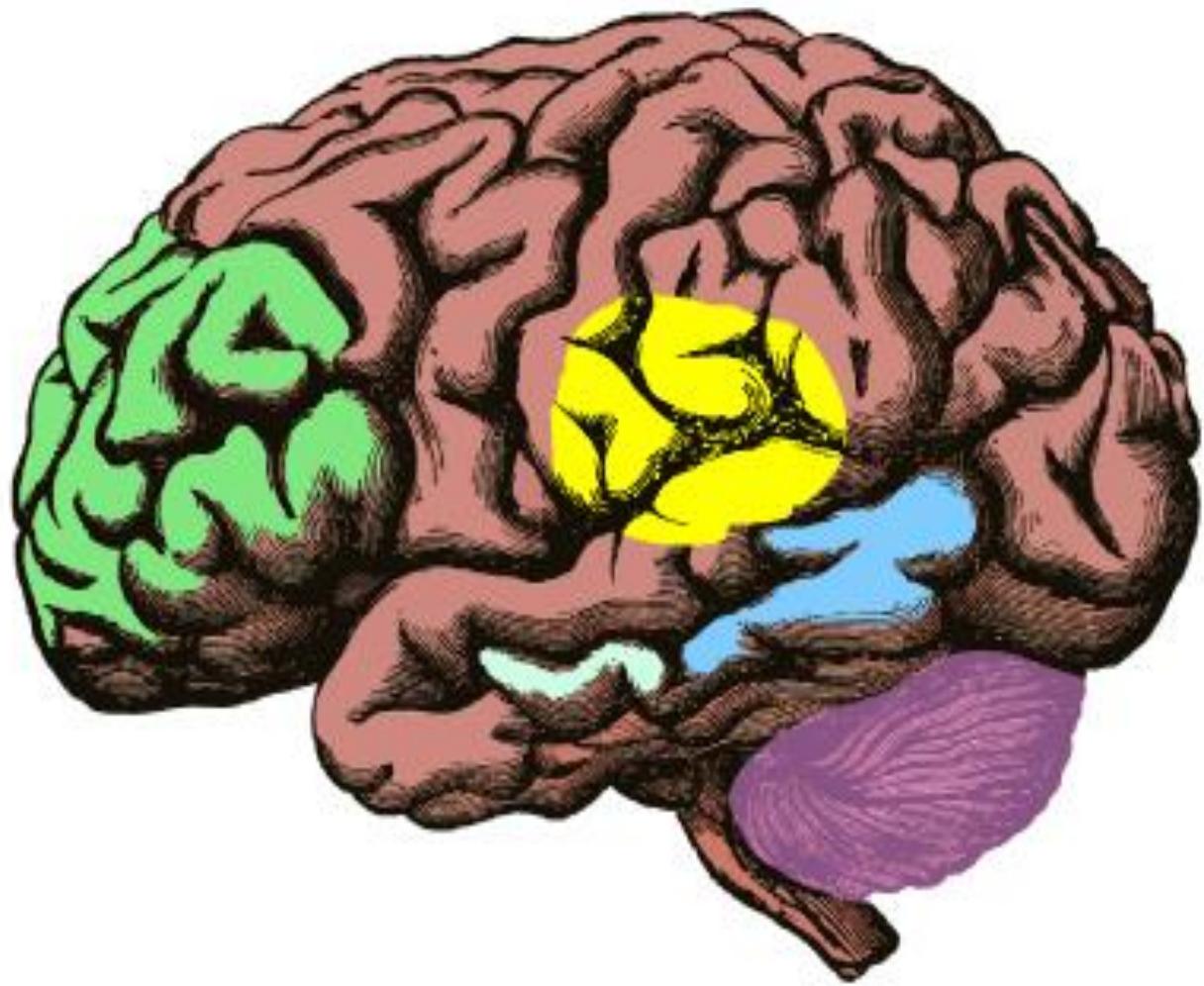
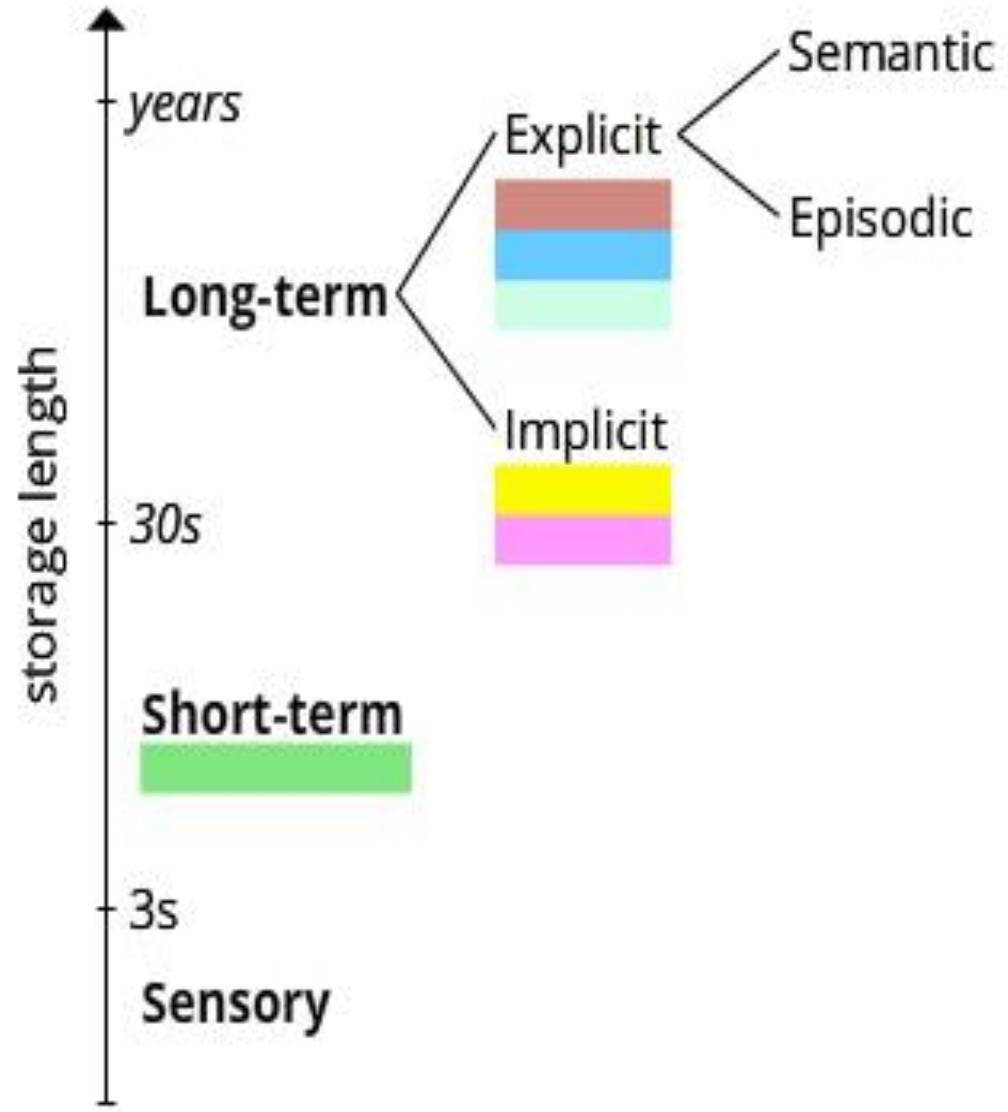
Human Long-term Memory

to store knowledge data

Human Working/Sensory Memory

to store raw/sensory/interim data

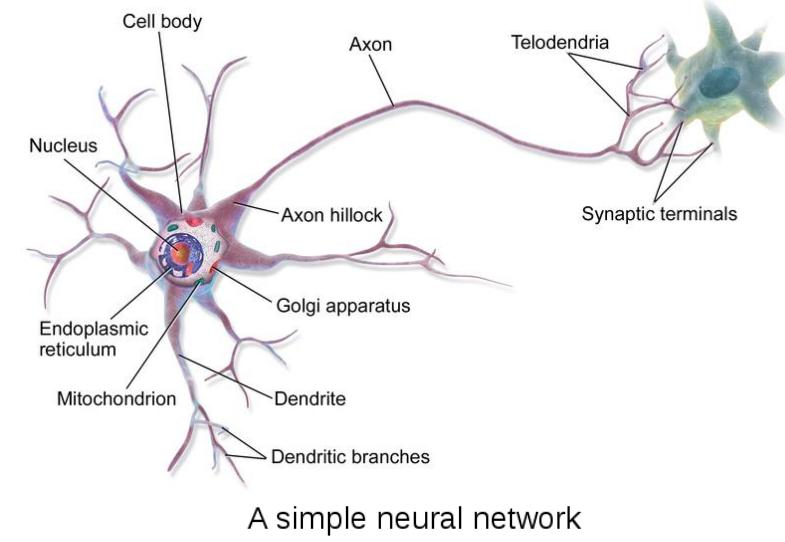
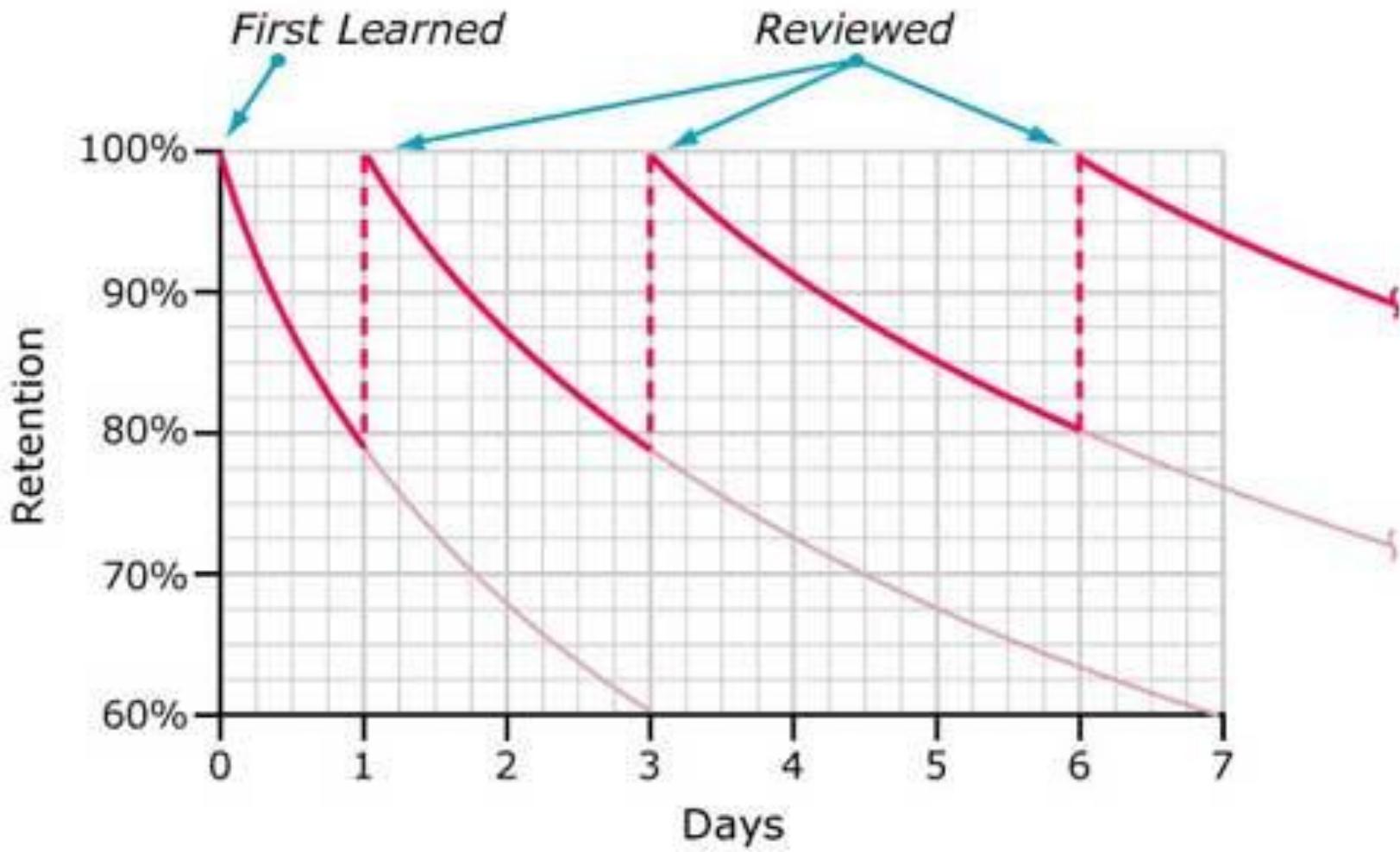




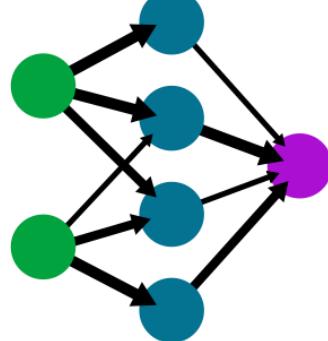


**Memorizing requires repetition;
Memorizing enables Learning.**

Typical Forgetting Curve for Newly Learned Information



A simple neural network
input layer hidden layer output layer



AI's memory is storage.

**(Structured) Database
&
SQL: structured query language**

What is a Database (DB) ?

A database is an organized collection of structured information, or data, typically stored electronically in a computer system.

A database is usually controlled by a database management System.

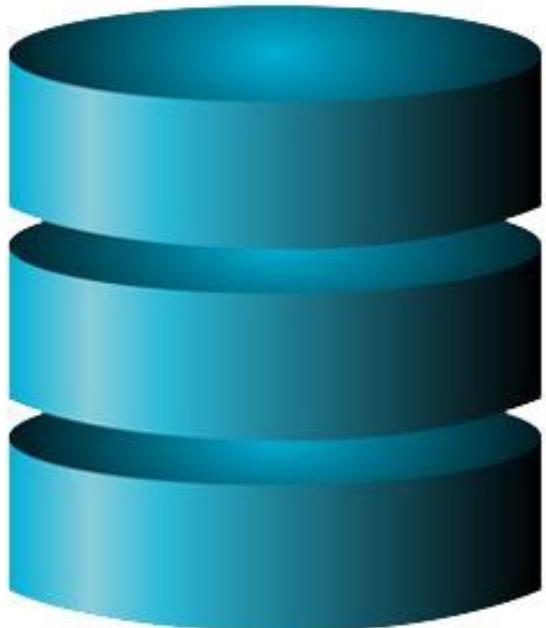


Table 1: Details of variables mapping to the Q-Chat-10 screening methods

Variabl e in Dataset	Corresponding Q-chat-10-Toddler Features
A1	Does your child look at you when you call his/her name?
A2	How easy is it for you to get eye contact with your child?
A3	Does your child point to indicate that s/he wants something? (e.g. a toy that is out of reach)
A4	Does your child point to share interest with you? (e.g. pointing at an interesting sight)

What is SQL ?

- SQL Or Structured Query Language makes it possible to for us to perform operations on a database.
- It allows us to access, read and modify the contents of a database.
- Select, Insert, update and delete are few of the most common operations performed using the SQL.
- However, the SQL statements can retrieve data from a relational database.

What is RDBMS ?

- A software system used to maintain relational databases is a relational database management system (RDBMS).
- The data in a RDBMS is stored in database objects which are called tables. This table is a collection of related data entries and it consists of numerous columns and rows.
- RDBMS is the basis (run-time environment) for SQL execution.

SQL Commands

- Operations on database is carried out using certain SQL commands. They are mainly categorized as:
 - DDL: Data Definition Language
 - DQL: Data Query Language
 - DML: Data Manipulation Language
 - DCL: Data Control Language

DDL: Data Definition Language

- DDL or data definition Language mainly focuses on creation and modification of database objects.
- For example, if you have to create a table in a database or drop that table for instance, you will have to use DDL commands.
- Some of the DDL commands are as follows :
 - Create: Create the database or its objects
 - Alter: Alter the structure of database
 - Drop: Delete database or database objects

DQL: Data Query Language

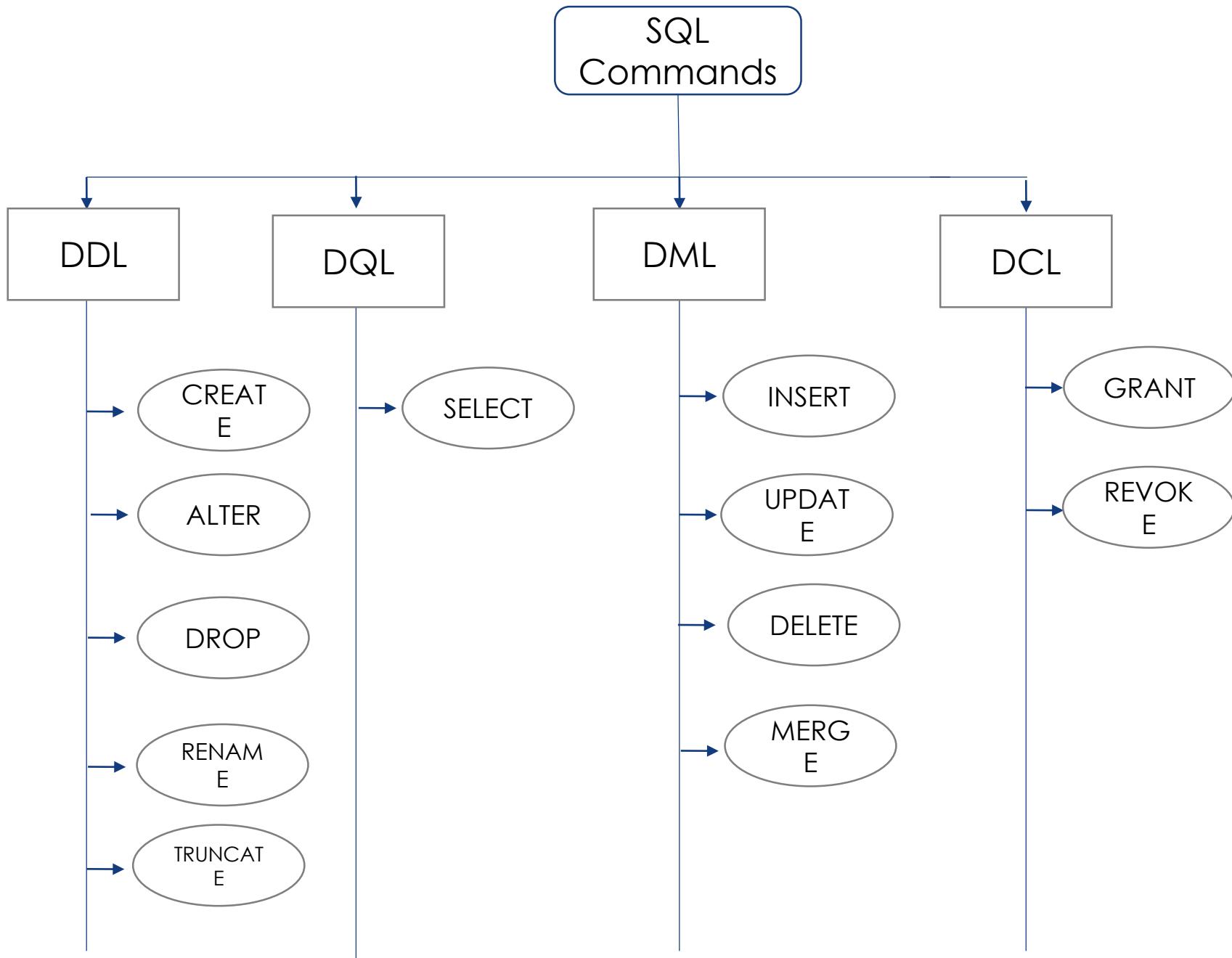
- DQL stands for Data Query Language
- This is Used to retrieve data from the database :
- SELECT command is used to perform this operation
- E.g. Select field_name from database_name where condition ;

DML: Data Manipulation Language

- Data Manipulation Language
- When the data has to be manipulated, i.e., records need to be inserted, modified or deleted from the Database, then we use Data manipulation language
- Some commonly used DML are :
 - Insert: addition of records to the existing table
 - Update: updating existing records of a table
 - Delete: deletion of a record from a table

DCL: Data Control Language

- Data Control Language is mainly used to Grant or Revoke user access to a database.
- A use case for this would be that a contractor has been assigned to your company project. However, since he is not part of the company, he has limited access.
- Thus, you would have to grant permission to your DB.
- Examples of DCL:
 - GRANT: Gives user access to DB
 - REVOKE: withdraw user's access to a particular DB that was granted access



SQL Table Keys

- Often, we have to maintain relationship with other tables and also provide uniqueness to fields in our existing table. SQL Keys help us achieve this. There are several SQL keys. However, we require only the following for now:
- Primary Key: A Primary key uniquely identifies records in a table
- Unique Key: same as primary key, but allows a null value
- Foreign Key: A primary key of another table is referred to by this table as foreign key (one field/column).

Further Reading

- <https://en.wikipedia.org/wiki/Database>
- https://www.tutorialspoint.com/sql/sql_rdbms_concepts.htm
- https://www.w3schools.com/sql/sql_intro.asp
- <https://sqlrelease.com/sql-server-tutorial/types-of-keys>

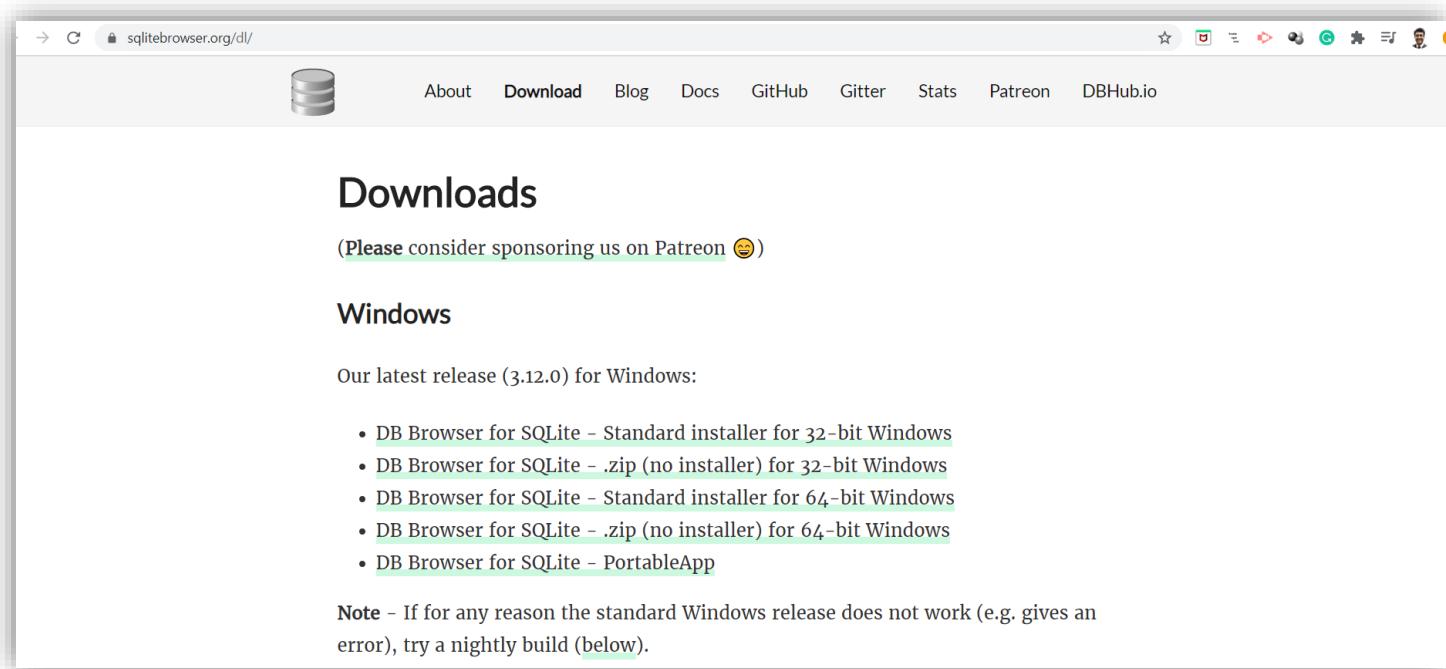
Tools: **SQLite DB & SQLite Browser**

SQLite

- Open Source, embedded database, i.e., Doesn't require a server to communicate with database.
- All database operations (read, write, etc.) are done on database disk file directly, thus also referred to as “serverless” database.
- More on SQLite: <https://www.sqlite.org/docs.html>

DB Browser - SQLite Installation

- Download Link: <https://sqlitebrowser.org/dl/>
- [Windows/Mac] Select the standard installer(32/64 bit based on machine)
- [Linux/Ubuntu] https://linuxhint.com/install_sqlite_browser_ubuntu/

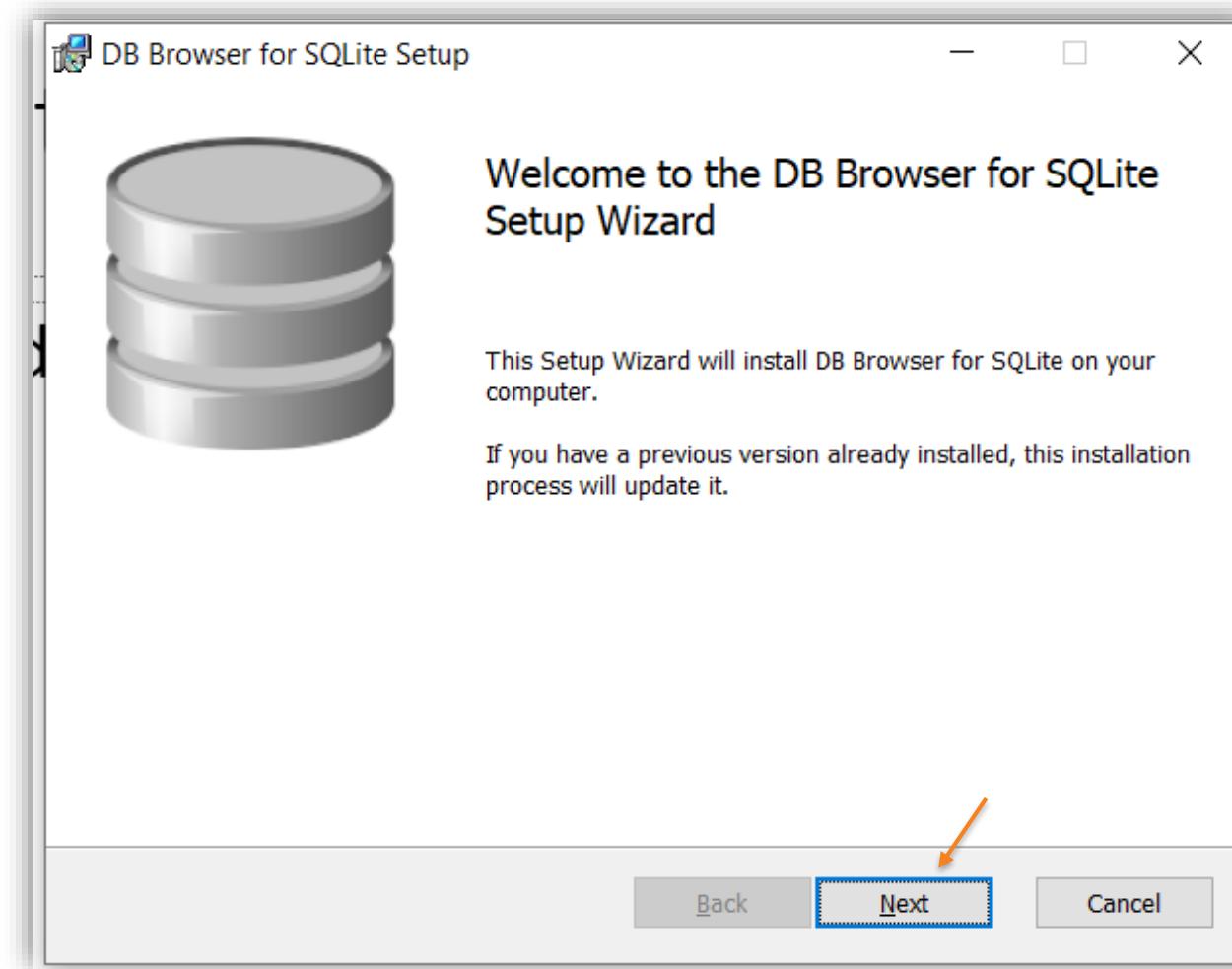


SQLite & SQLite Browser (Ubuntu 20.04)

Install the SQLite browser and the SQLite 3 database in Ubuntu 20.04

- https://linuxhint.com/install_sqlite_browser_ubuntu/
- More on SQLite: <https://www.sqlite.org/docs.html>

- Once downloaded, follow the installation steps as shown:





DB Browser for SQLite Setup



End-User License Agreement

Please read the following license agreement carefully

DB Browser for SQLite is bi-licensed under the Mozilla Public License Version 2, as well as the GNU General Public License Version 3 or later.

You can modify or redistribute it under the conditions of these licenses.

GNU GENERAL PUBLIC LICENSE

Version 3, 29 June 2007

I accept the terms in the License Agreement

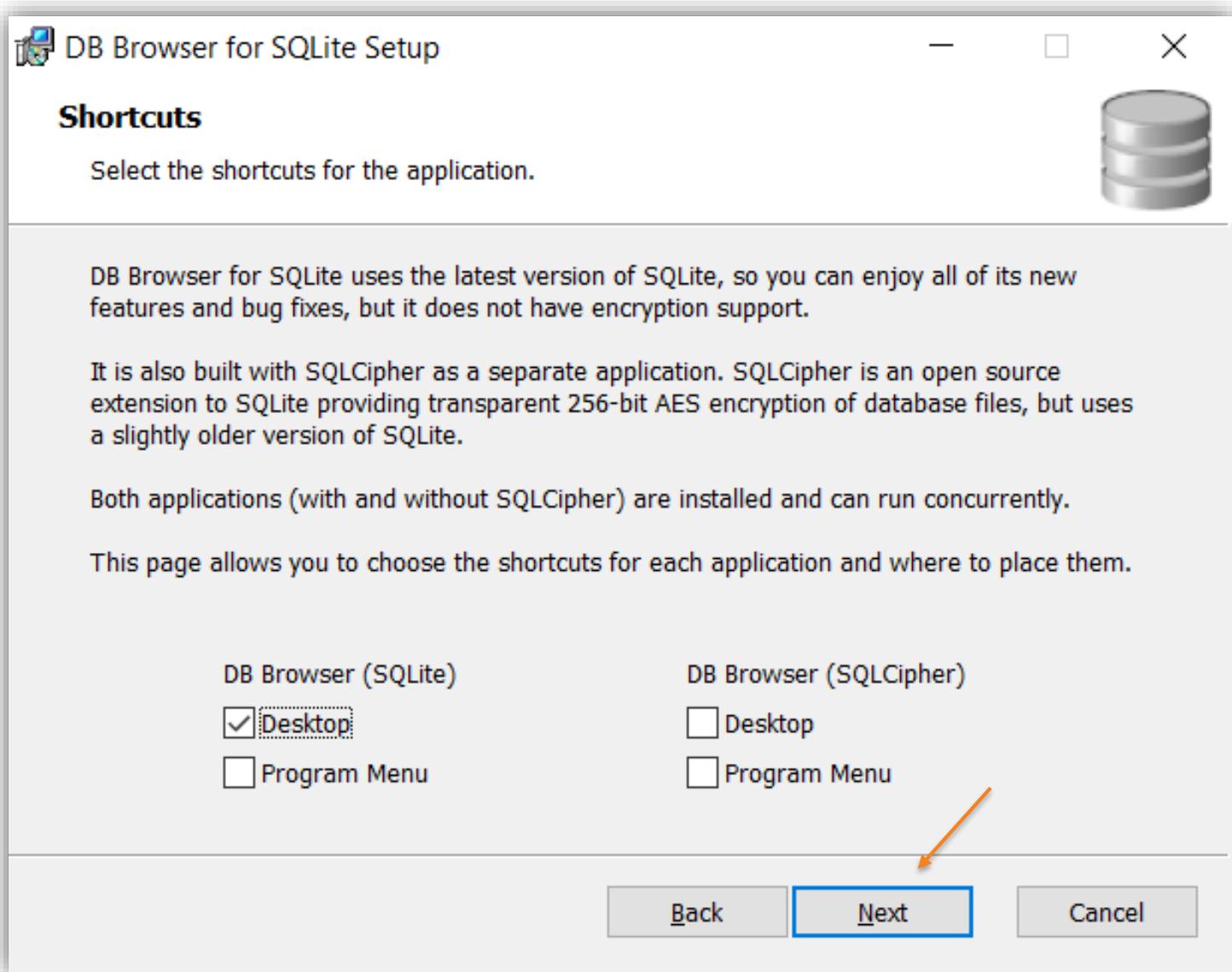


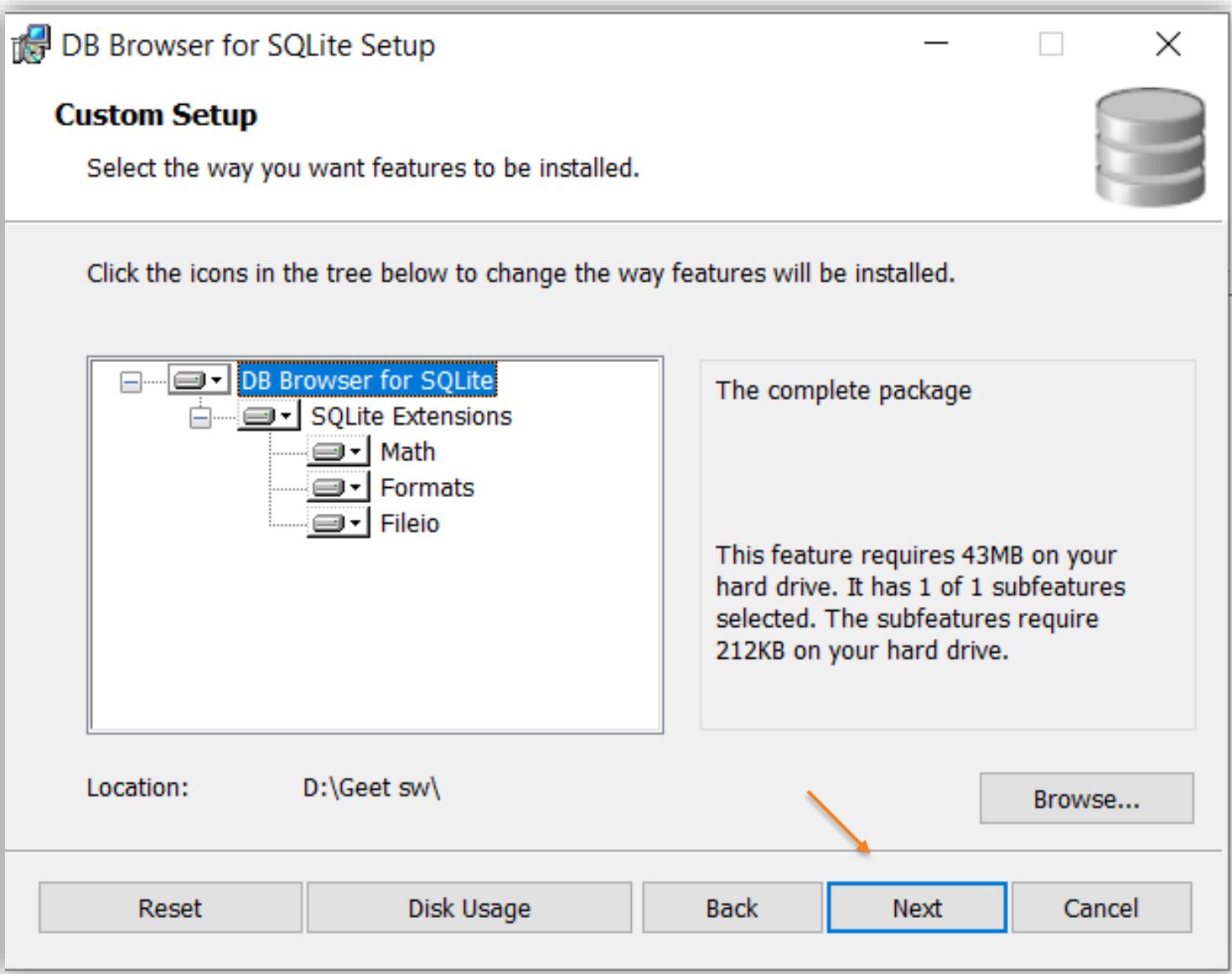
[Print](#)

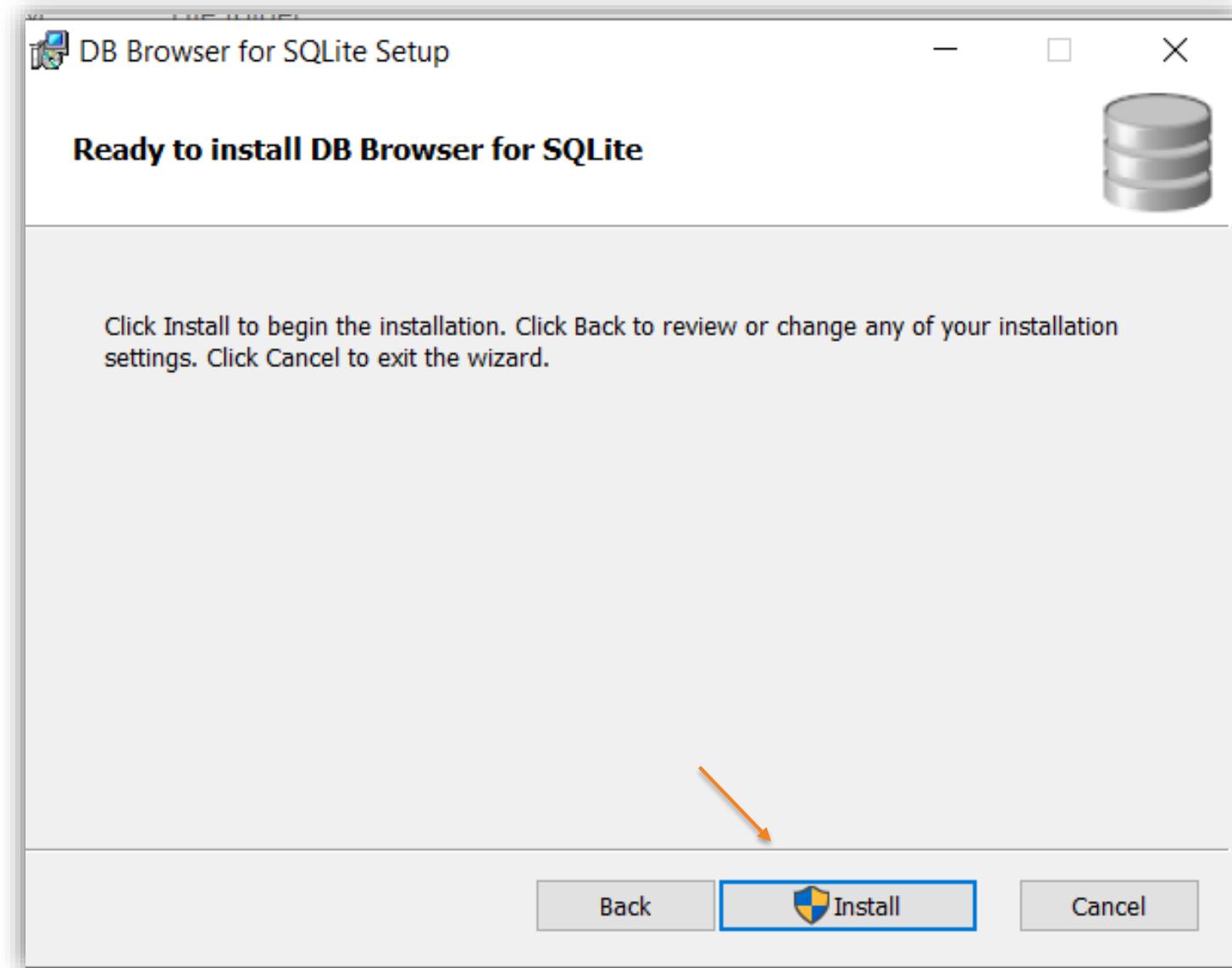
[Back](#)

[Next](#)

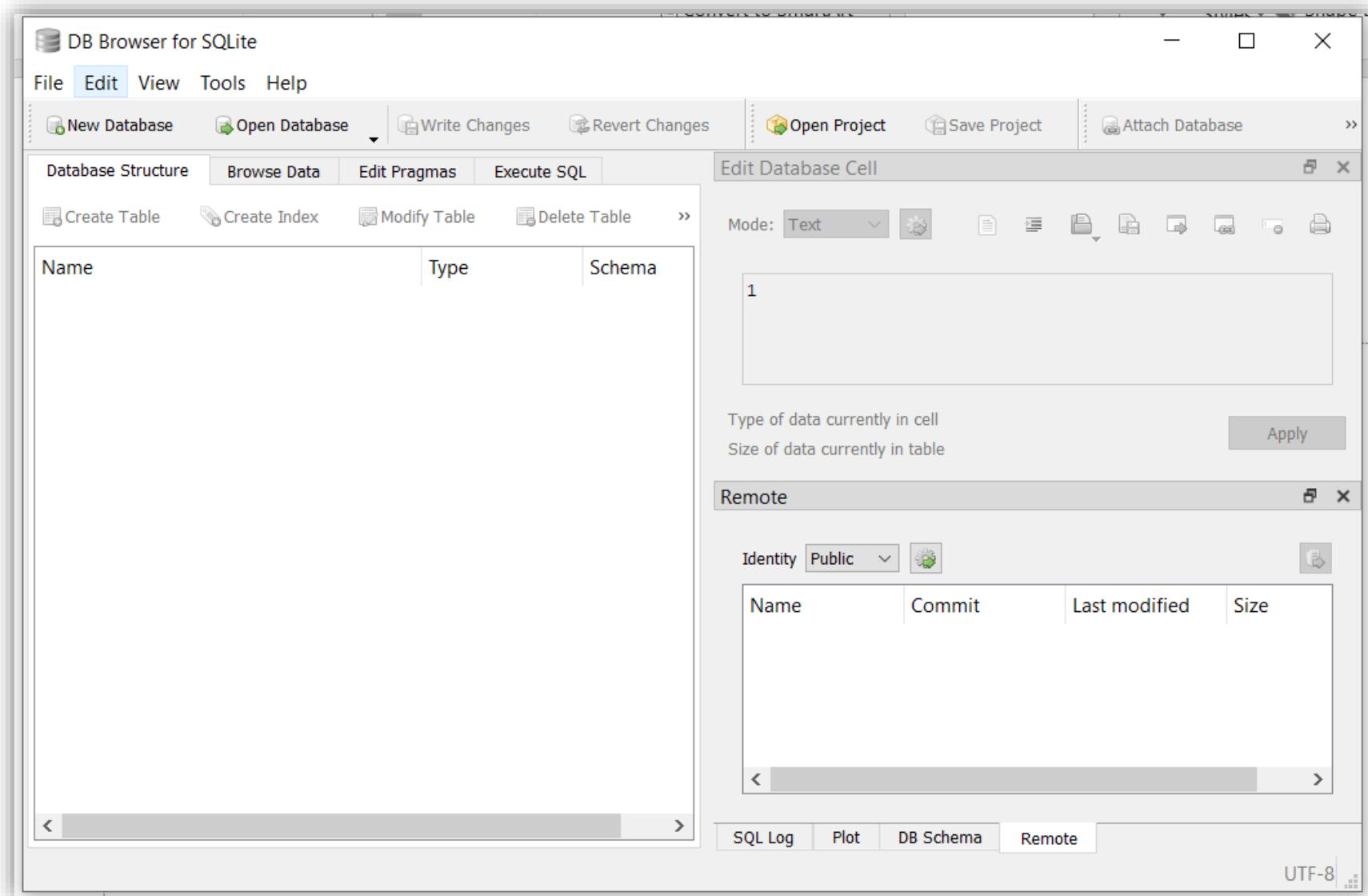
[Cancel](#)



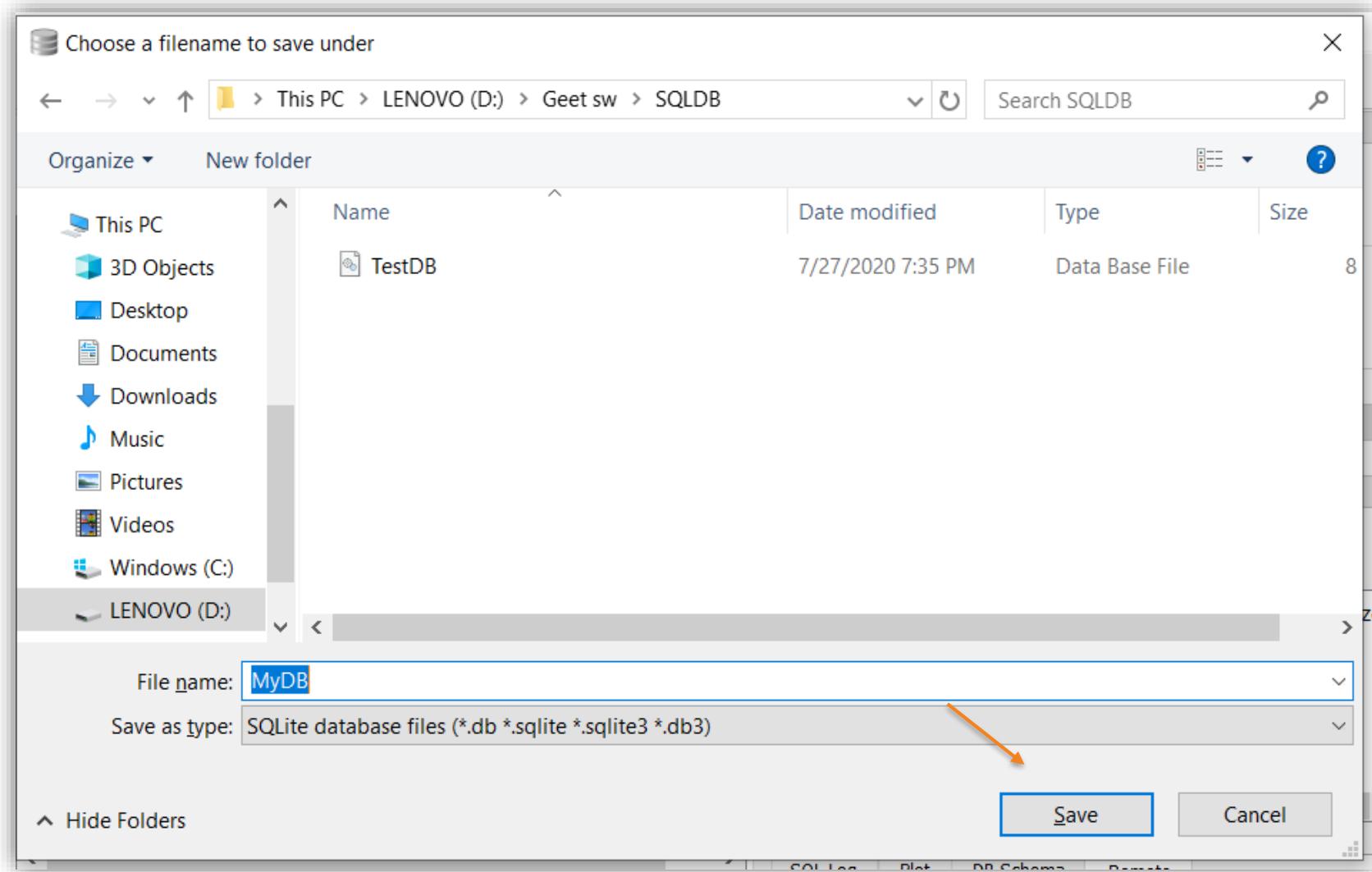




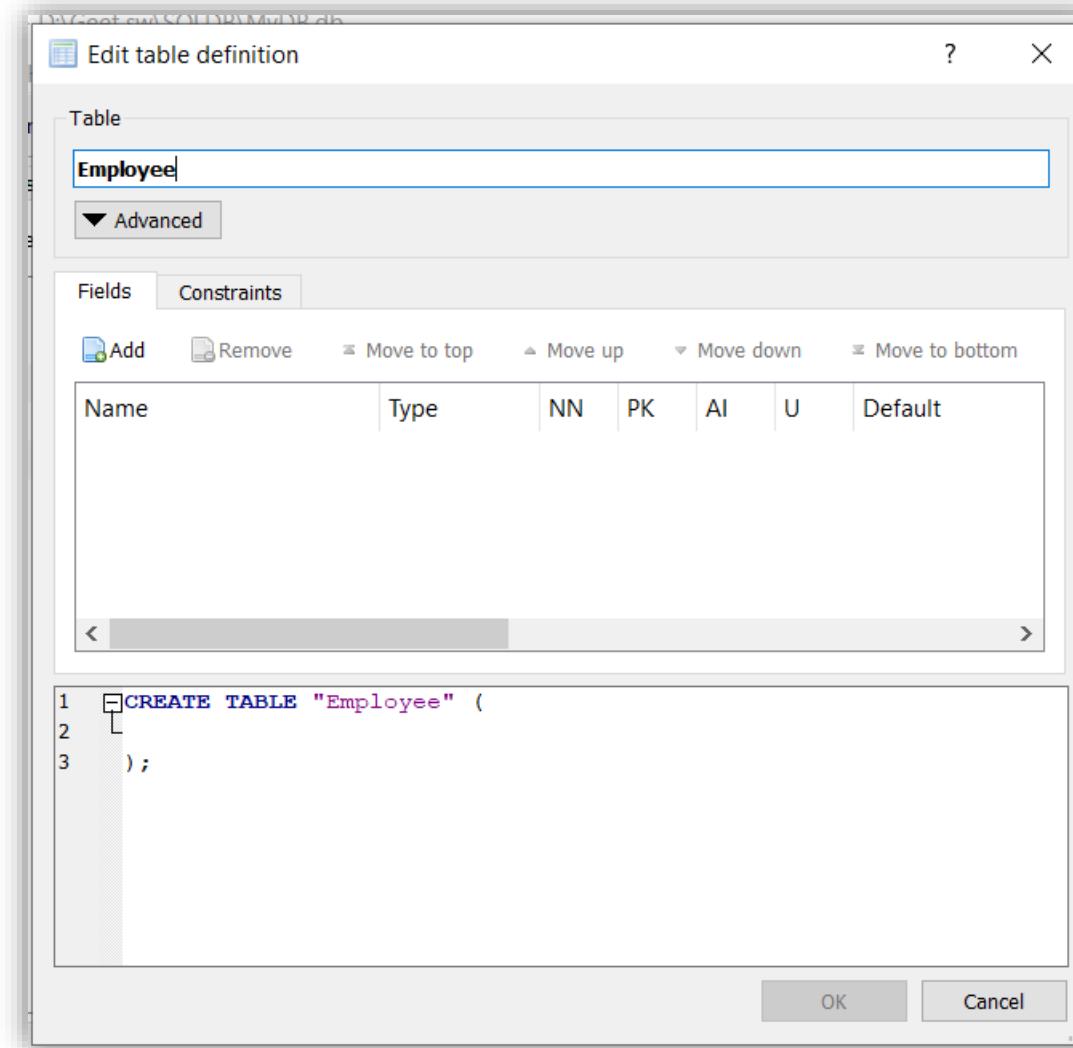
Using SQLite DB Browser



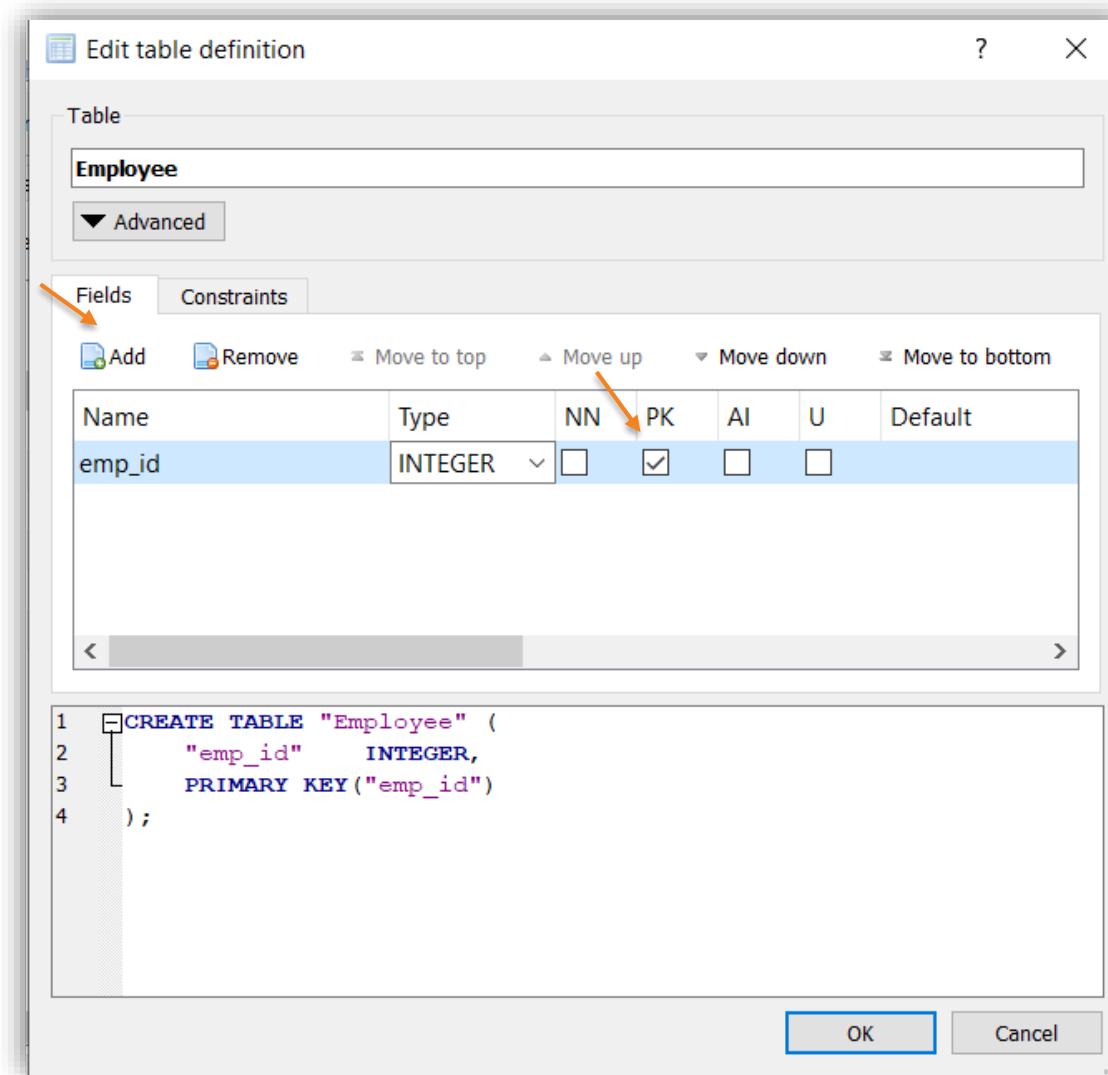
- Name your DB and save it in desired folder :



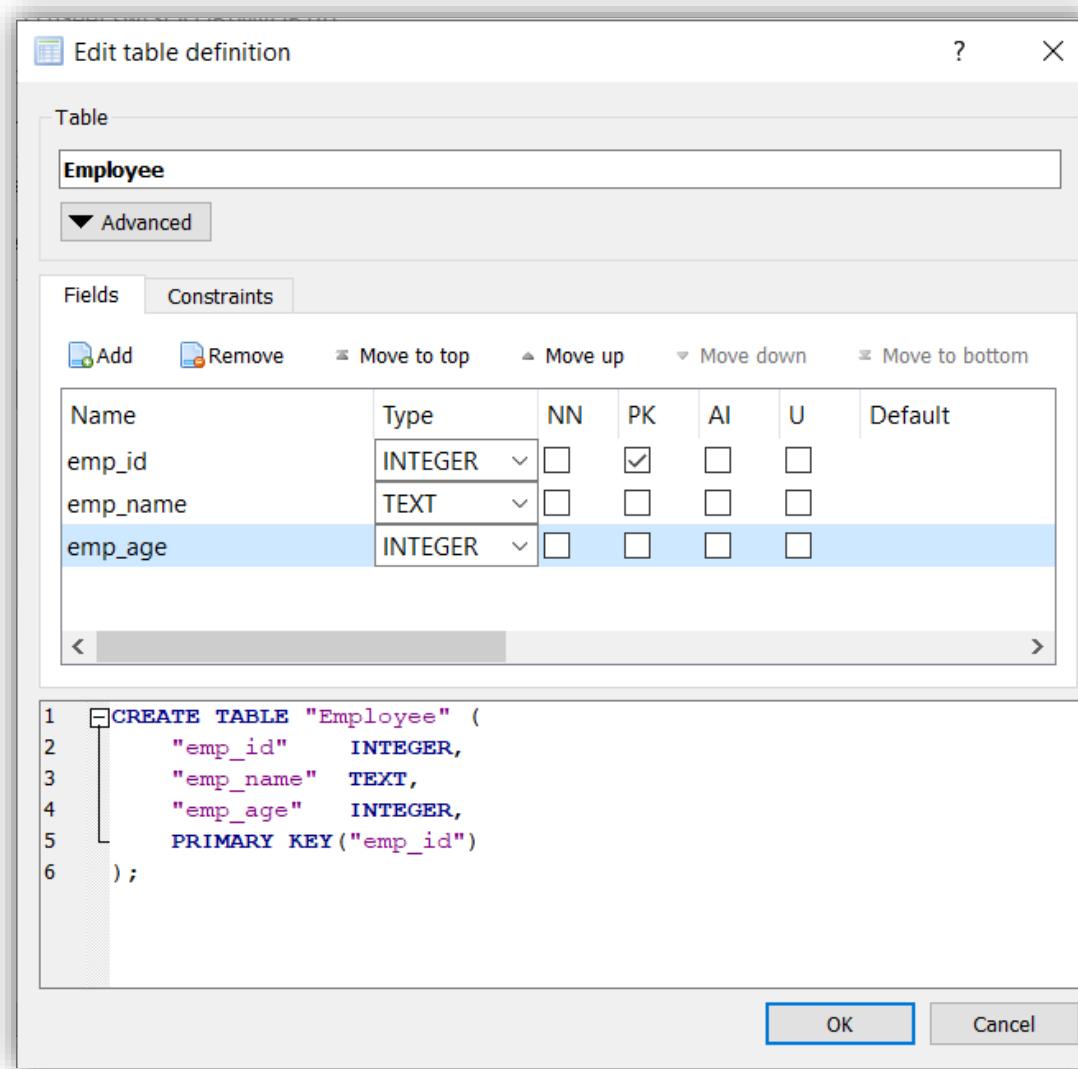
- Start by creating a table :
- Enter your table name as follows



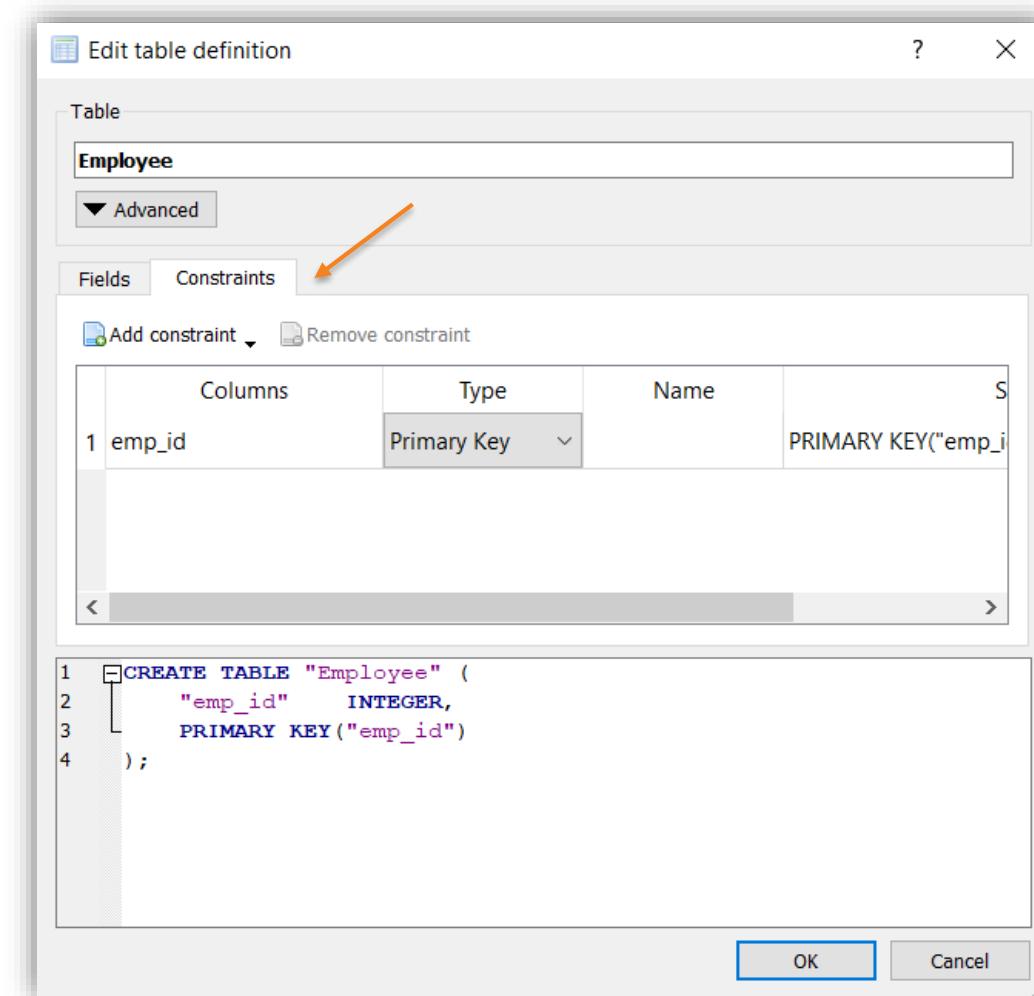
- Add Fields
- Enter a Primary Key Field in your Selection

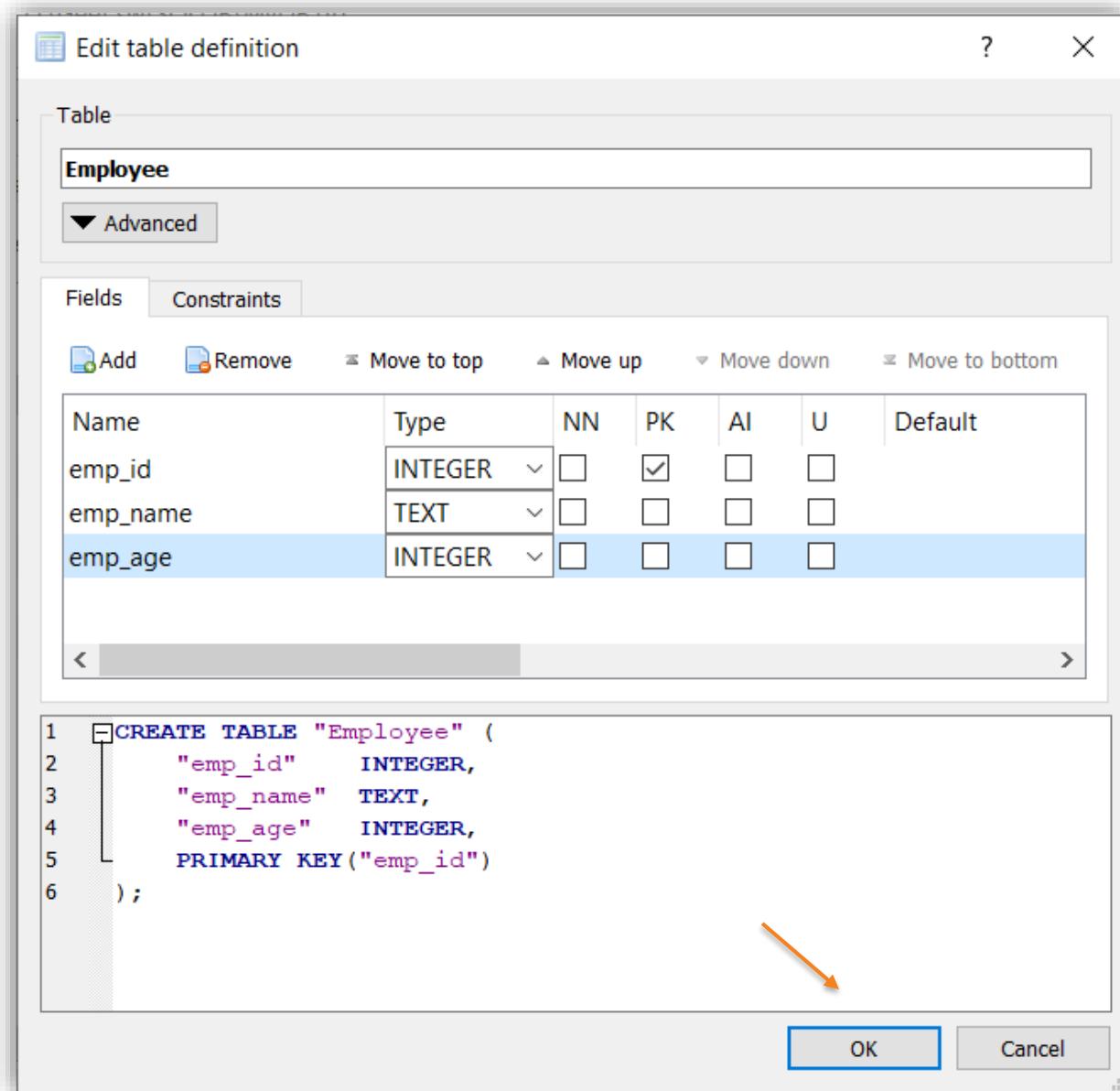


- Add Other Employee Details

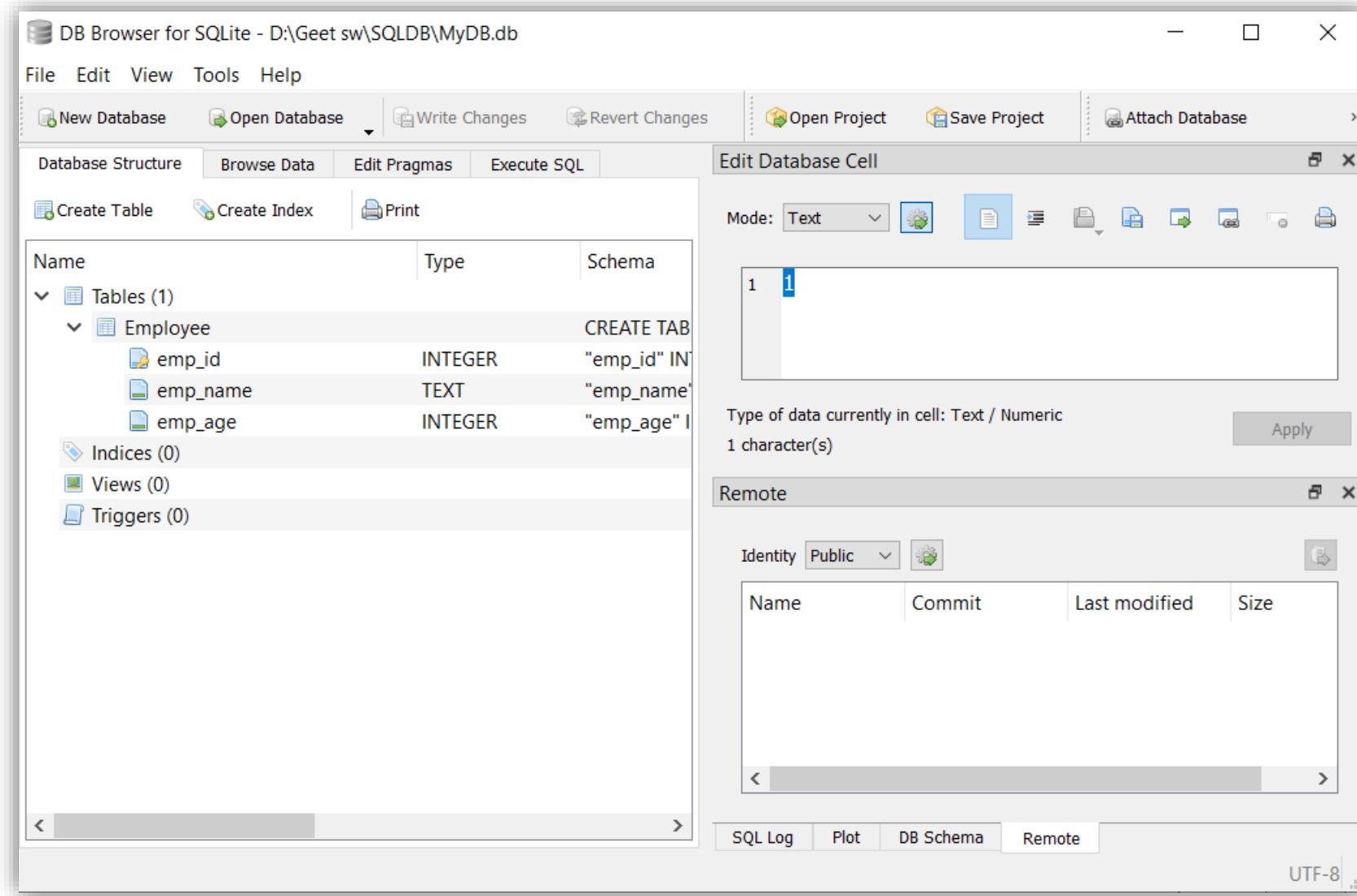


- Check the constraints tab.
- Primary key constraint which we added is shown here

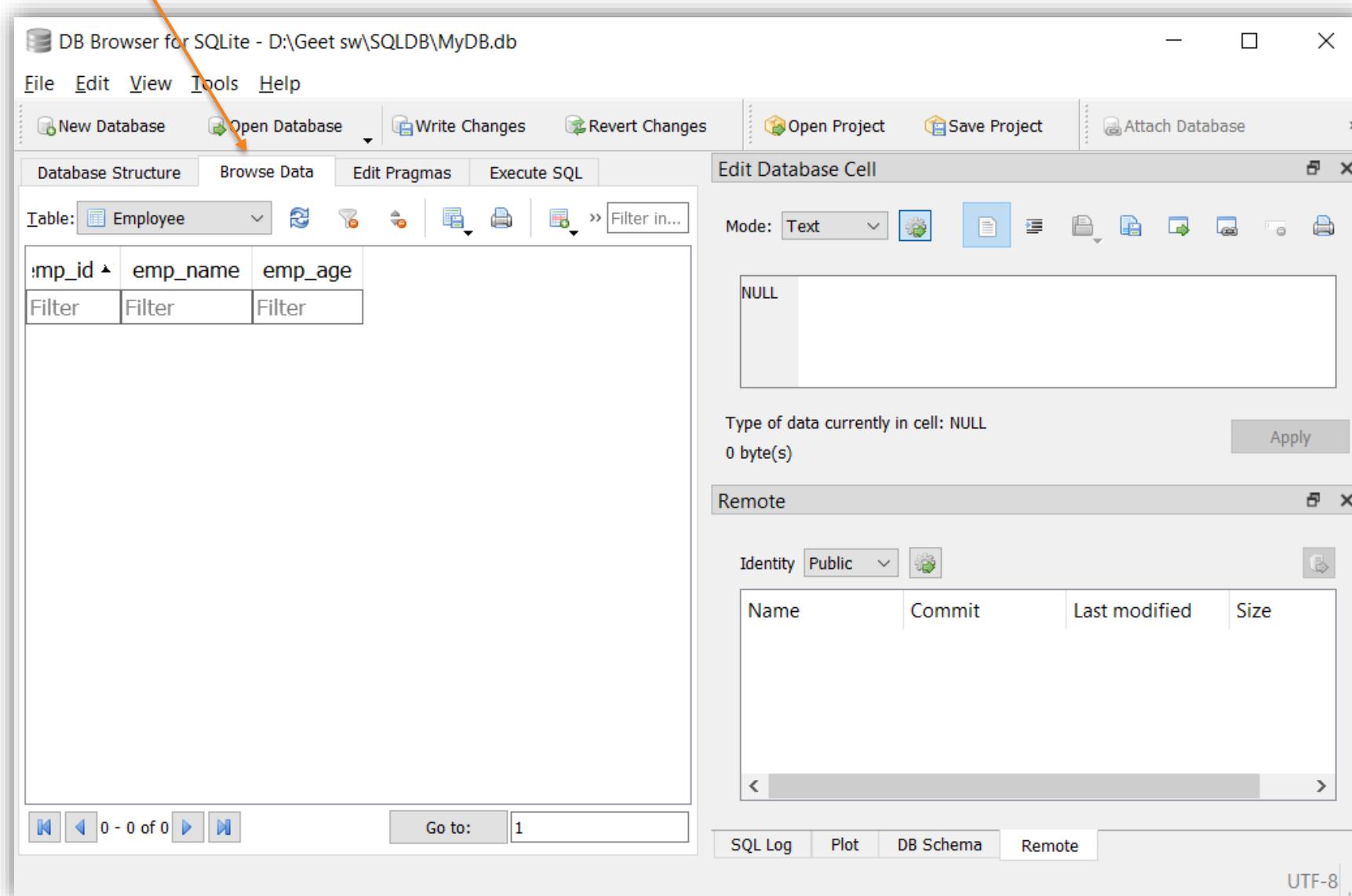




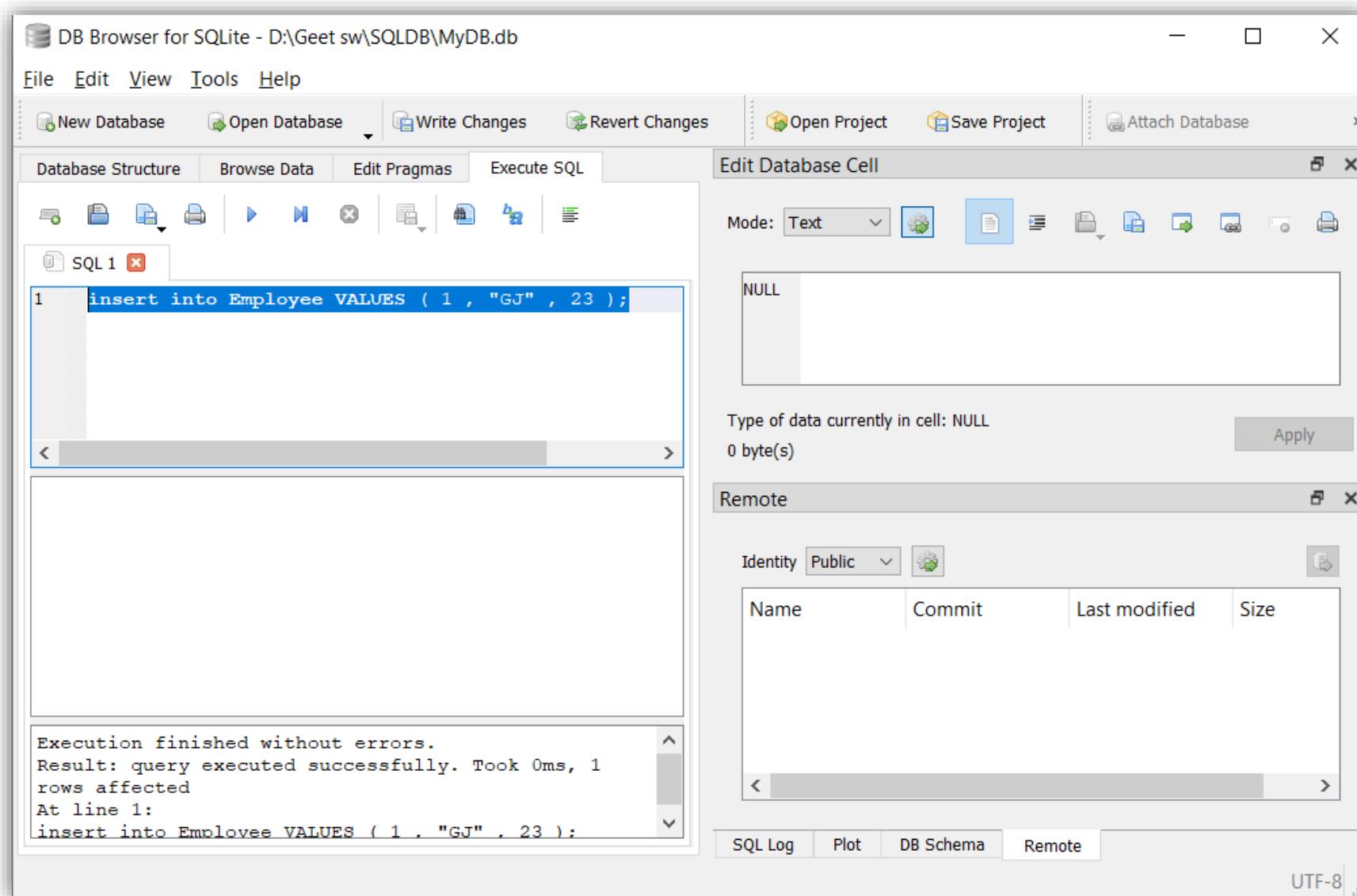
The details of the table created can be found under tables section



- Browse data tab provides all details about the fields created



Execute your SQL commands into the Execute SQL tab



Browser Data tab show the values entered into the table

The screenshot shows the DB Browser for SQLite interface with the following details:

- Title Bar:** DB Browser for SQLite - D:\Geet sw\SQLDB\MyDB.db
- Menu Bar:** File, Edit, View, Tools, Help
- Toolbar:** New Database, Open Database, Write Changes, Revert Changes, Open Project, Save Project, Attach Database
- Table Selection:** Employee
- Table Structure:** emp_id, emp_name, emp_age
- Data View:** A single row is displayed:

emp_id	emp_name	emp_age
1	GJ	23
- Edit Database Cell Dialog:** Mode: Text, showing the value "1".

Type of data currently in cell: Text / Numeric
1 character(s)
- Remote Dialog:** Identity: Public, showing a list of files.
- Bottom Navigation:** Go to: 1
- Bottom Tabs:** SQL Log, Plot, DB Schema, Remote
- Encoding:** UTF-8

SQL Commands to be Executed

- DDL (Data Definition Language): Create, Alter, Drop
- DQL (Data Query Language): Select
- DML (Data manipulation Language): Insert, Update, Delete

DDL (Data Definition Language)

- Create table:
 - CREATE TABLE table_name (column1 datatype, column2 datatype , ...) ;
 - E.g. Create table Employee (emp_id int, emp_name text, emp_age int);
- Alter table :
 - ALTER TABLE table_name ADD column_name datatype;
 - ALTER TABLE Employee ADD emp_phone int;
- Drop table:
 - DROP TABLE table_name;
 - DROP TABLE Employee;

DQL (Data Query Language)

- Select Statement :
 - Select Column from tablename;
 - E.g. Select emp_id from Employee;
 - use '*' to get all column values
 - E.g. Select * from Employee;
- If you want all values of emp_id = 1. Then use the following command :
 - Select * from Employee where emp_id = 1;

DML (Data Manipulation Language)

- Insert :
 - Insert Into table_name (column1, column2 .. column n) values (value1, value2 ... value n);
 - E.g. Insert into Employee values (1, "GJ", 23)
 - Note: if all column values are added, no need to explicitly mention columns
- Update
 - Update table_name set column_n = value_n where condition;
 - Update Employee set emp_name = "DiDi" where emp_id = 1;
- Delete
 - Delete from table_name WHERE condition;
 - Delete from Employee Where table_id =1 ;

Workshop

Use SQLite Browser & SQL console to create and execute of various SQL commands based on Autism data set/table:

- How many middle eastern children show ASD traits ?
- How many children who have Jaundice show ASD traits ?
- Are ASD traits dependent on hereditary ? Justify .
- People of which ethnicity are most likely to exhibit ASD traits ?
- What is the proportion of a white European girls (female) exhibit ASD traits among all white European girls?

Reference: https://www.w3schools.com/sql/sql_groupby.asp

Workshop Submission

- **SQL scripts, and write down answers to above questions in SQL comments**
- **Naming convention: StudentID YourFullName.sql, e.g. A1234567X Donald Duck - sln - SQL.sql/zip**
- **Use zip to a single file, then rename, if you plan to submit multiple files.**

1.3 Rule/Process Reasoning System [Workshop]

1.3.1 Machine Memory & Query

Special thanks to Geet Jethwani (A0215395B) for his contribution.

1.3.2 Textual Knowledge Processing

Special thanks to Yan Wei Quan (A0215498U) for his contribution.

1.3.3 Workshop Submission

Basic Text Preprocessing

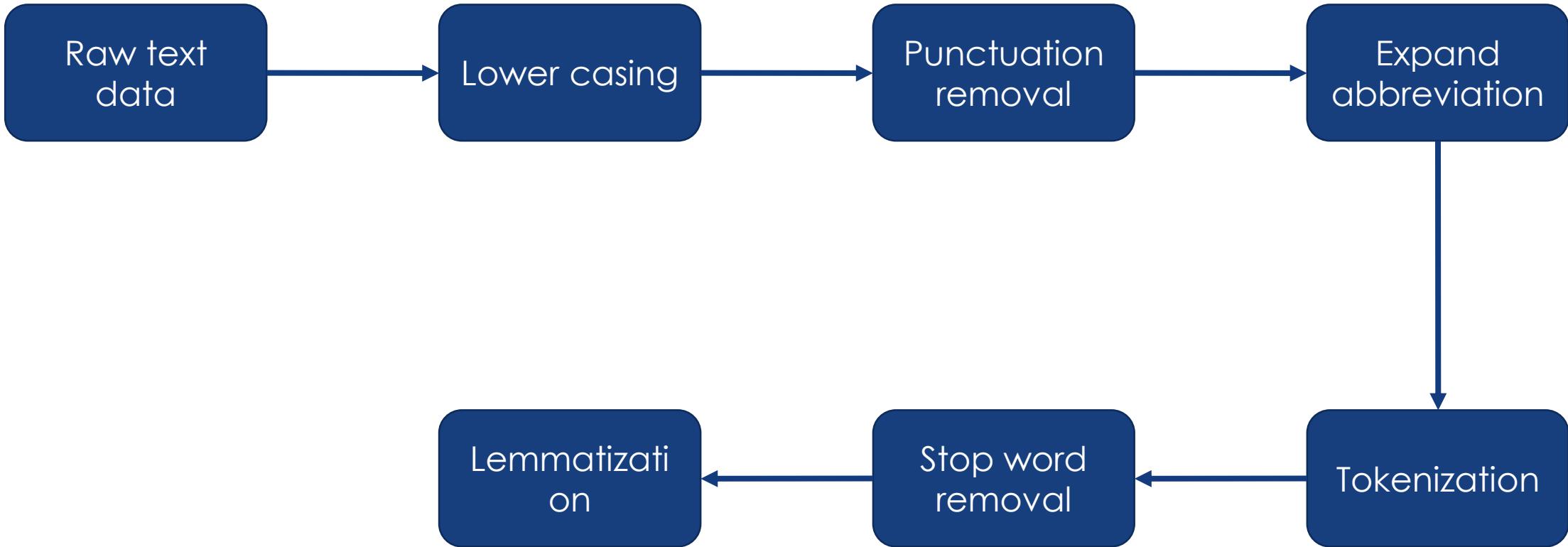
- **Learning Objectives**
 - Learn the common procedure of text preprocessing
 - Learn how to use spacy to do the text preprocessing and some basic tasks
- **Package to use,**
 - Spacy 2.3.2 in Python
 - nltk 3.5 in Python
 - re – Python standard library
- **Technique,**
 - Text processing technique
- **Case/Scenario,**
 - Preprocess of question & answer in FAQ (ASD scenario)
- **Requirement,**
 - Get the preprocessed sentences for all sentences in ASD database

Before the workshop

- **Installation**

1. go to <https://spacy.io/usage>, select your PC corresponding parameter and follow the installation guide.
2. nltk will be automatically installed when you install the Spacy

Text Pre-processing Procedure



Example: Text Pre-processing

Raw text:

[He said, “I'd have eaten more than 100 hamburgers from yesterday.”]

After lower casing:

[he said, “I'd have eaten more than 100 hamburgers from yesterday.”]

After punctuations removal:

[he said I'd have eaten more than 100 hamburgers from yesterday]

After expanding abbreviation:

[he said I would have eaten more than 100 hamburgers from yesterday]

After tokenization:

[['he'], ['said'], ['I'], ['would'], ['have'], ['eaten'], ['more'], ['than'], ['100'], ['hamburgers'], ['from'], ['yesterday']]

After stop word removal:

[['said'], ['would'], ['eaten'], ['100'], ['hamburgers'], ['yesterday']]

After lemmatization:

[['say'], ['would'], ['eat'], ['100'], ['hamburger'], ['yesterday']]

Workshop

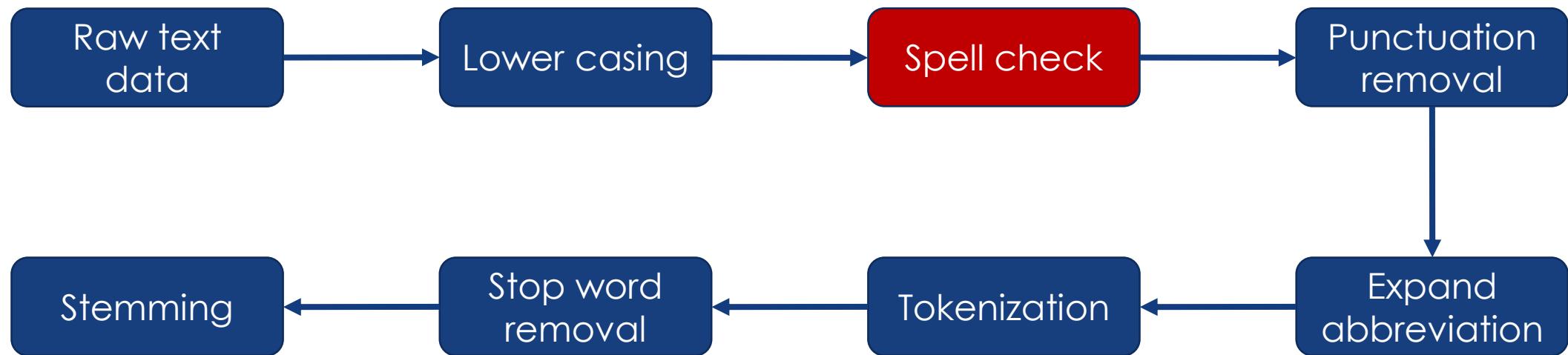
- Open the **A1234567X Donald Duck - Text Process** python notebook and execute the workshop.
- Construct the **my_preprocessing** function using Spacy package and provide the comparation result in the notebook.

Workshop Submission

- **Naming convention: StudentID YourFullName, e.g. A1234567X
Donald Duck – sln – Text Process.ipynb/zip**
- **Use zip to a single file, then rename, if you plan to submit multiple files.**

Workshop (optional)

- In real-world, spelling mistake is difficult to avoid and is very common in text data. Try to introduce a spell checker into the preprocessing procedure. The improved preprocessing will be,



References

1. Spacy: <https://spacy.io>
2. NLTK: www.nltk.org/index.html
3. Regular expression in Wikipedia:
https://en.wikipedia.org/wiki/Regular_expression

1.3 Rule/Process Reasoning System [Workshop]

1.3.1 Machine Memory & Query

Special thanks to Geet Jethwani (A0215395B) for his contribution.

1.3.2 Textual Knowledge Processing

Special thanks to Yan Wei Quan (A0215498U) for his contribution.

1.3.3 Workshop Submission

Workshop Submission

- **Naming convention: StudentID YourFullName**
- **Use zip to a single file, then rename, if you plan to submit multiple files.**

The screenshot shows the LumiNUS module page for ISY5001. The top navigation bar includes links for MY MODULES, MODULE SEARCH, CONTENT BANKS, and RESEARCH RECRUITMENT. The main content area displays the module details for 'Grad Cert in Intelligent Reasoning Systems (IRS-MR, IRS-RS, ...)' from '[1920] 2019/2020 Semester 2'. The 'GENERAL' section contains links for Module Overview, Module Settings, Module Details, Class & Groups, Attendance, and Task Report. The 'TOOLS' section contains links for Announcements, Chat, Conferencing, Consultation, and Forum. The 'Files' section, which is highlighted with an orange arrow pointing to it from the bottom left, contains a table listing four folder entries:

Folder Name	Status	...
IRS-MR: Machine Reasoning	Open	...
IRS-RS: Reasoning Systems	Open	...
IRS-CGS: Cognitive Systems	Open	...
IRS-PM: Practice Module	Open	...

END OF NOTES

APPENDICES

Demystify Machine Reasoning Machine Learning Machine Perception Machine Action

Model:
Reason/Think

Model:
Learn

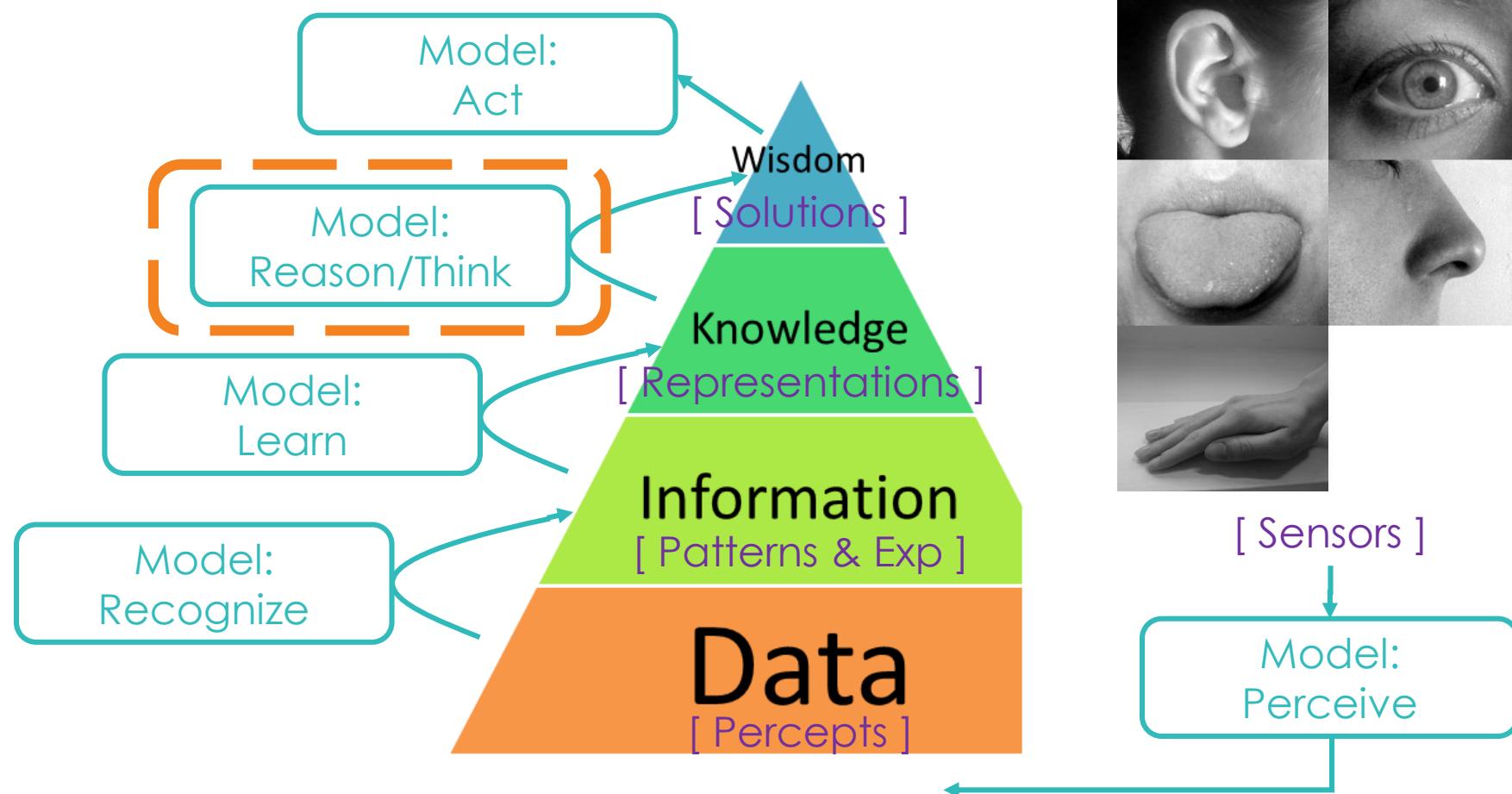
Model:
Perceive

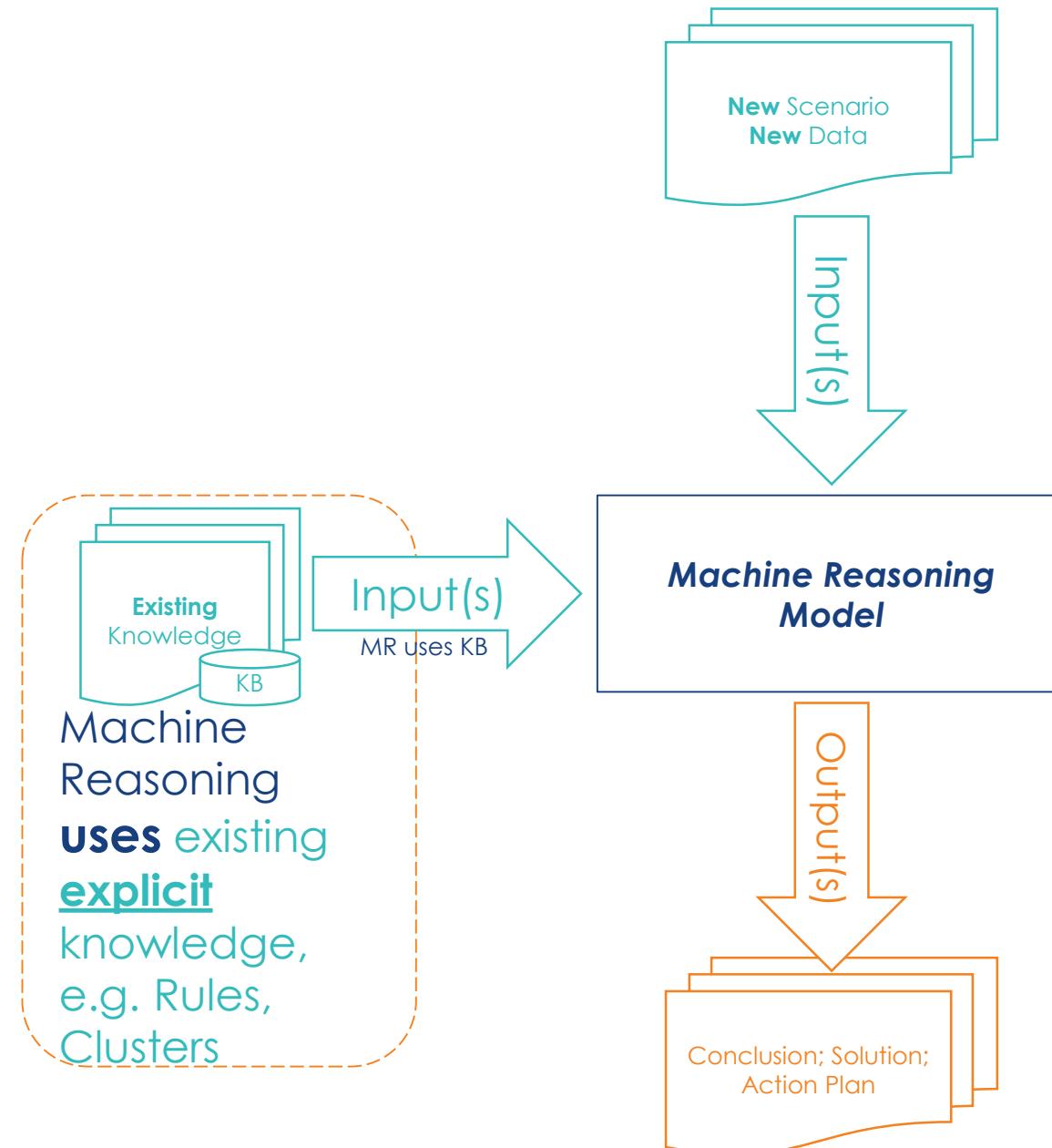
Model:
Act

A “model” view of “reasoning/thinking”

Model:
Reason/Think

What's a (reasoning/thinking) "model"?





EXAMPLE OF MACHINE REASONING (LOGICAL INFERENCE)

Deductive Reasoning

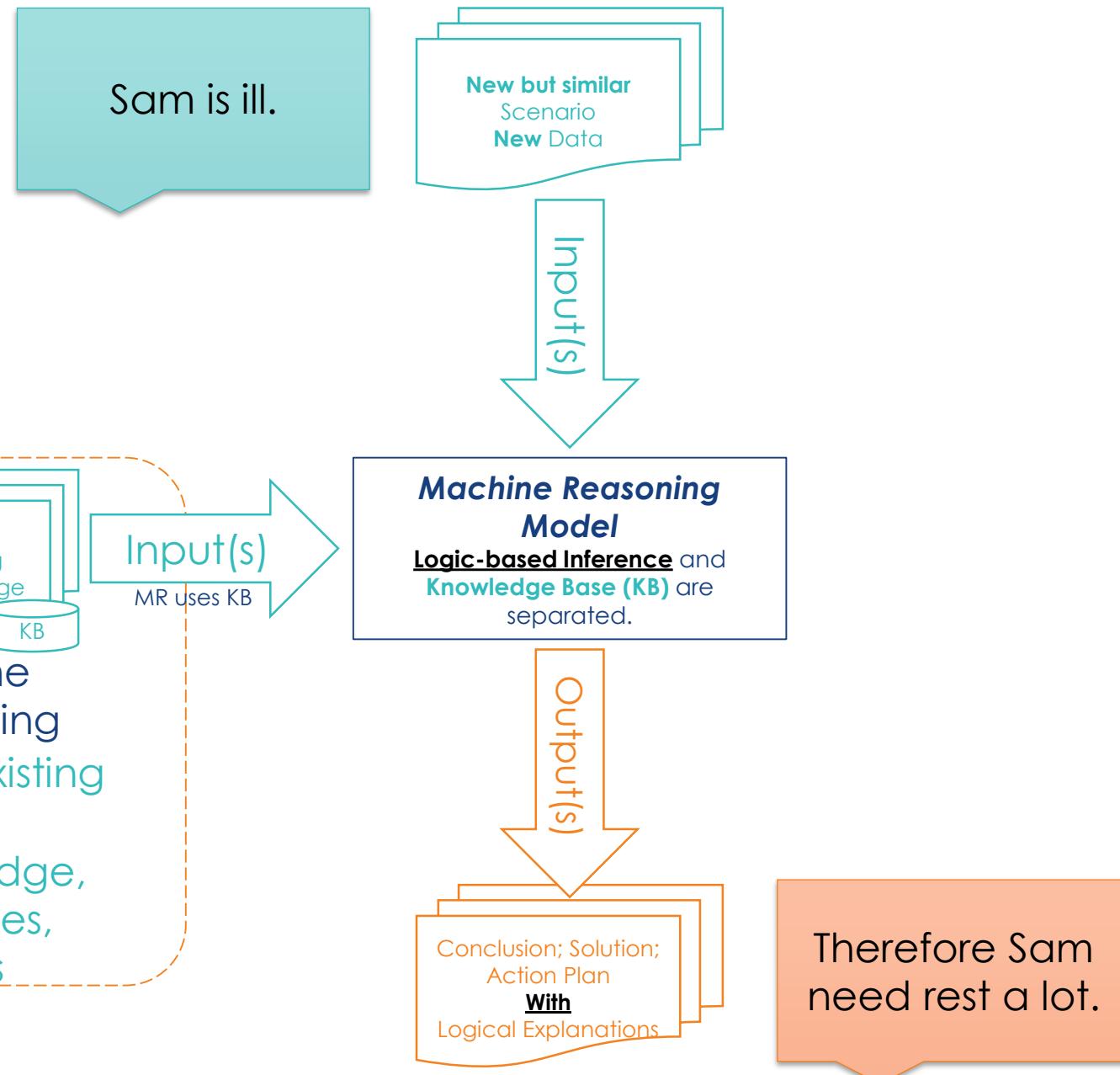
- **Knowledge/Rule** : All ill people need rest a lot.
- **Individual 1** : Sam is ill, therefore he need rest a lot.
- **Individual 2** : Jessie is ill, therefore she need rest a lot.
- **Individual ...**



☺ Reasoning Rationality: Universal → Individuals

All ill people
need rest a lot.

Machine Reasoning
uses **existing**
explicit
knowledge,
e.g. Rules,
Clusters



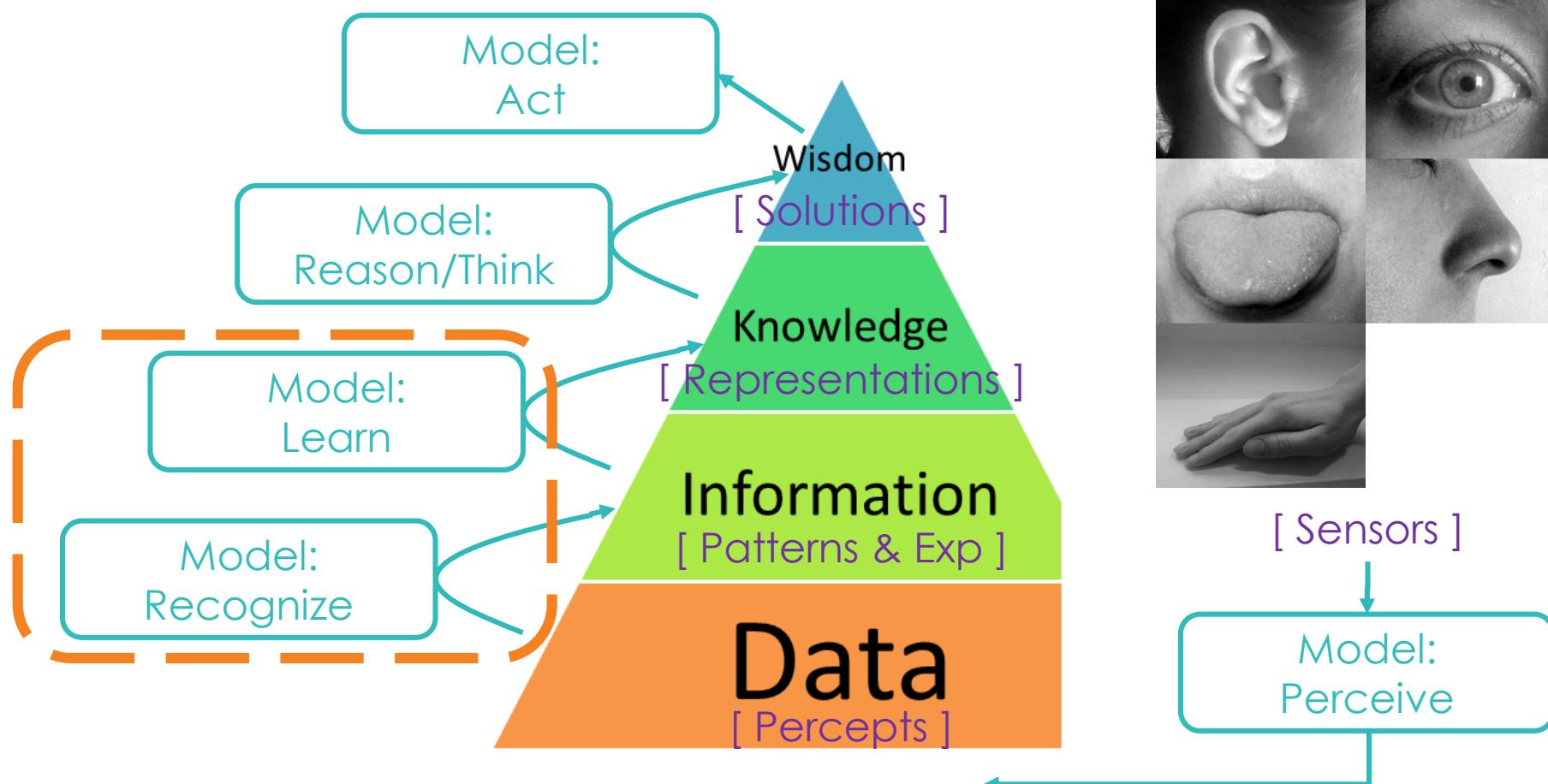
A “model” view of “learning/recognition”

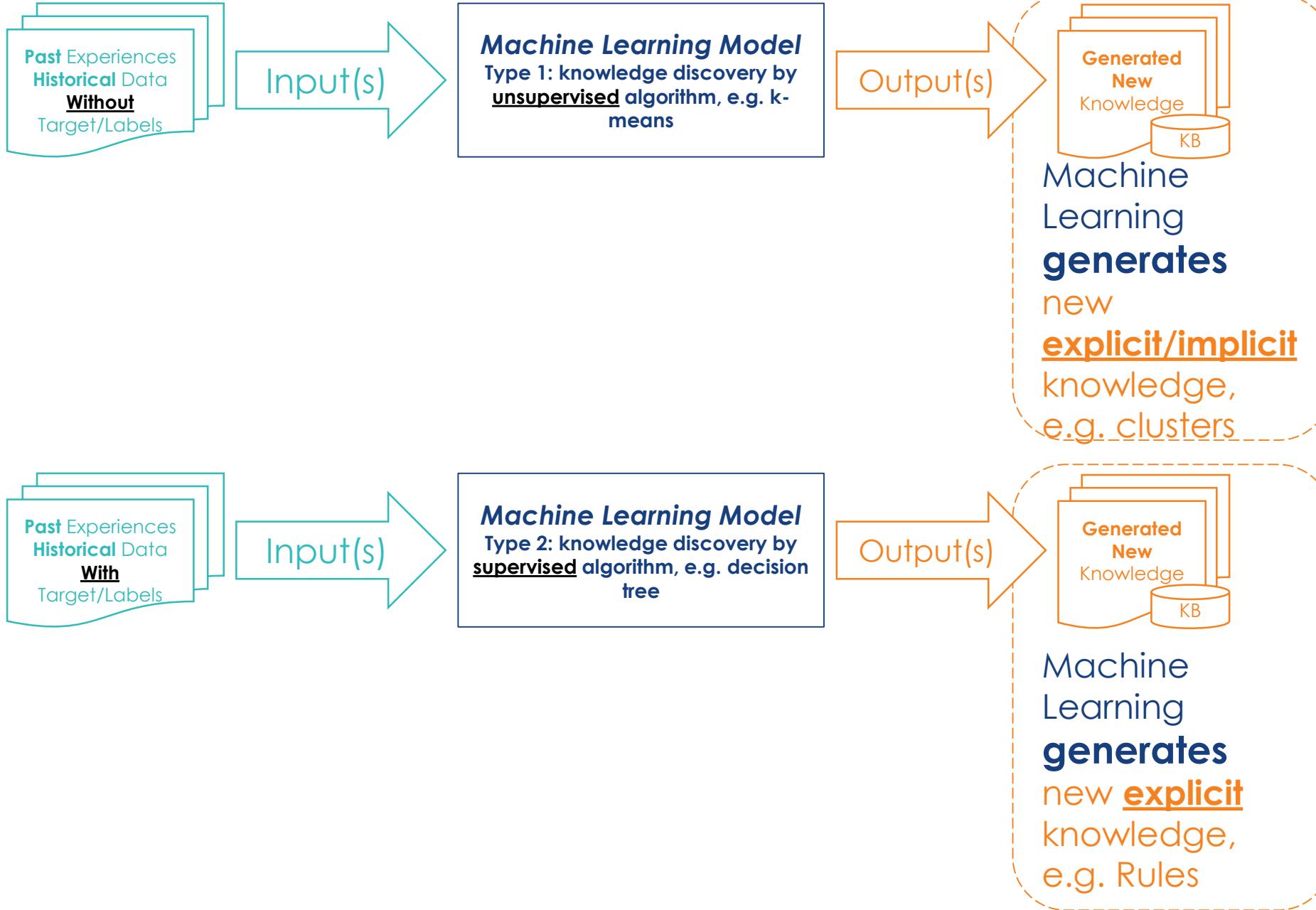
Model:
Recognize 识

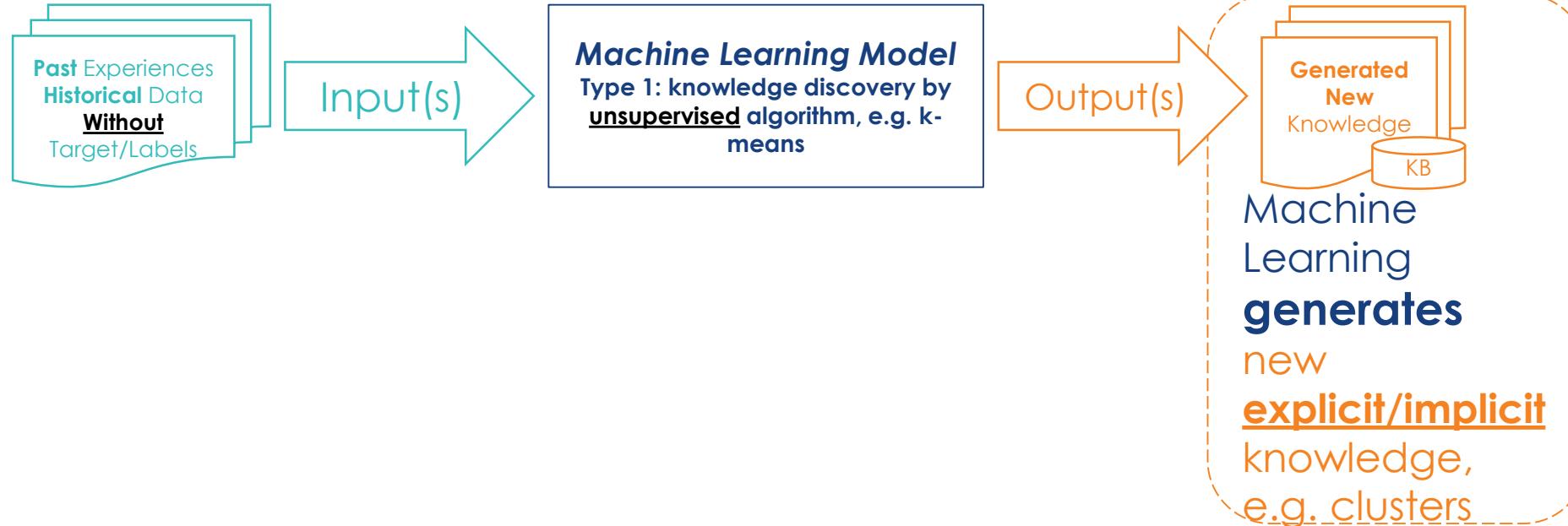
Model:
Learn

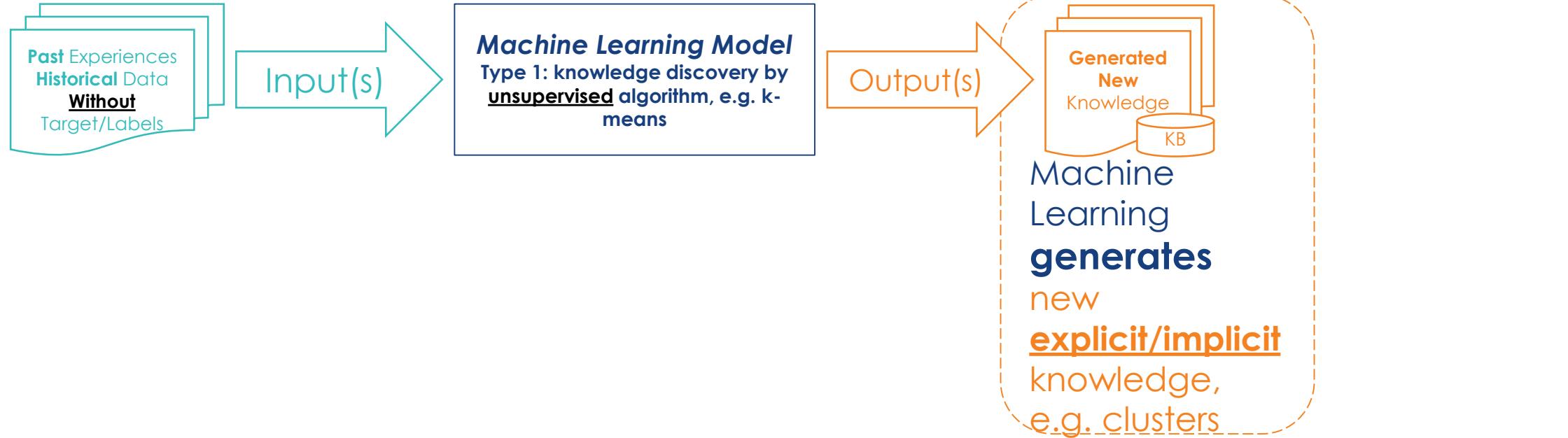
- knowledge-discovery-based (white box) machine learning model
- function-approximation-based (black box) machine learning model

What's a (knowledge-discovery-based machine learning) “model”?







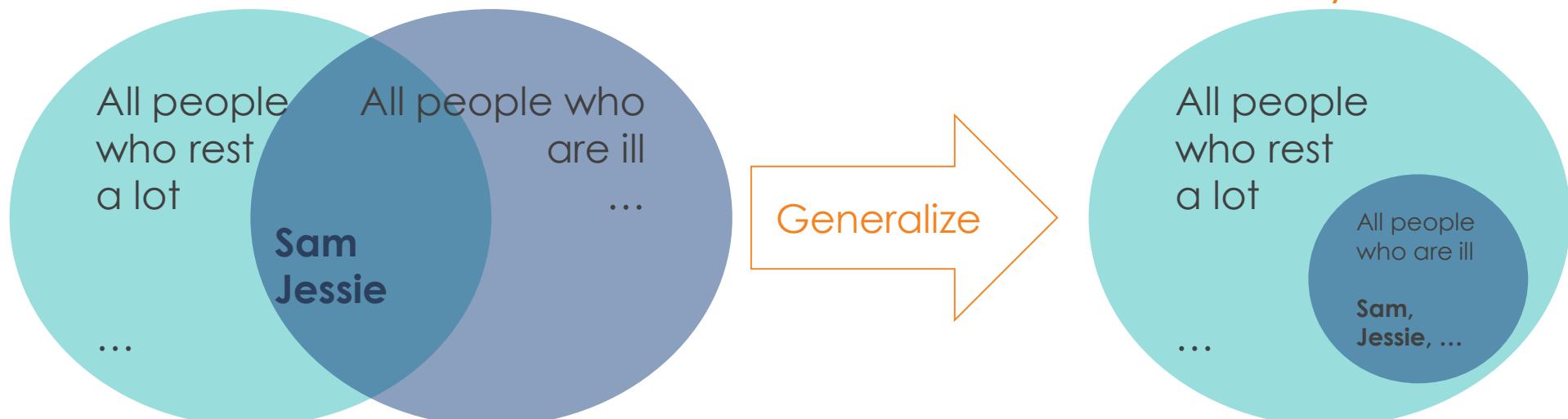


EXAMPLE OF MACHINE LEARNING

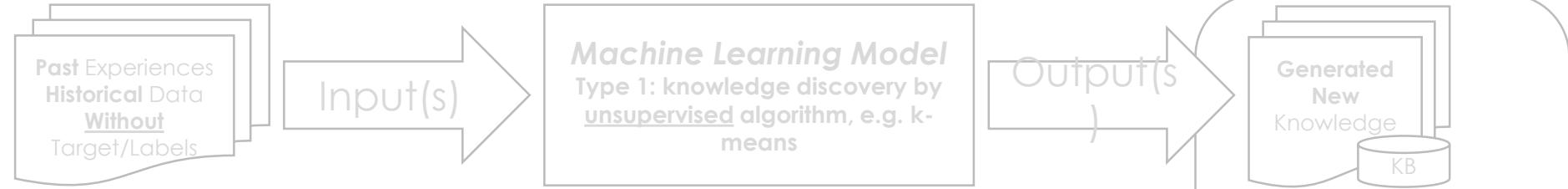
Inductive Reasoning

- **Individual 1** : When **lecturer Sam** is **ill**, he doesn't rest a lot.
- **Individual 2** : When **lecturer Jessie** is **ill**, she doesn't rest a lot.
- **Generalised Rule** : **All lecturers** who are **ill**, they don't rest a lot.

Targets:
No-Rest

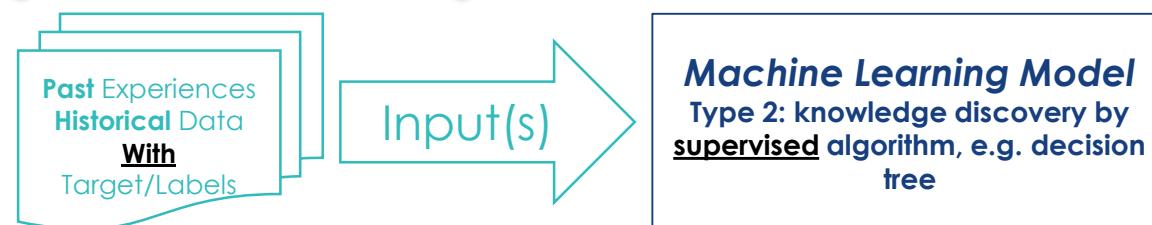


☺ Reasoning Rationality: Individual → Universal



When lecturer Sam is ill, he doesn't rest a lot. Target Label: No-Rest

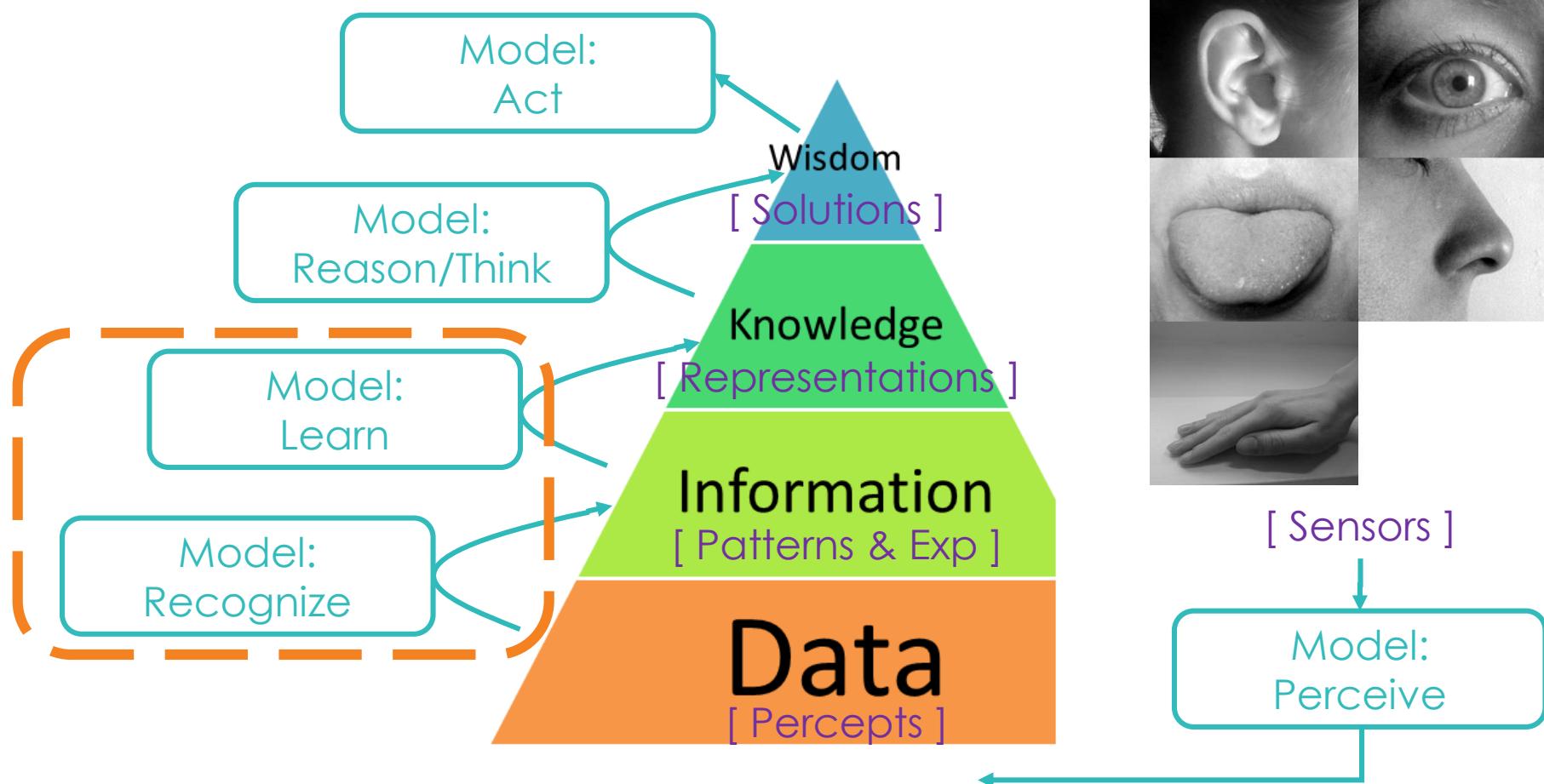
When lecturer Jessie is ill, she doesn't rest a lot. Target Label: No-Rest

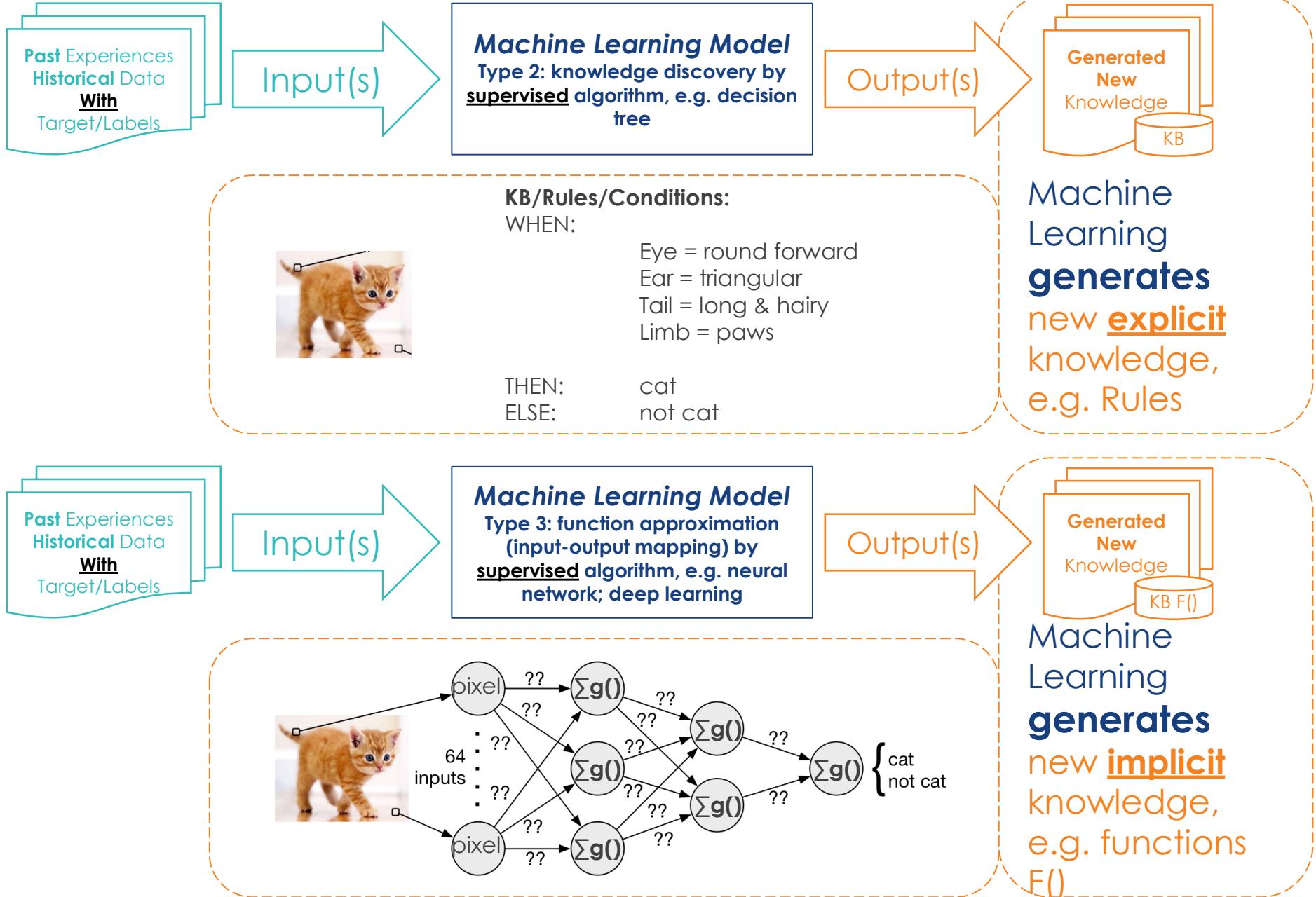


All lecturers who are ill, they don't rest a lot.

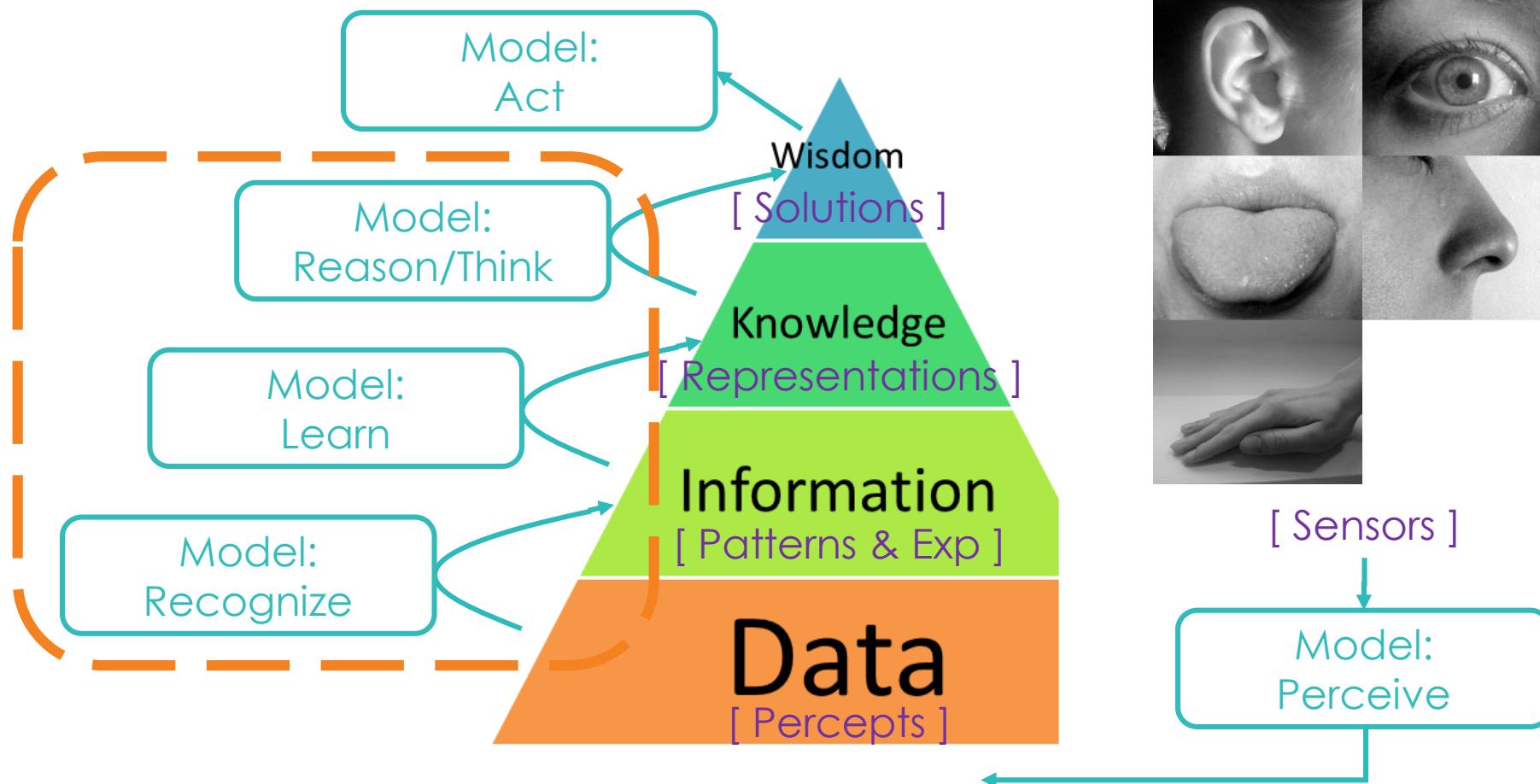
Machine Learning generates new explicit knowledge, e.g. Rules

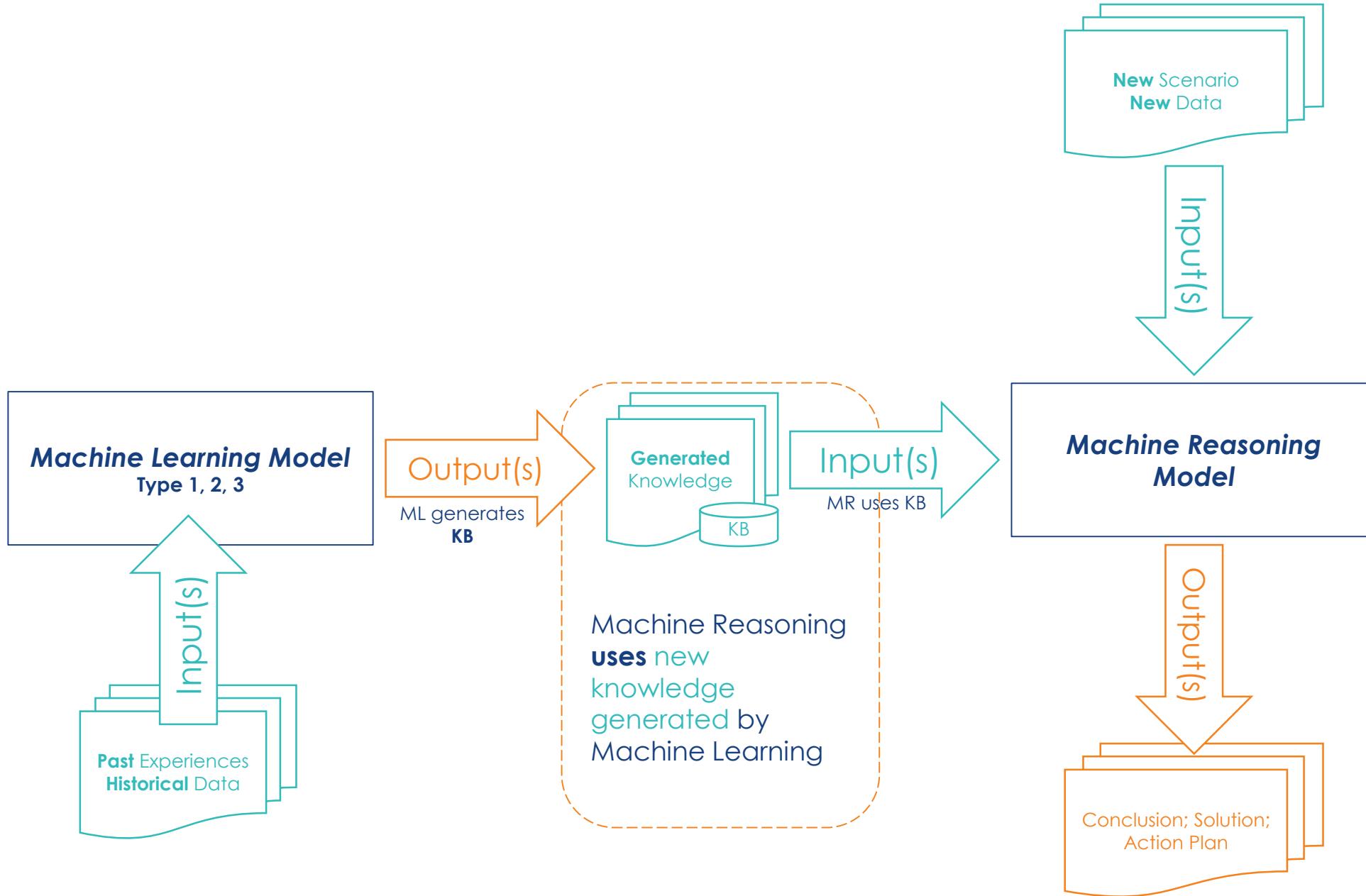
What's a (function-approximation-based machine-learning) “model”?

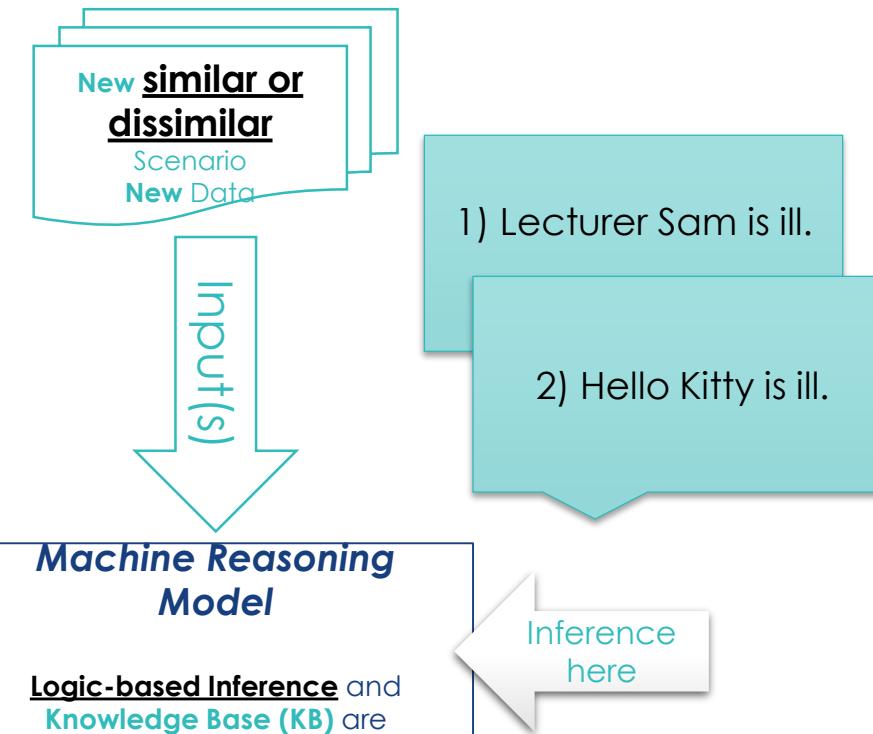
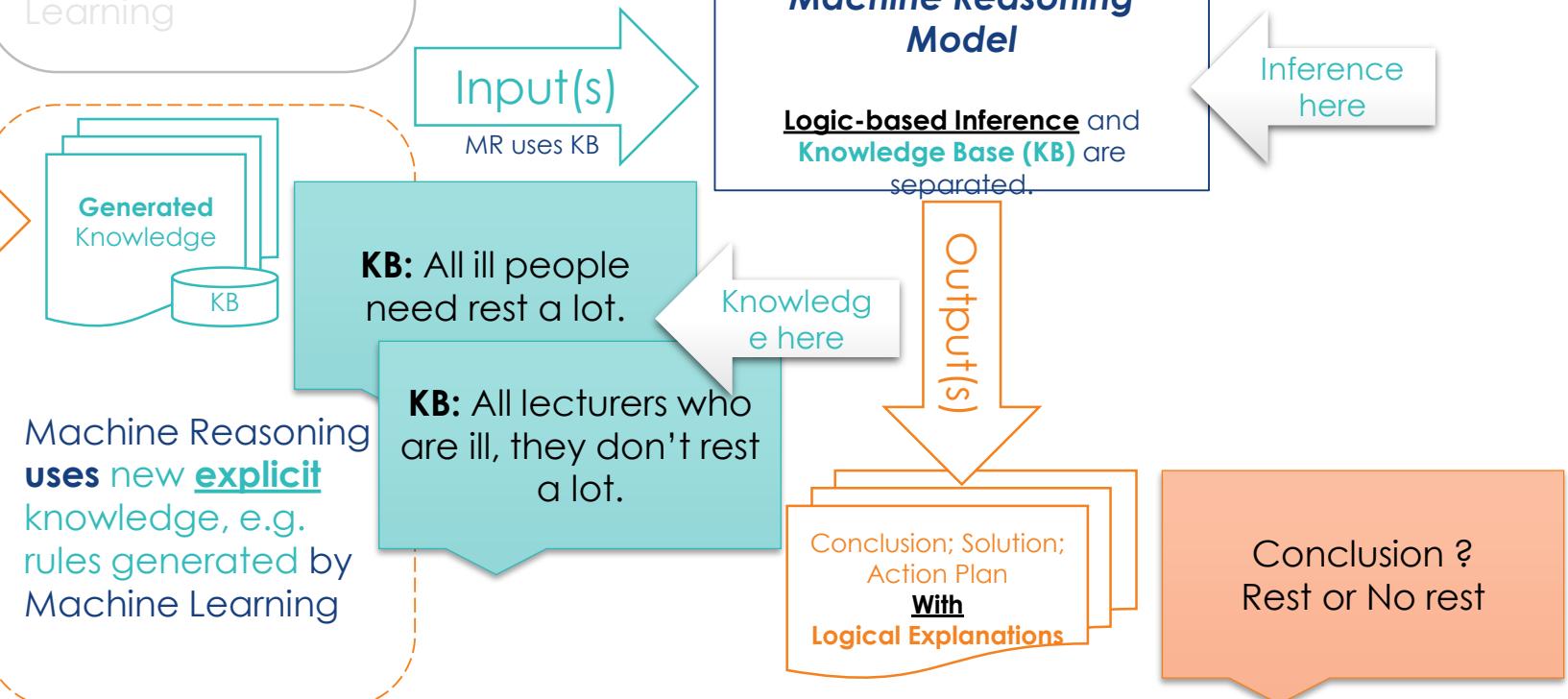
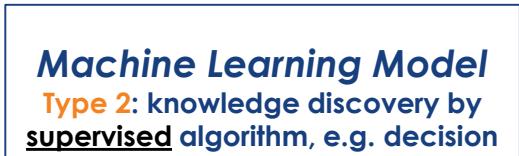
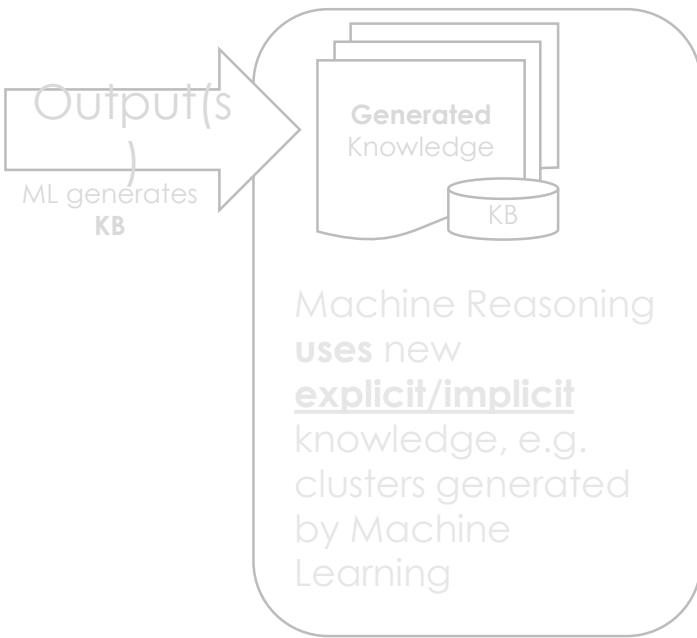
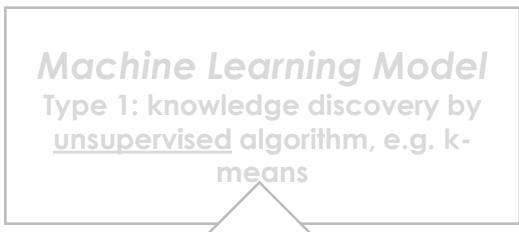




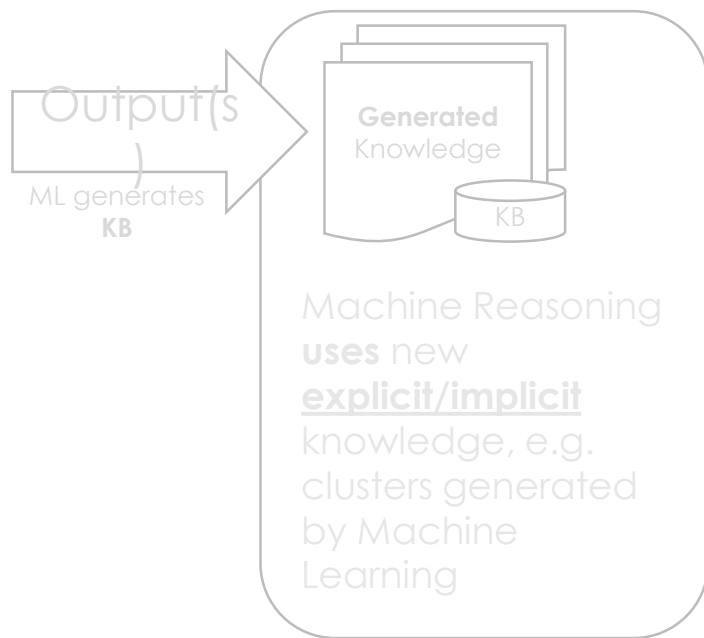
What's a (learning + reasoning) "model"?



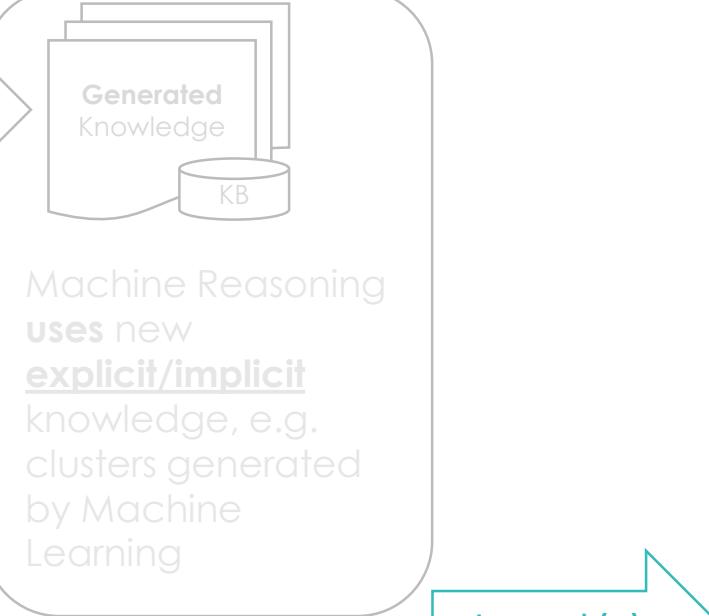




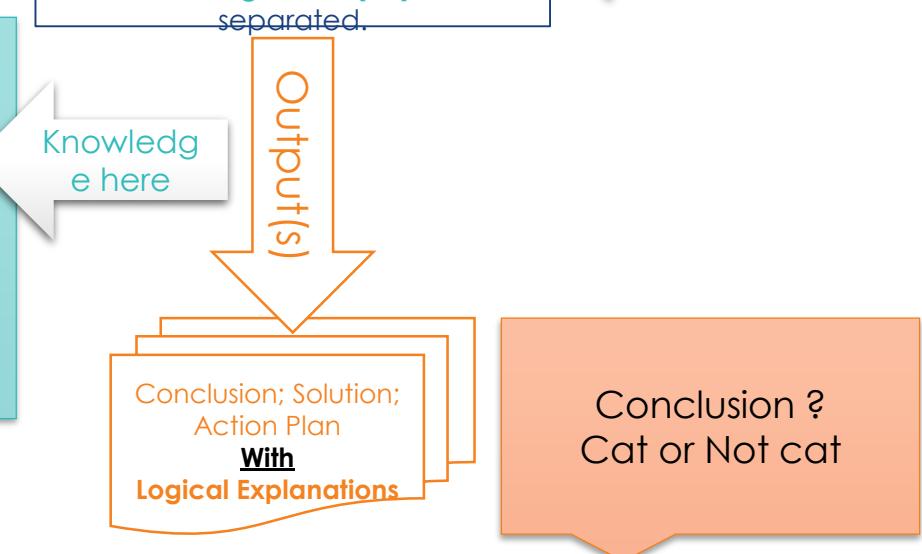
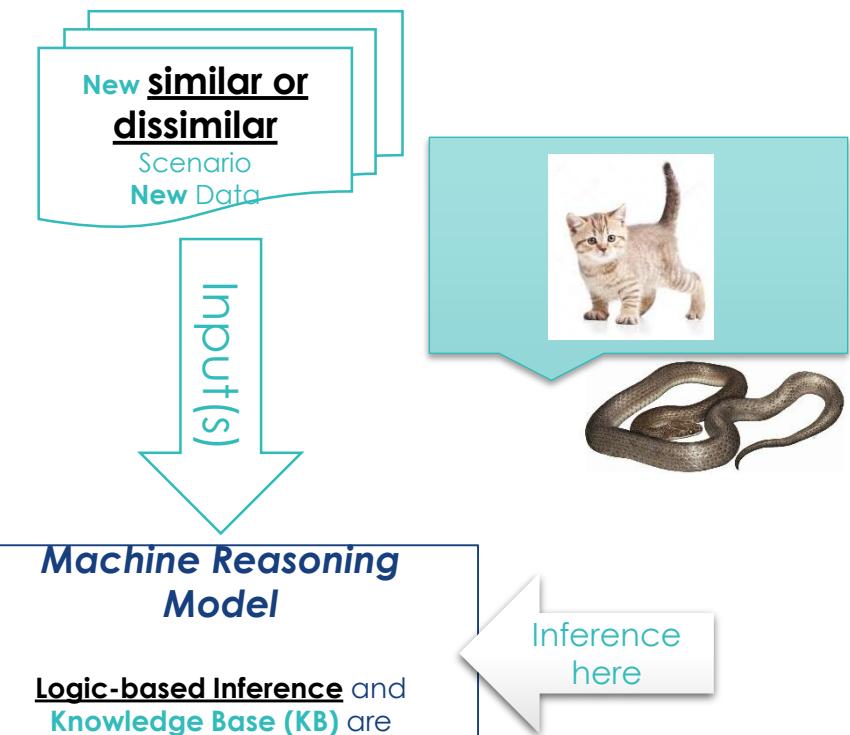
Machine Learning Model
Type 1: knowledge discovery by unsupervised algorithm, e.g. k-means



Machine Learning Model
Type 2: knowledge discovery by supervised algorithm, e.g. decision tree



KB (Cat):
Eye = round forward
Ear = triangular
Tail = long & hairy
Limb = paws
THEN: cat
ELSE: not cat



Machine Learning Model
Type 1: knowledge discovery by unsupervised algorithm, e.g. k-means

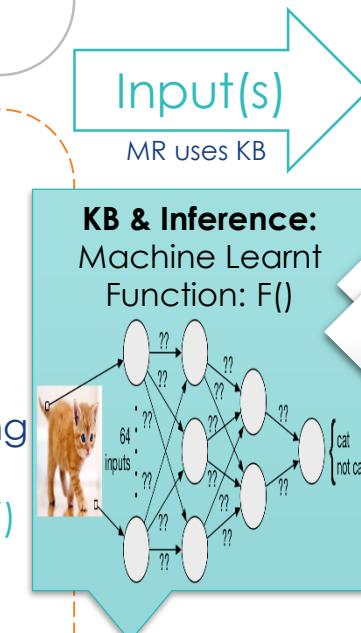


Machine Reasoning uses new explicit/implicit knowledge, e.g. clusters generated by Machine Learning

Machine Learning Model
Type 3: function approximation (input-output mapping) by supervised algorithm, e.g. neural network; deep learning



Machine Reasoning uses new implicit knowledge, e.g. $F()$ and coefficients generated by Machine Learning



New similar only
Scenario
New Data



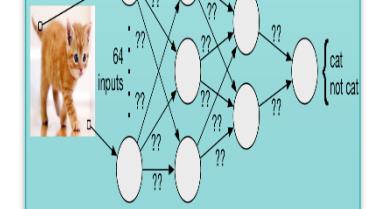
Machine Reasoning Model

Calculation-based Inference and Knowledge Base (KB: $F()$ & coefficients) are **NOT** separated.

Inference Knowledge both here



KB & Inference:
Machine Learnt Function: $F()$



Conclusion; Solution;
Action Plan
With Confidence only

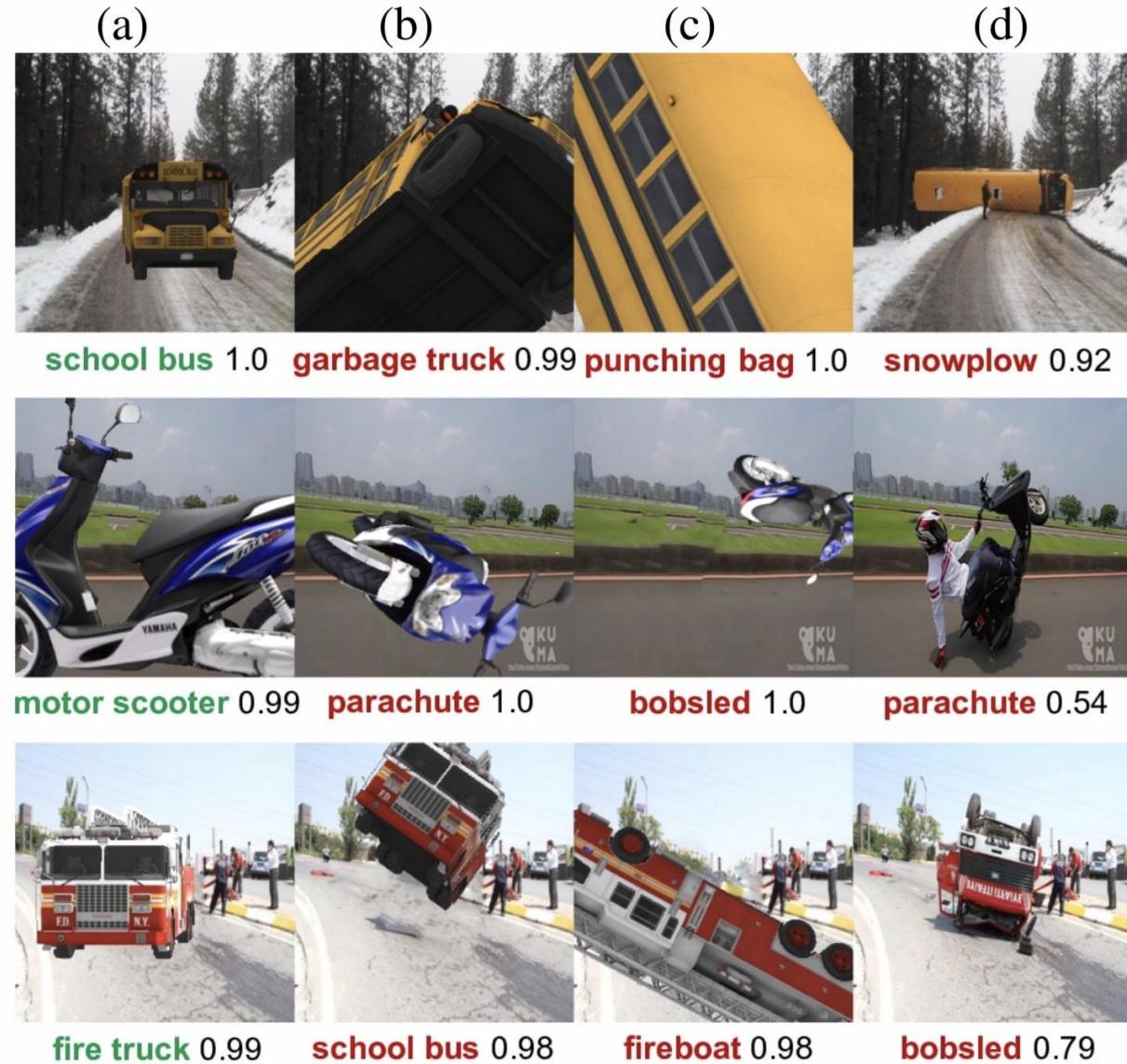
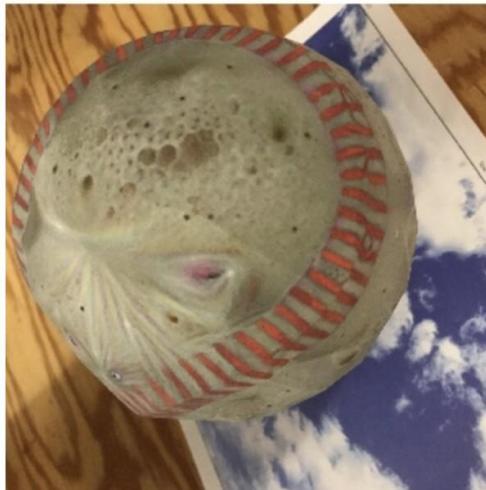
Conclusion ?
Cat or Not cat

The Deepest Problem with Deep Learning

(Type 3
ML model)

Gary Marcus

<https://medium.com/@GaryMarcus/the-deepest-problem-with-deep-learning->



Optional Rule/Process Reasoning System Workshop

- Refer to S-MR Workshop Guide.pdf

[Optional] Rule/Process Reasoning System

KIE BPMS/BRMS Suite – Workshop Tools

The screenshot shows the KIE Group website with a navigation bar at the top featuring 'KIE GROUP', 'DROOLS', 'OPTAPLANNER', 'JBPM', 'APPFORMER', and a 'redhat' logo. Below the navigation is a dark background with a grid pattern of white squares. The 'DROOLS' section title is in bold. A detailed description of Drools follows:

DROOLS

Drools is a business rule management system with a forward-chaining and backward-chaining inference based rules engine, allowing fast and reliable evaluation of business rules and complex event processing. A rule engine is also a fundamental building block to create an expert system which, in artificial intelligence, is a computer system that emulates the decision-making ability of a human expert.

DROOLS

Drools is a business rule management system with a forward-chaining and backward-chaining inference based rules engine, allowing fast and reliable evaluation of business rules and complex event processing.

[Read more →](#)

OPTAPLANNER

OptaPlanner is a constraint solver that optimizes use cases such as employee rostering, vehicle routing, task assignment and cloud optimization.

[Read more →](#)

JBPM

jBPM is a flexible Business Process Management suite allowing you to model your business goals by describing the steps that need to be executed to achieve those goals.

[Read more →](#)

APPFORMER

AppFormer is a low code platform to develop modern applications. It's a powerful tool for developers that can easily build applications by mashing up components and connect them to other Red Hat modules and software.

We make building apps looks easy.

[Read more →](#)

JBoss KIE

<http://www.kiegroup.org/>

JBoss KIE DROOLS

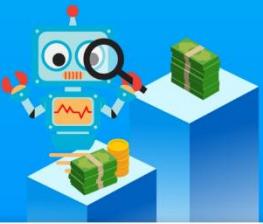
<http://www.drools.org/>

JBoss KIE JBPM

<http://www.jbpm.org/>

Drools salary in USA

Find out what is the average Drools salary



Type in a job title:

Drools

Find Salary

Drools Salary

Based on 9 salaries

Year Month Week Hour

\$107,250 / Year

Median
\$107,250

Low
\$81,756 High
\$145,920

The average **Drools** salary in USA is **\$107,250** per year or **\$55** per hour. Entry level positions start at

\$81,756 per year while most experienced workers make up to **\$145,920** per year.

Drools salaries per region

North Carolina

N/A

Texas

N/A

California

N/A

Minnesota

N/A

New Jersey

N/A

Show more

Related Salaries

Principal Software Engineer

\$150,000 >

Senior Software Engineer

\$130,000 >

Java Technical Lead

\$130,000 >

Drools

\$107,250 >

Senior Application Developer

\$103,795 >

Java Software Engineer

\$96,689 >

Show more

People also ask...

How much would I earn after taxes?

Active jobs with salaries

No results found for Drools

Archived salaries

JBPM Drools Developer

DiverseLynx | Irving, Texas



Salary : \$107,250 tails: Job Title: JBPM Drools Developer Customer – Telecommunication Location – Irving, TX

Business Rules (Drools) developer

Princeton Information Ltd | Raleigh, NC, United States



Salary : \$120,000 candidates requiring sponsorship. With this update, the full-time desired salary should not exceed

Java Developer- Drools

TEKsystems, Inc | US-CA-Sacramento



Salary : \$102,375 Must Haves: Drools Java REST \$50-55/hr. C2C Essential Functions Utilize business user stories to

JBPM Drools Developer

DiverseLynx | Texas, United States



Salary : \$107,250 tails: Job Title: JBPM Drools Developer Customer – Telecommunication Location – Irving, TX

Senior Drools Engineer



Drools Developer Customer – Telecommunication Location – Irving, TX

Senior Drools Engineer

Robert Half International Inc | Durham, NC



Salary : \$110,000 **\$110000 - 130000/year** ... Description Robert Half has an immediate need for a Senior

Senior RedHat JBoss Rules/Drools ...

ettain group | Morrisville, NC



Salary : \$142,500aleigh, NC (RTP) Terms : Long-term Contract (12 Months +) Compensation: \$65 - 75/hr W2

Drools Programmer ITS 4

Minnesota State government | St. Paul



Salary : \$74,510 **\$28.84 - \$47.58/hourly; \$60,217 - \$99,347/annually \$28.84 -**

Java / J2EE / Drools Developer

Bartech Group | Piscataway NJ



Salary : \$148,200 abilities Your specific duties as a Java / J2EE / Drools Developer will include: Pay Rate: **\$76.00** per hour

Java Developer (J2ee, spring batch, ...)

Confidential Company | USA



Salary : \$92,625 Job Description: Position: App Development Specialist Location: Lafayette, LA Rate: **\$45-\$50** Per



Jbpm salary in USA

Find out what is the average Jbpm salary



Type in a job title:

Jbpm

Find Salary

Jbpm Salary

Based on 10 salaries

Year Month Week Hour

\$126,750

/ Year

Median
\$126,750

Low

\$87,206

High

\$196,950

The average **Jbpm** salary in USA is **\$126,750** per year or **\$65** per hour. Entry level positions start at **\$87,206** per year while most experienced workers make up to **\$196,950** per year.

Jbpm salaries per region

New Jersey

N/A

Texas

N/A

Virginia

N/A

Florida

N/A

Idaho

N/A

Show more

Related Salaries

Principal Product Engineer \$180,000 >

Senior Java Engineer \$140,060 >

Senior Software Engineer \$130,000 >

Jbpm \$126,750 >

Full Stack Developer \$110,000 >

Software Engineer \$109,989 >

Lead Consultant \$45,000 >

Show more

People also ask...

How much would I earn after taxes?

Active jobs with salaries

No results found for Jbpm

Archived salaries

JBPM Drools Developer

DiverseLynx | Irving, Texas

Salary : \$107,250 tails: Job Title: JBPM Drools Developer Customer – Telecommunication Location – Irving, TX

JBOSS JBPM Developer

ASCII Group, LLC | Florham Park, NJ, US

Salary : \$117,000 title :JBoss JBPM DeveloperLocation :Florham Park, NJ | Buffalo Grove, ILDuration : 12

Business Analyst with BPM Experei...

Enterprise Solution Inc | York, Idaho

Salary : \$92,500 etc.) Location: NYC, NY Duration: Fulltime Compensation: \$75k-\$110k/Yr .C2C/C2H, No

Java JBPM Architect

iMinds Technology Systems, Inc. | Jersey City, NJ

Salary : \$175,500 JBPM Architect Location : TX, IL, NJ Type: Contract Rate: \$90/hr on C2C -----

JBPM Drools Developer

DiverseLynx | Texas, United States



Salary : \$107,250 tails: Job Title: JBPM Drools Developer Customer – Telecommunication Location – Irving, TX

Senior JBPM Consultant

Constratus Staffing LLC | Ashburn, VA, US



Salary : \$156,000 onstratus.com.I will call you ASAP. Title: Senior JBPM Consultant Duration: 12 months

Java JBPM developer

iMinds Technology Systems, Inc. | Jersey City, NJ



Salary : \$136,500 Java JBPM developer Location : NY, NJ Type: Contract Rate: \$70/hr on C2C -----

Need: JBPM Architect - Florida - 12 ...

ASCII Group LLC | Miami, FL, United States



Salary : \$175,500 ent is open with our client. Title : JBPM Architect Location : Florida Duration : 12 MonthsRate : \$

Senior JBPM Consultant

Bartech Group | Ashburn VA



Salary : \$214,500 he door with leading company, we want to talk with you! Senior JBPM Consultant Pay Rate:

JBPM Lead or Java with BPM experi...

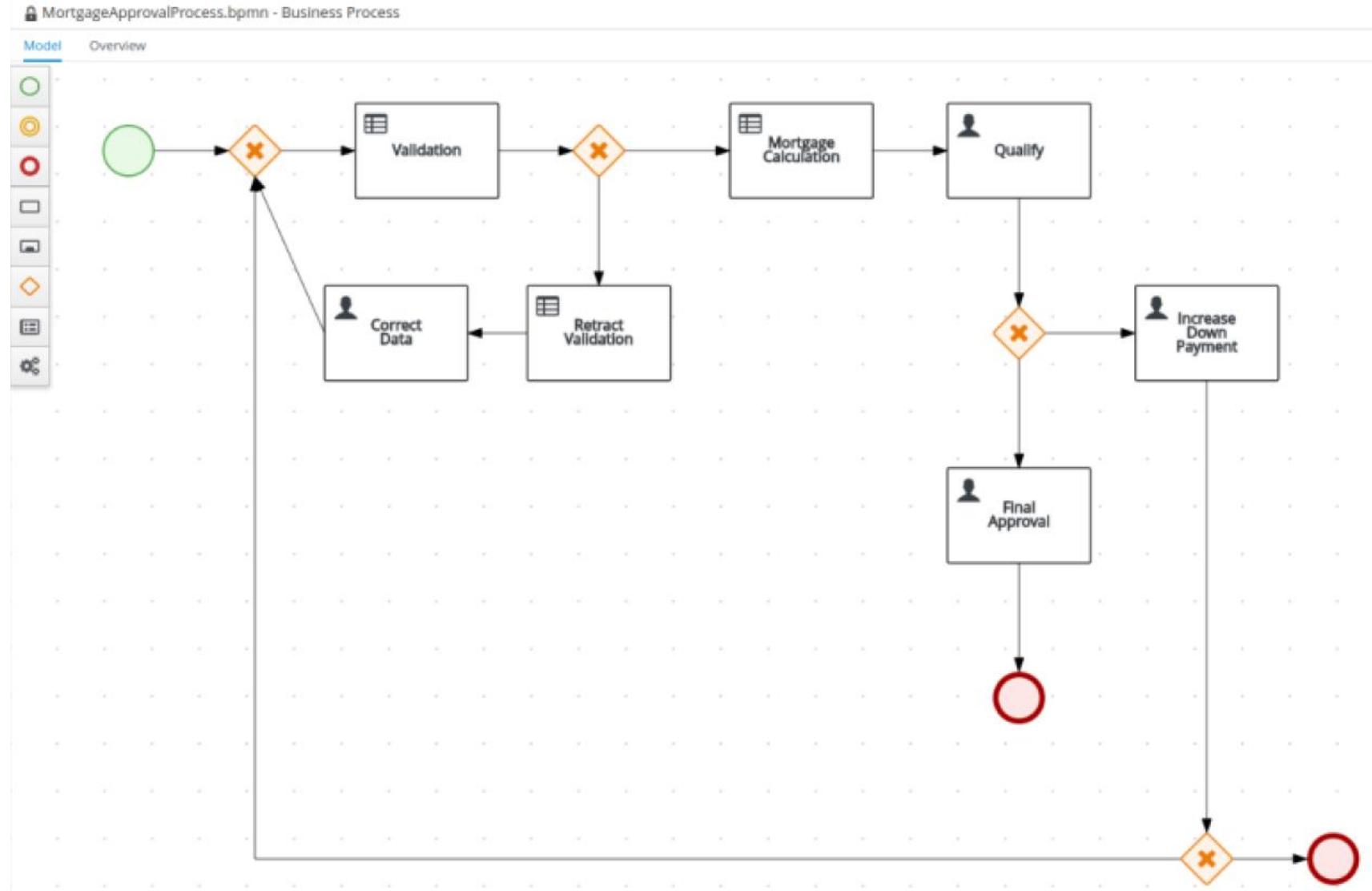
AQUA Information Systems Inc. | Quincy, United S...



Salary : \$82,875 m@aquainsys(DOT)com LinkedIn: Facebook: Chandu sadram Job Type:

[Optional] Rule/Process Reasoning System

KIE BPMS/BRMS Suite – Mortgage application systems



Filters

State

- Active
- Aborted
- Completed
- Pending
- Suspended

Errors

- With errors
- Without errors

Filter By

Name

Start Date

Last update

Start process instance

Correlation key

Form

Application

Down Payment

Years of amortization

50000 | 20

Applicant

Name

Sam GU Zhan

Age* ⓘ

Credit Rating* ⓘ

Has Job (check)* ⓘ

Own House (check)* ⓘ

21 | 3

Annual Income

123456

SSN

SSN

Property

Age of property

3

Address of property

25 ABC Road, Singapore, 110110

Locale

Urban

Sale Price

250000

Submit

New Process Instance

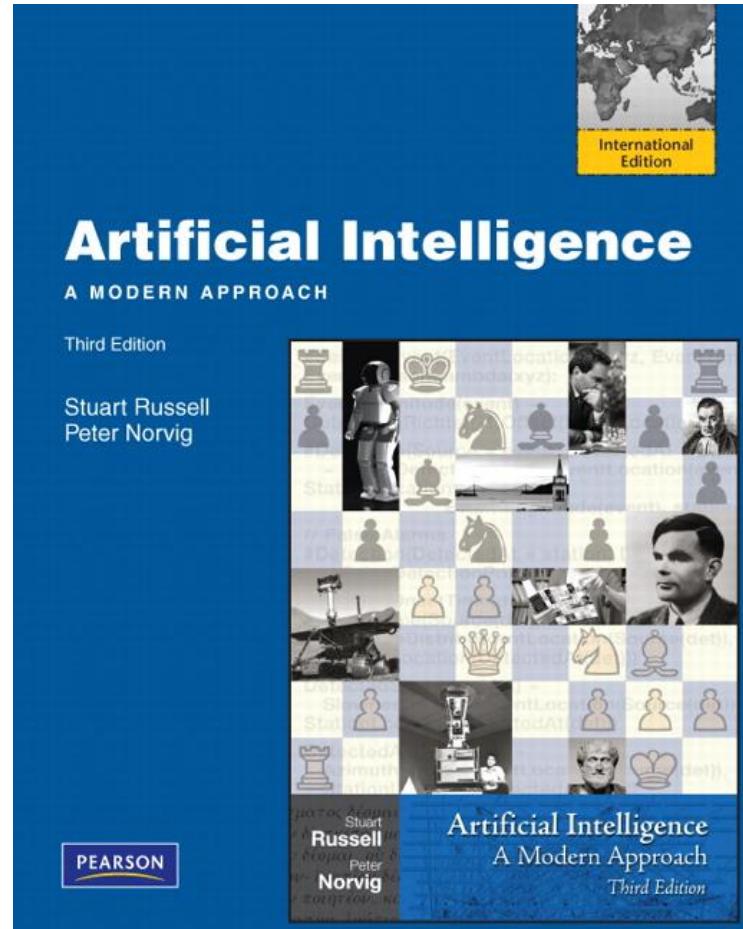
Save Filters | Clear All

Bulk Actions

Last update Errors Actions

0 of 0

Reference



Drools and jBPM tools	Eclipse plugins and support for Drools, jBPM and Guvnor functionality. Distribution zip contains binaries and sources.	Distribution ZIP
------------------------------	--	----------------------------------

1. Getting Started With Business Processes (PAM / jBPM)
https://access.redhat.com/documentation/en-us/red_hat_process_automation_manager/7.2/html-single/getting_started_with_business_processes/
1. Getting Started With Decision Services (DM / Drools)
https://access.redhat.com/documentation/en-us/red_hat_process_automation_manager/7.2/html-single/getting_started_with_decision_services/
1. KIE Workbench Tutorial: Data Object, Form, Task and Process creation
<https://www.youtube.com/watch?v=xQqxhEcrFB0>
<https://www.youtube.com/watch?v=US5tG4ZUPg0>
1. KIE Drools Official Tutorial
<https://www.drools.org/learn/video.html>
<https://www.drools.org/learn/slides.html>
1. KIE Drools On Boarding Course (Java & Eclipse)
<https://nheron.gitbooks.io/droolsonboarding/content/>
1. KIE Development Plugin for Eclipse IDE
<http://www.drools.org/download/download.html>



redhat.[®]

PROCESS AUTOMATION MANAGER (PAM / JBPM) & DECISION MANAGER (DM / DROOLS)

Key Customer Case Studies

Welcome to KIE Workbench

KIE Workbench offers a set of flexible tools that support the way you need to work. Select a tool below to get started.



Design

Create and modify [projects](#) and [pages](#).



Deploy

Administer [provisioning](#) and [servers](#).



Manage

Access [process definitions](#), [process instances](#), [tasks](#), [jobs](#) and [executions](#) [errors](#).



Track

View [task inbox](#), [process reports](#) and [task reports](#).

Welcome to Red Hat Process Automation Manager

Red Hat Process Automation Manager (RHPAM) offers a set of flexible tools that support the way you need to work. Select a tool below to get started.



Design

Create and modify [projects](#) and [pages](#).



Deploy

Administer [provisioning](#) and [servers](#).



Manage

Access [process definitions](#), [process instances](#), [tasks](#), [jobs](#) and [executions](#) [errors](#).



Track

View [task inbox](#), [process reports](#) and [task reports](#).

Aviva Achieves Faster Response Times - Courtesy: Red Hat PAM



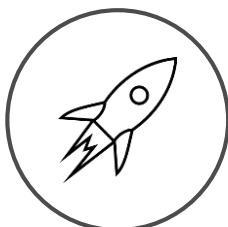
Aviva leveraged Fuse to manage additional service endpoints and establish a service gateway for routing and service integration with third-party vendor systems, such as Kofax and IBM FileNet.

CHALLENGE

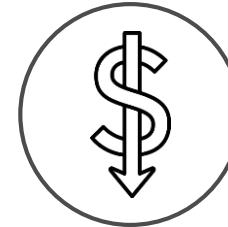
The inflexible bond management and workflow systems of Aviva's new acquisition FPI, was hampering its goal of bringing the new joint offering to the Asian market faster.

SOLUTION

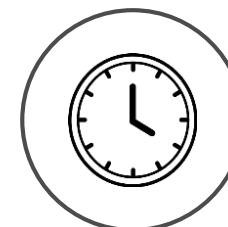
- Aviva decided to migrate from FPI's existing AWD system to a new & faster imaging and workflow application based on **Red Hat Process Automation Manager (PAM)**.
- Standardized on a single process automation platform leveraging **PAM** to unify applications across users in Singapore, Hong Kong and Dubai, in 6 months.



New Services at
a Faster Rate



Lower
Overall Costs



Faster
Response Times

Jalisco State Government, Powered by Red Hat Middleware, Increases Service Rate by 900%



"With the Red Hat Solution, we can gradually scale up and grow in line with demand for our services. This capability is quite extraordinary, because we can add other solutions that permit further improvement of our services and building innovative applications "

- MASTER MARIA ANGELINA ALARCON
ROMERO
DIRECTOR, TECHNOLOGY INNOVATION, GOVERNMENT
OF THE STATE OF JALISCO

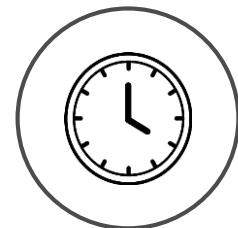
Case Study

CHALLENGE

With dispersed data sources and manual processes, Jalisco State was finding it challenging to cope with the increasing demands of its citizens

SOLUTION

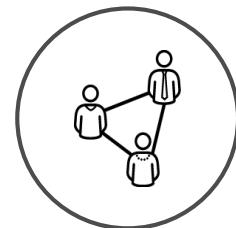
With Red Hat Fuse connecting disparate systems and **BPM Suite** automating the complex processes, Jalisco State provided a wide range of services from mobility, public safety, and revenue collection to environmental issues. Citizens could pay road taxes or traffic fines, order birth certificates, or electronically sign receipts from one online location.



Traffic
Infringement
Notices Sent
within 3 days
rather than
120 days



Enhanced
Security



Citizens Served
Per Day
Increased from
3,000 to
30,000

70 Million Seamless Ride Bookings Per Year Powered by Red Hat Decision Manager



"We anticipate moving from large software releases quarterly to functional releases monthly, with system refinements happening as often as weekly." Our IT organization is now a responsive partner with a business focus."

- MICHAEL QUINTERO
ENTERPRISE SOLUTIONS ARCHITECT
LOGISTICARE

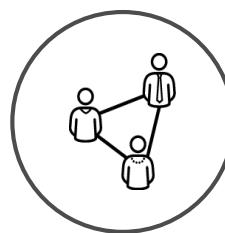
Case Study

CHALLENGE

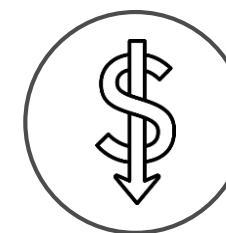
Business has grown over 60% and the core app was not able to handle the growing scale and complexity of business. The app contained custom business logic that made meeting the evolving needs of clients & partners, increasingly difficult.

SOLUTION

- Saved \$6Mn in operations by using **DM** to define complex rules for regulatory compliance, routing, payments, and ride scheduling.
- Adopted the OpenShift container platform to manage, deploy and scale apps and APIs, built using Red Hat Middleware.



Easier
Third Party
Integration



Operational
costs reduced by
\$6 Mn



Increased
agent efficiency
by 15%

KIE System Architecture

KIE functionality overview

What are the KIE projects?



Drools
Rule engine
and Complex Event Processing
Example: insurance rate calculation

Drools Workbench

Design rules,
decision tables, ...

Drools Execution Server

REST/JMS service
for business rules



OptaPlanner
Planning engine
and optimization solver
Example: employee rostering

OptaPlanner Workbench

Design solvers,
benchmarks, ...

OptaPlanner Execution Server

REST/JMS service
for optimization



jBPM
Workflow engine

Example: mortgage approval process

jBPM Workbench

Design workflows,
forms, ...

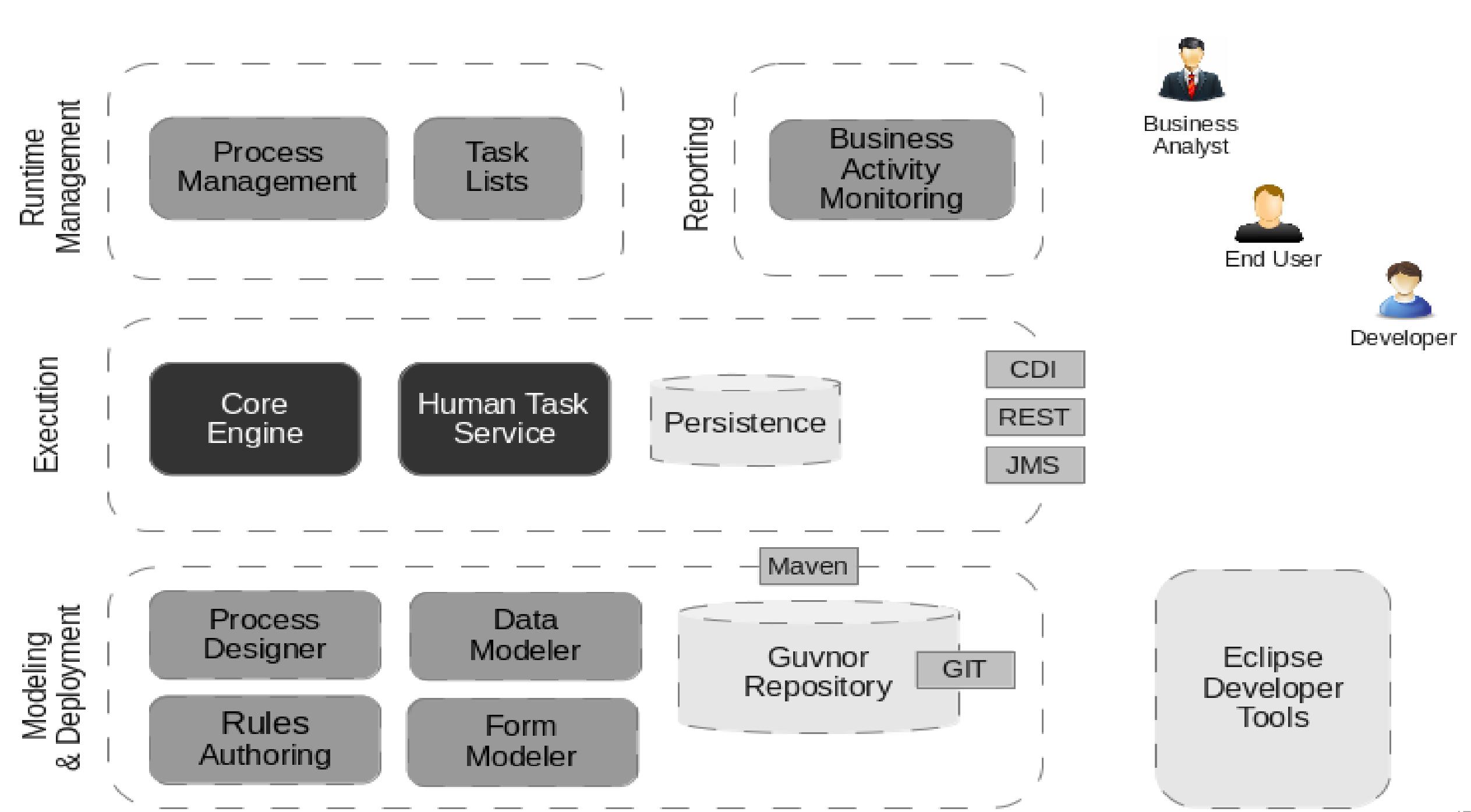
jBPM Execution Server

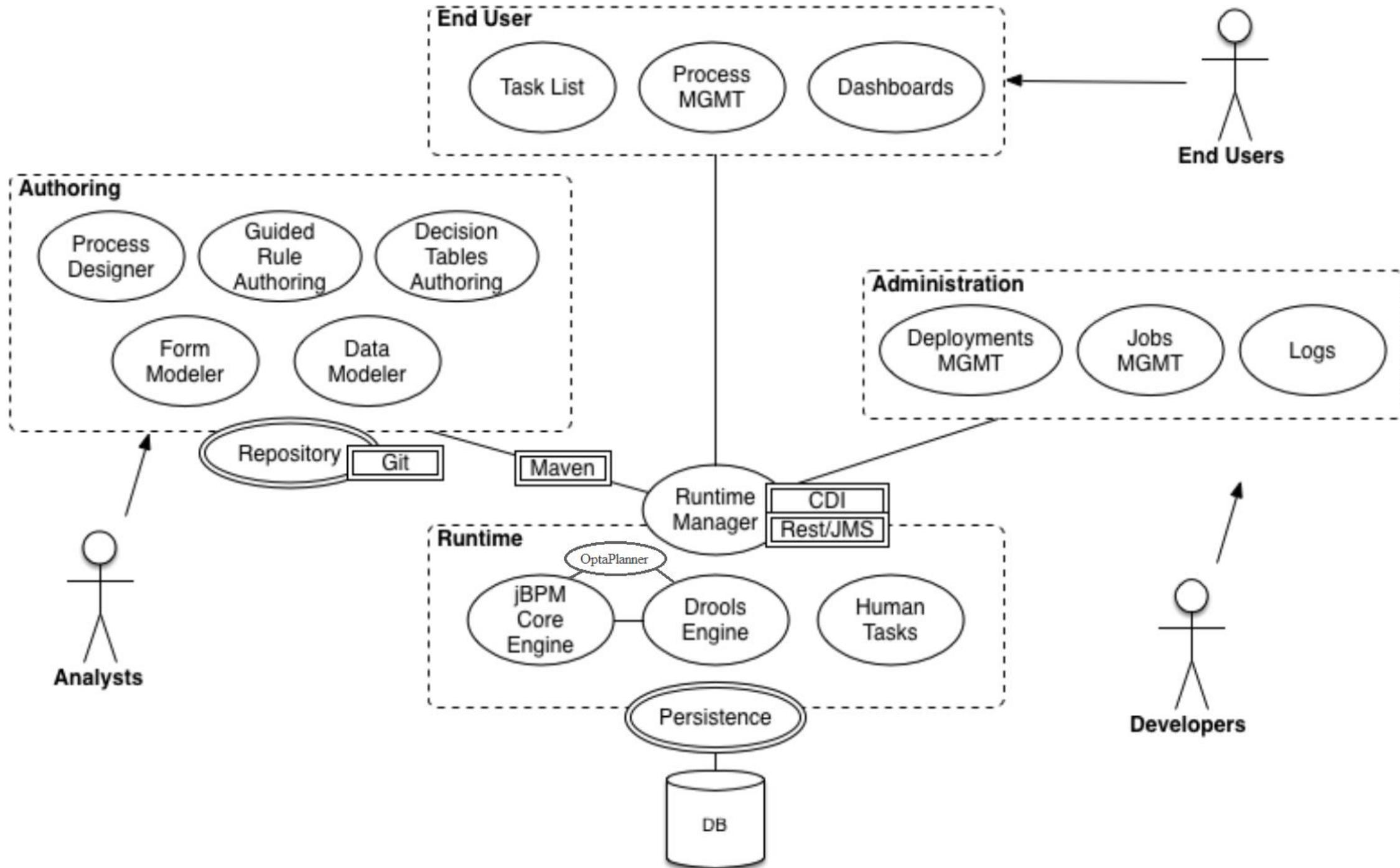
REST/JMS service
for workflows

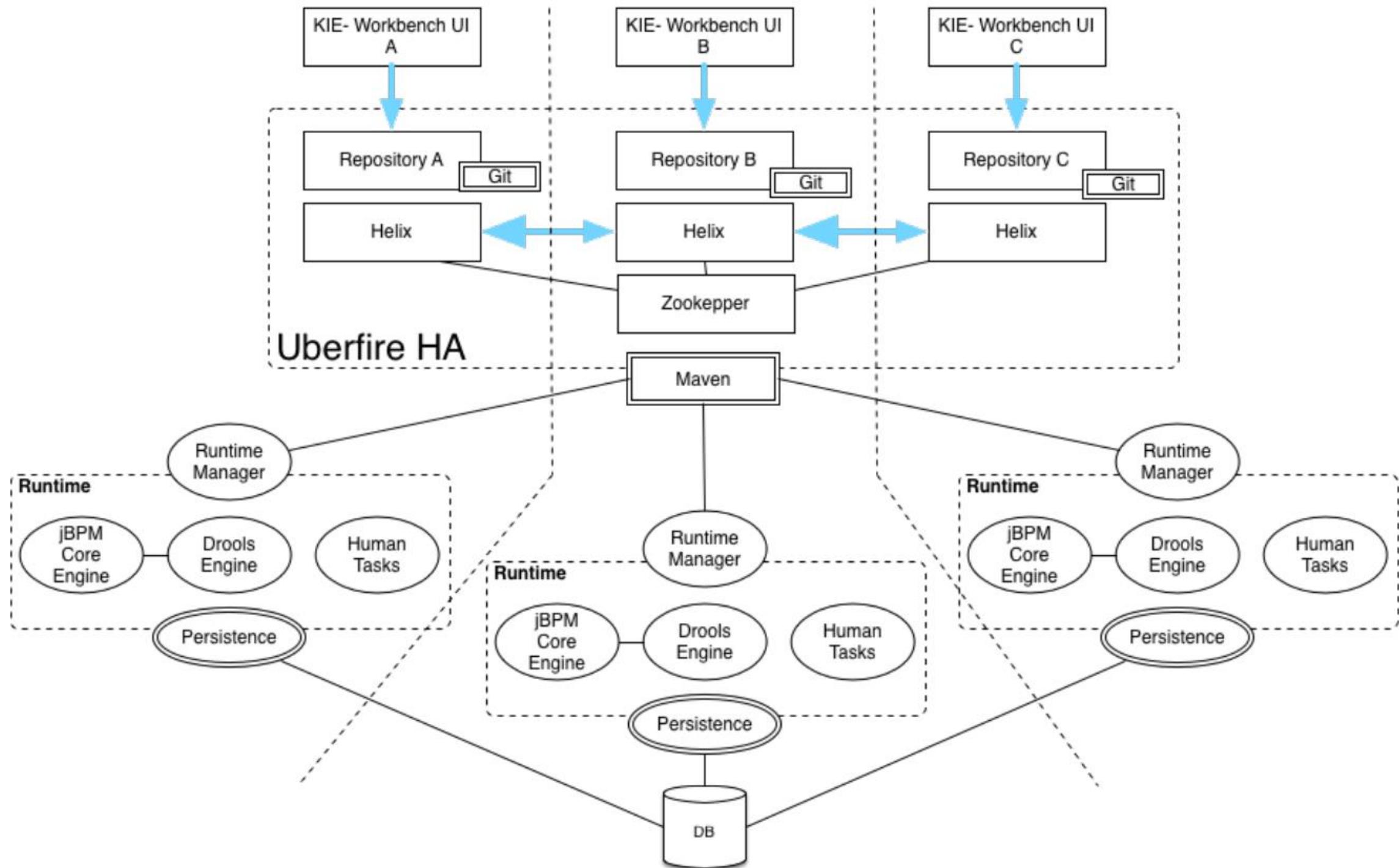


Lightweight, embeddable engines (jars)
which run in a Java VM

Web applications (wars)
which run on a Java Application Server







END OF APPENDICES