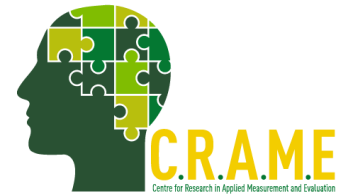




UNIVERSITY OF
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Integrating Technology into Educational Assessments

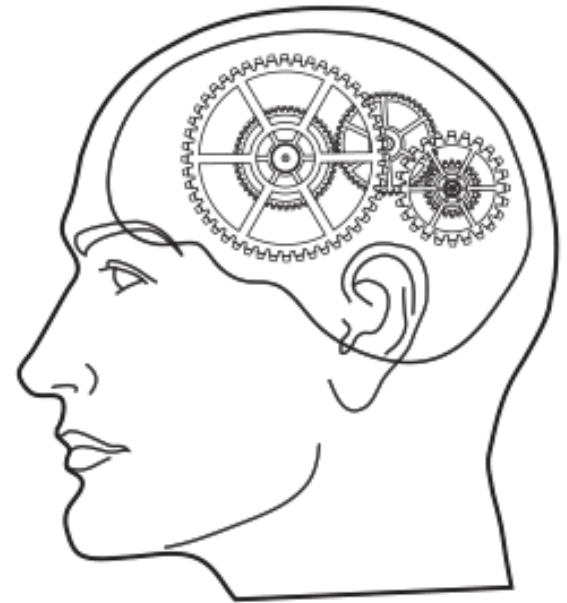
Okan Bulut

Centre for Research in Applied Measurement and Evaluation
University of Alberta

March 1, 2019

Early History of Testing/Assessment

- Francis Galton's measurement of individual differences (1884-1890)
- James Cattell – first mental test (1890)
- Spearman's book on general intelligence (1904)
- Thorndike's book on mental measurement (1904)
- Binet-Simon IQ test (1908, 1911)



Mental Age 3 Years:

1. Points to nose, eyes, mouth, etc.
2. Repeats "It rains"; "I am hungry"
3. Repeats 1 & 2
4. Sees in pictures objects:
 1. _____
 2. _____
 3. _____
 4. _____

Three or more pictures showing:-

1. Familiar objects.
2. Decided action.
3. Emotion.

Mental Age 4 Years:

1. Knows sex.
2. Recognizes key, knife, penny.
3. Repeats 1 & 4 & 8
4. Compares lines.

Key
Knife
Penny
Sets of lines.

Mental Age 5 Years:

1. Compares 3 & 59 -- 6 & 159.
2. Copies square.
3. Repeats "His name is John; he is a very good boy".
4. Counts 4 pennies.
5. "Patience"

4 Weights 3a, 6a, 12a, 18a.
Square.
4 Pennies.
Visiting card cut diagonally.

Mental Age 6 Years:

1. Morning or afternoon?
2. Defines:
 1. Fork. 4. Horse.
 2. Table 5. Mamma.
 3. Chair.
3. Puts key on chair; shuts door; brings box.
4. Shows right hand; left ear.
5. Chooses prettier:
 - 1 & 2 _____
 - 3 & 4 _____
 - 5 & 6 _____

Key
Box
6 pictures:
3 ugly or deformed.
3 not ugly or deformed.

Binet Scale of Human Intelligence

IQ Score	Original Name	Modern Term
Over 140	Genius or Near-Genius	
120 - 139	Very Superior	
110 - 119	Superior	
90 - 109	Average or Normal	
80 - 89	Dull	Dull Normal
70 - 79	Borderline Deficiency	Mild
50 - 69	Moron	Moderate
20 - 49	Imbecile	Severe
Below 20	Idiot	Profound

Multiple-Choice Testing (1925)

I have red, green and yellow papers in my hand. If I place red and green papers on the chair, which color do I still have in my hand?

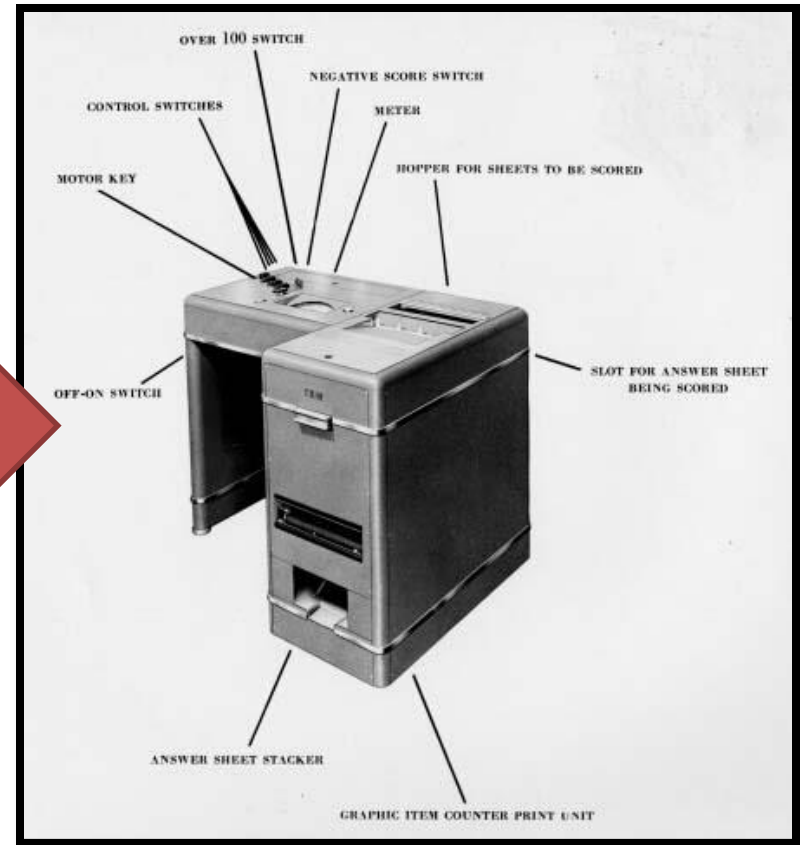
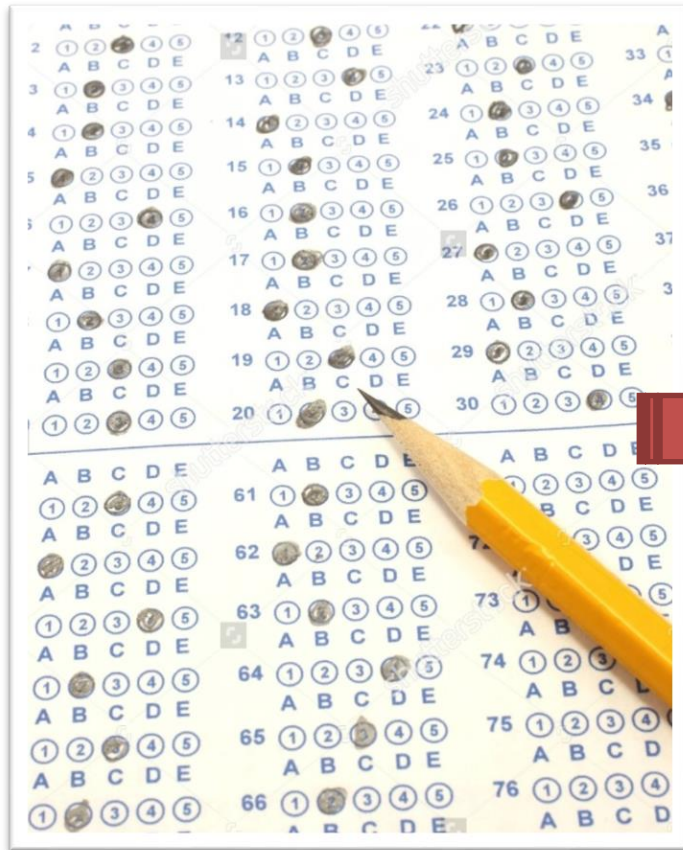
Red Green Yellow

Think of the thickness of the peelings off apples and oranges. Put a line around the name of the fruit having the thinner peeling.

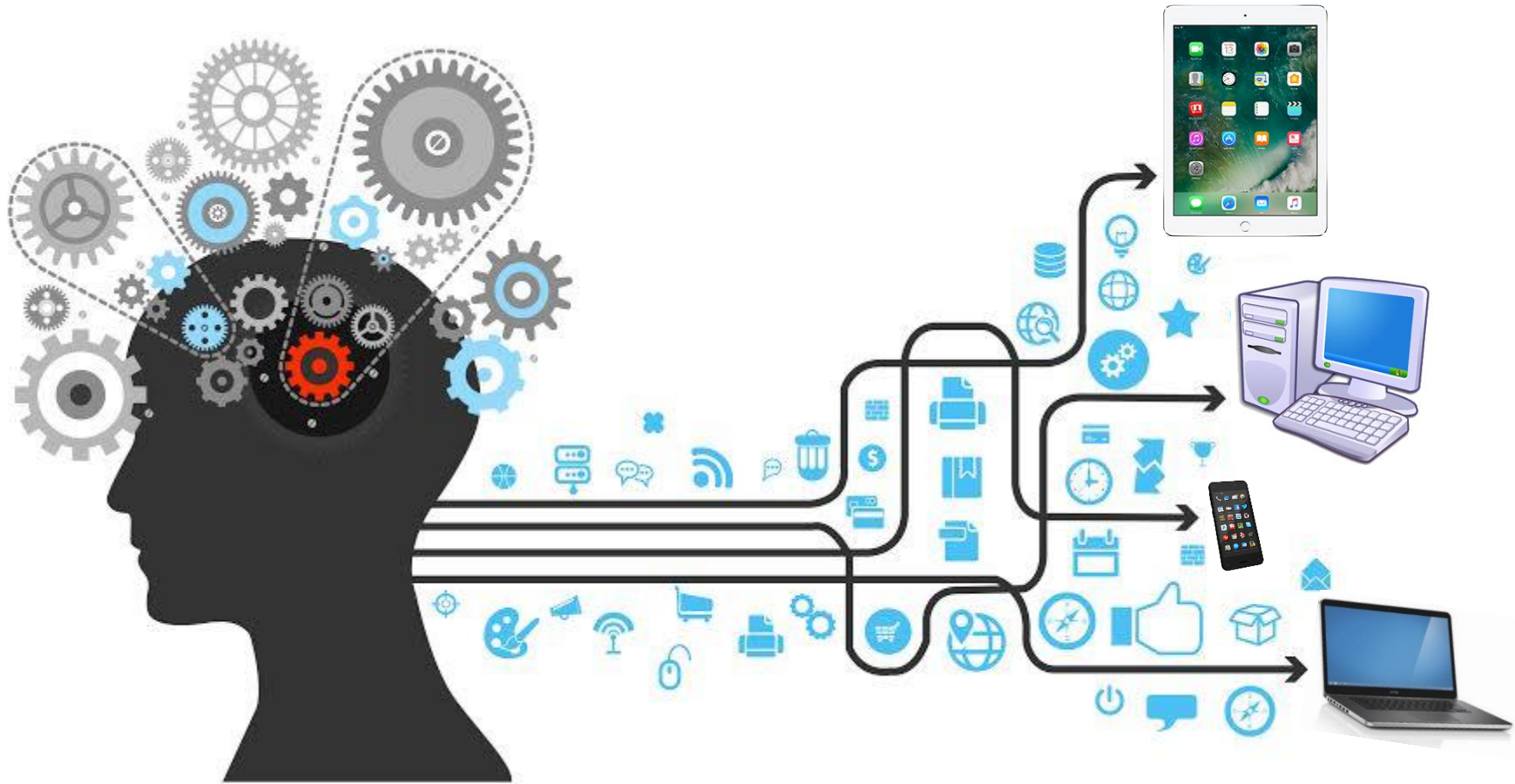
Apples Oranges

Source: Kelly, F. J. (1916). The Kansas silent reading tests. *Journal of Educational Psychology*, 7(2), 63-80.

IBM Test Scoring Machine (1934)

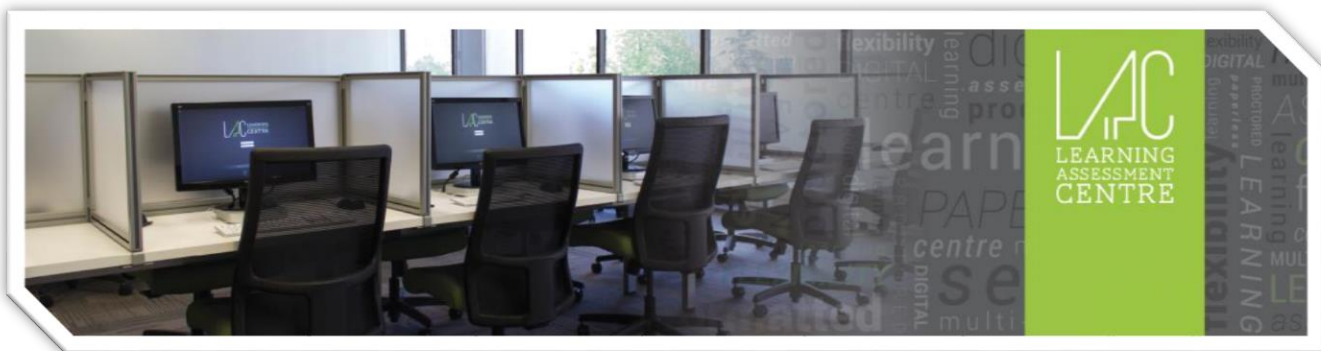


Today's Assessment Tools

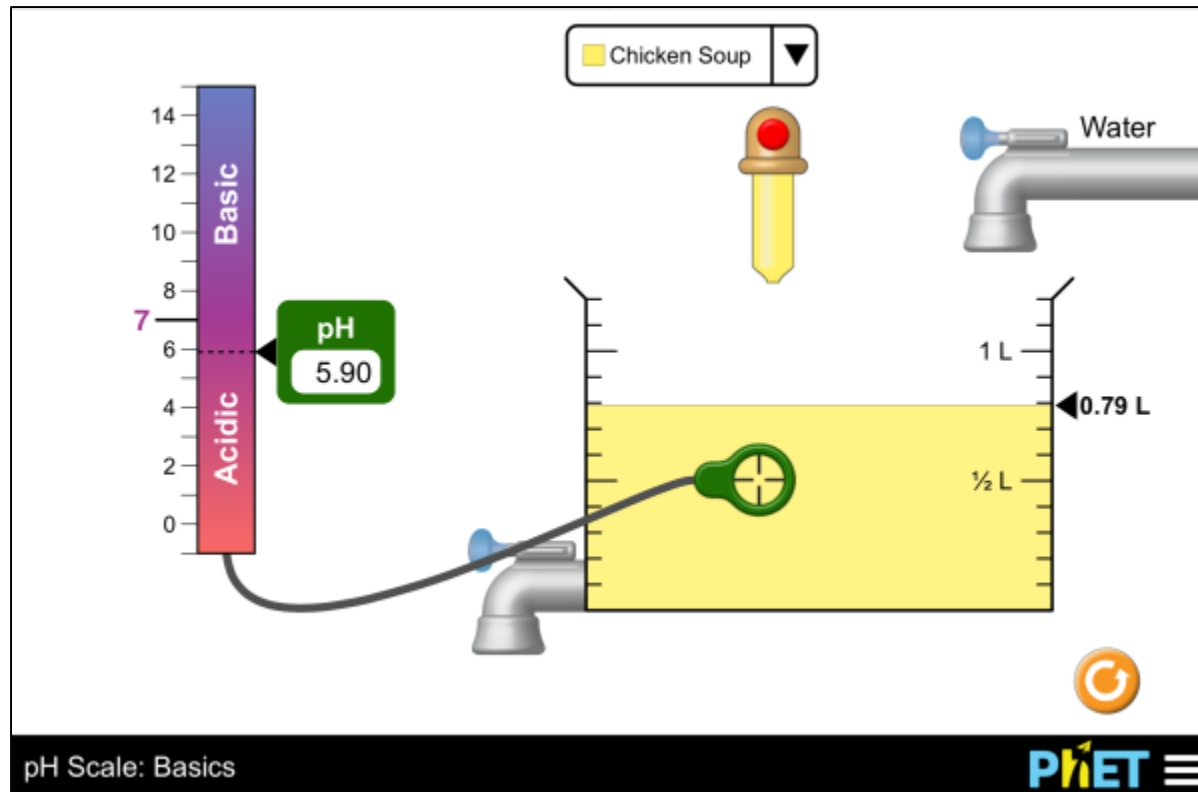


Computer-Based Testing

- ❑ Computer-based testing (CBT) delivers a fixed-length, non-adaptive test via a computer (or a similar tool, such as tablets).
- ❑ A good example of CBT is [Learning Assessment Centre](#).
 - ❑ 100+ workstations
 - ❑ Over 20,000 computer-based exams were administered to U of A students at LAC last year

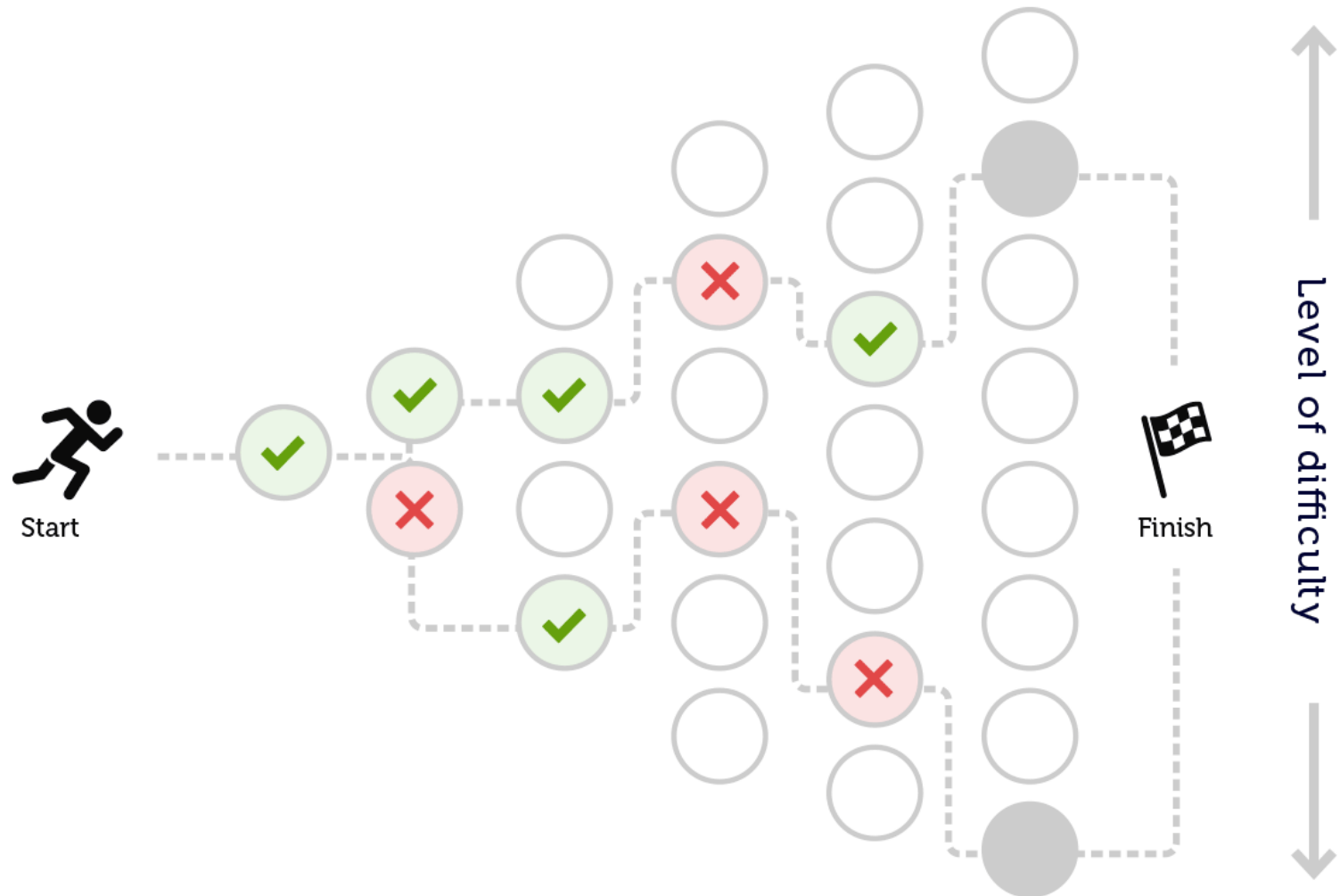


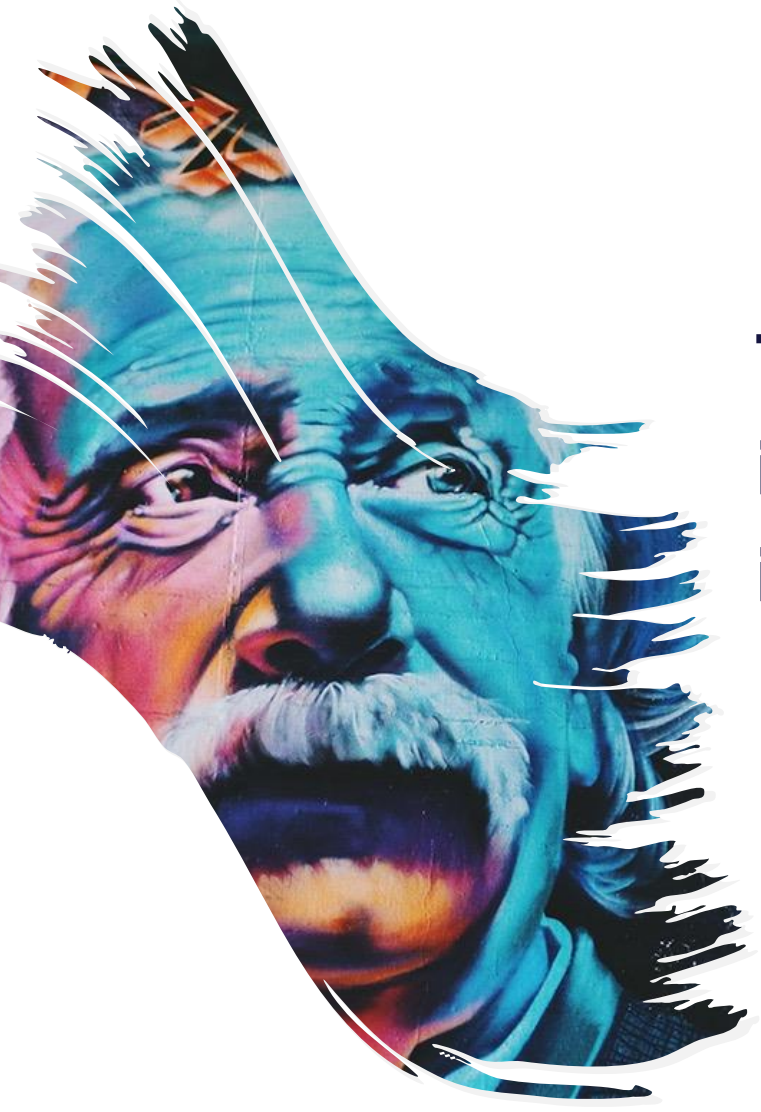
Computer-Based Testing



Source: <https://phet.colorado.edu/en/simulation/ph-scale-basics>

Computerized-Adaptive Testing



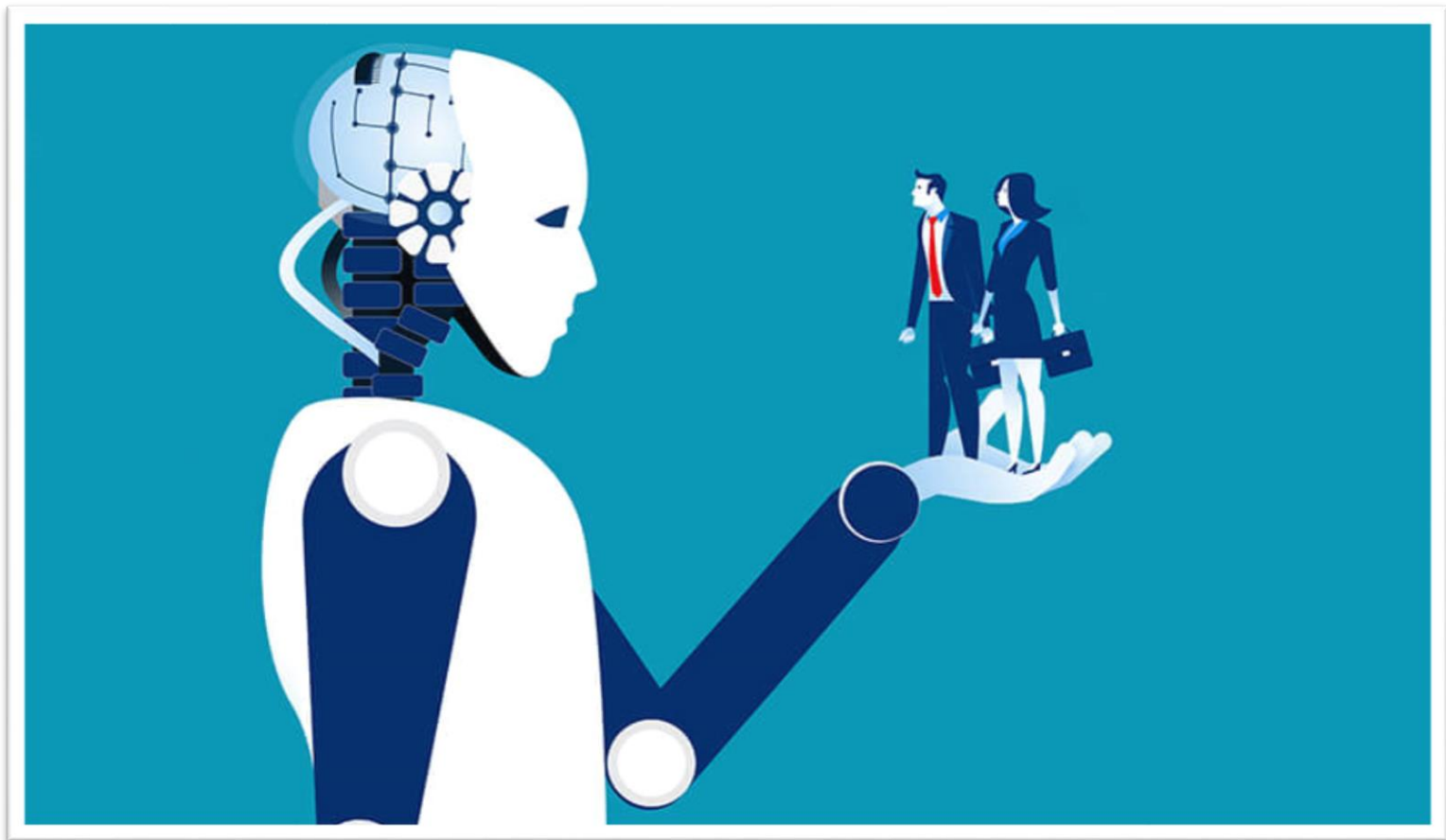


**The true sign of intelligence
is not knowledge but
imagination.**

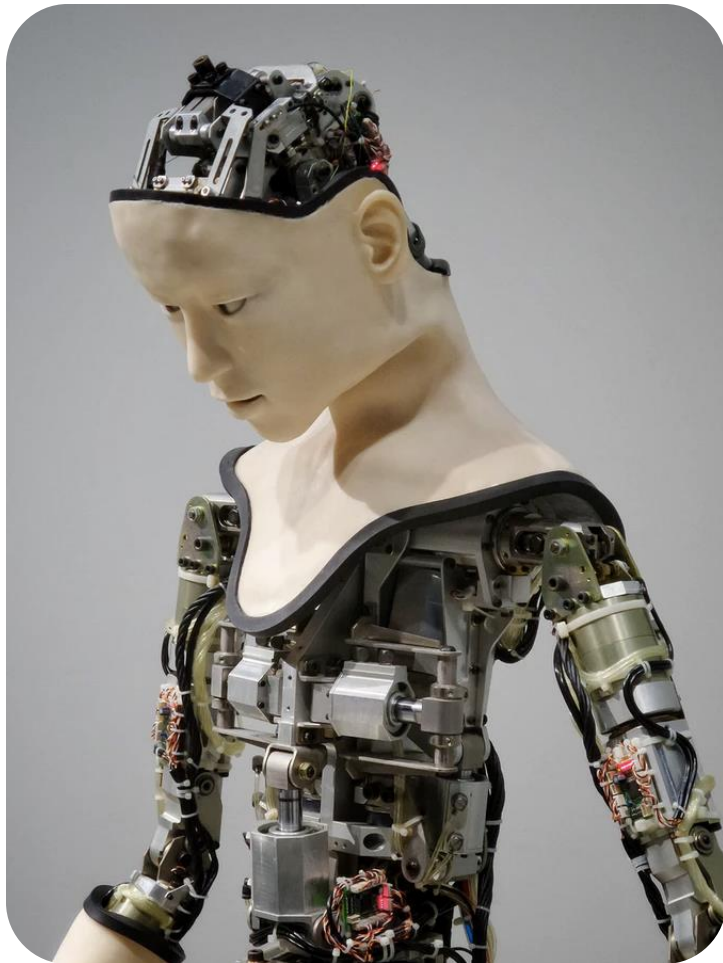
-- Albert Einstein

Artificial Intelligence (AI)

“Having a computer do something that we assume(d) only entities having human-like intelligence could do”



Artificial Intelligence & Language



<https://ai.google/>

<https://cloud.google.com/natural-language/>

“Language is the key to everything”, Kurzweil says.

“When you write an article you're not creating an interesting collection of words. The message in your article is information, and the computers are not picking up on that. So, we would like to actually have the computers read. We want them to read everything on the web and every page of every book, then be able to engage an intelligent dialogue with the user to be able to answer their questions.” -- Ray Kurzweil (Director of Engineering at Google)

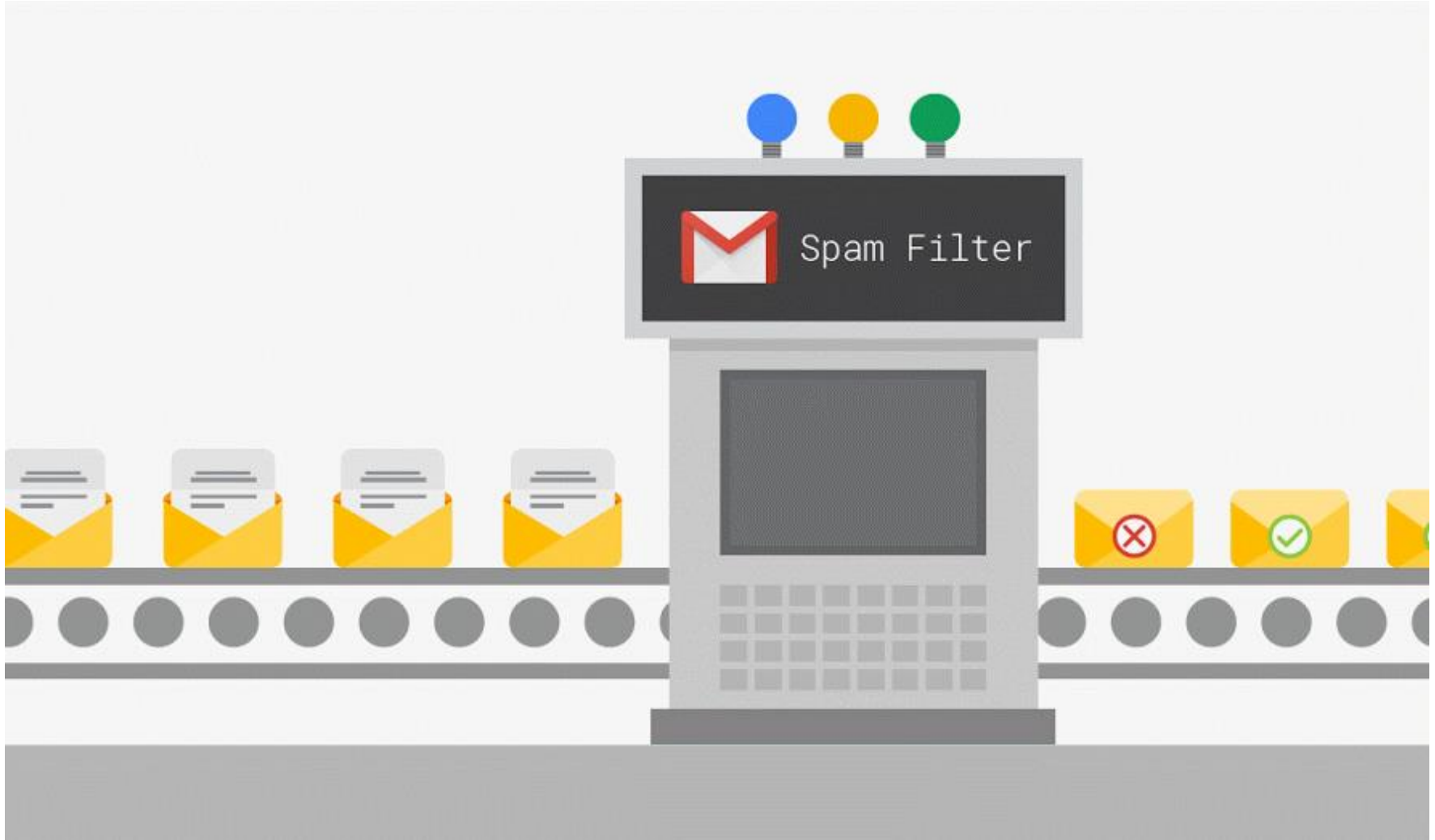
Source: [The Guardian](#)

Can Computers Understand Human Language?

What can I help you with?

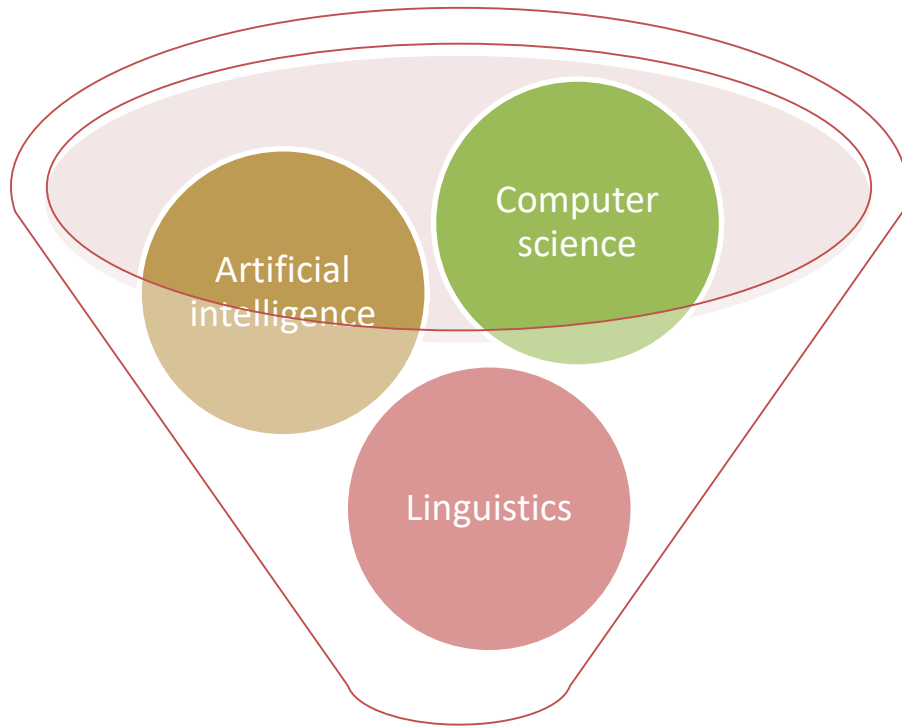


Can Computers Understand Human Language?

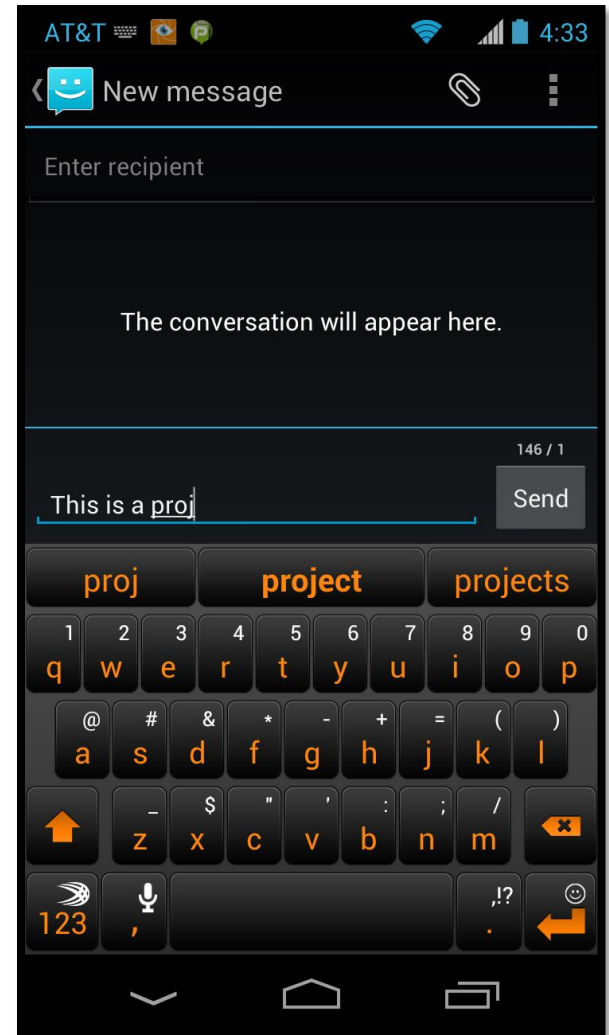
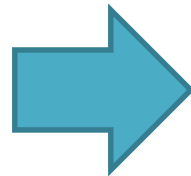


Source: <https://i.gifer.com/Ou1t.gif>

Natural Language Processing (NLP)



Understanding text and speaking



Natural Language Processing (NLP)

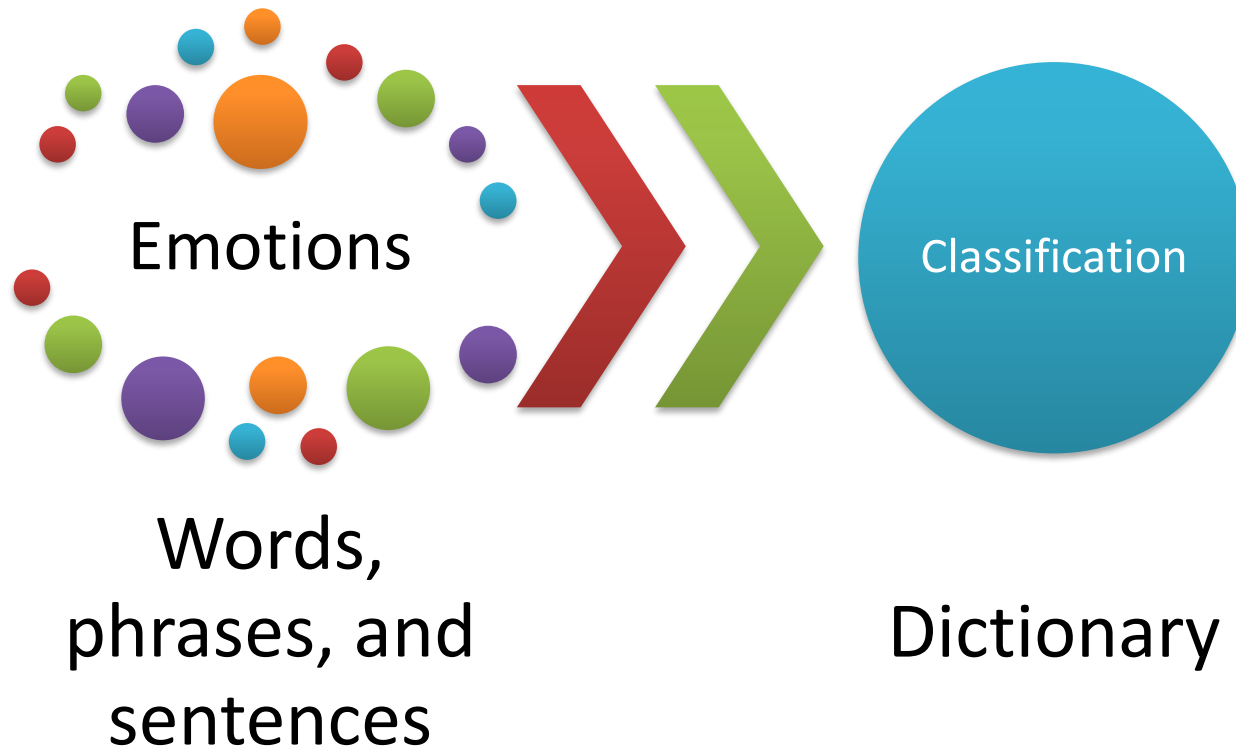
- ❑ Computers do **not** understand human language intuitively.

“LeBron James was on fire last night. He destroyed the Celtics in the first half.”



Natural Language Processing (NLP)

- ❑ Extracting sentiments from text



Natural Language Processing (NLP)

“When one door closes, another opens; but we often look so long and so regretfully upon the closed door that we do not see the one that has opened for us.”

– Alexander Graham Bell

<https://cloud.google.com/natural-language/>



Google Cloud

Natural Language Processing (NLP)

Document & Sentence Level Sentiment

Entire Document

When one door closes, another opens; but we often look so long and so regretfully upon the closed door that we do not see the one that has opened for us

Score

Magnitude

-0.7

0.7

-0.7

0.7

Score Range

-1.0 — -0.25

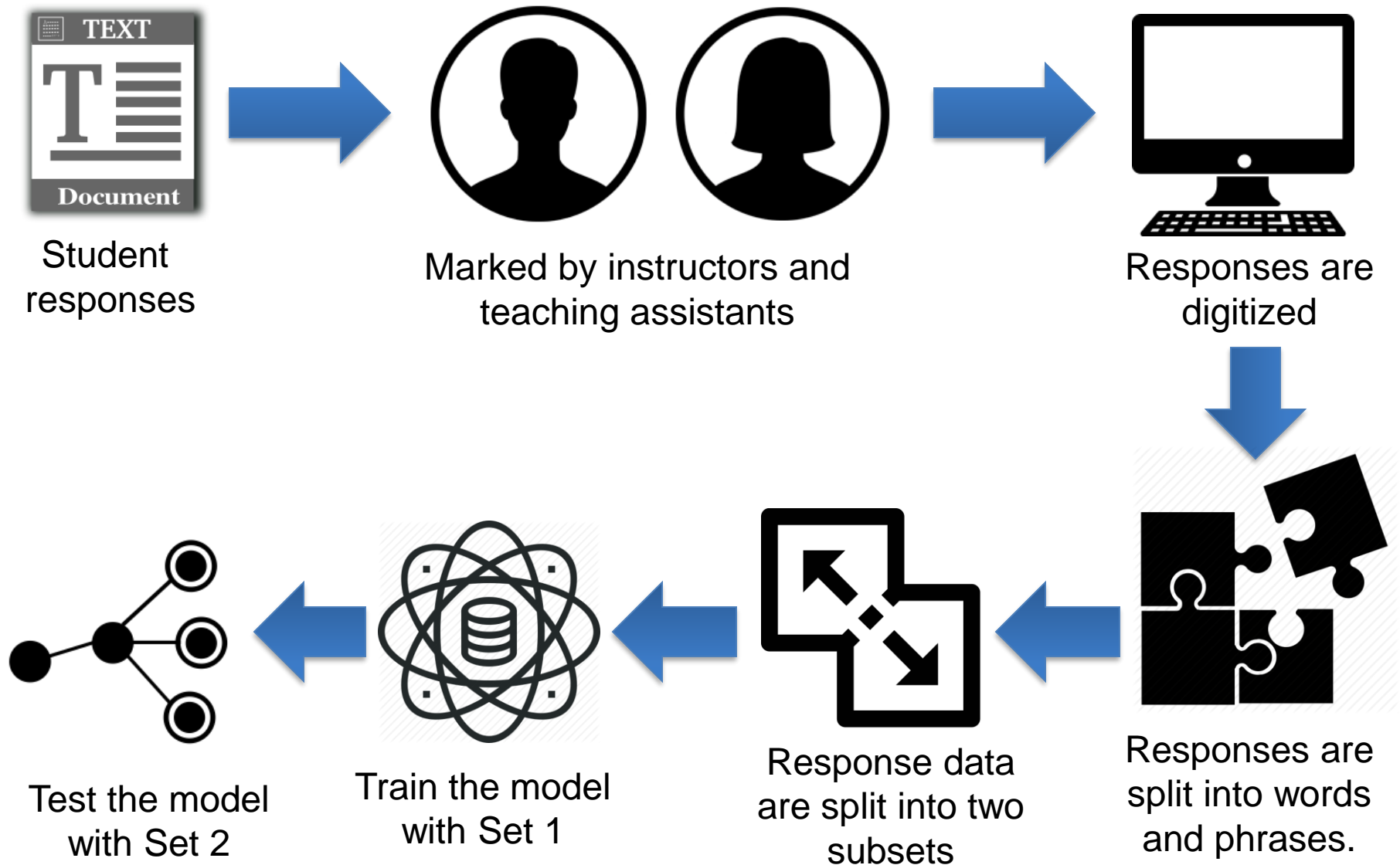
-0.25 — 0.25

0.25 — 1.0



Google Cloud

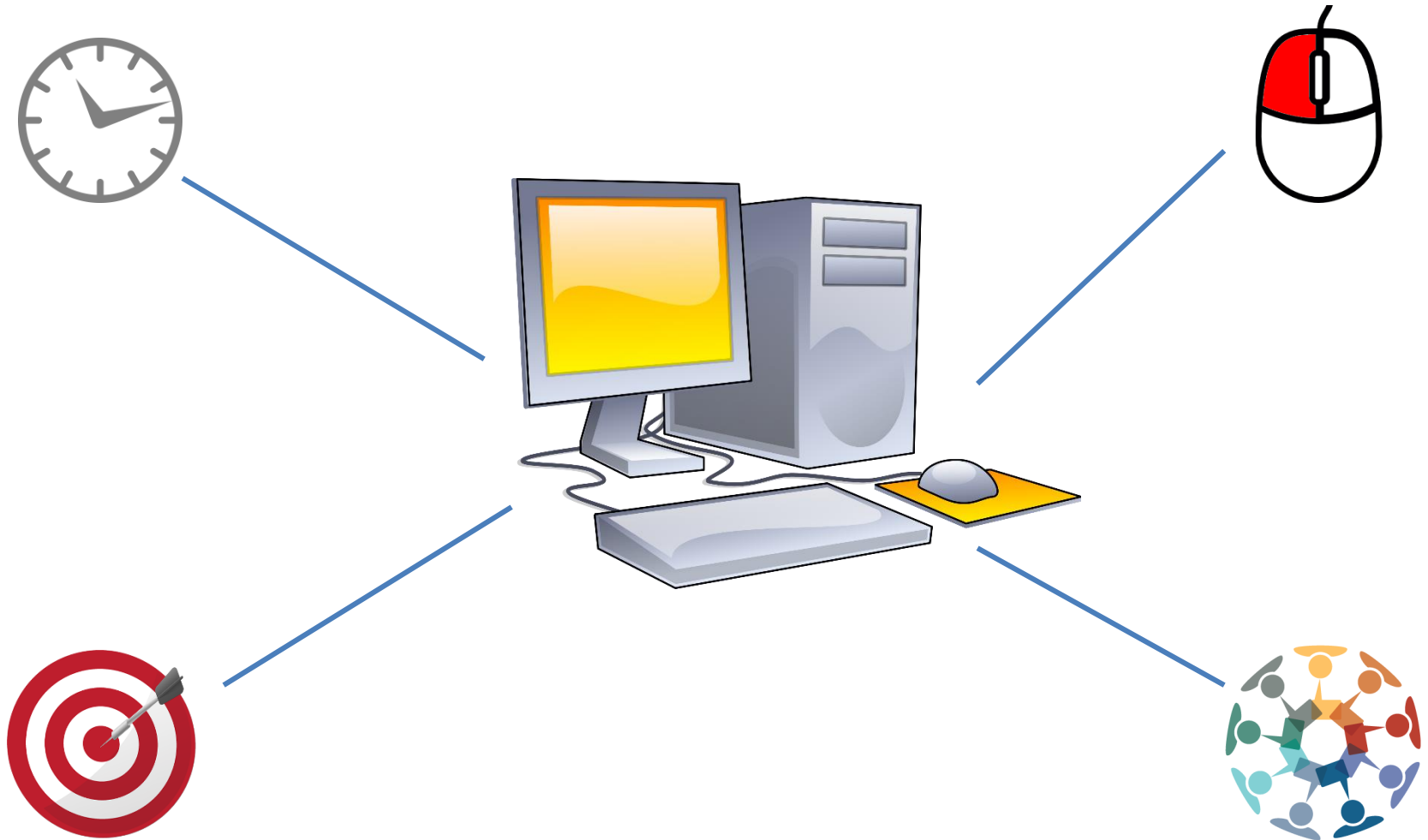
Automated (Essay) Scoring with NLP



Log Files

05:52:19	Info	AboutLog	170	0	"Changing App Context: {0: 1} -> {0: 4097}"
05:52:19	Info	Status	163	0	"INSTALL SPACE REQUIRED: {0: 10169266} KB; SPACE AVAILABLE: {1: 123510776} KB; LOC: {2: C:\}"
05:52:19	Info	Step	25	55502	"User advanced from '{0: Connecting}' page to '{1: Summary}' page."
05:52:19	Info	Selection	38	55612	"The following lines show the default selections for the Summary page when it first appeared."
05:52:19	Info	Selection	99	0	"This is a new installation of 2016 SP1.0."
05:52:19	Info	Selection	102	0	"[Download Options: {Operation:=Install only (do not download) (Enabled: 1)}, {Background downloader:=Do not use (Enabled: 1)}] (Enabled: 1)"
05:52:19	Info	Selection	103	0	"[Installation Location: {Installation location:=C:\Program Files\SOLIDWORKS Corp (Enabled: 1)}, {Install from:=G:\SOLIDWORKS DOWNLOADS (Enabled: 1)}] (Enabled: 1)"
05:52:19	Info	Selection	104	0	"[Toolbox/Hole Wizard Options: {Toolbox installation location:=C:\SOLIDWORKS Data (Enabled: 1)}, {Toolbox installation method:=New Tool (Enabled: 1)}] (Enabled: 1)"
05:52:19	Info	Selection	105	0	"Estimate Installation Size" page."
05:52:23	Info	Step	25	55502	"User a
05:53:24	Info	Selection	37	55611	"The us
05:53:24	Info	Selection	36	55610	"The us
05:53:24	Info	Selection	36	55610	"The us
05:53:24	Info	Selection	36	55610	"The us
05:53:24	Info	Selection	36	55610	"The us
05:53:24	Info	Selection	36	55610	"The us
05:53:24	Info	Status	163	0	"INSTAL
05:53:25	Info	Status	163	0	"INSTAL
05:53:25	Info	Step	25	55502	"User a
05:53:27	Info	Step	25	55502	"User a
05:53:33	Info	Selection	37	55611	"The us
05:53:33	Info	Step	25	55502	"User a
05:53:37	Info	Step	25	55502	"User a
05:53:48	Warning	Message	9	55200	"Dialog
05:53:48	Info	Status	163	0	"INSTAL
05:53:48	Info	Step	23	55500	"Page 'I
05:53:50	Info	Selection	37	55611	"The us
05:53:50	Info	Status	163	0	"INSTAL
05:53:50	Info	Status	163	0	"INSTAL
05:53:50	Info	Step	25	55502	"User a
05:53:56	Info	Step	25	55502	"User a
05:54:37	Info	Step	23	55500	"Page 'I
05:54:43	Info	Selection	37	55611	"The us
05:54:44	Info	Status	163	0	"INSTAL
05:54:44	Info	Step	25	55502	"User a
05:54:58	Info	Selection	37	55611	"The us
05:54:58	Info	Selection	39	55613	"The fol
05:54:58	Info	Selection	99	0	"This is
05:54:58	Info	Selection	102	0	"[Download Options: {Operation:=Install only (do not download) (Enabled: 1)}, {Background downloader:=Do not use (Enabled: 1)}] (Enabled: 1)"
05:54:58	Info	Selection	103	0	"[Installation Location: {Installation location:=C:\Program Files\SOLIDWORKS 2016 (Enabled: 1)}, {Install from:=G:\SOLIDWORKS DOWNLOADS (Enabled: 1)}] (Enabled: 1)"
05:54:58	Info	Selection	104	0	"[Toolbox/Hole Wizard Options: {Toolbox installation location:=C:\Program Files\SOLIDWORKS 2016\SOLIDWORKS 2016 DATA (Enabled: 1)}] (Enabled: 1)"
05:54:58	Info	Selection	105	0	"Estimated installation size: 9.0 GB"
05:54:58	Info	Selection	43	55617	"The source folder that will be used is: {0: G:\SOLIDWORKS DOWNLOADS\SOLIDWORKS 2016 x64 SP01}"
05:54:58	Info	Selection	44	55617	"The Installation Manager Source Folder that will be used is: {0: G:\SOLIDWORKS DOWNLOADS\SOLIDWORKS 2016 x64 SP01\slidm}"
05:54:59	Info	Step	25	55502	"User advanced from '{0: Summary}' page to '{1: Install Progress}' page."
05:54:59	Info	Selection	107	0	"Writing serial numbers to the registry..."

Log Files



Future of Assessment

- ❑ Personalized learning (more online courses, one-to-one online tutoring)
- ❑ More personalized guidance (course selection, career planning, etc.)
- ❑ More advanced human-computer interaction (simulations, virtual reality applications)



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Thank You!

bulut@ualberta.ca