



Hillcrest School: Career Day

Tony Yousefnezhad, Ph.D.
Computer Scientist

Research Associate, University of Alberta
CEO, Learning By Machine



Slides

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Outline

- The background of my education
- Math & Computer Science
- Reading Minds
- PTSD Prediction
- Income
- Conclusion

The background of my education

My Background

- Highschool (**Math and Physics**)
 - More than ten awards in national and international programming competitions
 - Volunteer internship with one of Iran's top software companies
 - Acquiring more than 60 diplomas from Microsoft, Cisco, etc.

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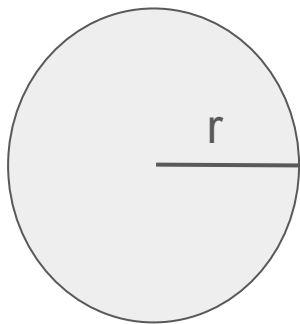
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 - Graduated as the top student
- Doctoral degree with two majors
 - Majors: **Computer Science (Artificial Intelligence)**, and *Computational Neuroscience*
 - Graduated as the top student

Math & Computer Science

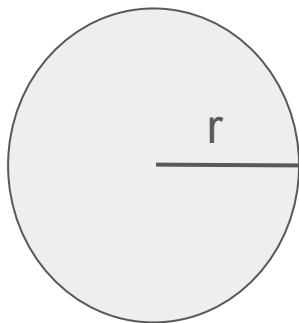
What are the benefits of
studying mathematics?





$$A = \pi r^2$$

π



$$A = \pi r^2$$

π

3.1415926535 8979323846 2643383279 5028841971 6939937510 5820974944 5923078164
0628620899 8628034825 3421170679 8214808651 3282306647 0938446095 5058223172
5359408128 4811174502 8410270193 8521105559 6446229489 5493038196 4428810975
6659334461 2847564823 3786783165 2712019091 4564856692 3460348610 4543266482
1339360726 0249141273 7245870066 0631558817 4881520920 9628292540 9171536436
7892590360 0113305305 4882046652 1384146951 9415116094 3305727036 5759591953
0921861173 8193261179 3105118548 0744623799 6274956735 1885752724 8912279381
8301194912 9833673362 4406566430 8602139494 6395224737 1907021798 6094370277
0539217176 2931767523 8467481846 7669405132 0005681271 4526356082 7785771342
7577896091 7363717872 1468440901 2249534301 4654958537 1050792279 6892589235
4201995611 2129021960 8640344181 5981362977 4771309960 5187072113 4999999837
2978049951 0597317328 1609631859 5024459455 3469083026 4252230825 3344685035
2619311881 7101000313 7838752886 5875332083 8142061717 7669147303 5982534904
2875546873 1159562863 8823537875 9375195778 1857780532 1712268066 1300192787
6611195909 2164201989...

Prime Numbers

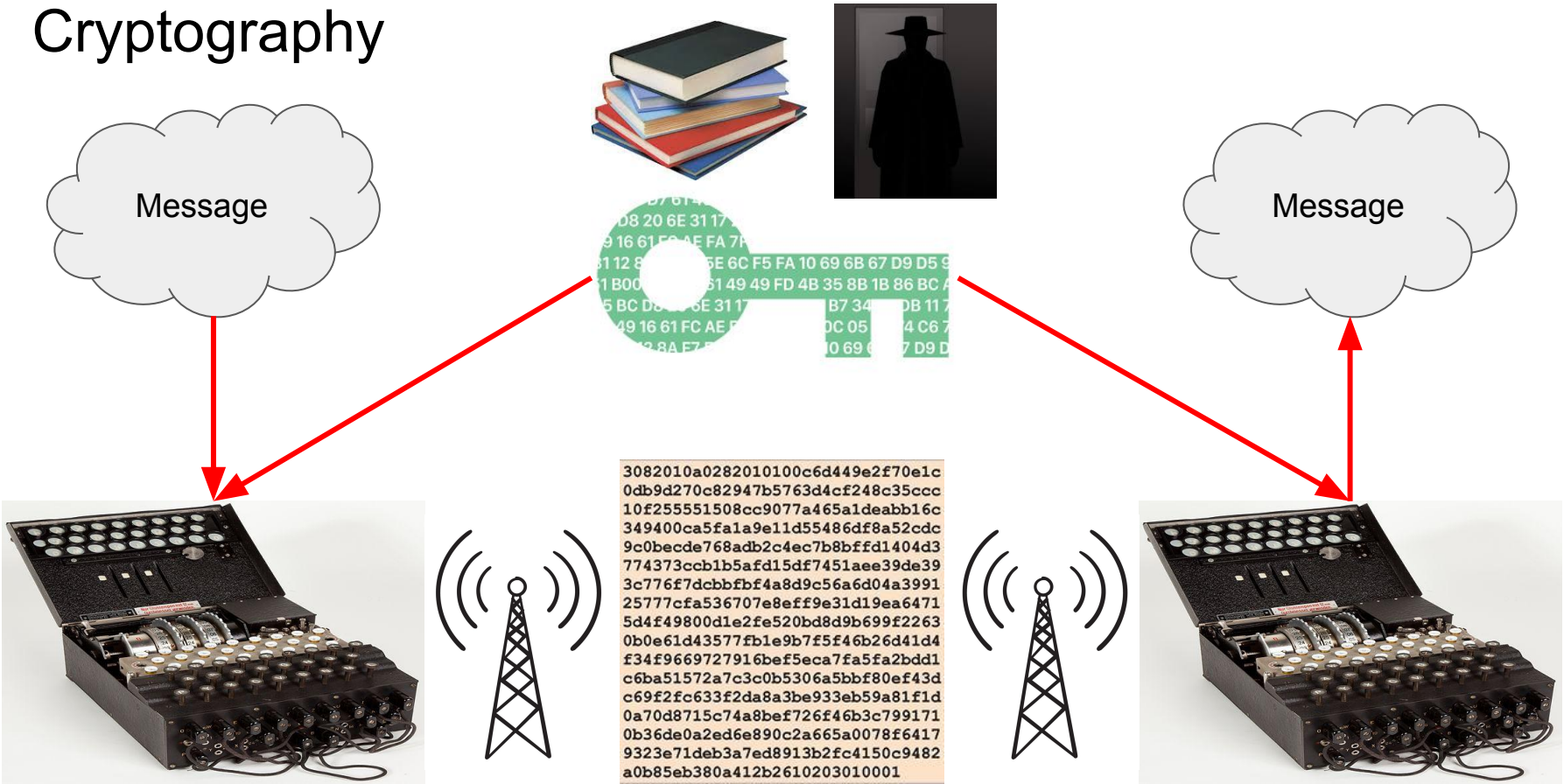
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Prime Numbers

What is the best way to become a millionaire with prime numbers?

							8	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

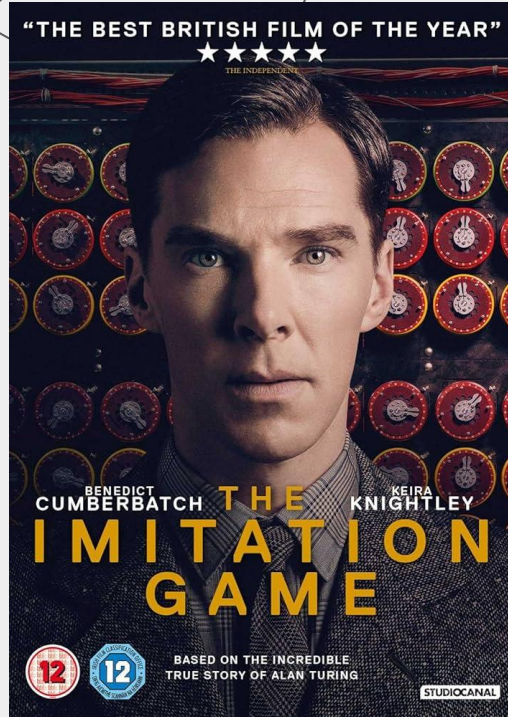
Cryptography



Enigma machine (World War II)

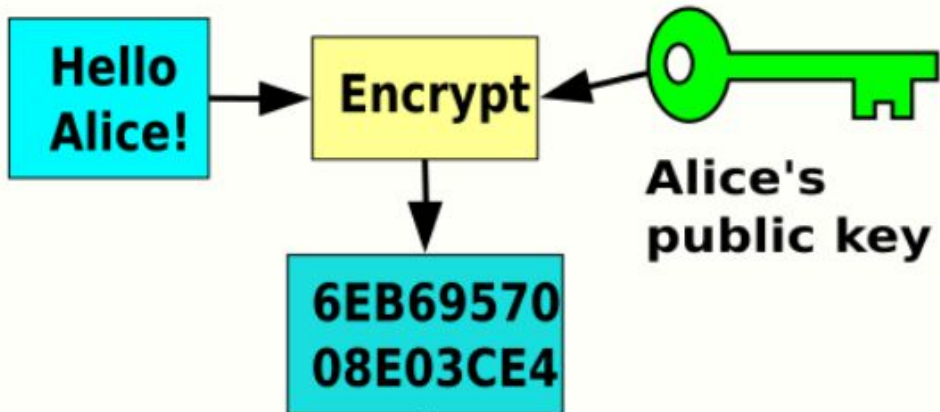
Cryptography

Me

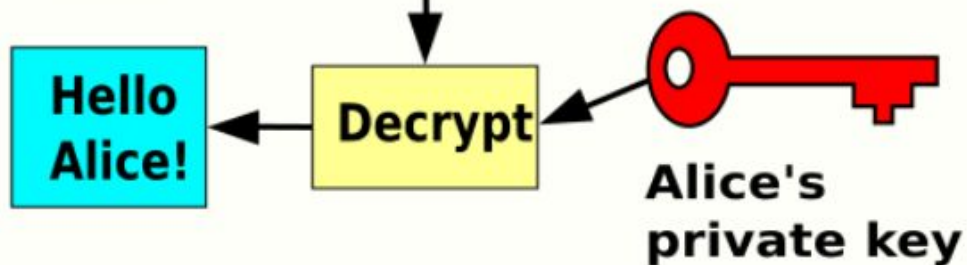


Enigma machine (World War II)

Bob



Alice



Bob

Hello
Alice!

Encrypt



Alice's
public key

6EB69570
08E03CE4

Alice

Hello
Alice!

Decrypt

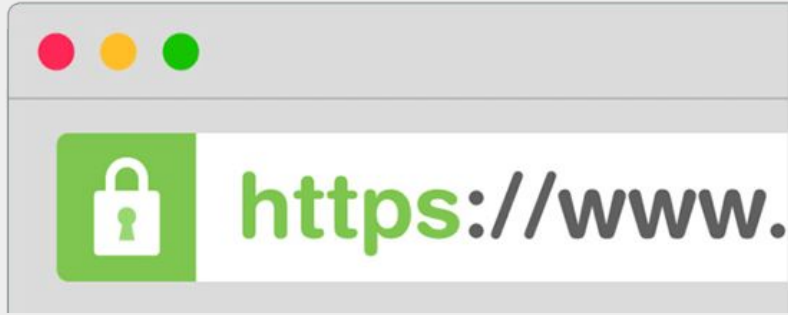


Alice's
private key

Based on product
of two very large
prime numbers

Bob

Hello
Alice

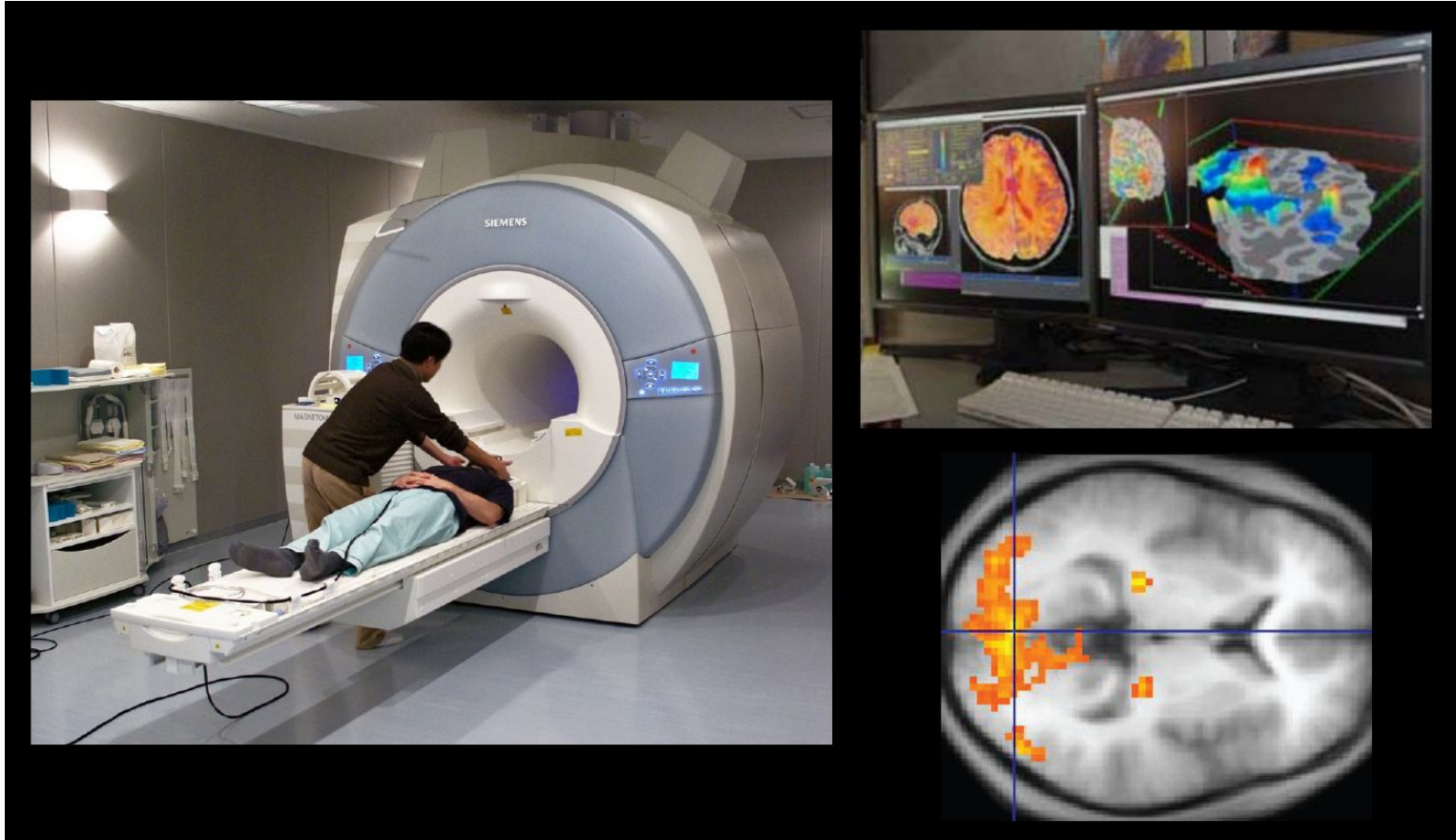


Alice!

P

Reading Mind

functional Magnetic Resonance Imaging (fMRI) machine



Task-based fMRI data

Subject

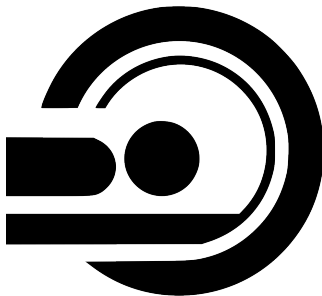


Subject

Task-based fMRI data

Subject

fMRI scan



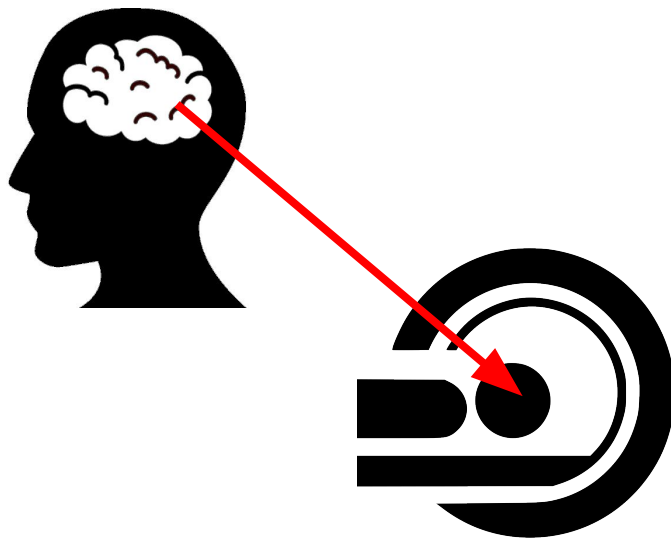
Subject

Task-based fMRI data

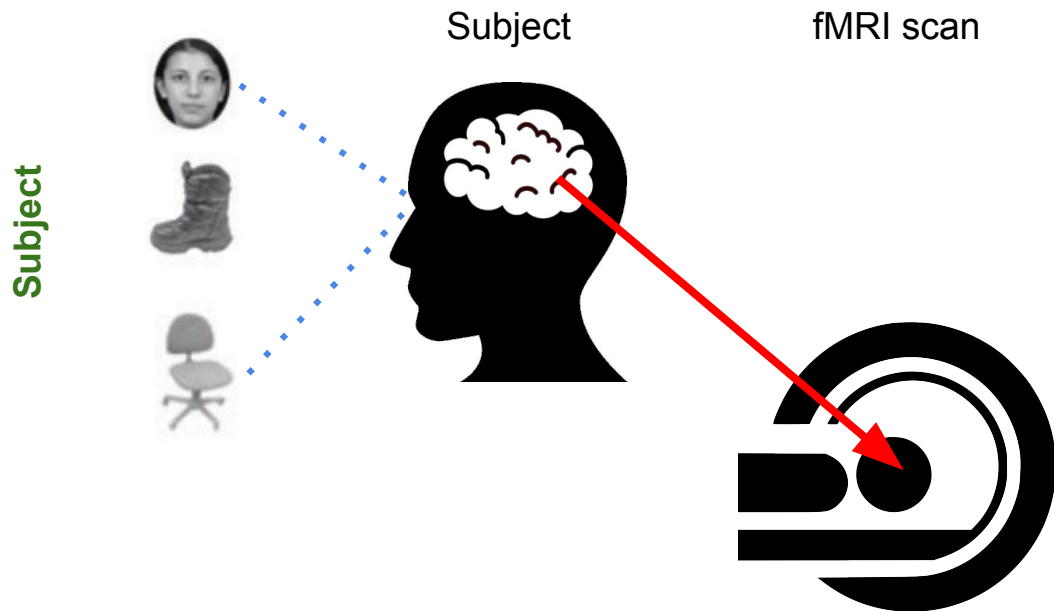
Subject

fMRI scan

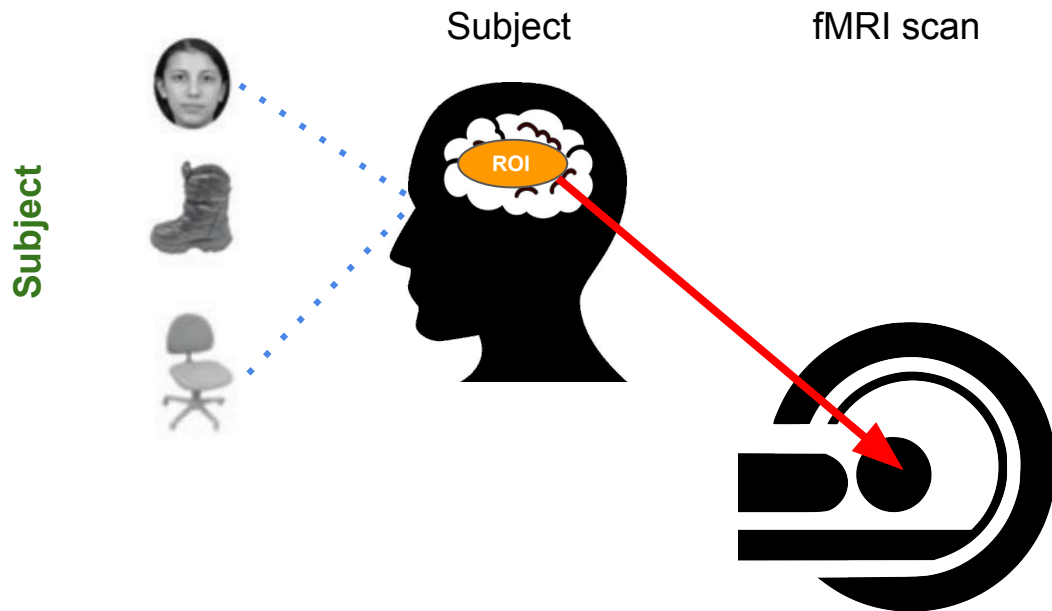
Subject



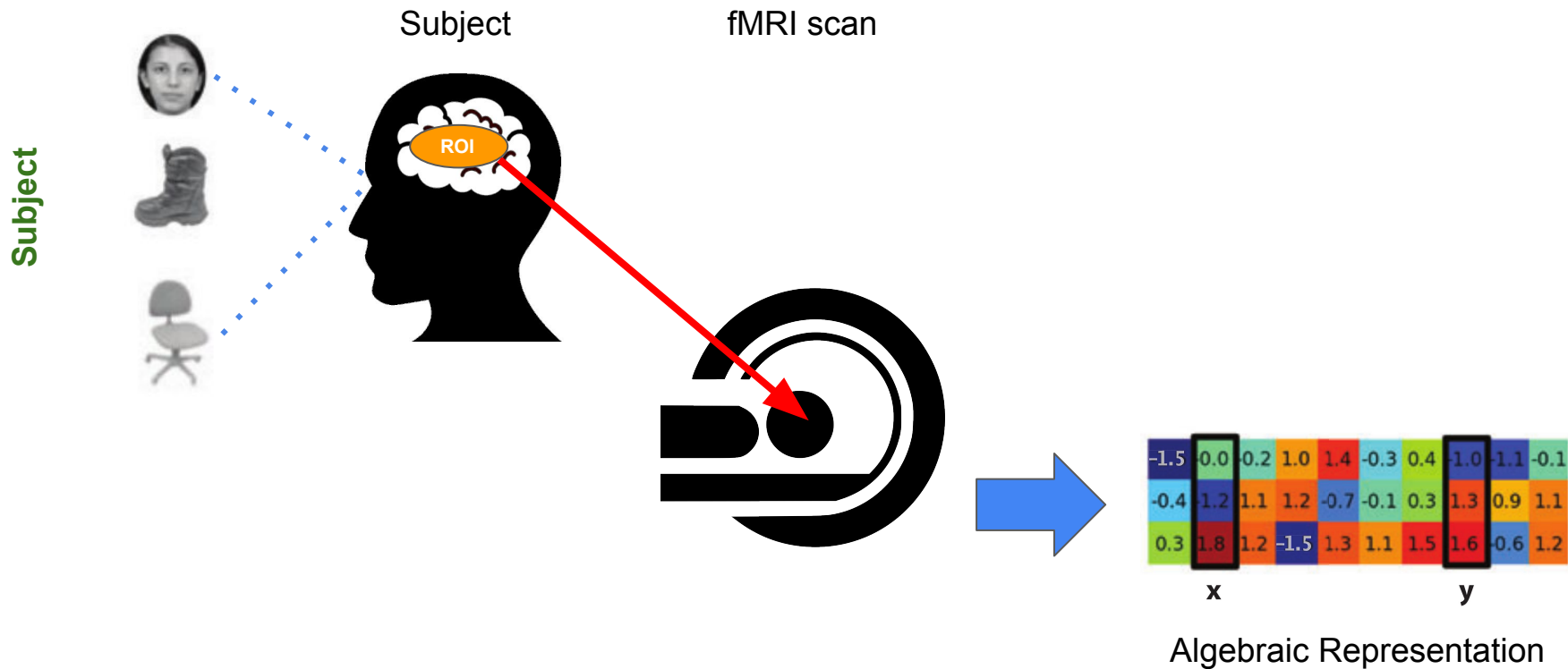
Task-based fMRI data



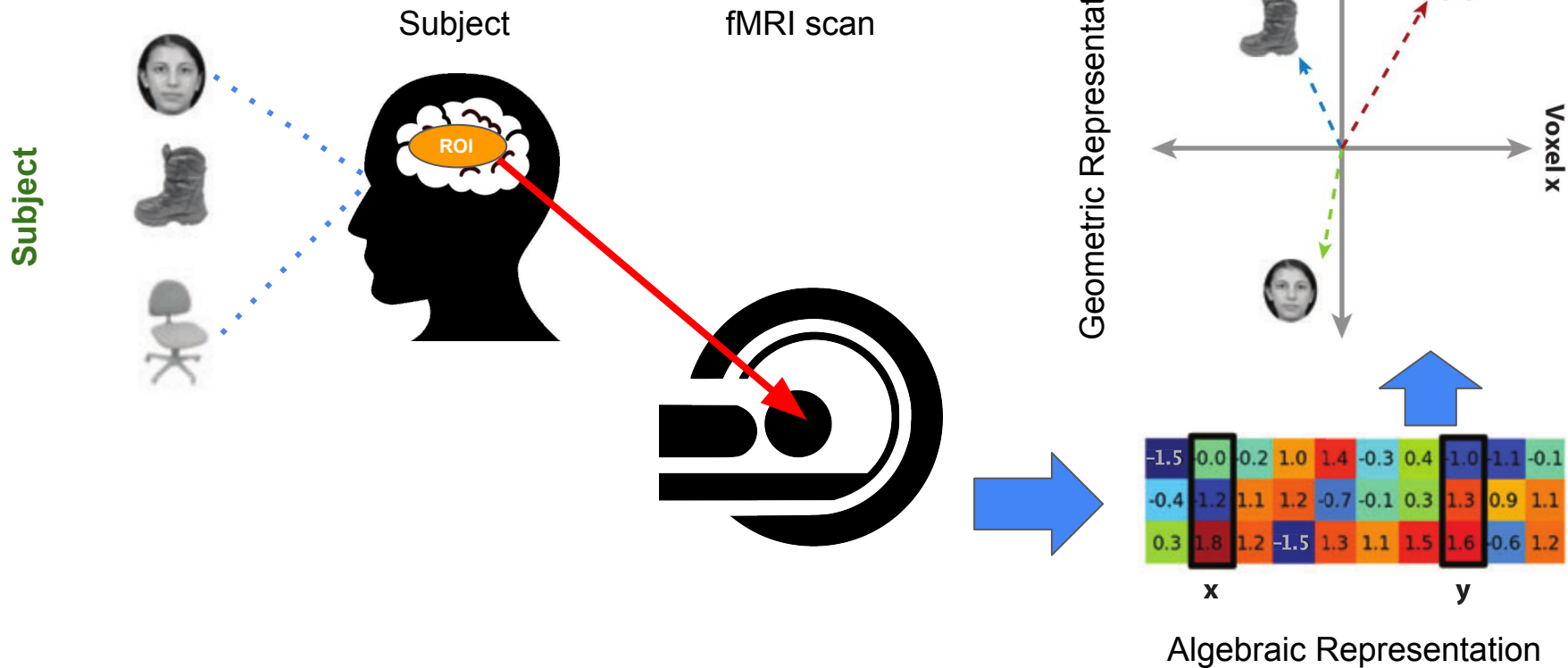
Task-based fMRI data



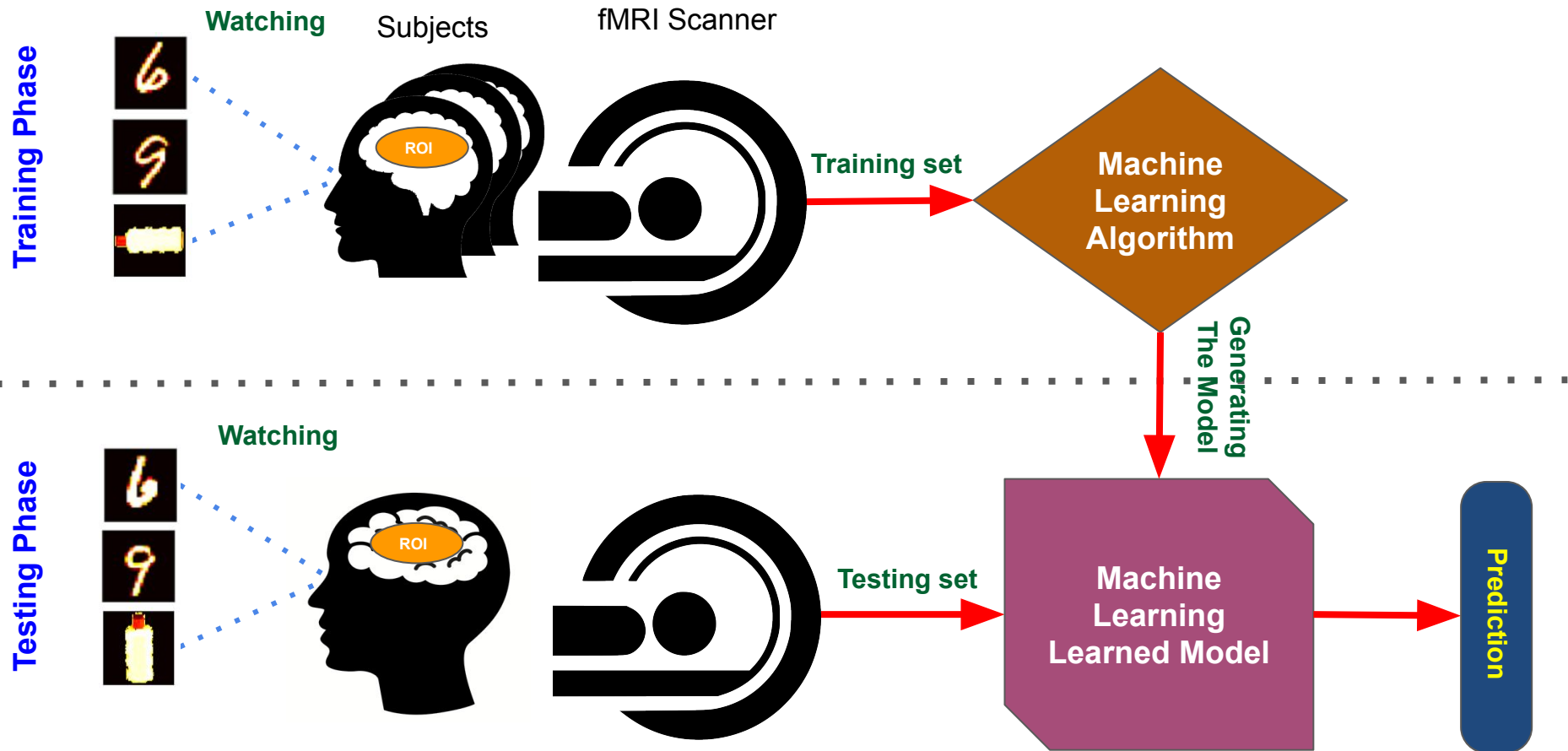
Task-based fMRI data



Task-based fMRI data



> Classification Analysis for fMRI data



> Classification Analysis for fMRI data

- Prediction can be categories of stimuli
 - *E.g.*, six, nine, or bottle
- It also can be the actual stimuli
 - *E.g.*,

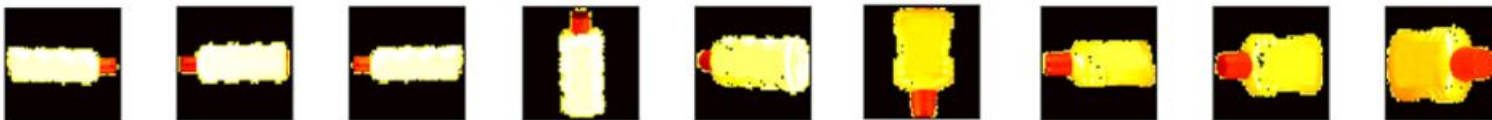


- Alternatively, it can be something related to the cognitive task:
 - *E.g.*, Anxiety versus Control, defined **in the term of subject**

Prediction

> Reconstructing image from human brain

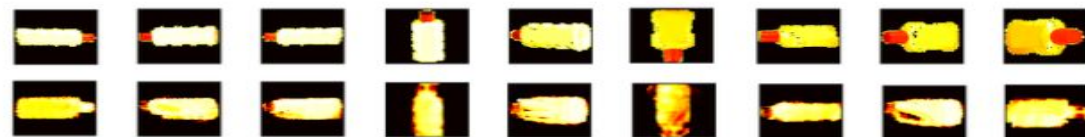
The image watched during scan:



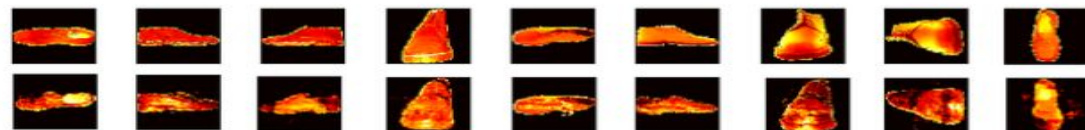
The image reconstructed from brain responses:



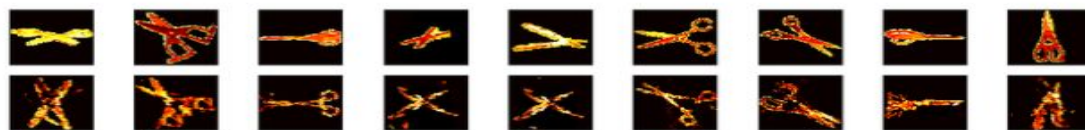
bottles



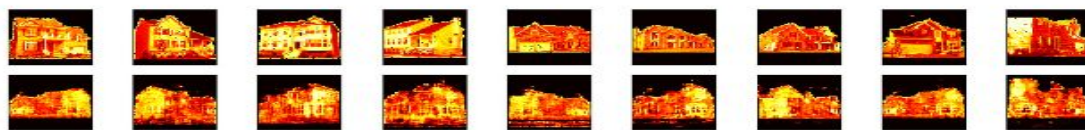
shoes



scissors



houses



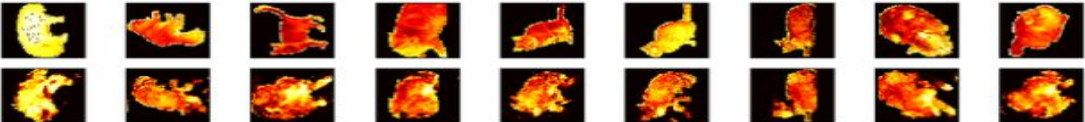
faces



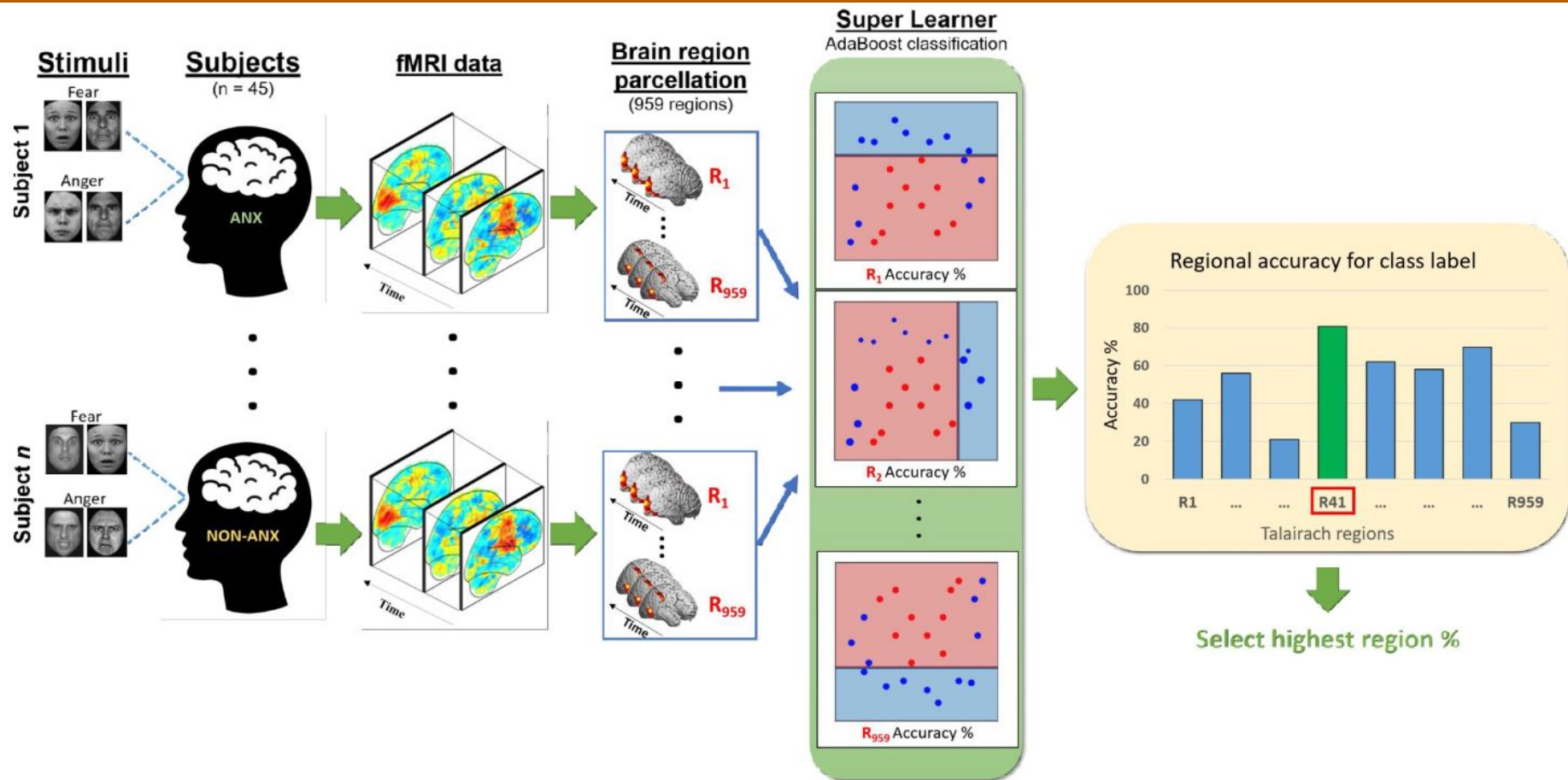
chairs



cats



> Predicting Pediatric Anxiety



PTSD Prediction

Our robotic representative, Eli, conducts interviews with soldiers who may be experiencing Post-traumatic Stress Disorder (PTSD).



Participant Text data

Start time (seconds)	End time (seconds)	Text	Subject	PCL-C Binary
45.3	48.6	"I'm doing well, how about yourself?"	1	PTSD
58.9	60.3	"I'm from California."	1	PTSD
...
...
329.6	331.1	"It was very hard"	274	NONE

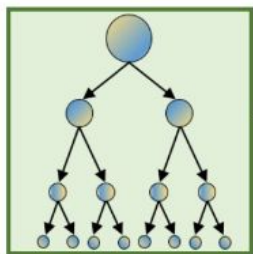
Sentiment Analyzer
(e.g., VADER)

Sentiment Scores

Text	Subject	Sentiment Score [-1, 1]	PCL-C Binary
"I'm doing well, how about yourself?"	1	0.75	PTSD
"I'm from California."	1	0.00	PTSD
...
...
"It was very hard"	274	-0.75	NONE

Bin Generator

Final Random Forest Model

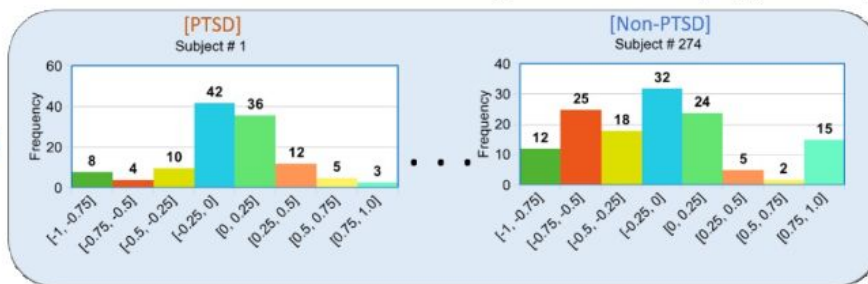


Sentiment Analyzer



of bins

Concatenate scores for each subject into bins (e.g., 8 bins)



Bin sizes = [3, 7, 8, 12, 15, 18, 21, 25, 29]

80.4%
prediction
accuracy

Income

Income

- Computer Engineering
 - Bachelor's degree
 - 50K - 120K (median: 80K)
- Computer Scientist
 - Master's degree or Ph.D.
 - 50K - 140K (median: 90K)
- Data Scientist
 - Ph.D.
 - Academic 90K - 190K (median: 100K)
 - Industry 110K - 250K (median: 150K)

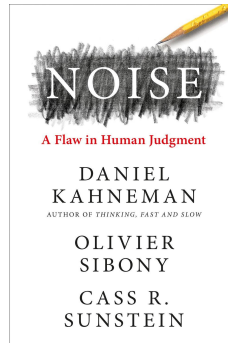
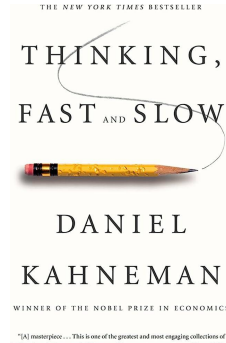
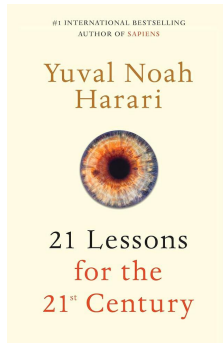
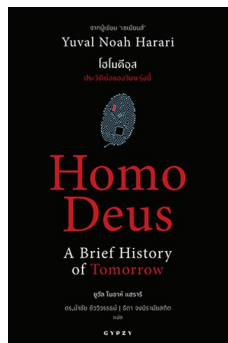
Conclusion

Personal Experiences

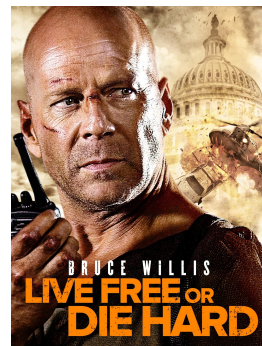
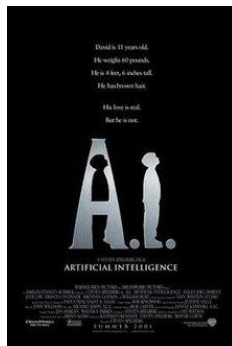
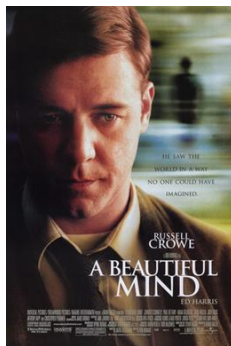
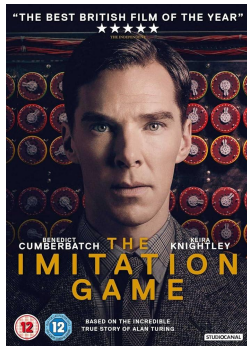
- Be patient
- Keep your focus
- Work hard >> Just be smart
- Be volunteer for challenging tasks
- Find friends and communities with the same interests

Suggestions

- Books



- Movies



My home office





Thank You

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Computer Scientist



Slides