



TWC

Tetherless World Constellation, RPI

Artificial Intelligence in the age of Deep Learning, Watson, and the Semantic Web

Jim Hendler

Tetherless World Professor of Computer, Web and Cognitive Sciences

Director, Institute for Data Exploration and Applications

Director, RPI-IBM AI research collaboration

Rensselaer Polytechnic Institute

<http://www.cs.rpi.edu/~hendler>

Major talks at: <http://www.slideshare.net/jahendler>

Artificial Intelligence An Existential Threat!!!!!!!

(we're all going to die!)

Artificial Intelligence: Our Best Hope for the Future!!!!

(if we don't do this, we're all going to
die!!)

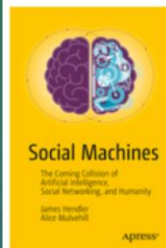


Talk derives in part from a recent book

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Social Machines

The Coming Collision of Artificial Intelligence, Social Networking, and Humanity

Authors: **Hendler, James, Mulvehill, Alice**



Late 20th Century AI criticism

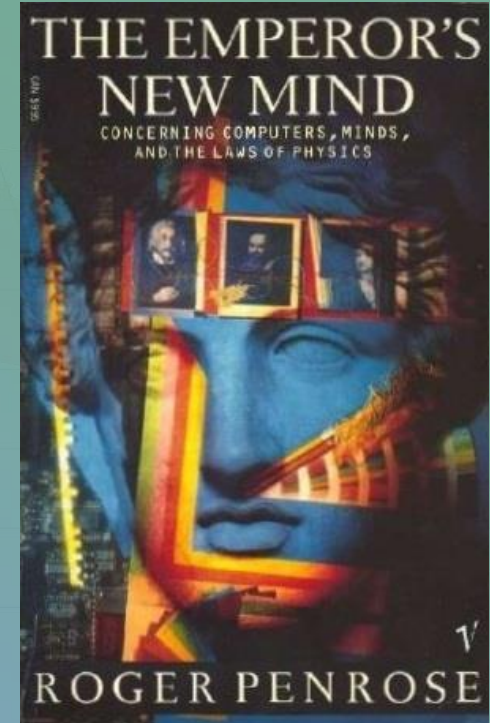
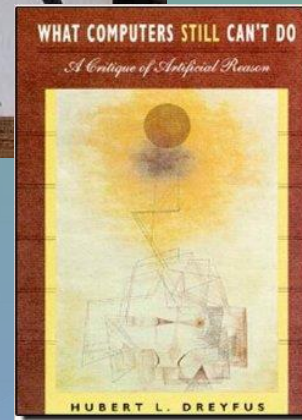
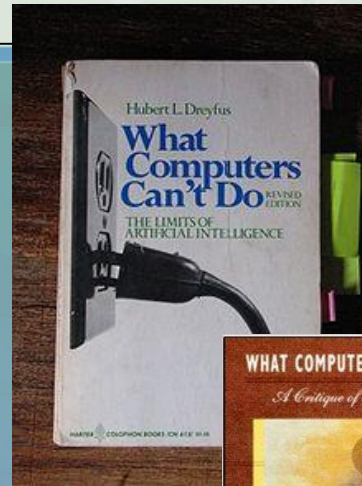
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"I will argue that in the literal sense the programmed computer understands what the car and the adding machine understand, namely, exactly nothing."

John Searle

Share & Enjoy More @ [QuotesDump.com](https://www.QuotesDump.com)



A discussion/response to Stephen Hawking



BBC: Stephen Hawking warns artificial intelligence could end mankind (Dec 2, 2014)

“He told the BBC: The development of full artificial intelligence could spell the end of the human race.”

"It would take off on its own, and re-design itself at an ever increasing rate," he said. "Humans, who are limited by slow biological evolution



Backing up - why are we here NOW?

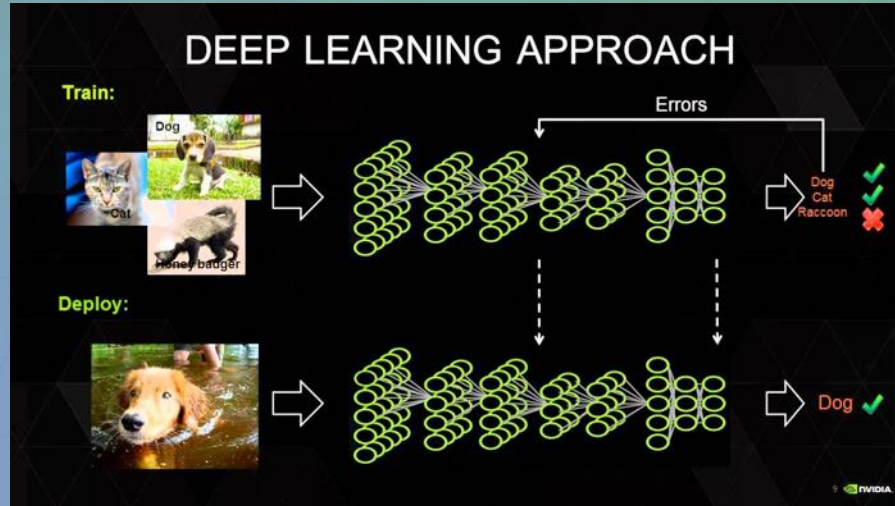
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- Several important AI technologies have moved through “knees in the curve” bringing much of the attention to AI again
 - Deep Learning (eg AlphaGo, vision processing)
 - Associative learning (eg Watson)
 - Semantic Web/Knowledge Graphs (Natural Language)



A) Deep Learning

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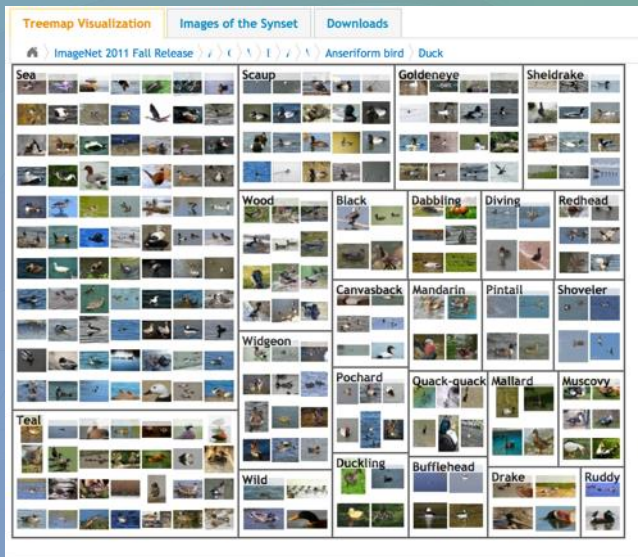


“phase transition” in capabilities of neural networks w/machine power

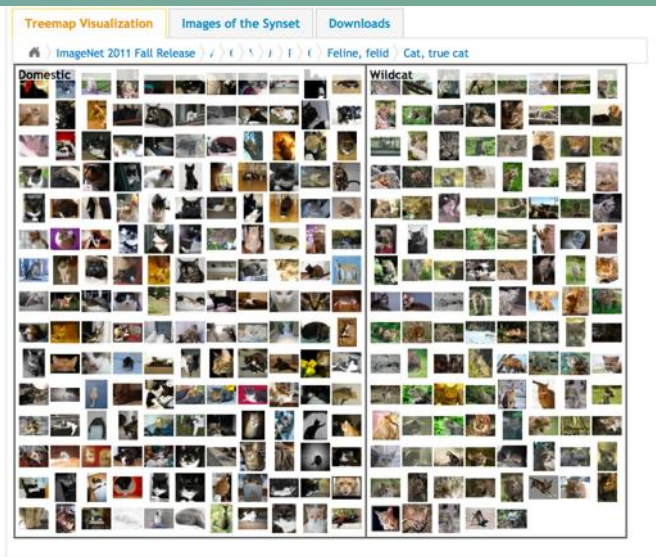


Trained on lots of categorized images

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Imagenet: Duck



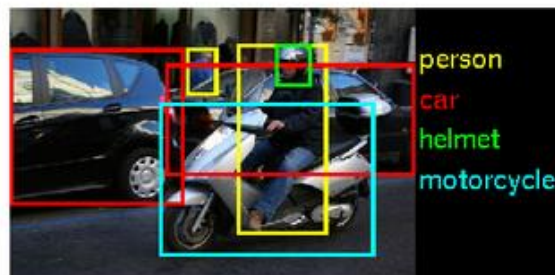
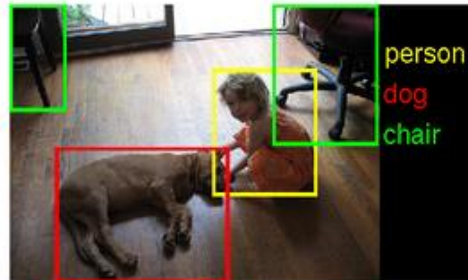
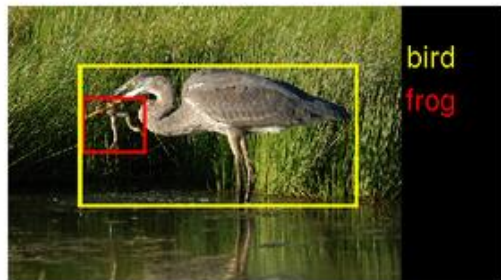
Imagenet: Cat



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Impressive results

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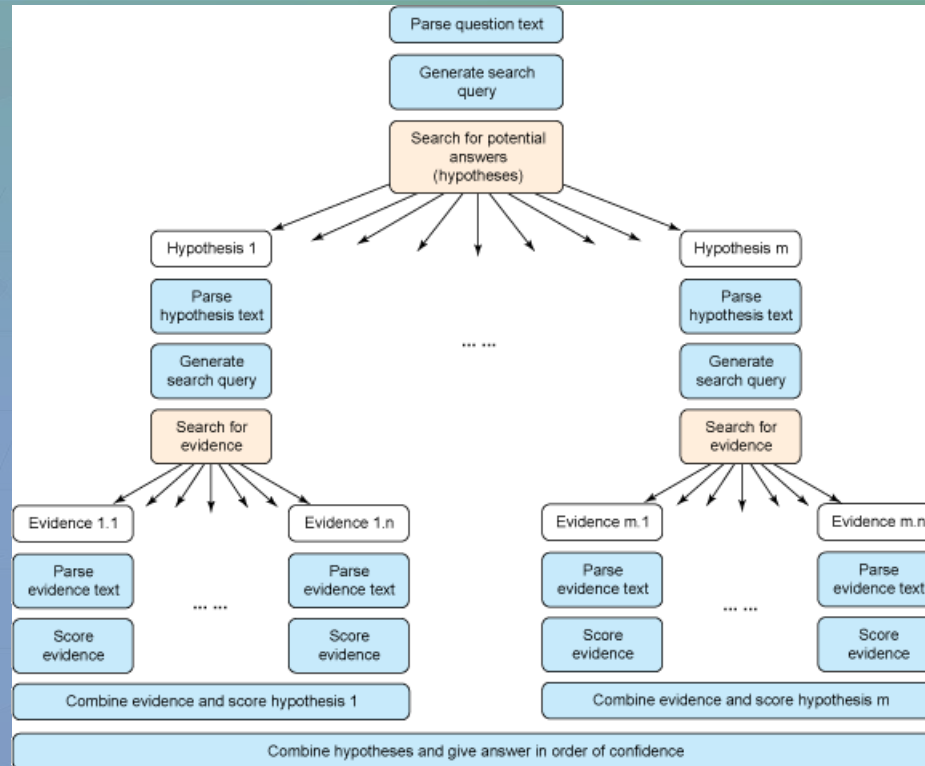


Increasingly powerful techniques have yielded incredible results in the past few years



B) Associative knowledge (text mining/QA)

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Impressive Results

Tetherless World Constellation, RPI



Watson showed the power of “associative knowledge”



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C) Semantic Web

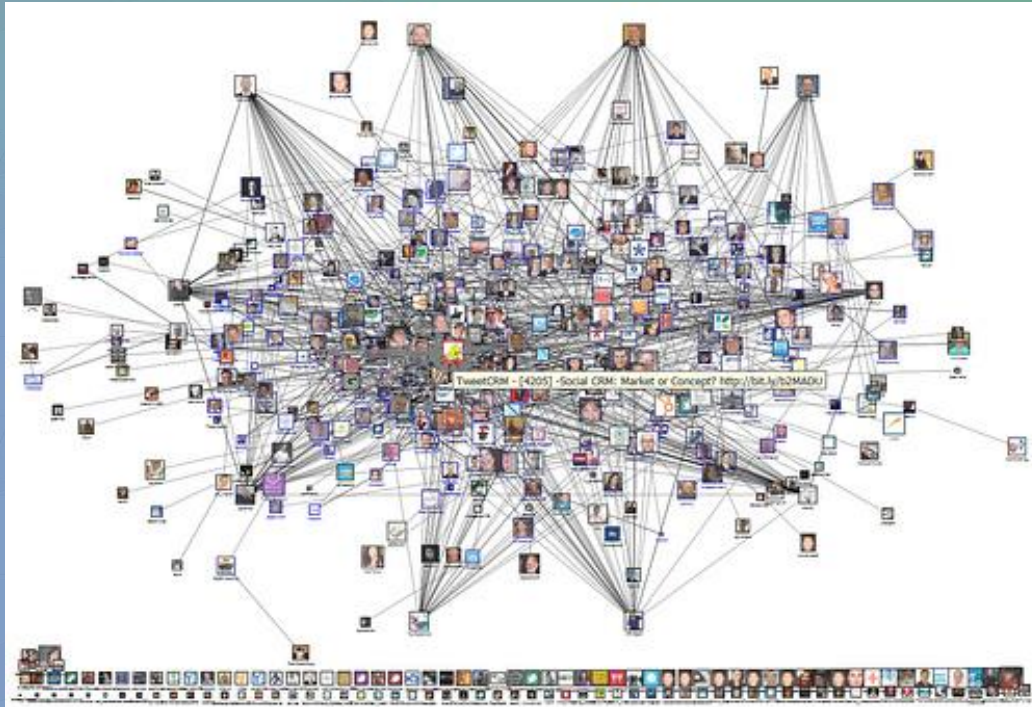
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“Knowledge graphs” mined from extracted and learned data

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Impressive Results

Tetherless World Constellation, RPI

How tall is tom cruise?

45,900,000 Results Any time

Tom Cruise - Height
5' 7"
(1.70 m)

	Katie Holmes 5' 9" (1.75 m)		Brad Pitt 5' 11" (1.80 m)
	Emily Blunt 5' 7" (1.71 m)		Leonardo DiCaprio 6' 0" (1.83 m)

People also ask

- How tall is Tom Brady?
- How much does Tom Cruise weigh?
- How tall is Tom Holland?
- How tall is Tom Hanks?

Tom Cruise Real Height - How tall? - CelebHeights
<https://www.celebheights.com/s/Tom-Cruise-3.html>
Tom has everywhere claimed that he is 5'10" tall. Both Justin bieber and tom cruise have same height. James said on 13/Nov/17 tom cruise is 5'10" without shoes as claimed by him.

7 Photos Of Tom Cruise Pretending To Be Taller Than His Co ...
<https://www.buzzfeed.com/gggggn/7-photos-of-tom-cruise-...>
7 Photos Of Tom Cruise Pretending To Be Taller Than His Co-Stars Tom Cruise is only 5' 7". However,

Tom Cruise
Actor

Thomas "Tom" Cruise is an American actor and producer. He has been nominated for three Academy Awards and has won three Golden Globe Awards. He started his career at age 19 in the film Endless Love.

Wikipedia IMDb Twitter Facebook Tumblr

Born: Jul 03, 1962 (age 55) - Syracuse, NY
Net worth: \$570 million USD (2017)
Children: Connor Cruise (Son) - Suri Cruise (Daughter) - Isabella Jane Cruise (Daughter)
Parents: Thomas Mapother III (Father) - Mary Lee Pfeiffer (Mother)
Spouse: Katie Holmes (m. 2006 - 2012) - Nicole Kidman (m. 1990 - 2001) - Mimi Rogers (m. 1987 - 1990)
Partner: Penélope Cruz (2001 - 2004)

Movies

Edge of Tomorrow 2014	Oblivion 2013	Mission: Impossible - Rogue Nation 2015	Jack Reacher 2012	Top Gun 1986

Google finds embedded metadata on >30% of its crawl – Guha, 2015



Not just Google...

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Baidu tom cruise 百度一下

网页 图片 贴吧 视频 知道 新闻 文库 音乐 地图 更多»


百度为您找到相关结果约6,650,000个

您可以查看: **英文结果**

TOM CRUISE 百度百科

 职业: 演员、制片人
生日: 1962年7月3日
个人信息: 173cm/巨蟹座/O
代表作品: 《壮志凌云》《雨人》《生于七月四日》《夜访...
简介: 汤姆·克鲁斯 (Tom Cruise), 1962年7月3日出生于美...
[早年经历](#) [演艺经历](#) [个人生活](#) [主要作品](#) [获奖记录](#) [更多>>](#)
<https://baike.baidu.com/>

Tom Cruise 百度翻译

Tom Cruise  

[词类] [人名] 汤姆克鲁斯;
[例句] S: I also heard that **Tom Cruise** and Katie Holmes made an appearance at the Oscars. 
我还听说汤姆克鲁斯和凯蒂霍尔姆斯在奥斯卡颁奖典礼露面了。
[进行更多翻译](#)

fanyi.baidu.com =


汤姆·克鲁斯 Tom Cruise - 汤姆·克鲁斯 (豆瓣) 豆瓣电影

 汤姆·克鲁斯简介、图片写真、获奖情况及电影作品一览... 官方网站:
<http://www.tomcruise.com/> 分享到 ...
<https://movie.douban.com/celeb/> - 百度快照

美国艺人 展开

 苏尔·史丹 汤姆克鲁斯的 鬼马公主	 布拉德·皮特 威尼斯电影 节的男主角	 约翰尼·德普 卓尔不群的 好莱坞演员	 马特·达蒙 被评为全球 最佳性感男人
 汤姆·克鲁斯 美国知名男 演员导演	 汤姆·克鲁斯 鱼而走红	 基努·里维斯 靠《矩阵》电 影翻身	 阿尔·帕西诺 美国电影巨 星

英国演员 展开

 丹尼尔·克雷格 哈利波特的中 继任主演	 汤姆·克鲁斯 全球英语电 影最佳男主角	 本·斯蒂勒 奥斯卡上的最 佳喜剧男演员	 休·格兰特 英国影视剧 舞台剧演员
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tom cruise

1,350,000 Results Any time

Comprehensive coverage on Tom Cruise

33 Unforgettable Tom Cruise Moments That Changed Hollywood Forever
There are few working actors today as iconic as Tom Cruise. From his crane movie starts to *Tropic Thunder*...

Tom Cruise
American Actor
Thomas Cruise Mapother IV best known by his stage name Tom Cruise, is an American actor and producer. He started his career at age 19 in the film *Endless Love*, before making his breakthrough in the comedy *Risky Business* and receiving widespread attention for starring in the action drama *Top Gun* as a Lieutenant Peter "Maverick" Mitchell. After starring...

Official Tom Cruise Website
www.tomcruise.com
The Official Tom Cruise Website. Featuring Tom Cruise's biography, links to social media accounts, and information about his latest film.

Tom Cruise - IMDb
<http://www.imdb.com/name/nm0000129/>
Tom Cruise, Actor: *Top Gun*. In 1976, if you had told fourteen-year-old Franciscan seminary student Thomas Cruise Mapother IV that one day he'd not only become the world's most famous actor, one of the top 100 movie stars of all time, he would have probably grinned and said you'd that ambition was to get the president.

Tom Cruise - Wikipedia
https://en.wikipedia.org/wiki/Tom_Cruise
Thomas Cruise Mapother IV is an American actor and producer. He started his career at age 19 in the film *Endless Love*, before making his breakthrough in the comedy *Risky Business* and receiving widespread attention for starring in the action drama *Top Gun* as a Lieutenant Peter "Maverick" Mitchell. After starring in *The Color of Money* and *Top Gun*, Cruise starred opposite Demi Moore in the Academy Award for Best Picture-winning drama *Rain Man*. For his role as anti-war activist Rick Kincaid... See more on en.wikipedia.org/. Text under CC-BY-SA license.

Twitter Tweet Button
platform.twitter.com/widgets/tweet_button.html#t=Tom_Cruise...
Twitter Tweet Button - Tweet

Videos of tom cruise
img.youtube.com/vi/...

People also search for
Brad Pitt, Emily Blunt, Jennifer Lopez, Kelly McGillis, Jeffrey Dean Morgan, etc.

Semantic Search

Google's knowledge graph has been big news this year, but Baidu claims to have been integrating its own version - "box computing" - since 2009. It works in the same way as the Knowledge Graph, displaying relevant data and information directly on the SERPS above the main results.



Summary: AI has done some way cool stuff

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- Deep Learning: neural learning from data with high quality,
- Watson: Associative learning from data with high quality
- Semantic Web/Knowledge Graph: Graph links formation from extraction, clustering and learning

but, there are still problems...



Combining these technologies

Tetherless World Constellation, RPI

Question: what is the person holding

Predictions::

- **phone** (score: 9.84 = 2.73 [image] + 7.11 [word])
- **scissors** (score: 8.96 = 3.01 [image] + 5.94 [word])
- **bat** (score: 8.82 = 1.08 [image] + 7.73 [word])

Based on image only: texting (3.82), yes (3.29), bar (3.09),

Based on word only: wii remote (9.21), tennis racket (8.98), ski poles (8.67),





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still a long way to go

Tetherless World Constellation, RPI

Question: what is the person holding

Predictions::

- **ski poles** (score: 8.37 = -0.30 [image] + 8.67 [word])
- **surfboard** (score: 8.35 = 0.22 [image] + 8.13 [word])
- **bat** (score: 7.84 = 0.10 [image] + 7.73 [word])

Based on image only: helicopter (4.88), plane (4.58), pilot (4.40),

Based on word only: wii remote (9.21), tennis racket (8.98), ski poles (8.67),





still a long way to go

Tetherless World Constellation, RPI

Knowledge graphs...

- ... are not perfect
- Or: the importance of human editors

Michelangelo

Artist



Michelangelo di Lodovico Buonarroti Simoni, commonly known as Michelangelo, was an Italian sculptor, painter, architect, poet, and engineer of the High Renaissance who exerted an unparalleled influence on the... [wikipedia.org](https://en.wikipedia.org/wiki/Michelangelo)

Born: March 6, 1475, [Caprese Michelangelo](#)

Died: February 18, 1564, [Rome](#)

Parents: [Ludovico di Leonardo di Buonarrotto Simoni](#), [Francesca di Neri del Miniato di Siena](#)

Feedback

YAHOO!



Michelangelo
Leonardo
Raphael
Donnatello

Association \neq Correctness



TWCG

KR: Human Expression

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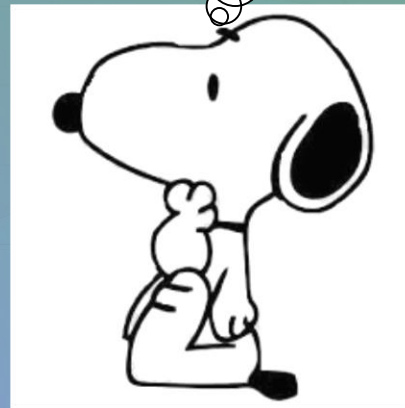
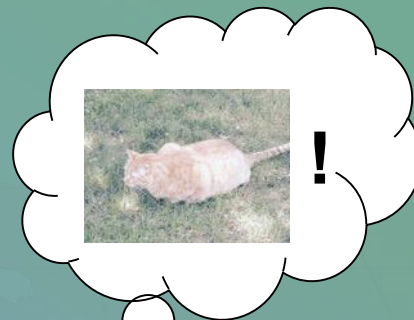


Cute kid story: first two words



Telling cats from ducks doesn't need KR

Tetherless World Constellation, RPI





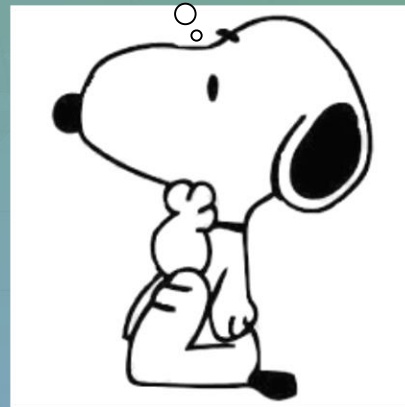
“Saying things about the world” does

Tetherless World Constellation, RPI

How would you explain the difference between a duck and a cat to a child?



"If I was telling it to a kid, I'd probably say something like 'the cat has fur and four legs and goes *meow*, the duck is a bird and it swims and goes *quack*'. "





Let's look at a relatively simple scene

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What is the relationship between this man and this woman?



But with background included

Tetherless World Constellation, RPI



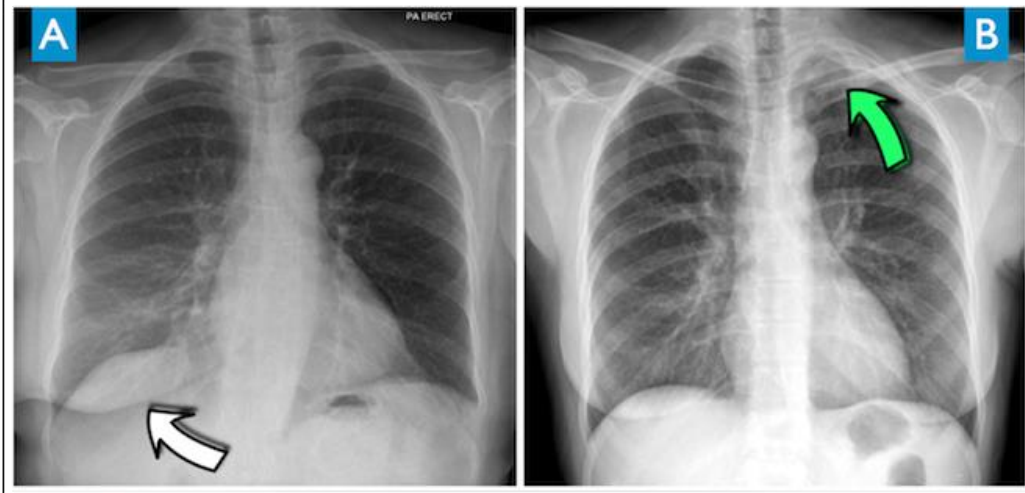
What is the relationship between this man and this woman?

Seeing the bride adds significant information that cannot be easily learned w/o background knowledge or extensive new training

But – how do we train for exceptions...



Which woman has lung cancer?



Woman A has a breast shadow on her right (white arrow) but does not have one on the left because she has had a mastectomy for breast cancer. Such asymmetric density can cause an inexperienced film reader to mistakenly diagnose a lung abnormality.

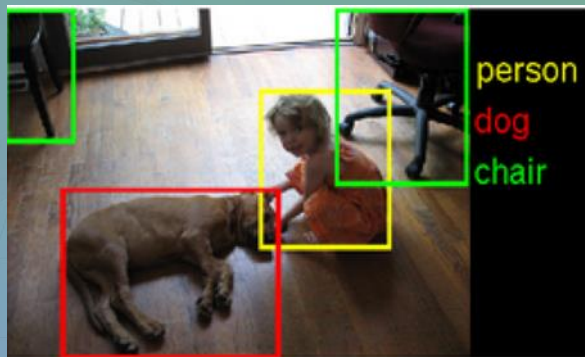
Woman B has a lung cancer hiding in the apical region often termed a **Pancoast tumor** (green arrow). These can be very difficult for the untrained eye to spot and this area is an important "check area" for radiologists when interpreting chest x-rays.



TW
C

KR: Surrogate knowledge?

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Which could you sit in?

What is most likely to bite what?

Which one is most likely to become a computer scientist someday?

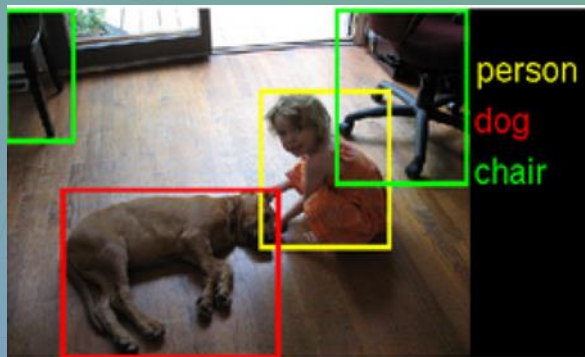
...



TW C

“Surrogate” knowledge

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Which could you sit in?

What is most likely to bite what?

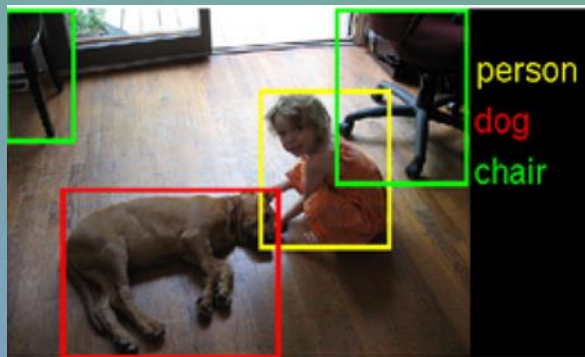
Which one is most likely to become a computer scientist someday?

How would they go about doing it?



KR: Recommended vs. Possible inference

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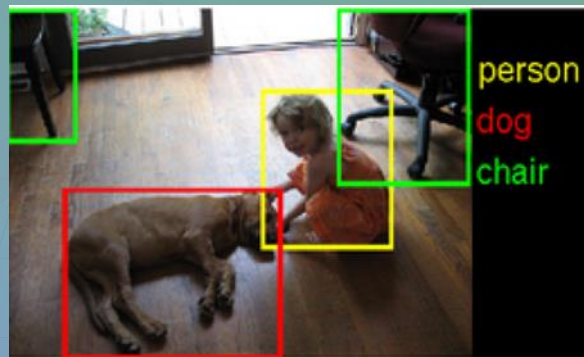


Which one would you save if the house was on fire?



Ethical AI systems need certainty

Tetherless World Constellation, RPI



Which one would you save if the house was on fire?
Would you use a robot baby-sitter without knowing which of the three possibilities it would choose?



- Context is key
 - AI learning systems still perform best in well-defined contexts (or trained situations, or where their document set is complete, *etc.*)
 - **Humans are significantly better at recognizing context and deciding when extraneous factors don't make sense**
 - Or add extra “inferencing” (the bride example)



Human-AI interaction is the way forward

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- Evidence that “centaurs” win
 - Human(s) and computer(s) teams currently beat either at chess (Go centaurs underway)
 - Anecdotal evidence that humans w/Watson top choices outperform Watson or human alone at Jeopardy
 - Medical study (diagnostic):
 - Doctor w/computer outperformed just doctor, just computer, two doctors



TWOC

And this matters!

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Stanislav Petrov: The man who saved the world



“There was no rule about how long we were allowed to think before we reported a strike ... but we knew that every second of procrastination took away valuable time, that the Soviet Union’s military and political leadership needed to be informed without delay. All I had to do was to reach for the phone; to raise the direct line to our top commanders — but I couldn’t move. I felt like I was sitting on a hot frying pan ... **when people start a war, they don’t start it with only five missiles ...**”

We must all strive to be like Petrov and learn to trust the combination of AI training and human intuition.