

Automatically Finding Relevant Images

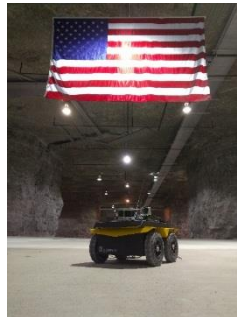


Garrett Warnell

U.S. Army Research Laboratory

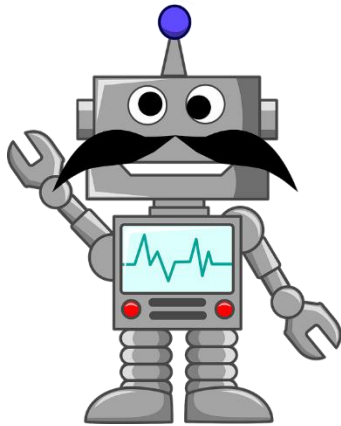
scenario

- autonomous robot exploring unknown space
- remotely-situated human teammate

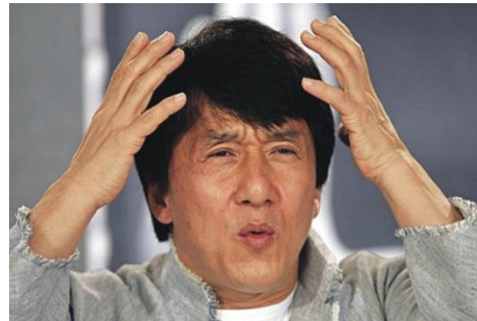


scenario

- low-bandwidth: robot-human communication link can only transmit text and single images
- **script**: robot provides text summary, human asks question, robot provides image as answer



r: i went into a room and saw a
hamburger on a table



h: did the hamburger have cheese?

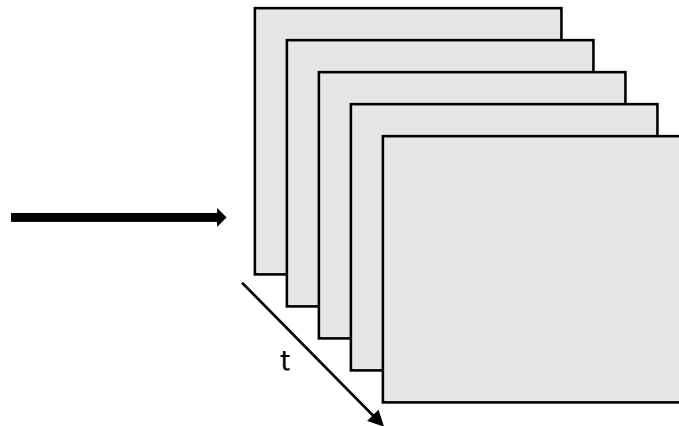


problem formulation

- pose this problem as one of supervised machine learning

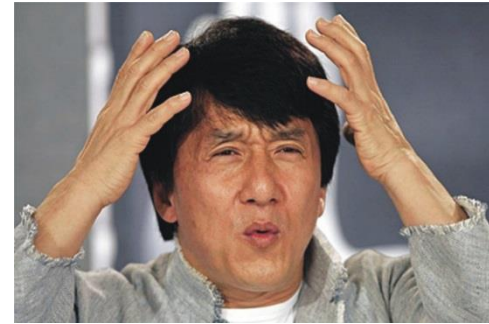
$$\{(x_i, y_i)\} \xrightarrow{\text{find } f} y = f(x)$$

- data
 - images from robot exploration ...



problem formulation

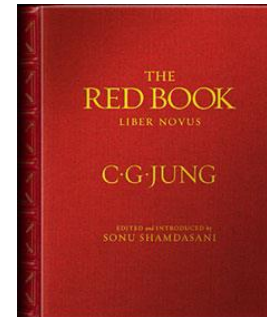
- ... questions about these images ...



h: what is the title of the red book?

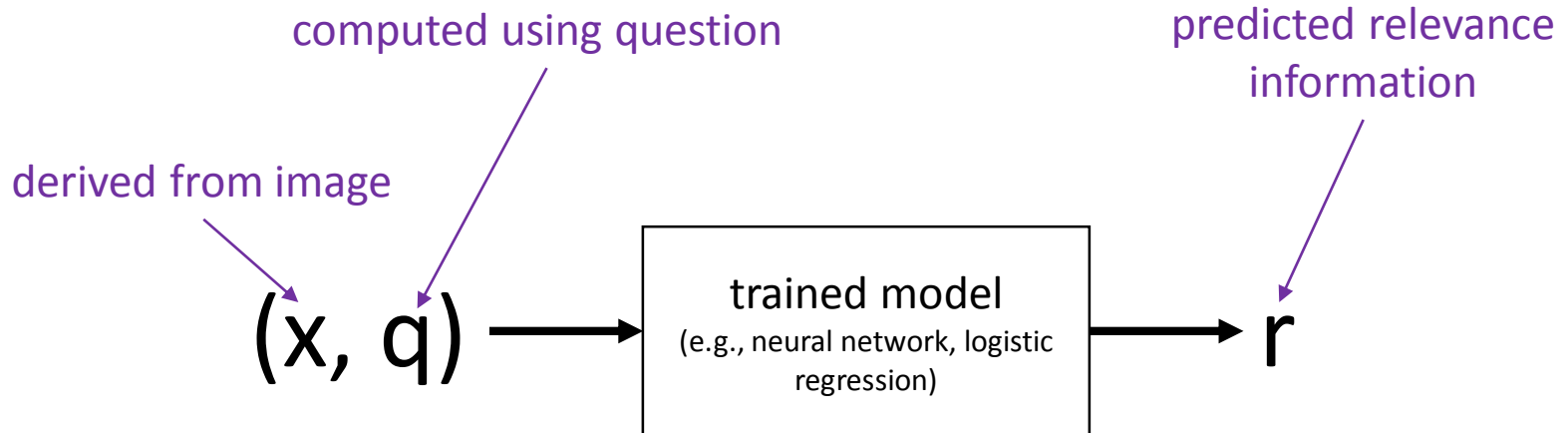
amazon mechanical turk™
Artificial Artificial Intelligence

- **labels:** indicate whether or not each image is *relevant* to the question



problem formulation

- model



tasks

- make robotic exploration gather useful data:



same object;
multiple views

- pan-tilt-zoom camera control



tasks

- object detection



- object tracking, with pan-tilt-zoom

<https://youtu.be/CigGvt3DXlw>

<https://youtu.be/VnqRGYVCndc>

