Introduction to Artificial Intelligence

Week 1

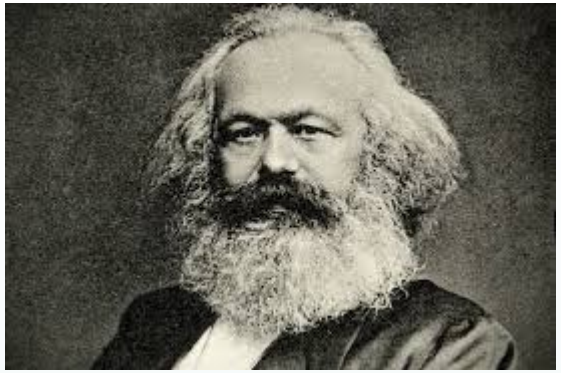
My Contact

- Email: m.makhmutov@innopolis.ru
  - Please preface all emails about the course with the subject [IntroAI] to allow for a quick response
- Office 418
  - Office hours – Thursday 4:20 – 6:00 PM
  - This is the BEST method for us to make contact and for you to receive a solution
- Please do not telegram, use it only in case of urgent questions
- FYI
  - I sleep at night
  - Usually I will ask for larger issues for you to come see me

TAs

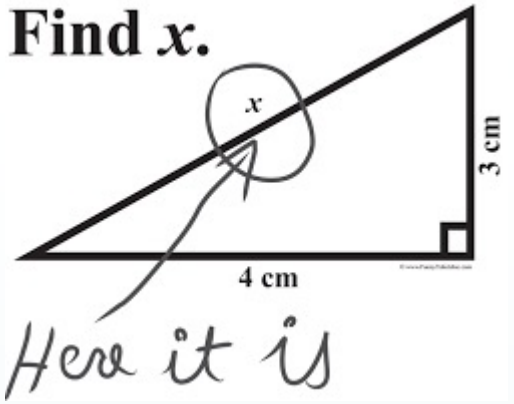
- Rufina Galieva (B20-01, B20-02) r.galieva@innopolis.university
- Dmitry Devitt (B20-03, B20-04) d.devitt@innopolis.university
- Munir Makhmutov (B20-05, B20-06) m.makhmutov@innopolis.ru

Marks Breakdown



- Lab Participation – 10%
  - No lab in first week and week of the midterm
  - Students are allowed to miss up to 2 labs without penalty to grade
    - I don't care if this is due to club reasons, illness, etc.
- Assignment 1 – 20%
- Midterm Test – 25%
- Assignment 2 – 20%
- Final – 25%
- Bonus – 5%
  - Given based on instructor's and TA's impression

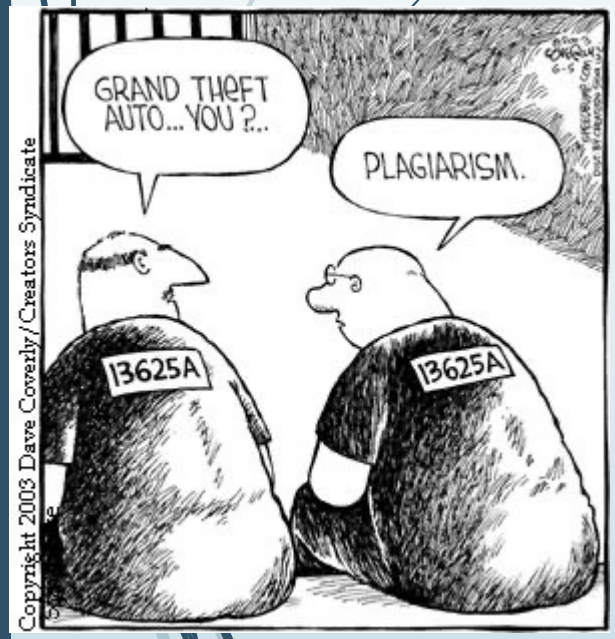
Course Procedures



- As a matter of course I will not accept late assignments or missed tests without prior legitimate excuses given in a reasonable period before the due date
- Not legitimate
  - I was working on a project/hackaton for X and didn't do the work for this class
  - I was sick due to my own hand (*i.e.* too much parties)
  - My computer broke two weeks ago and I couldn't work on the assignment
- There is a short time period between final exam and grades being locked – any requests beyond this period will be not heard
  - I do not regrade based on "but I need more marks to get the grade of X"
  - Legitimate reasons for regrade
    - Marks not added correctly
    - Mistake by the marker based in fact
      - note if we cannot understand what you wrote as you intended then we cannot regrade it
  - You may always request feedback or clarification
    - We want you to learn from any mistakes

Academic Misconduct

- **Academic misconduct** is any action or attempted action that may result in creating an unfair **academic** advantage for oneself or an unfair **academic** advantage or disadvantage for any other member or members of the **academic** community. – UC Berkley
- Some of academic misconduct cases:
  - Cheating – copying or communicating answers to an evaluation
  - Plagiarism – using someone else's work as your own
  - Work for hires – hiring out your course work to a third party
  - Submission of work for which credit has been obtained upon previously
  - Possession of unauthorised aids
  - Preventing any other students from accessing materials for an academic advantage
  - Falsification of records or Impersonation
  - Disruption to classrooms – *e.g.* pulling a fire alarm to get out of a test; failure to follow instructions during a test (*i.e.* pencils down)
  - Accomplices – Enabling or acting as a knowing or negligent party to any of the above



Academic Misconduct Policy at IU

- Innopolis policy (minimums)
  - First offence is 0 on the unit and note in record
  - Second offence is 0 in the course and note in record
  - Third is immediate expulsion
  - Even on a first offense on a major unit such as a final exam this may be enough to lead to an expulsion due to low grades
- Note – we reserve the right to increase penalties in egregious cases
- We reserve the right to use technical methods to detect plagiarism such as MOSS or Turn-it-in

What are you allowed to do

- Cite sources in essays, code, etc. when you use them
- Study for a test with other students in the class
- Ask another student to look at your code as there is a bug you can't figure out – just don't have them fix it for you though
- Demonstrate to another student the method of solving a problem conceptually – don't write their answer for them
- Ask for help from TAs and/or the Professor when you are having difficulties

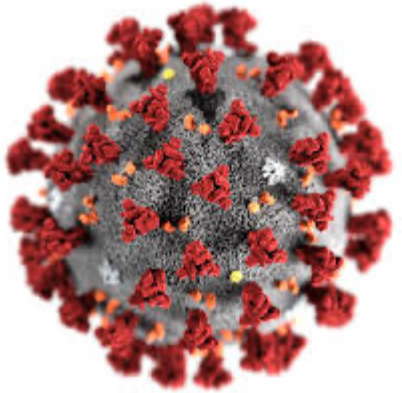
Course Materials

- Main Text
  - Artificial Intelligence a Modern Approach 3rd Edition – Russel and Norvig
- Secondary Text
  - Computational Intelligence For Modeling and Optimization - Ashlock

Tips for Success

- Read the syllabus
  - Lots of answers to many of life's (or at least the course administrations) questions are in it
- Read the book
- Attempt all questions
- Study a little each week – don't think you can just cram on the last day
- Form a regular study group and meet to discuss the assignments and tests
- Come to office hours after attempting the question and ideally have some plan of attack
  - If you're the TA/Professor what 'question' would you want to assist with more?
    - "I don't know how to do Question X!"
    - "I think Question X can be solved by Y method but I cannot see how to make step Z to occur - can you suggest how to accomplish this?"
- Try to find out where these techniques are being used for an issue/problem you care about

COVID Protocols



- Masks
  - Masks are required in all teaching spaces
  - It must cover mouth and nose
- Sanitation
  - Wash your hands
- Distance
  - 1.5m
  - Please file in and out of the room maintaining distance
- Myself and the TAs are empowered to dismiss from the room anyone who is not following these rules for the safety of the class
- Breaks
  - I think everyone gets tired wearing these masks
  - I suggest two 5-10 min breaks every half hour

Attendance

- You are expected to attend both labs and lectures
- We reserve the right to maintain attendance lists in lecture and forward them to the DoE
- The legitimate excuses of students due to actions or illness should be known by DoE
- If there is any individual issues – please contact myself and the DoE in an email

Agreements

Introduction

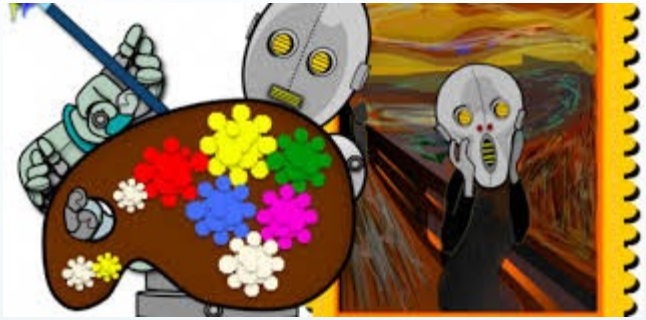
The introduction to the introduction to AI

Artificial Intelligence

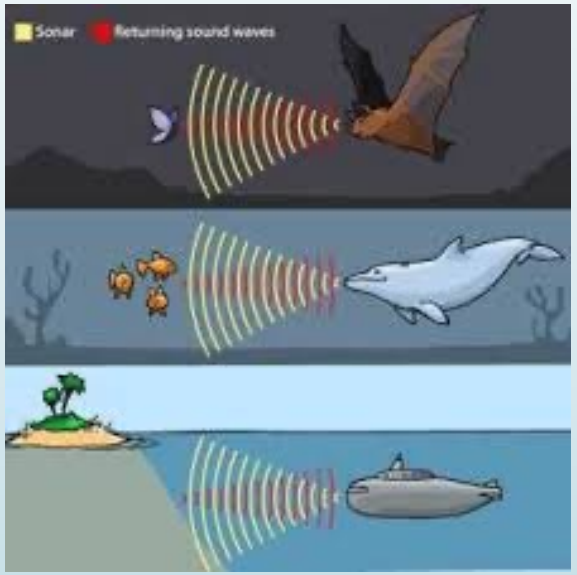
- Breaks down into four major definitions classes:
  - Thinking Humanly
  - Thinking Rationally
  - Acting Humanly
  - Acting Rationally
- Six major areas of concern (Russel & Norvig)
  - Natural Language Processing
  - Knowledge Representation
  - Automated Reasoning
  - Machine Learning
  - Computer Vision
  - Robotics

AI onwards

- Computational Creativity



- Biomimicry



Why should we care?

Catalogue of fears

Probability of computerisation of different occupations, 2013
(1 = certain)

Job	Probability
Recreational therapists	0.003
Dentists	0.004
Athletic trainers	0.007
Clergy	0.008
Chemical engineers	0.02
Editors	0.06
Firefighters	0.17
Actors	0.37
Health technologists	0.40
Economists	0.43
Commercial pilots	0.55
Machinists	0.65
Word processors and typists	0.81
Real-estate sales agents	0.86
Technical writers	0.89
Retail salespeople	0.92
Accountants and auditors	0.94
Telemarketers	0.99

Source: "The Future of Employment: How Susceptible are Jobs to Computerisation?", by C. Frey and M. Osborne (2013)

Economist.com

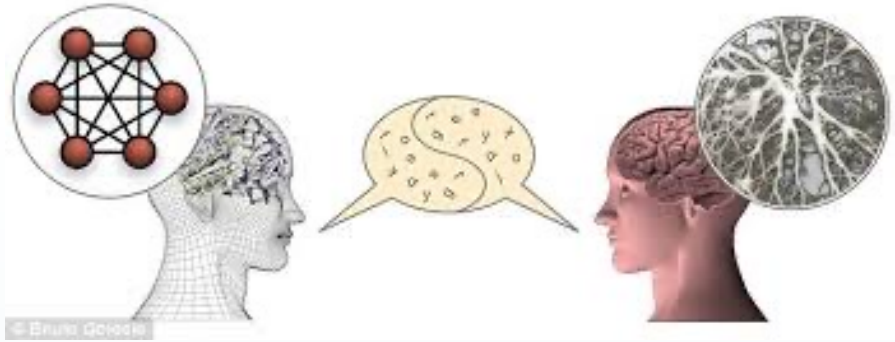
The future job situation:

- The Guardian, Sept. 13, 2016, "Robots will eliminate 6% of all US jobs by 2021, report says"
- BBC News, May 25, 2016, "Foxconn replaces '60,000 factory workers with robots'"
- The Economist, Jun. 25, 2016, "The impact on jobs: Automation and anxiety"

Why should we care?

- Forbes Article - Automation, COVID, And The Future Of Work
  - Oct 2020 by Adi Gaskell
  - Questions the automation of jobs
  - Jobs in companies where AI has been engaged have actually INCREASED 15%
    - Firms productivity which engaged with AI was increased
    - This lead the firms to engage with new locations and move into new markets
  - Young people are the most vulnerable to employment issues
    - Most younger people are in jobs which are consumer facing
      - Retail, Services, etc.
      - These are also more gig work or temporary employment opportunities

Why should we care?



- Via the Analysis of building something we learn more about it
- In order to understand our own process of thought
  - Build something which "thinks"
  - Explore what it means to be "rational"
  - What does it mean to be "intelligent"?
- Is there something beyond mechanical action to our brains
  - Free Will

Why should we care?

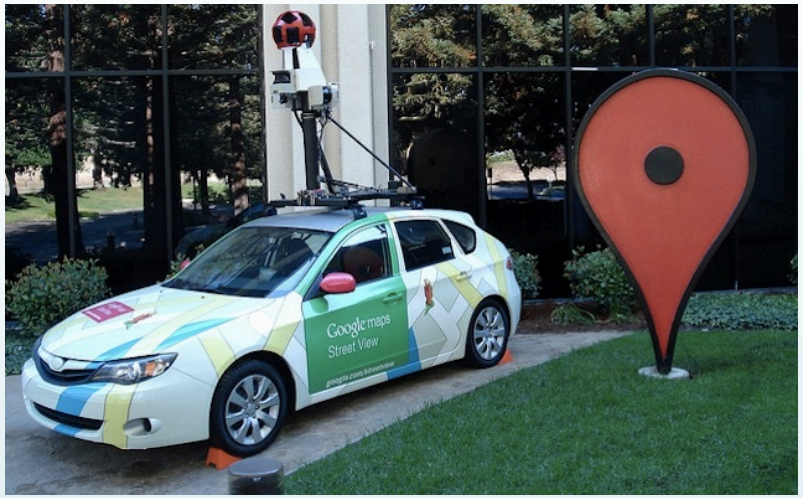
- Fear is defeated by knowledge
- If our future is going to be a terrifying world of the robots and AI
  - "I, for one, welcome our new overlords"
- The wars of the future will not be fought on the battlefield or at sea. They will be fought in space, or possibly on top of a very tall mountain. In either case, most of the actual fighting will be done by small robots. And as you go forth today remember always your duty is clear: To build and maintain those robots. - Simpsons

Intelligence is Situational

- Highly depends on cultural factors
- People of Indigenous tribes
  - Plants/Animals
  - Navigation of waters
- Methods of Transport
  - Horse
    - Do you know how to ride one
    - Do you know how to feed, water, and restaddle one
    - Do you know how to breed them
  - Cars
    - Do you know how to drive
    - Do you know how to refuel, put in washer fluid, do an oil change
    - Do you know how an engine works enough to make repairs or build one

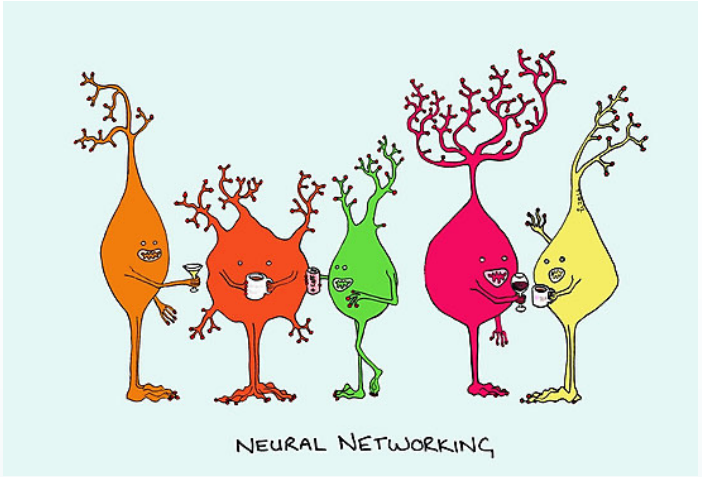
Self Driving Cars – Offloading Intelligence into Technology

- AI is taking the act of driving a car away from us
- Gradual Process
  - Powered Steering
  - Clutch assists
  - Automatic Transmissions
  - ABS
  - Four wheel skid prevention systems
  - Backup Cameras
  - Drive-by-wire
- What was once a skill required to live will become
  - Much like horses are to us now a skill which is reserved for those who are interested
  - Special teams of off-board drivers who will fix what cannot be done by AI now



Human Decision Making

- Decision Trees
- Game Trees
- Expert Systems
- Neural Networks



Bioinspired

- Humans are perhaps not only the one type of intelligence we mimic
- Swarms
  - Birds Flocking
  - Ant Colonies seeking food
  - Bees finding flowers
- Evolution and Breeding
  - Genetics
- Movement in Robotics

Embodied AIs

- A robot without a program is soulless
- An AI without a body is just a ghost
- AIs now have more physical (robot) or digital (agent) embodiment
  - Siri/Galaxy/Cortana – Digital Embodiment
  - Video Game Characters
- Humans love to make non-Human things have human characteristics
- Greek Mythos
  - Ovid's narrative poem Metamorphoses
  - Pygmalion (sculptor) fell in love with a statue he had carved
  - Comes to life due to inference of the gods (Aphrodite)
  - Daedalus (inventor) put voice to a statue using quicksilver (*i.e.* mercury)
  - Talos is an artificial man made of Bronze (Hephaestus)
  - Pandora made of clay (Hephaestus at request of Zeus)

Strong & Weak AI

- Strong AI
  - Human based design
  - Human based constructions
- Weak AI
  - Problem Solving for specific tasks
  - May or may not have human aspects
  - Majority of AI work is on this issue

Welcome to the course

- Think about what products you use every day will be obsolete due to AI in the near future
  - Will this be good for humanity or bad – make a list of pros and cons
- What is Intelligence?