ARTIFICIAL INTELLIGENCE

WHAT IS INTELLIGENCE?

WHAT ARE THE INDICATORS?

WHAT IS INTELLIGENCE?

- Quantity of information?
- Speed of processing?
- Are any computers intelligent yet?
- Are all people intelligent?

AI EXAMPLES

- Game Playing
- Robot Control
- Problem Solving
- Machine Vision
- Natural Language Processing
- Intelligent Tutoring Systems

These days, it's basically applied machine learning

GAME PLAYING

- Checkers
- Chess
- Go
- **Why games?**
- **What does it mean for a game to be “solved”?**
- **What games will AI not be able to solve anytime soon?**

WHAT IS A PROBLEM?

HOW DO WE GO ABOUT SOLVING A PROBLEM?

STATES

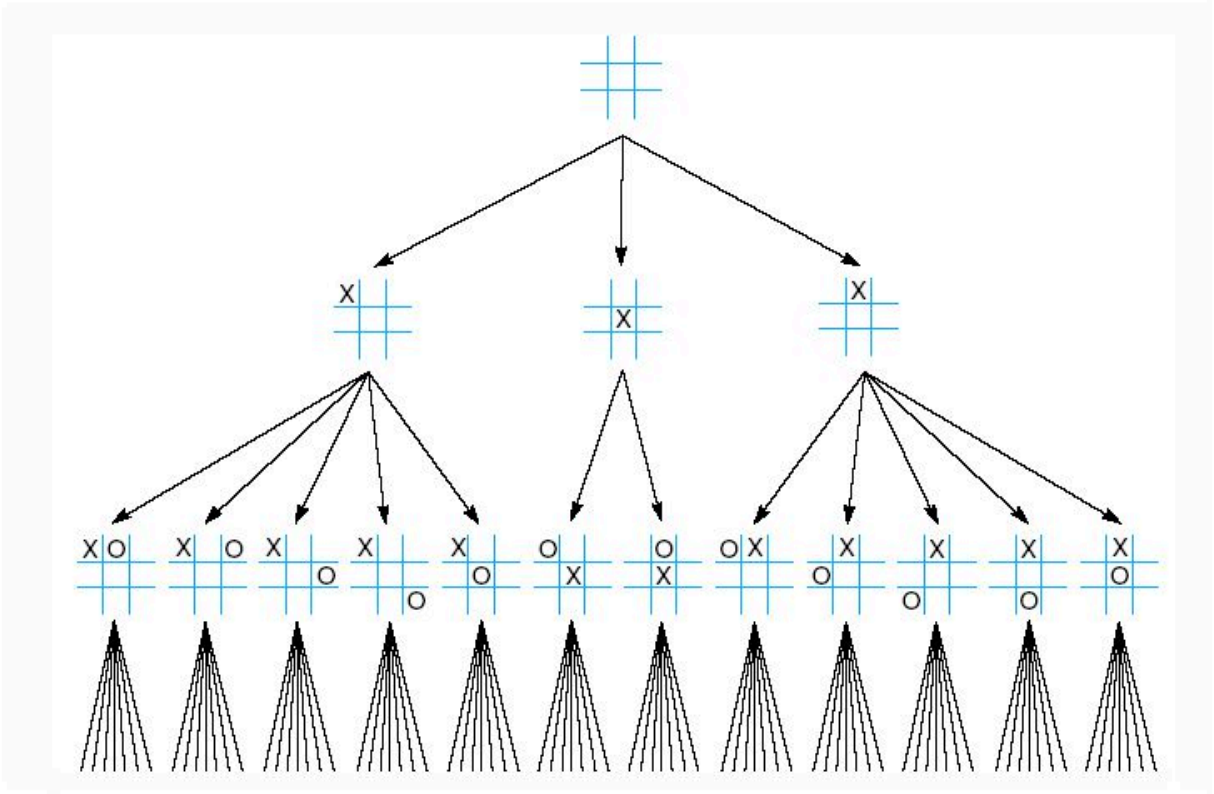
Independent, complete representation of a situation/problem

- Picture of a game board
- Save file for a video game
- Other examples?

STATE SPACE

- **A problem can have any number of states**
- **Actions change one state into another**
- **This web of states and connections forms the state space**
- **Somewhere in the state space are "desirable" states**
  - Goal states

TIC-TAC-TOE STATE SPACE



SEARCH METHODS

- **Now solving a problem simply means navigating the state space**
- **How do we do that?**
- **Blind Search**
  - Demo

GET SMARTER - HEURISTICS

- **Blind search kinda sucks**
- **Let's guess how far the solution is from a given state**
  - Heuristic
- **In the maze: distance to the exit**
- **A* Search**

WHEN THIS BREAKS DOWN - WICKED PROBLEMS

What if we can't know the state, or our actions, or what a goal state looks like?

Unfortunately, most modern problems are this

Based upon Rittel and Webber (1973)

ROBOT CONTROL

- **Robots can't know everything in advance**
  - No knowledge of state space
- **Reinforcement Learning**
  - Develop behaviors evolutionarily, not through pre-programmed routines
  - Sometimes lots of error

COMPUTER VISION

- Text Recognition
- Facial Recognition
- Automated Driving
- Medical Imagery
- Face Construction/Recreation
- 3D Model Reconstruction

AI BIAS

AI are NOT unbiased, they are exactly as biased as the people that make them

Amazon's facial recognition matched 28 members of Congress to criminal mugshots

New ACLU test illustrates the limits of Amazon's Rekognition system

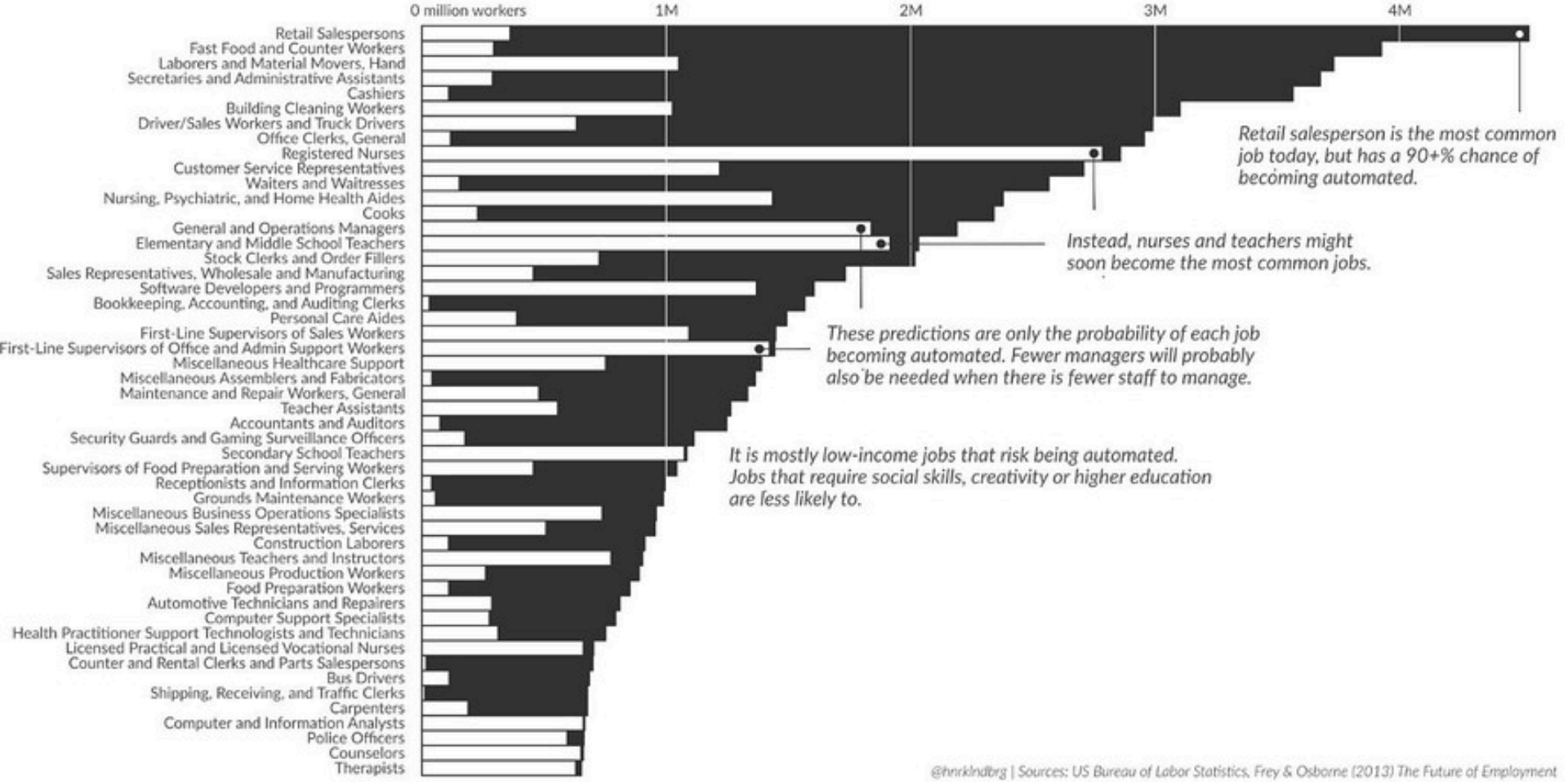
By Russell Brandom | @russellbrandom | Jul 26, 2018, 8:02am EDT

"11 of the 28 false matches misidentified people of color (roughly 39 percent), . Only twenty percent of current members of Congress are people of color, which indicates that false-match rates affected members of color at a significantly higher rate."

INTELLIGENT TUTORING SYSTEMS

- Observe student behavior to create profile
- Assess how a student is progressing
- Adapt material to suit student's needs
- Model student engagement and frustration to maintain focus
- Yep, Watson is here too

AUTOMATION


0 million workers
1M
2M
3M
4M
Retail Salespersons
Fast Food and Counter Workers
Laborers and Material Movers, Hand
Secretaries and Administrative Assistants
Cashiers
Building Cleaning Workers
Driver/Sales Workers and Truck Drivers
Office Clerks, General
Registered Nurses
Customer Service Representatives
Waiters and Waitresses
Nursing, Psychiatric, and Home Health Aides
Cooks
General and Operations Managers
Elementary and Middle School Teachers
Stock Clerks and Order Fillers
Sales Representatives, Wholesale and Manufacturing
Software Developers and Programmers
Bookkeeping, Accounting, and Auditing Clerks
Personal Care Aides
First-Line Supervisors of Sales Workers
First-Line Supervisors of Office and Admin Support Workers
Miscellaneous Healthcare Support
Miscellaneous Assemblers and Fabricators
Maintenance and Repair Workers, General
Teacher Assistants
Accountants and Auditors
Security Guards and Gaming Surveillance Officers
Secondary School Teachers
Supervisors of Food Preparation and Serving Workers
Receptionists and Information Clerks
Grounds Maintenance Workers
Miscellaneous Business Operations Specialists
Miscellaneous Sales Representatives, Services
Construction Laborers
Miscellaneous Teachers and Instructors
Miscellaneous Production Workers
Food Preparation Workers
Automotive Technicians and Repairers
Computer Support Specialists
Health Practitioner Support Technologists and Technicians
Licensed Practical and Licensed Vocational Nurses
Counter and Rental Clerks and Parts Salespersons
Bus Drivers
Shipping, Receiving, and Traffic Clerks
Carpenters
Computer and Information Analysts
Police Officers
Counselors
Therapists
Retail salesperson is the most common job today, but has a 90+% chance of becoming automated.
Instead, nurses and teachers might soon become the most common jobs.
These predictions are only the probability of each job becoming automated. Fewer managers will probably also be needed when there is fewer staff to manage.
It is mostly low-income jobs that risk being automated. Jobs that require social skills, creativity or higher education are less likely to.
@hnrklndbrg | Sources: US Bureau of Labor Statistics, Frey & Osborne (2013) The Future of Employment

BUG ROB ABOUT (APPROPRIATE) STUFF WHENEVER YOU WANT!

ROBTHOMP@UW.EDU