

AI applications in industry

Types of AI

- Narrow/Weak – specific task
 - eg Voice or image recognition (Alexa, Siri)
- General/Strong – replicates human intelligence across many tasks
 - Largely theoretical
- Superintelligent – surpasses human intelligence in all aspects
 - Still speculative

What is *Narrow/Weak* AI?

- It is behaviour by a machine that has characteristics of human intelligence
- What are the key characteristics of intelligence?
 - The ability to apply knowledge gained from one field to a different field
 - If continuing to learn, not always giving the same answer to the same question
 - Weighing the alternative answers to a question
- AI behaviour occurs due to the software being executed
 - If it always gives the same answer to the same question, it's not AI – it's deterministic
 - AI software differs from other types of software in that its behaviour is due to large quantities of underlying data – usually a Large Data Model (LDM) or a Large Language Model (LLM). It may have access to this data during execution, or it may have been previously trained on the data

Types of *Narrow/Weak* AI

- Supervised learning
 - Trained for a specific task
- Transfer learning
 - Applies specific training to a different task
 - Currently being developed

Applications of Narrow/Weak Supervised learning AI

- Healthcare
 - Diagnosing diseases
 - Examining medical images for known patterns
 - Suggesting possible diagnoses
 - Ranking patients by urgency of need
 - Predicting patient outcomes
 - Analysing complex factors
 - Utilising large datasets
 - Personalising treatment plans
- Banking and finance
 - Analysing past audio recordings and paper records
 - Huge quantities of historical audio and paper records
 - Categorising by factors, allowing searching
 - Detecting fraud patterns
 - Multiple factors
 - Large datasets
 - Ranking by risk level
 - Algorithmic trading
 - Risk assessment
- Agriculture
 - Analysing drone videos
 - Weed identification
 - Autonomous machinery
- Transportation
 - Route planning
 - Google Maps knows
 - where the slow traffic is right now
 - how long a journey would usually take
 - Bus apps predict arrival times
 - Driverless vehicles
 - Warehouse optimisation
- Retail
 - Improve first level telephone service
 - Eliminate “Press 1 for accounts, 2 for technical”
 - Customer describes their need in natural language
 - Demand forecasting
 - Personalised marketing

Commercial factors affecting take-up of AI by industry

- Benefits
 - Elimination of human factor
 - 24/7 availability
 - Reducing manual work
 - Prompt decision-making
 - Functioning in hazardous conditions
- Risks
 - Governance networks need to change
 - Use of unstructured and multi-modal data
 - Single-cell risk scrutiny no longer adequate
 - Exposure of data to non-compliant regimes
 - Violation of licence conditions
 - Leakage of personal data
 - Leakage of intellectual property

Technical factors affecting take-up of AI by industry

- Speed of response required
 - < 1 second eg driverless vehicles, algorithmic trading
 - < 5 seconds eg chatbots, search engines
 - < 24 hours eg analysing historical data
- Accuracy required
 - Life and death eg driverless vehicles
 - Major commercial risk eg algorithmic trading
 - Minor commercial risk eg route planning
 - Personal inconvenience eg chatbot, Google Maps
- Processing power required
 - Needs large remote engine to respond to every query that needs a real-time response
 - Can use a smaller, local, engine that responds quickly and is periodically re-trained from a large remote dataset
 - Engine runs occasionally eg to analyse historical data

Is Industry X actually using AI or just saying that it does?

- A recent survey of organisations in the East of England found that
 - 25% say that they use AI
 - How many of these were only using an AI-based search engine?
 - 75% say that they plan to use AI within the next 12 months
 - Well, they would say that, wouldn't they?
 - They wouldn't want to be seen as technophobic
 - Recruitment to entry-level white-collar jobs is 32% lower this year
 - The most common reason given was AI
- If an organisation is leveraging AI significantly
 - It probably gives them competitive advantage
 - They're not going to release too many details

Case studies – on the record vs off the record

- A UK-based insurance company
 - On the record – no news
 - Off the record - is shedding up to 75% of its risk management department because of AI
- An international investment bank
 - On the record – uses AI in algorithmic trading
 - Off the record – AI has so far been rejected for algorithmic trading because the risks and rewards can't be adequately evaluated
- An international HR/Payroll bureau
 - On the record – no news
 - Off the record – has been using AI for more than 12 months to write user-facing software. Most of this software passes automated testing without modification.

Case study – cleaning address data

- A company receives customer street address data from a 3rd party
 - The data is complete and accurate for 60% of UK addresses, less for foreign addresses
 - No alternative supplier is viable
 - Provider quotes a high price and a long lead time for improving quality
- Can the data be cleaned after receipt?
 - This is not a real-time need. Data is received in hourly batches.
 - New data can be compared to existing data that is complete and accurate
 - a UK postcode determines, at minimum, city, district and street
 - UK data with either the city, or district, or street missing or inaccurate can be fixed
 - This increases completeness and accuracy of UK data to 73%.
- Google provides, at a cost per record, an API (called Google Place) that accepts partial, inaccurate or muddled street address data
 - The Google engine uses AI
 - Accurate and high-confidence data can be returned in 91% of UK cases
 - Also 85%+ accurate for all 1st-world and 2nd-world countries. Less good for 3rd-world countries, but that data is not used by the company
- The average quality of the company's customer data gradually increases over time
 - The proportion of addresses that need to be referred to Google decreases, and therefore Google's charges decrease
- Is this an example of AI?

Case study – cleaning telephone number data

- The same company also receives customer phone numbers
 - Less than 10% of these, when dialled, result in a ringing tone
- The phone numbers have historically been sent to an outside agency, along with customer names and street addresses
 - This costs money
 - The agency has been taken over and their data processing is now only carried out in the USA
 - GDPR prohibits this data transfer
 - Can the data be cleaned to an adequate accuracy in-house?
- The company's customer records contain more information than just name and address
- Data is freely and publicly downloadable that associates characteristics of a phone number (eg country code, area code, length) with the postal town for most countries.
- For each phone number, multiple customer characteristics are evaluated to determine the likely components of the phone number, in descending order of probability
- This results in a unique match in 95% of cases
- Multiple matches are flagged for inspection by human eye
- 99.6% of automatic matches result in phone numbers that, when dialled, result in a ringing tone
- Is this an example of AI?
 - It doesn't use a Large Data Model or a Large Language model
 - Because it references changing information, it doesn't always give the same answer