EE220

Intelligent & Connected Machines in Society

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This is not a traditional engineering/science type lecture module. This is about "soft" issues and questions are very welcome

32 lectures

2-hour end of year exam

(50%)

2 Assignments (50%)

2 essays

No minimum marks required in individual sections

Turnitin will be used and high similarity scores will result in marks being deducted

Probable Discussion Topics

Ludditism and the role of machines in history

Luxury vs need and technology progressiveness

Acceptance of technology – what works and what doesn't

Ethics, programming morality into machines

Safety critical issues and the "person in the middle" e.g. cars

Privacy and invasiveness of "aware" technologies

Probable Discussion Topics

Insurance and legal responsibility

Impact on employment

Impact on the medical field

Impact on children, and the loss of skills

Reliability and Dependability

Public Perception of Robotics and Intelligent Machines

THIS MODULE IS A DISCUSSION MODULE.

YOU WILL GET MORE OUT OF IT BY ASKING QUESTIONS AND I WILL BE GIVING SMALL EXERCISES TO DO IN CLASS AND AT HOME

YOU WILL BE WRITING ESSAYS – DURING THE YEAR AND IN THE EXAM!

The 2018 Jan exam paper – Q1

QUESTION 1 (60 Marks)

For each of the following questions, write brief answers. Answers should typically be between 40 and 100 words.

(a) Briefly describe the four types of human or operator induced failure and in a case of liability, who would be responsible in each case. (5 marks)

(b) List and explain the different fault management strategies that should be used to prevent failures. (5 marks)

(c) Explain what is meant by responsibility, and why it is important. (5 marks)

(d) Explain the "Principle of Ontogeny Non-Discrimination" and why it is relevant to the issue of autonomous machines. (5 marks)

(e) Intelligent machines can be deliberately confused. Discuss the implications of this for autonomous machines. (5 marks)

(f) Discuss the issues around "If drunk, do you have the legal authority to authorise a self-driving car to take you home?" (5 marks)

(g) List and explain the key features that are said to be relevant in making a robot or a machine "likeable". (5 marks)

(h) Explain the differences in perception for smooth rounded objects and sharp-pointy objects. What impact does this have? (5 marks)

(i) What is the difference between a fault and a failure? (5 marks)

(j) What is meant by the concept "Deep Stupidity"? (5 marks)

(k) Explain the concepts of autonomous and semi-autonomous machines. (5 marks)

(l) Explain what is required by the EU General Data Protection Regulation? What does the policy say about collecting and storing data about children? What is the issue around consent and children. (5 marks)

The 2018 Jan exam paper – Q2

QUESTION 2 (40 Marks)

Write an essay on *one* of the following topics. (40 marks)

- The nature of employment in a future of intelligent automation. Ensure that in your discussion you provide at least three examples of jobs that are likely to disappear and those that are likely to remain (six job examples in total). Provide reasons for your selection.

OR

- Trust in Autonomous machines in society. In your essay focus on issues that may result in a lack of trust or increased concern about the responsibility awarded to an autonomous device. This is a multi-facetted problem so provide multiple reasons for this issue and the context in which trust is an issue. Ensure that you provide examples to highlight your answers. Discussions of militarised autonomous systems are not acceptable.

OR

- On connected technologies – focusing on the services that continuous connectivity can provide; the issues around intrusiveness; and the reliability of systems that are dependent on a connection to the internet and some distant data server. Ensure that in your essay you provide examples of at least one connected product and describe the data that they collect and the reliability of that product in the absence of an internet connection.

This must be a substantive essay. It should contain between 1000 and 2000 words (approximately 4-6 pages). Marks will be provided for both the validity of the content, the structure and quality of the essay.
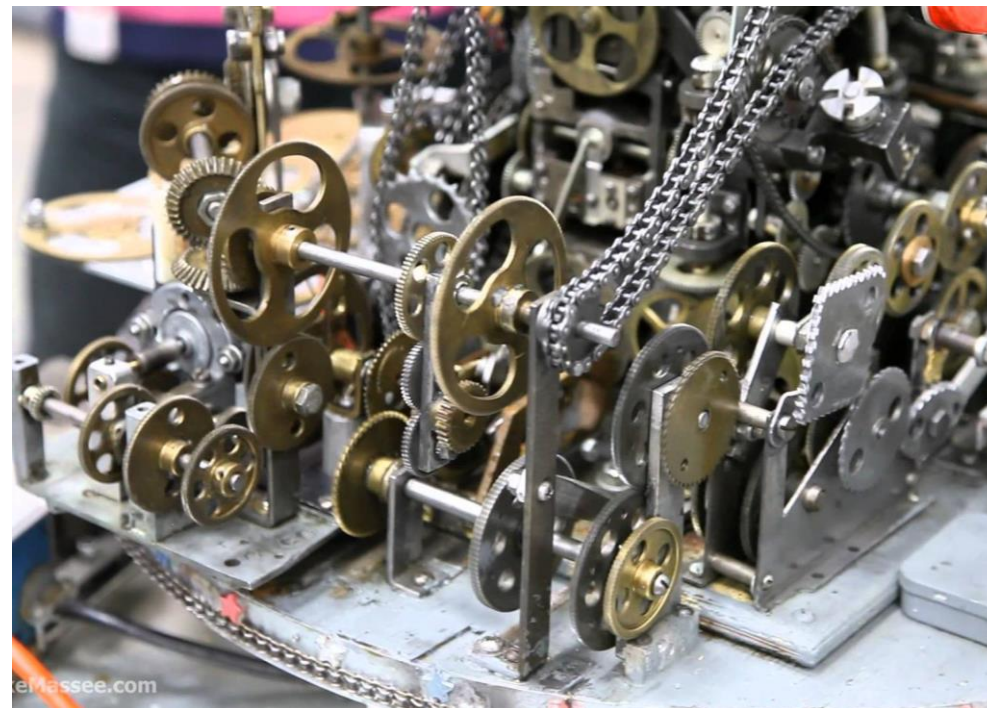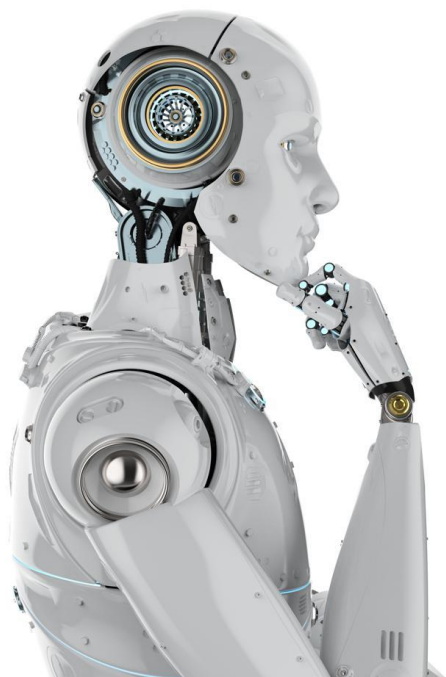
What is an Intelligent Machine??

What is an Intelligent Machine??

Intelligence has been defined in many different ways including as one's capacity for logic, understanding, self-awareness, learning, emotional knowledge, planning, creativity, and problem solving.
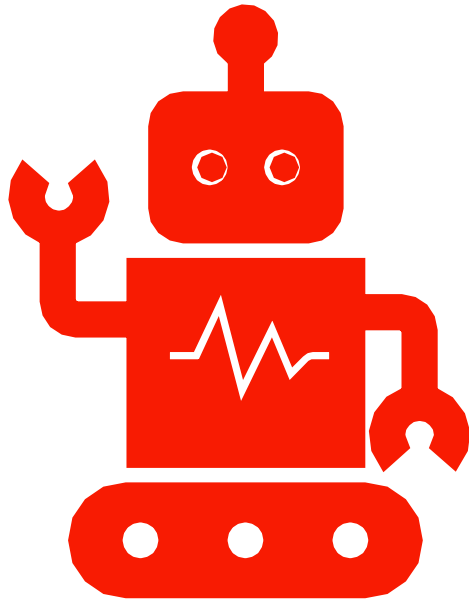
It can be more generally described as the ability **or inclination** to perceive **or deduce** information, and to retain it as knowledge to be applied towards adaptive behaviours within an environment **or context**.

Courtesy of Wikipedia

What is an Intelligent Machine??
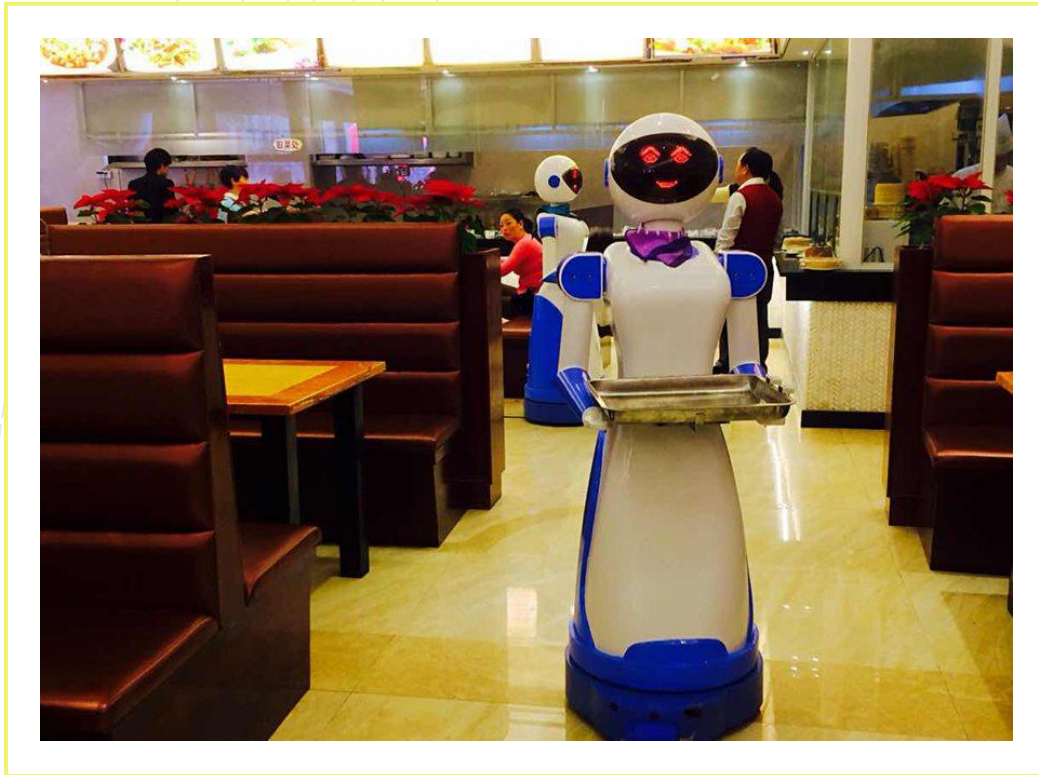
- **To perceive**

- **To extract knowledge**

- **To adapt behaviour**

The level of "intelligence" can vary from context to context. Some scenarios are more complicated than others.
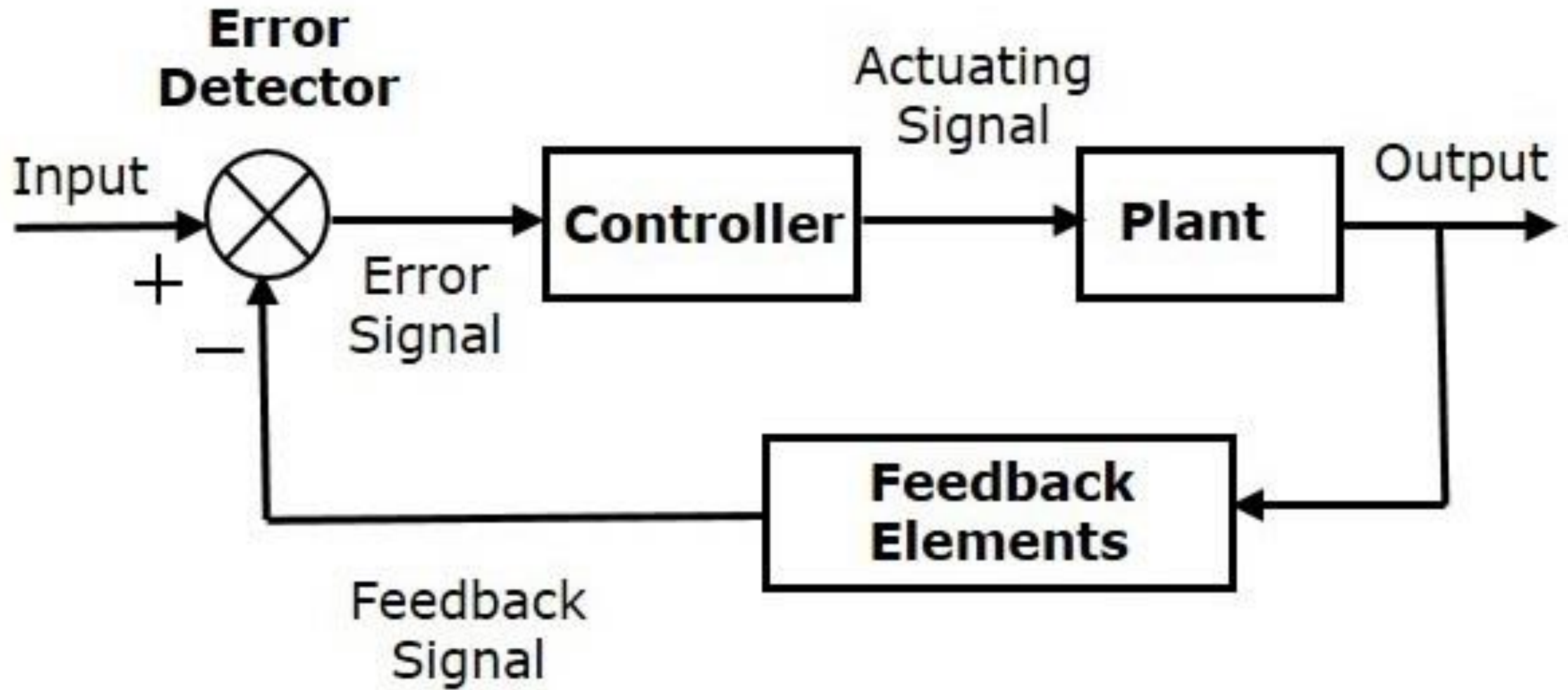
To perceive

- Usually requires a sensor and produces a signal

To extract knowledge

- We process the signals in some ways, often in software

To adapt behaviour

- We appropriately react to achieve our aim, which we call a "control system"

In the 1800's we could build machines that control the temperature of a steam engine, the speed of a car, the flow of liquids and chemicals

- detect, process, make a change

Machines intelligently controlling machines is easy

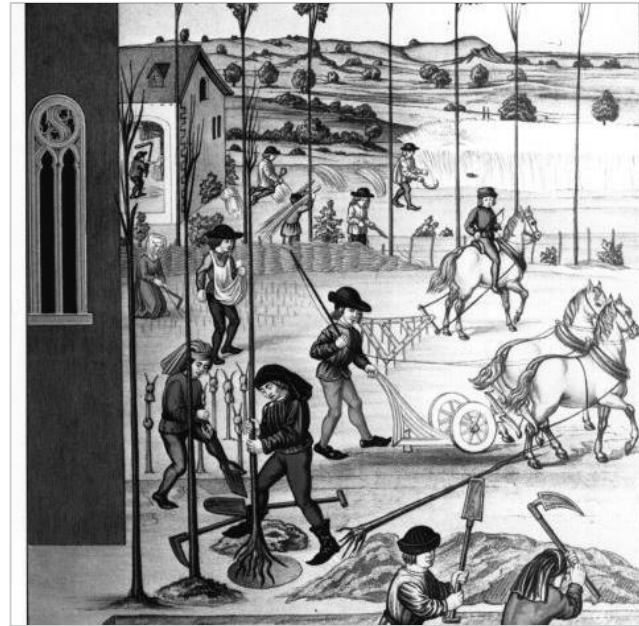**Machines intelligently controlling humans is not**

History

The Industrial Revolution: Europe 1750-1850

- Three main elements

  - The use of machines in farming

  - The use of machines to make cloth
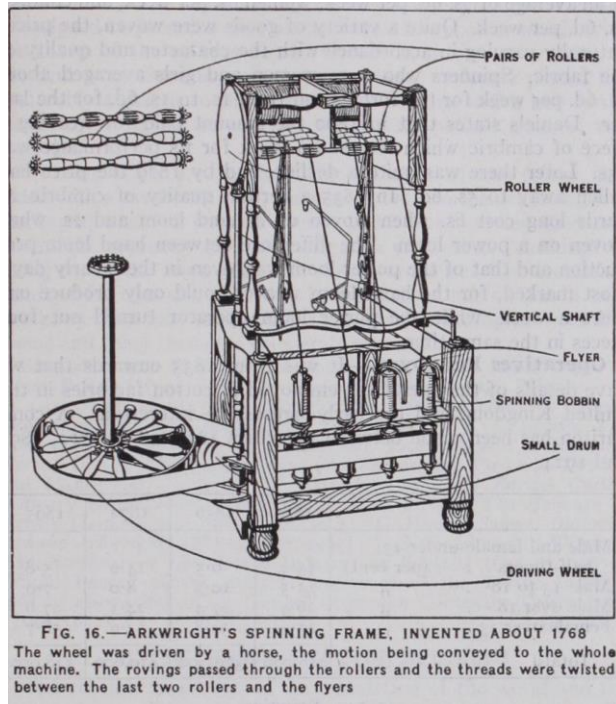
  - The use of coal to get away from wind and water

Farming

- Production has gone up hugely
- Employment has gone down hugely

IRISH SPINNING WHEEL.
"The Irish people cannot only design beautiful things, but can also execute them with indefatigable industry."
JOHN RUSKIN.

14/6/05

13 Corrig As. Kingstown.

Spinning Loom

FIG. 16.—ARKWRIGHT'S SPINNING FRAME, INVENTED ABOUT 1768
The wheel was driven by a horse, the motion being conveyed to the whole machine. The rovings passed through the rollers and the threads were twisted between the last two rollers and the flyers

1764-1768: Cotton Spinning Machines

- Multiple inventors of different types around the world.

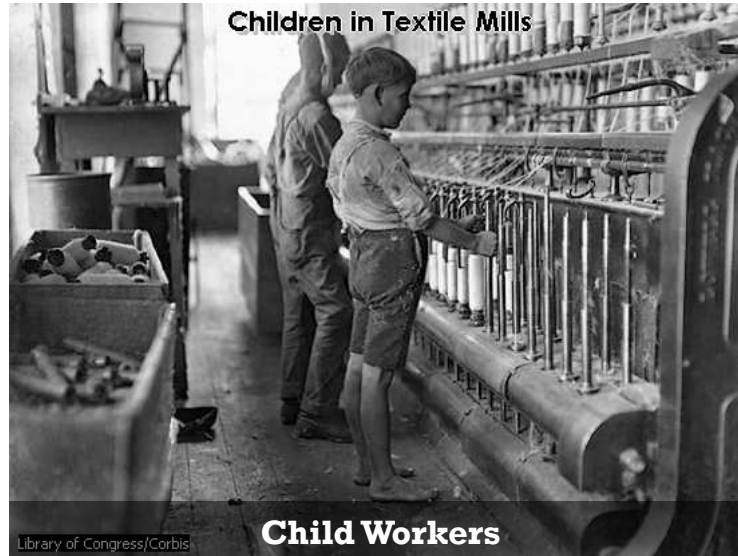- The spinning Jenny (Hargreaves, UK) sold 20,000 in the first 12 years after 1768.
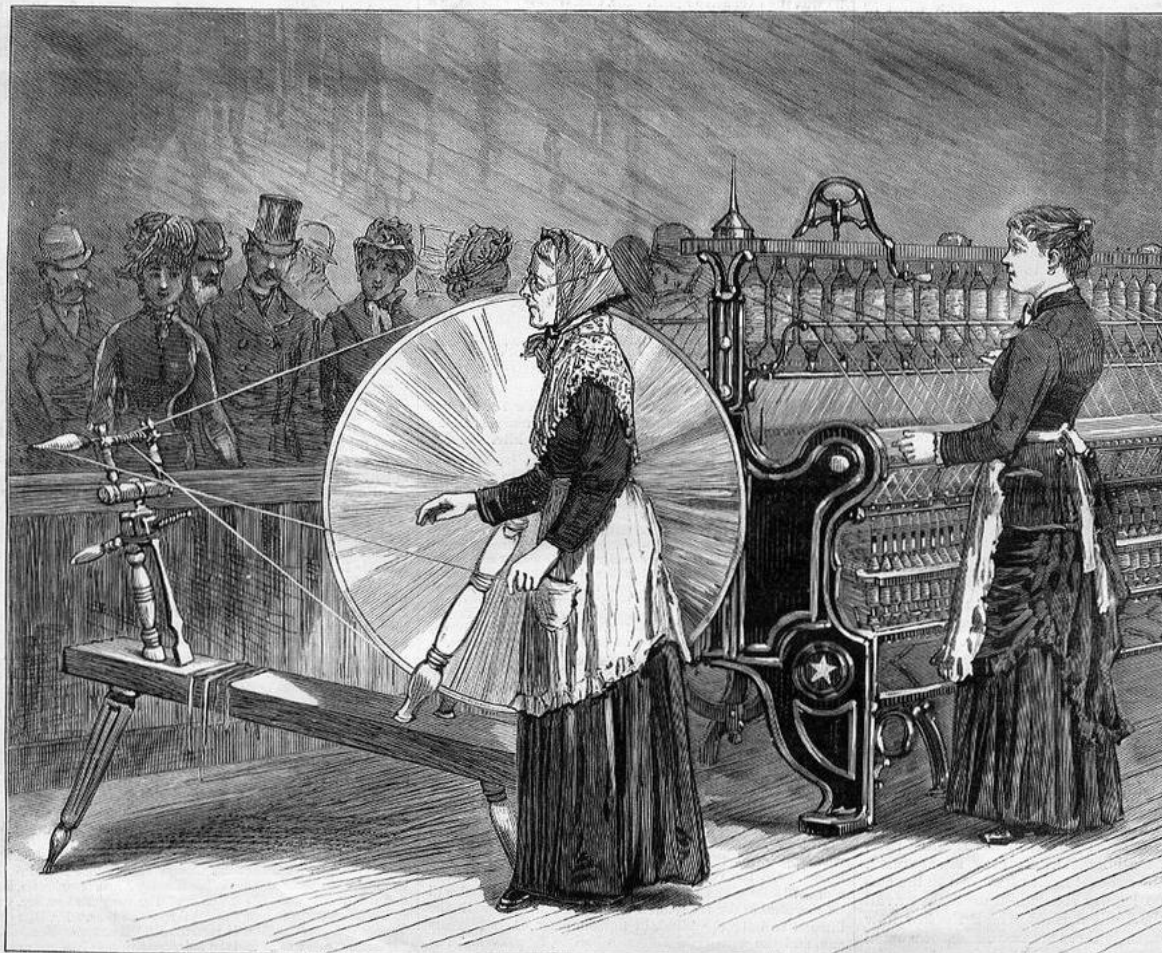
THE ATLANTA INTERNATIONAL COTTON EXPOSITION—SPINNING, OLD AND NEW STYLES.—From a Sketch by Horace Bradley.—[See Front Pag

By 1881:
Spinning Wheels
were historical

The Impact: Food and Clothing

Only Affordable to the Wealthy

Tenements

Children in Textile Mills

Library of Congress/Corbis

Child Workers

PUNCH, OR THE LONDON CHARIVARI.—July 21, 1855.

No sanitation, pollution

And we hope the Dirty Fellow will consult the learned Professor.

The Impact: Pollution, Slums, Child Workers

The Impact: Unemployment, Disease, Famine

Ned Ludd
The Luddite Rebellion
1811-1813

In Nottinghamshire, where the Luddite attacks began in November 1811, there were the 'framework-knitters' or 'stockingers' who produced hosiery. They complained machines were producing lower grade goods and used unskilled workers

In Yorkshire, the Luddites were led by the croppers, highly skilled finishers of woolen cloth the greatest threat to them was a more recent invention, the hated shearing frame which eventually almost entirely displaced them over the next ten years

The Lancashire cotton weavers and spinners were, like the stockingers, mainly outworkers, producing cloth on hand looms in their own homes and paid by the piece. The factory system, with its vast mills and steam-powered looms undercut the cottage weavers.

Destroy the Machines
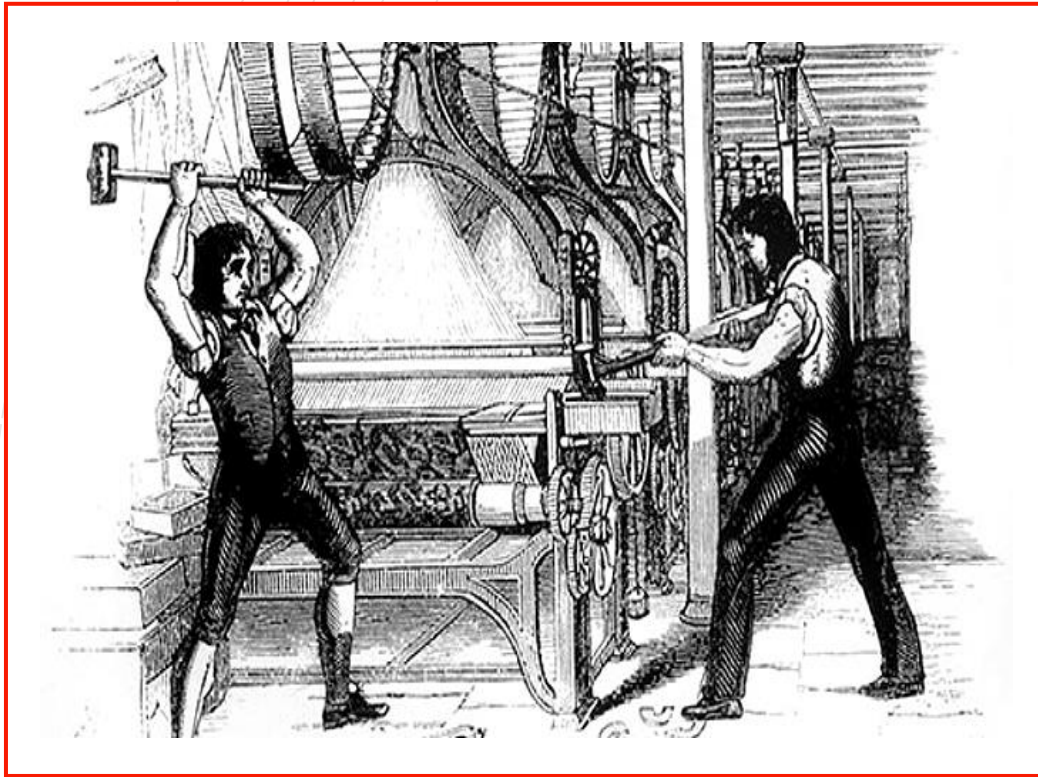
- The Luddites broke the automated looms
- Sending warnings with Letters signed by "General Ludd"

Shirewood Camp" to Spencer Perceval at London (Sherwood as in Robin Hood)

The first & most important part of my Duty is to inform you & I request you do the same to all your Colleagues in office, also the Regent; that in consequence of the great sufferings of the Poor & whose grievances seem not to be taken into the least consideration, by Government. I shall be under the necessity of again calling into action (not to destroy, many more frames) ie. but my brave Sons of Shirewood, who are determined & sworn to be true & faithful avengers of their & Country's wrongs. I have waited patiently to see if any measure were likely to be adopted by Parliament to alleviate distress in any shape whatever; but that hand of conciliation is shut & my poor suffering country is left without a ray of hope: The Bill for Punishing with death. has only to be viewed. with contempt & opposed by measure equally strong; & the Gentlemen who framed it will have to repent the act: for if one man's life is Sacrificed,! blood for !blood. Should you be called upon you can not say I have not given you notice of de---

I have the honor to be
Genl C Ludd

WHEREAS,

Several EVIL-MINDED PERSONS have assembled together in a riotous Manner, and DESTROYED a NUMBER of

FRAMES,

In different Parts of the Country:

THIS IS

TO GIVE NOTICE,

That any Person who will give Information of any Person or Persons thus wickedly

BREAKING THE FRAMES,

Shall, upon CONVICTION, receive

50 GUINEAS
REWARD.

And any Person who was actively engaged in RIOTING, who will impeach his Accomplices, shall, upon CONVICTION, receive the same Reward, and every Effort made to procure his Pardon.

☞ Information to be given to Messrs. COLDHAM and ENFIELD.

Nottingham, March 26, 1811.

- "General Ludd" was a fictictious character named after Ned Ludd

- There were more soldiers deployed against the Luddites than were fighting at the time in the Napoleonic Wars

- There were few arrests because the community supported the Luddites

- They were never a formal organisation

- It was an economic argument not a technology one. They wanted the workers in the factories to be properly trained and paid. The factory owners did not and capitalism won out.

Some facts

Insight....

- Successful machines replace expensive skilled workers

- Enable lower paid unskilled workers

or

- Need less skilled workers

Destruction of Stocking Frames, etc. Act 1812

Man over Machine

The Act, as passed, made the **destruction of mechanised looms** *– stocking frames – a capital felony (and hence a crime punishable by death. Similarly raised to the level of capital felony were the associated crimes of damaging frames and entering a property with intent to damage a frame. In these respects the act was a stronger version of the Protection of Stocking Frames, etc. Act 1788, which had made similar acts punishable by 7–14 years in a penal colony*

All measures included in the Act were only to be applied temporarily, and were duly set to expire on 1 March 1814.

The **death penalty** *once again reinstated in the Destroying Stocking Frames, etc. Act 1817*

Discuss…

Today, which is more important, a man or a machine??

In 1800's they were quite clear

What do you think?

Tuesday, 01 October 2019

Return of the Luddites: British Workers Sabotaging Workplace Robots

Written by Warren Mass

Tweet

font size ⊖ ⊝ ⊕ ⊕ | Print | Email

Several British newspapers, including the *Daily Mail*, *The Sun*, and the *Telegraph*, have reported that some workers in the U.K. who are fearful that they may lose their jobs to workplace robots have resorted to sabotaging the robots.
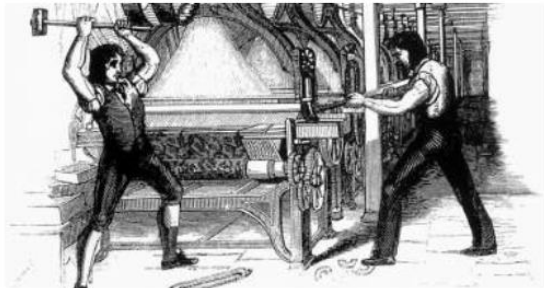
Professor Jonathan Payne, who led a study at De Montfort University in Leicester that looked into the use of robotics in healthcare, concluded that U.K. workers are often strongly opposed to the introduction of these intelligent machines into their work places. This was in contrast to Norway, where co-working robots are often given affectionate names and welcomed.

Payne, who is a professor of Work, Employment, and Skills, was quoted by the *Daily Mail:* "We heard stories of workers standing in the way of robots, and minor acts of sabotage — and not playing along with them."

Homework

Identify 5 major areas where
"intelligent automation" will impact on future employment

Each person should think about

| Specific job being replaced | Roughly the number of workers involved | Roughly the salary of those workers | Why are they vulnerable? |

We will discuss them in the next class

Discussion Section

Highly Replaceable jobs

Title Examiners, Abstractors, and Searchers	Insurance Underwriters	Tax Preparers	New Accounts Clerks	Library Technicians	Data Entry Clerks
Insurance Claims and Policy Processing Clerks	Brokerage Clerks	Order Clerks	Bank Loan Officers	Insurance Appraisers, Auto Damage	Shop Tellers
Procurement Clerks	Shipping, Receiving, and Traffic Clerks	Wood, Metal and Plastic Machine Operators	Credit Analysts	Claims Adjusters, Examiners, and Investigators	Drivers (deliveries, short and long distance)
Legal Secretaries	Bookkeeping, Accounting, and Auditing Clerks	Restaurant and Coffee Shop Servers	Payroll and Timekeeping Clerks	Real Estate Brokers	Cashiers

Highly Replaceable jobs

Ushers, Lobby Attendants, and Ticket Takers

Cooks, Restaurant

Textile Machine Operators

Surveying and Mapping Technicians

Secretaries and Administrative Assistants

Office Clerks, General

Receptionists and Information Clerks

Jewelers and Precious Stone and Metal Workers

Postal Service Clerks

Print Binding and Finishing Workers

Construction Equipment Operators

Bill and Account Collectors

Manicurists and Pedicurists

Paralegals and Legal Assistants

Hotel, Motel, and Resort Desk Clerks

Question

What do they have in common?

Humans are inconvenient to work with in these jobs

- Repetitive
- Limited number of variations
- Large work force required
- The individual is not highly paid but the workforce costs a lot of money
- Low Skilled Workers
- Risk of injury
- Timetabling
- Breakdown causes relatively minor issues

Not Replaceable jobs

- Engineers (Aero, EE, Mech, Marine, Civil, Chem)
- Fashion Designers
- Forensic Science Technicians
- Healthcare Social Workers
- Human Resources Managers
- Hydrologists
- Interior Designers
- Logisticians
- Machine Supervisors
- Makeup Artists, Theatrical and Performance
- PR and Marketing Marriage and Family Therapists
- Medical and Health Services Managers
- Medical Scientists
- Microbiologists
- Occupational Therapists
- Orthodontists
- Orthotists and Prosthetists
- Pharmacists
- Physical Therapists
- Police and Emergency Services

Not Replaceable jobs

- Anthropologists and Archeologists
- Art Producers and Directors
- Athletic Trainers
- Biochemists and Biophysicists
- Biological Scientists, All Other
- CEOs and senior management
- Chiropractors
- Choreographers
- Psychologists and Mental Health workers
- Computer and Information Research Scientists
- Computer Systems Analysts
- Conservation Scientists
- Curators (Museums)
- Dentists, General
- Doctors, Nurses, and Surgeons
- Managers
- Recreation Workers
- Sales Managers
- Soil and Plant Scientists
- Sports staff

Question

What do they have in common?

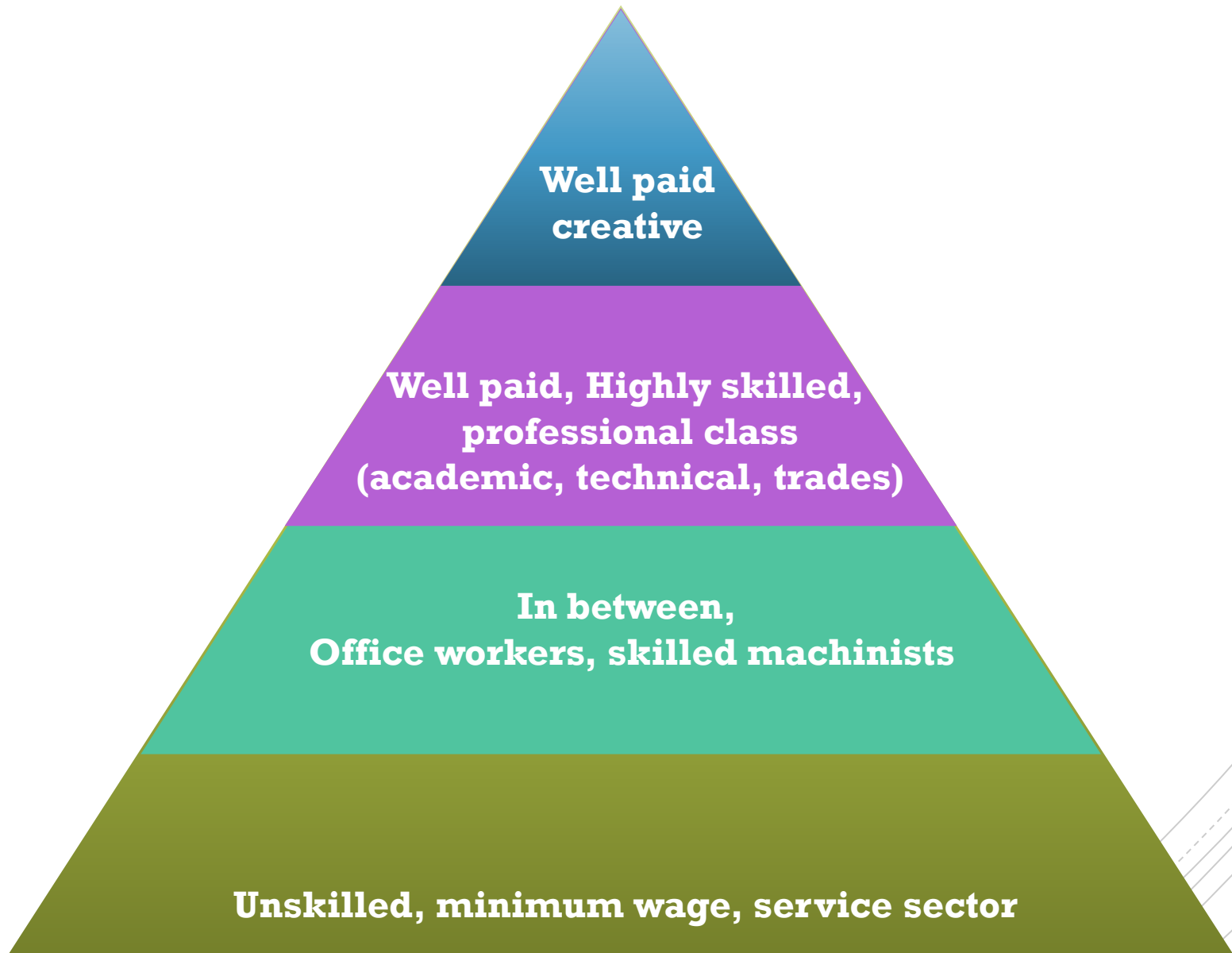# Robots are inconvenient to work with in these jobs

- Non - Repetitive
- Unlimited variations
- Innovation
- Creativity
- No 'select from list' solution
- Highly Skilled / Specialised
- Breakdown can cause very large problems

Jobs that are routine, even if skilled, can be easily automated
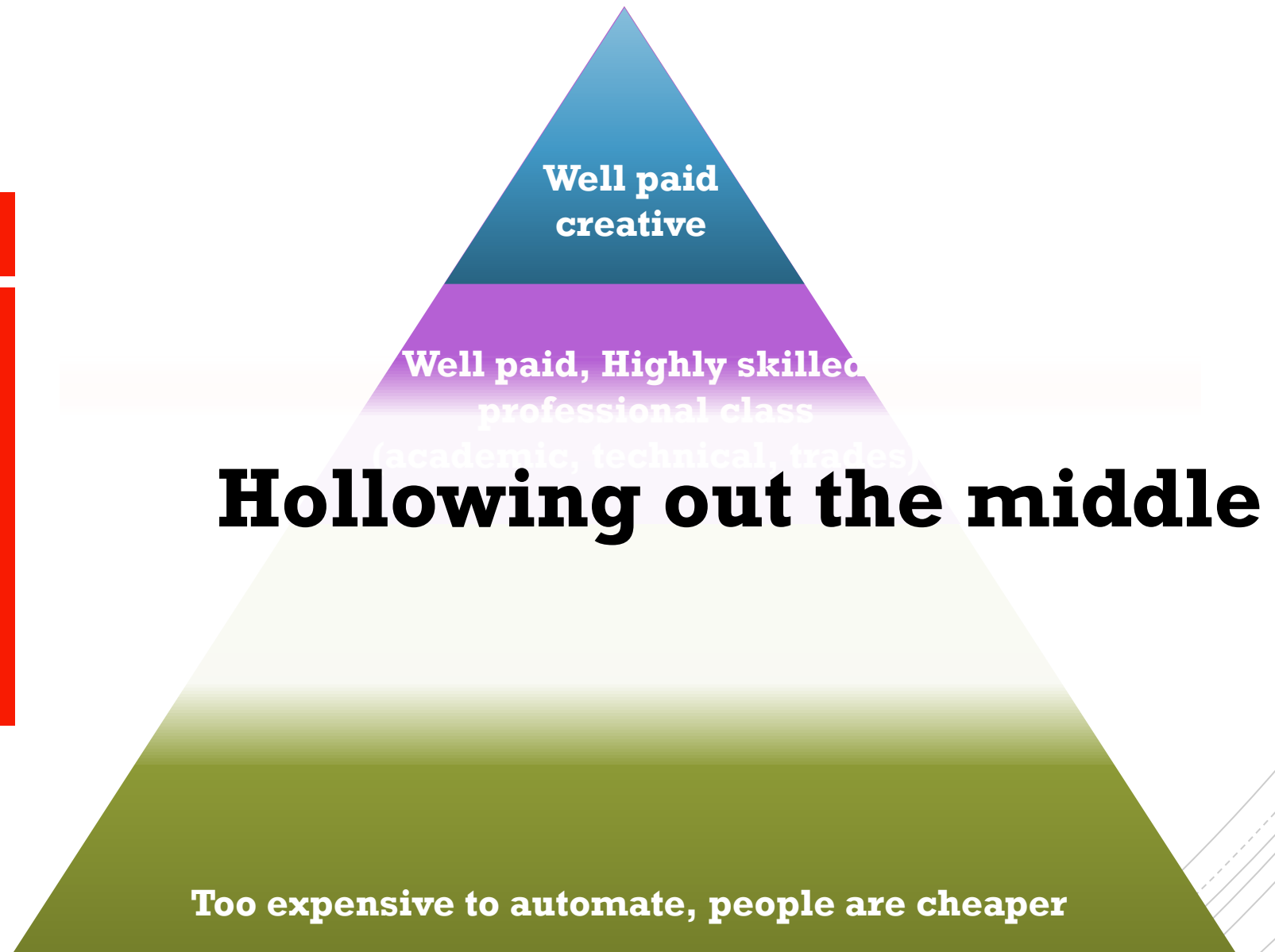
Jobs that are creative, dealing with people or nature, cannot be

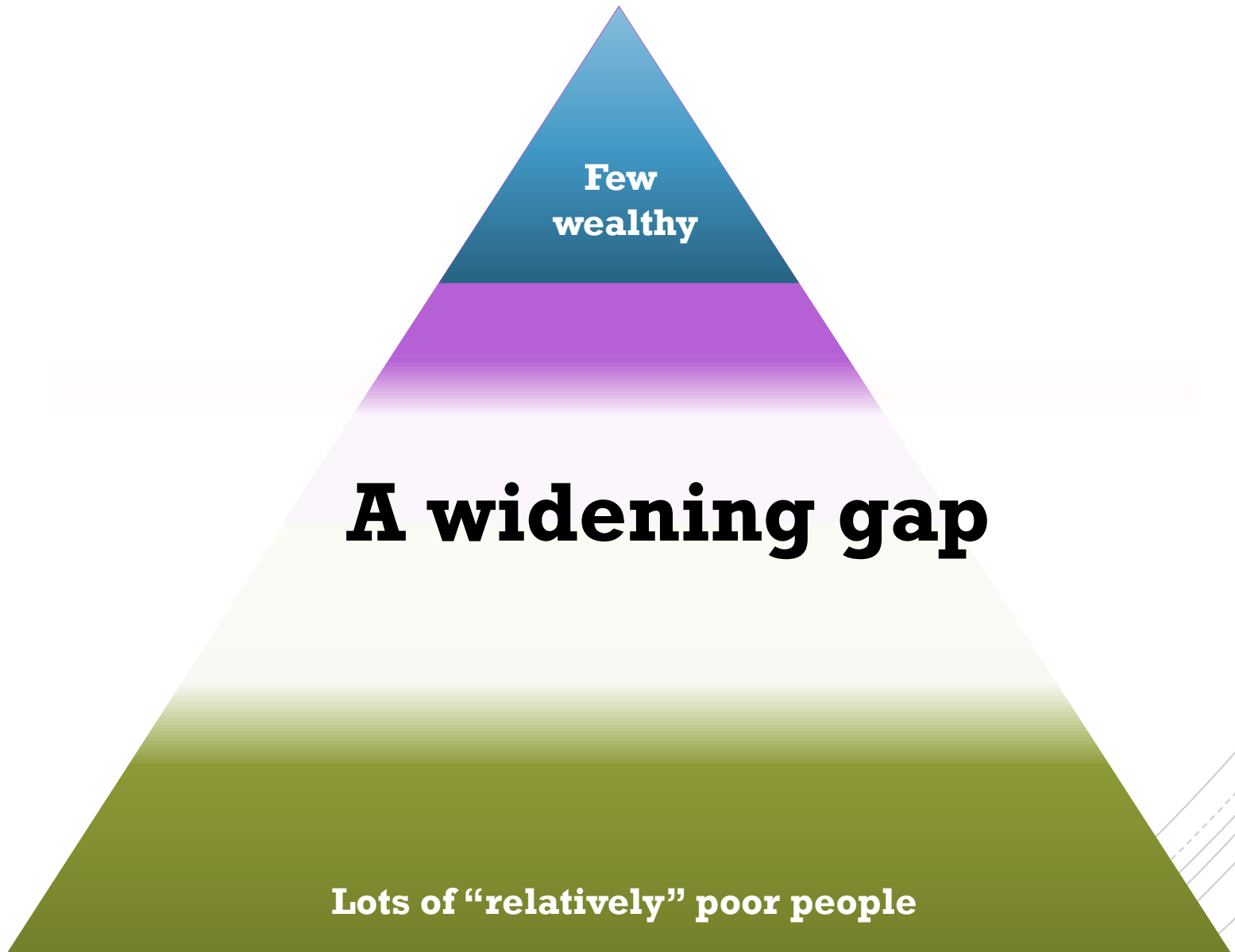The employment food chain

More jobs at the bottom than the top.

Well paid creative

Well paid, Highly skilled, professional class (academic, technical, trades)

In between, Office workers, skilled machinists

Unskilled, minimum wage, service sector

The Impact of Automation

Well paid creative

Well paid, Highly skilled professional class (academic, technical, trades)

Hollowing out the middle

Too expensive to automate, people are cheaper

Social Inequality

Few wealthy

A widening gap

Lots of "relatively" poor people
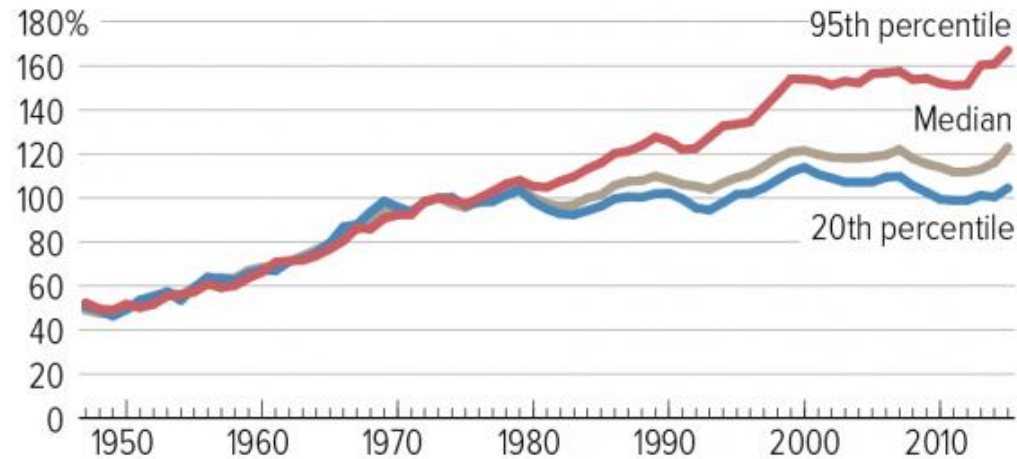
Income Gains Widely Shared in Early Postwar Decades — But Not Since Then

Real family income between 1947 and 2015, as a percentage of 1973 level

95th percentile

Median

20th percentile

Income Concentration at the Top Has Risen Sharply Since the 1970s

Share of total before-tax income flowing to the highest income households (including capital gains), 1913-2015

Top 1 percent

Top 0.5 percent
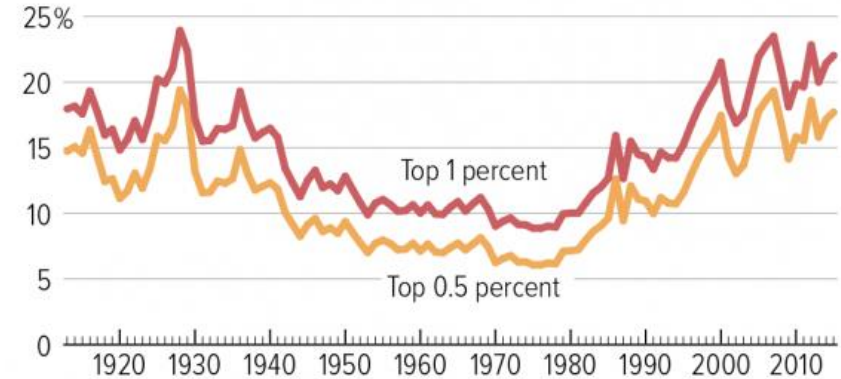
Source: Emmanuel Saez, based on IRS data

CENTER ON BUDGET AND POLICY PRIORITIES | CBPP.ORG

- The computer era started in the 1970's
- Since then the US is rapidly regressing to Victorian/medieval income distributions

- Is it a co-incidence?

- In the US, most people did not see any "real" income increases in over 20 years and some not much in 40 years.

- Everything changed in the 70's

Extreme example
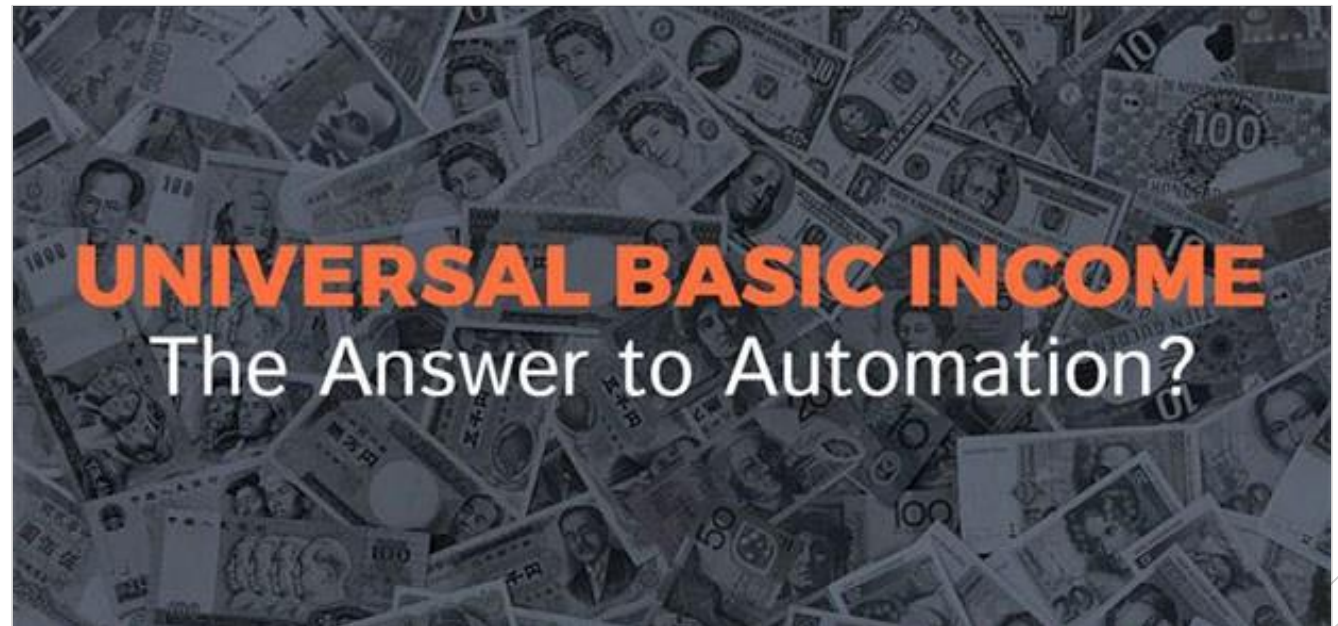
If a factory or shop or office were automated fully

There would be no employees

The owners would make a fortune

If every shop, office, factory, was automated who'd have the money to buy anything?

As a result…

- It's a real problem, often explored in sci-fi novels

- Some interesting examples of how this could all go so very wrong

UNIVERSAL BASIC INCOME
The Answer to Automation?

- **Are we on the right path?**

- **What's your role in this future?**

- **Should we be "Luddites"?**