# MACHINE LEARNING

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اَللّٰهُمَّ اُرْزُقْنِی عِلْمًا نَافِعًا وَاسِعًا عَمِيْقًا

اَللّٰهُمَّ اُرْزُقْنِی رِزْقًا وَاسِعًا حَلَالًا طَيِّبًا
مُبَارَكًا مِنْ عِنْدِكَ

# WEEK 01 LECTURE 01

# ~~WEEK 01 LECTURE 01~~
# INTRODUCTION

# FILL THE SURVEY

# GENERAL INTRODUCTION

# GENERAL INTRODUCTION

- Name
- Why you want to Learn Machine Learning
- What are your goals after doing it.
- Any Prior Experience.

# WHAT IS CONSCIOUSNESS

# WHAT IS INTELLIGENCE

# WHAT IS ARTIFICIAL INTELLIGENCE

# WHAT IS LEARNING

# WHAT IS MACHINE LEARNING

# ARTIFICIAL INTELLIGENCE VS MACHINE LEARNING

# SHOULD I TAKE THIS CLASS ?

A COMMON QUESTION

# DETAIL COURSE OUTLINE SHALL BE SHARED IN NEXT WEEK

BUT TO HELP YOU TO MAKE YOUR MIND

# WHAT ARE MY PLAN ?

- In Class
  - Discuss a Machine learning Algorithm
  - Do the relevant Mathematics in Class
  - An Example

# WHAT ARE MY PLAN ?

- At Home
  - Code the Algorithm in Python (do not use APIs)
  - Code the Algorithm with API
  - Compare its performance.

# DECISION POINT 01

- Math Requirements:
  - If you are not comfortable with Linear Algebra and Multivariate Calculus and do not want to learn the MATH do not take the class.
  - If You are comfortable with MATH or keen to learn **Linear Algebra** and Multivariate Calculus you are welcome.

# DECISION POINT 02

- Programming Requirements:
  - If you are not comfortable with Programming in Python and do not want to learn do not take the class.
  - If You are comfortable with **Programming in Python** or do want to learn it you are welcome.

# DECISION POINT 03

- Can I manage It
  - 3 hour class means 3 hour class or may be 20 minutes less.
  - 7-8 hour working on assignments
  - Assignments are essential to get pass.
  - In case you ready to learn MATH and PROGRAMMING add extra 10 hours.

# DECISION POINT 04

نمبر نہیں لگیں گئے۔


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# LECTURE 02

اَللّٰهُمَّ اُرْزُقْنِی عِلْمًا نَافِعًا وَاسِعًا عَمِيْقًا

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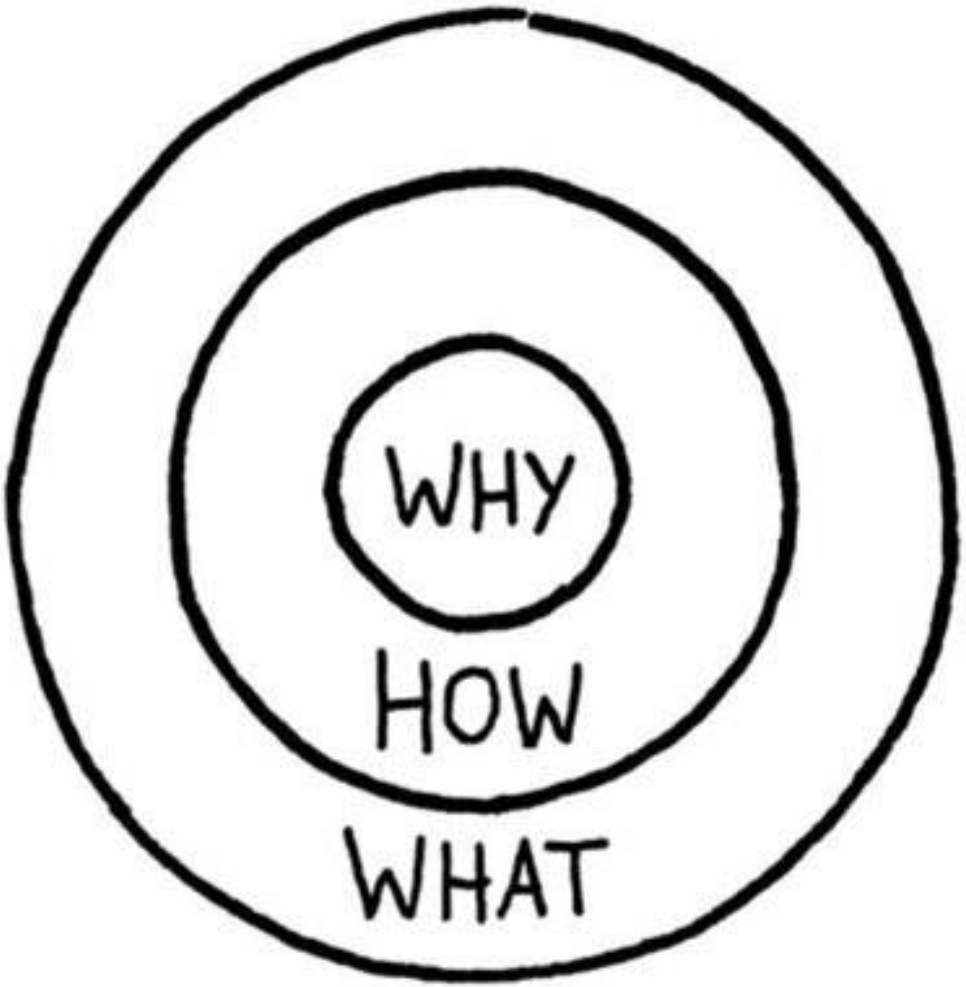
مُبَارَكًا مِنْ عِنْدِكَ

# THE GOLDEN CIRCLE

SIMON SINEK

# GOLDEN CIRCLE




**Why = The Purpose**
*What is your cause? What do you believe?*

Apple: We believe in challienging the status quo and doing this differently

**How = The Process**
*Specific actions taken to realize the Why.*

Apple: Our products are beautifully designed and easy to use

**What = The Result**
*What do you do? The result of Why. Proof.*

Apple: We make computers

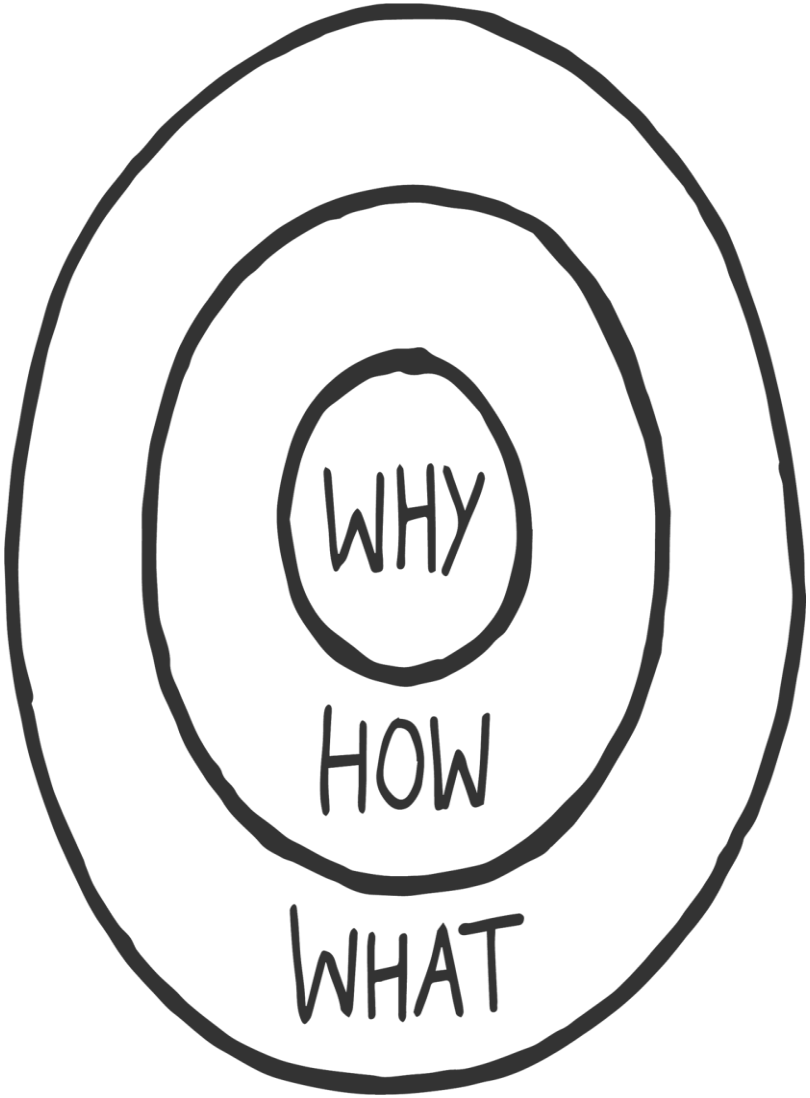
# A TIP

- You want to be successful in life start thinking every goal and task in terms of Golden Circle.

# GOLDEN CIRCLE OF MACHINE LEARNING

# WHY

Any idea ?



# WHO ARE WE ?

WHAT IS UNIQUE IN US ?

# CONSCIOUSNESS

# DIFFERENCE BETWEEN HUMAN AND ANIMALS

# FOOD OF THOUGHT

- A chimpanzee, our closest genetic relative (around 99% similar in DNA), can be taught to do basically everything a human can, though of course at a more generally primitive level.

# DIFFERENCE

| HUMAN | ANIMALS |
| --- | --- |
| | |
| | |
| | |
| | |

# ACTIVITY

- How are you feeling now?
- How you end up here ?
- Why you are here ?

# CONSCIOUSNESS

HUMANS HAS CONSCIOUSNESS

# FROM WHERE THIS CONSCIOUSNESS CAME

BRAIN IS PHYSICAL THING BUT WHERE IS CONSCIOUSNESS

# TWO BROAD APPROACHES

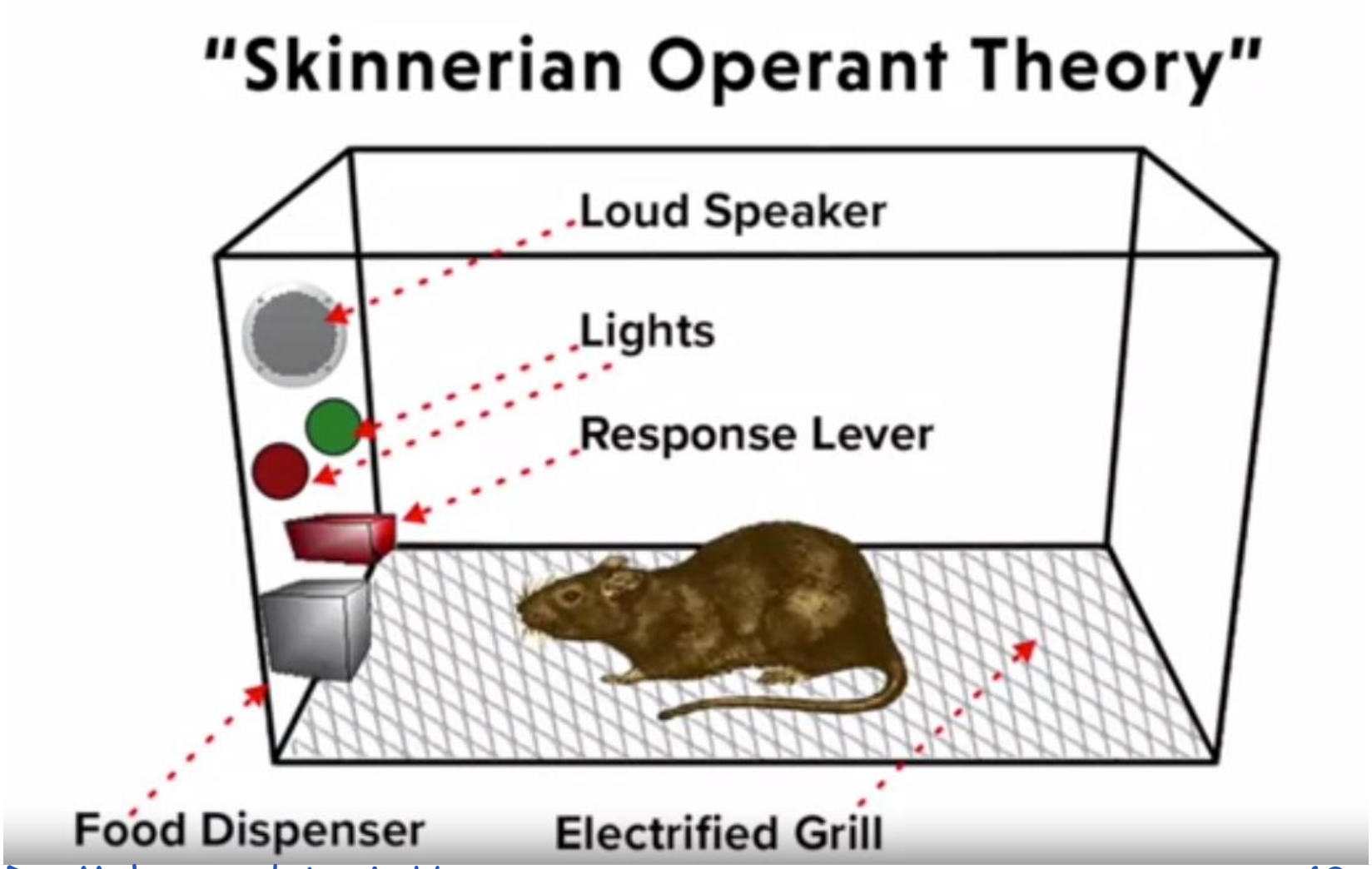
# MATERIALISM

OUR THOUGHTS ARE PRODUCT OF CHEMICAL REACTIONS

# BEHAVIORISM

## An example of materialism

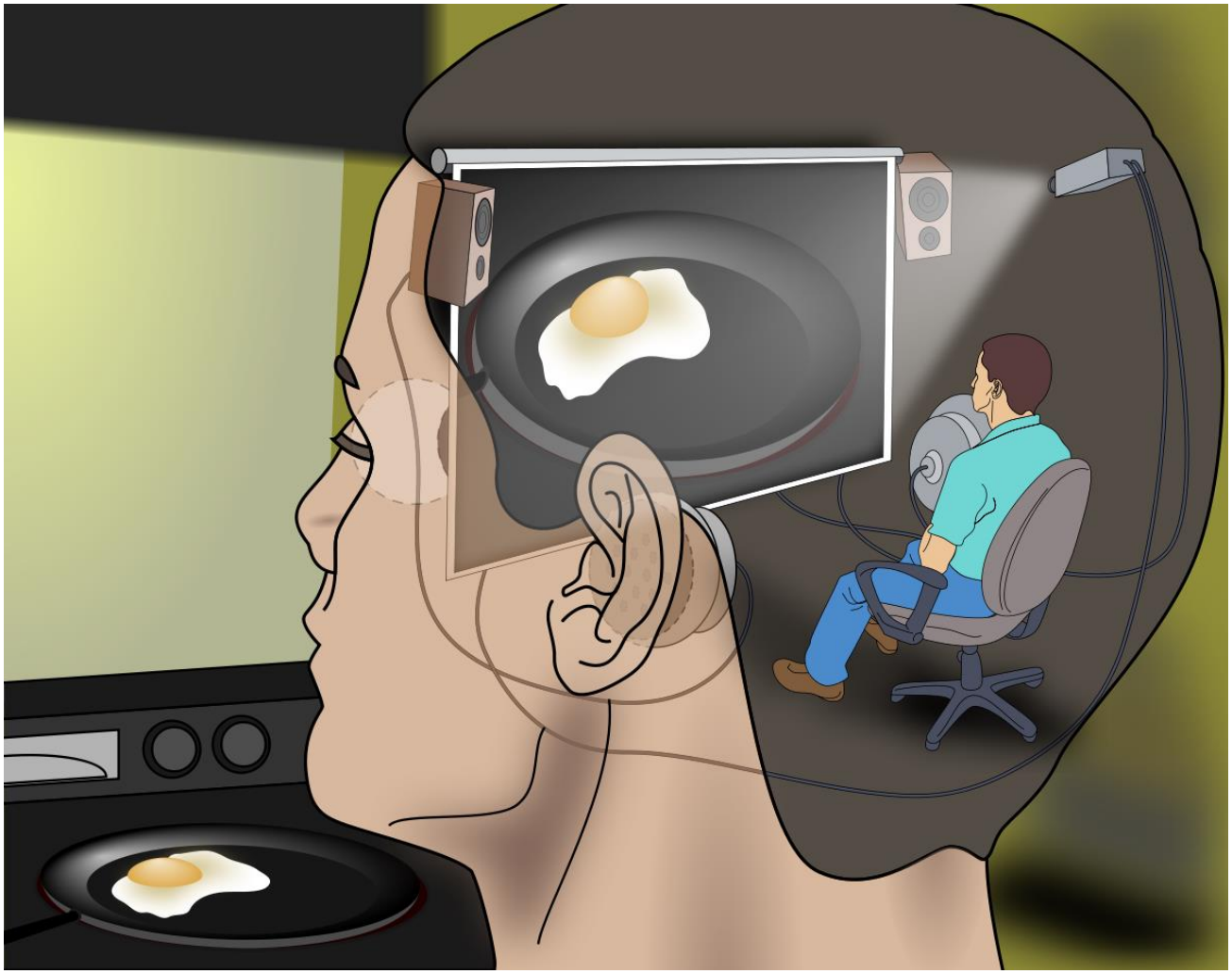
# BEHAVIORISM



# DUALISM

ANOTHER NAME OF MIND BODY PROBLEM

# DUALISM

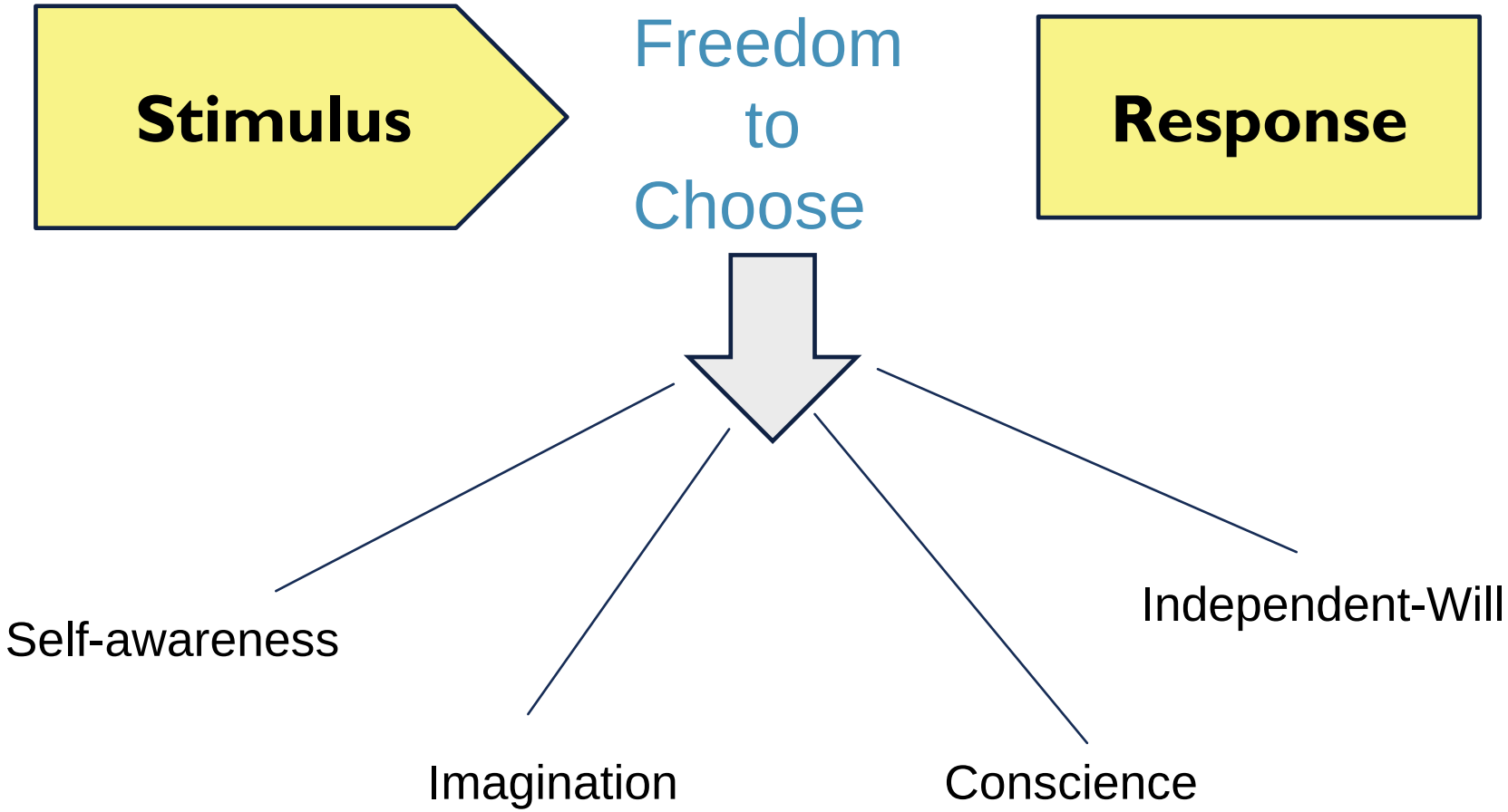


# INTERESTING CONCLUSION

# THE CHARACTERISTIC

The essential difference between animals and humans is the ability to self-reflect.

# BETWEEN BEHAVIORISM AND DUALISM



# FREEDOM TO CHOOSE

# FREEDOM TO CHOOSE

# REACTIVE NATURE OF HUMANS

- Mostly Human work in that way they react on the environment factors. For example:
  - You shall read when I announce a quiz.
  - You do the assignment a day before or a period before.
  - You stop using your mobile when I ask you to leave the class.
  - You start taking notes when I ask this question is coming to exam

# NO WHY

Usually, We do not think about the thing (why) that make us unique from animals and computers.

# COMING BACK TO TOPIC

# WHY OF ARTIFICIAL INTELLIGENCE.

A DREAM, STILL DREAMING

# WHY: THINKING HUMANLY

## Thinking humanly: cognitive approach

Requires to determine how humans think!

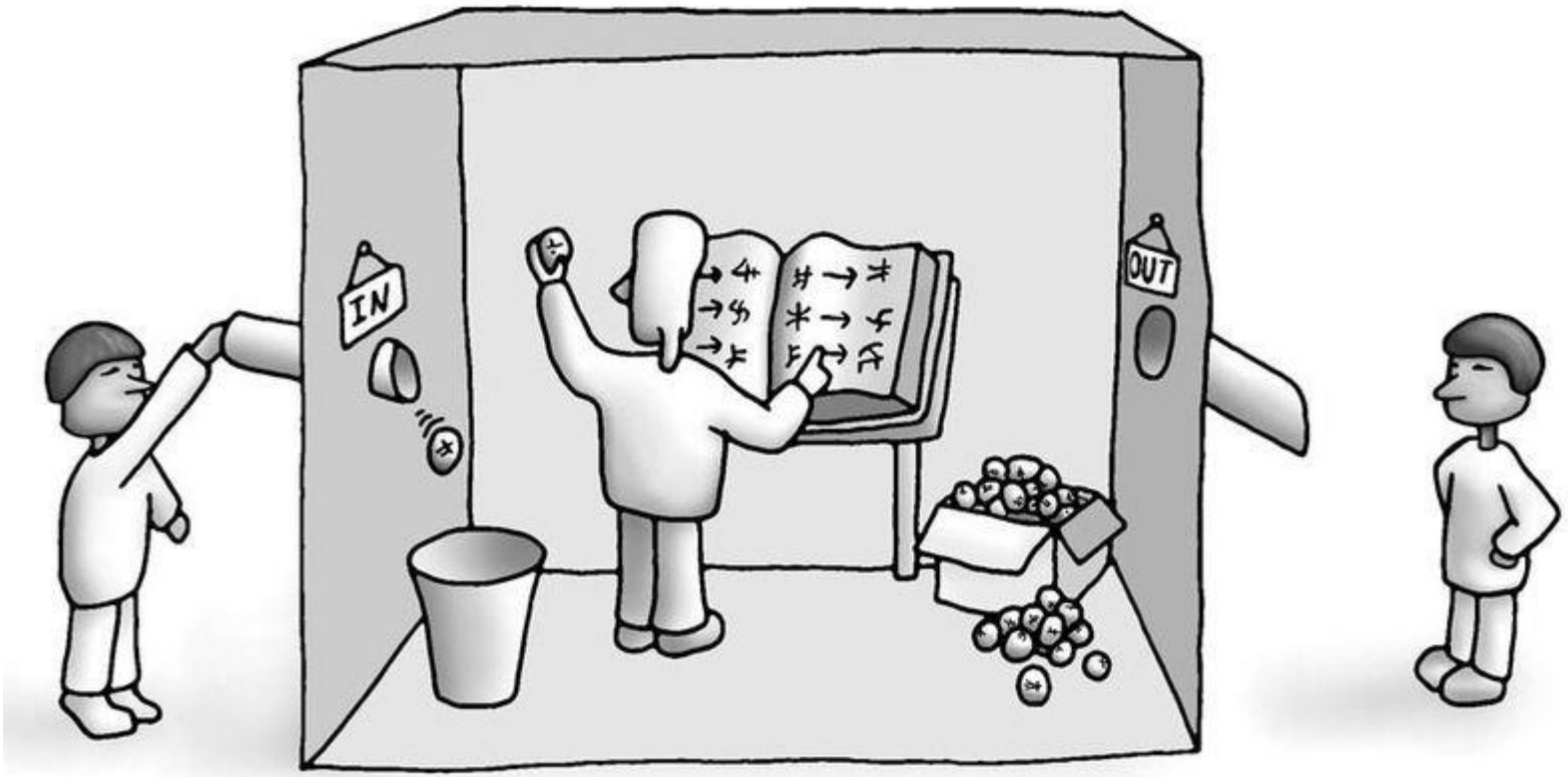
1960's "cognitive revolution".

Requires scientific theories of internal activities of the brain

- What level of abstraction? "Knowledge" or "circuits"?
- How to validate?

**Today, Cognitive Science and Artificial Intelligence are distinct disciplines.**

# CHINESE ROOM EXPERIMENT



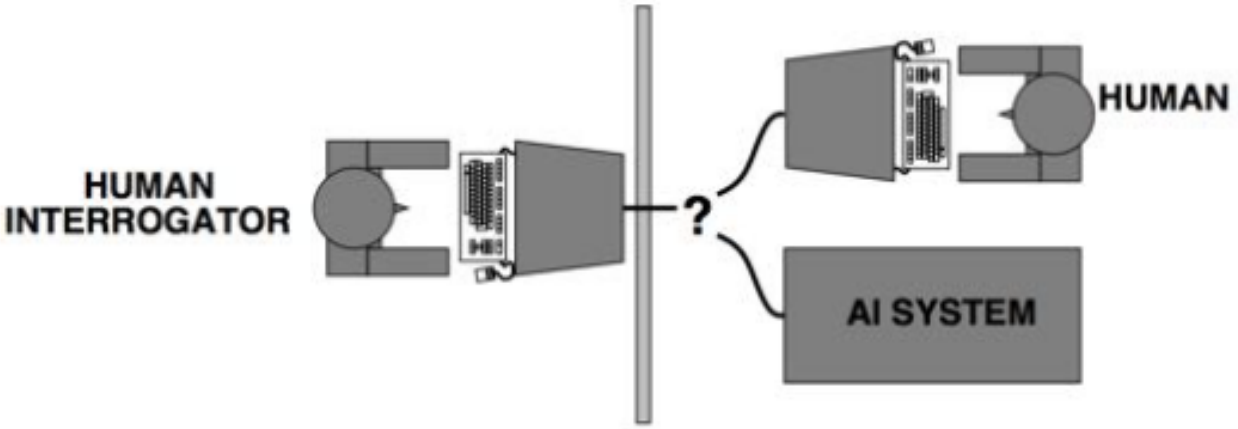
# DREAM LESS.

A DREAM WITH PROGRESS

# WHY: ACTING HUMANLY

## Acting humanly:

- **Turing test (Alan Turing 1950)**: A computer passes the test of intelligence, if it can fool a human interrogator.




Credit: From Russel and Norvig slides.

- **Major components of AI:** knowledge, reasoning, language, understanding, learning.

# WHY: ACTING HUMANLY TOO AMBITIOUS

Acting humanly:

# AGAIN DREAM BIG.

A DREAM STILL DREAMING

# WHY: THINKING RATIONALLY

## Thinking rationally: Laws of thoughts.

- Codify "right thinking" with **logic**.
- Several Greek schools developed various forms of logic: *notation* and *rules of derivation* for thoughts.
- Problems:

  1. Not all knowledge can be expressed with logical notations.
  2. Computational blow up.

# REASONABLE DREAM

YES WE ARE MOVING TOWARD IT

# WHY: ACTING RATIONALLY

## Acting rationally:

- The right thing: that which is expected to maximize goal achievement, given the available information.
- A **rational agent** is one that acts so as to achieve the best outcome, or when there is uncertainty, the best expected outcome.
- Aristotle (Nicomachean Ethics):
  *"Every art and every inquiry, and similarly every action and pursuit, is thought to aim at some good."*

# WHY OF AI

## Four schools of thoughts (Russel & Norvig)

| Thinking humanly | Thinking rationally |
|---|---|
| "The exciting new effort to make computers think... *machines with minds*, in the full and literal sense." (Haugeland, 1985) | "The study of mental faculties through the use of computational models." (Charniak and McDermott, 1985 |
| **Acting humanly** | **Acting rationally: Our approach** |
| "The study of how to make computers do things which, at the moment, people are better." (Rich and Knight, 1991) | "Computational Intelligence is the study of the design of intelligent agents." (Poole et al., 1998) |

# INTELLIGENCE

CONSCIOUSNESS DIFFICULT TO PRODUCE

# LET'S MAKE DREAM MORE REASONABLE

# LEARNING

INSTEAD OF INTELLIGENCE

# WHAT IS LEARNING

- Herbert Simon defines learning as:

*"any change in a system that allows it to perform better the second time on repetition of the same task or on another task drawn from the same population (Simon, 1983)".*

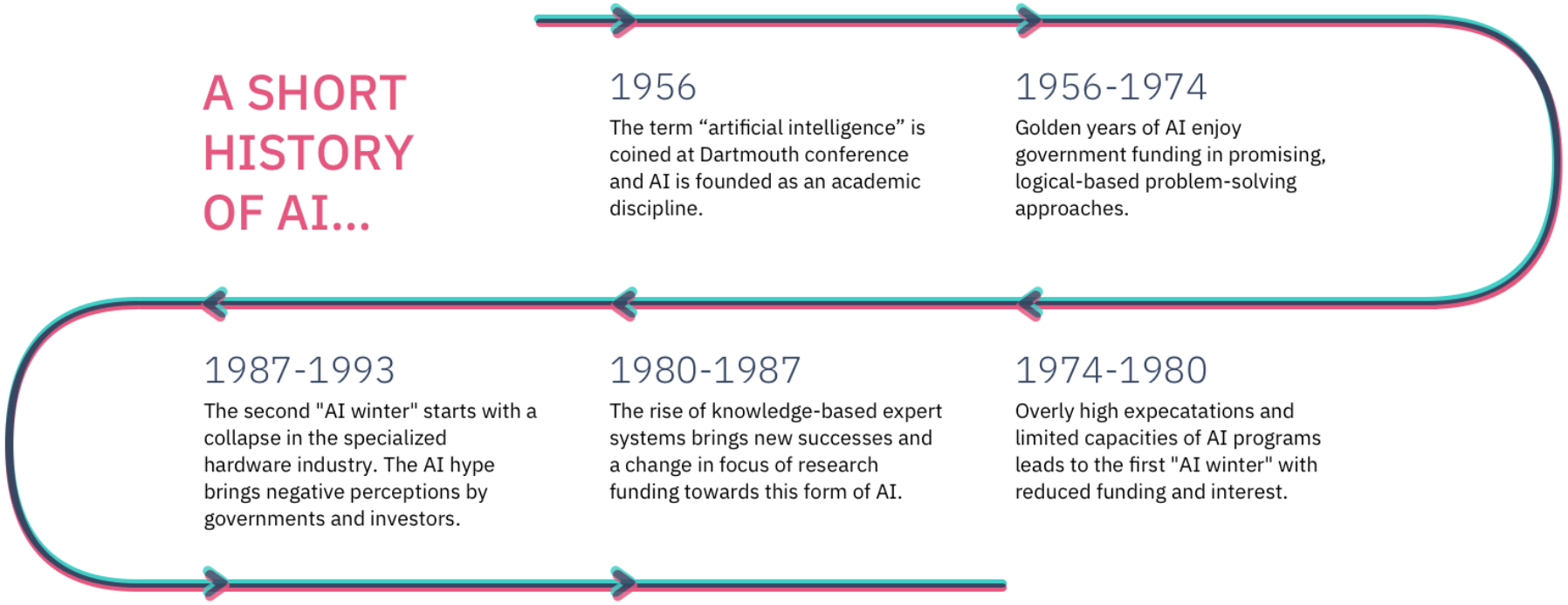
# ARTHUR SAMUEL (1959)

*Machine learning:* "Field of study that gives computers the ability to learn without being explicitly programmed"

# TOM MITCHELL (1999)

- "A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P, if its performance at tasks in T, as measured by P, improves with experience E."

# HISTORY OF AI



# ASSIGNMENT 01 (A)

- Write the summary of following materials
  - Is Brain a digital computer
  - Mind Body Problem
  - AlphaGo Learning

# ASSIGNMENT 01 (B)

- Do the Exercise Question (Handwritten submission is Required not printed)
  - Philosophical Foundation of AI

# OTHER USEFUL RESOURCES

- Other useful Resources
  - Golden Circle