Artificial Intelligence

VYNYL

Your Strategic Technology Partner | vynyl.com

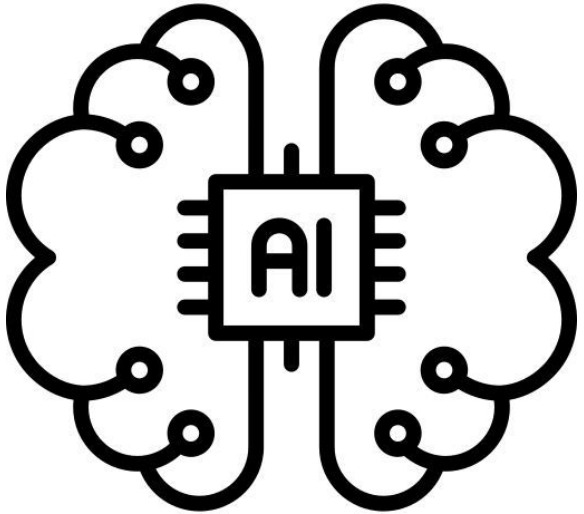
What is Artificial Intelligence?

"The goal of work in artificial intelligence is to build machines that perform tasks normally requiring human intelligence" - Nils J Nilsson

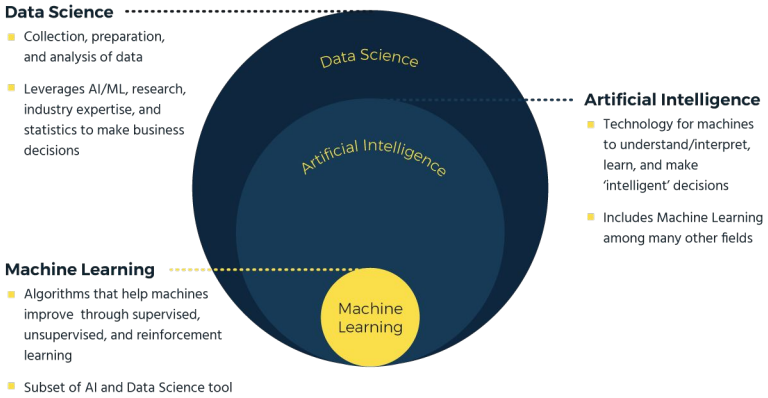
"We define AI as the study of agents that receive [input] from the environment and perform actions" - Stuart Russell & Peter Norvig

"Artificial intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment." - Nils J Nilsson

"Intelligence is the capacity of an information-processing system to adapt to its environment while operating with insufficient knowledge and resources" - Pei Wang



AI vs. Data Science vs. Machine Learning



Data Science, Machine Learning, and Artificial Intelligence

Data Science is focused on uncovering information within data. Data Science uses both Machine Learning and Artificial Intelligence and it comprises all aspects of data collection, data preparation, and data analysis.

Machine Learning is the science of getting computers to learn and act like humans do while improving their learning over time in an autonomous way. It is a subset of AI and draws on statistical techniques and algorithms.

Artificial Intelligence aims to bring human intellect to machines. It is focused on creating machines that solve complex problems, perceive the world, understand human communication, and make decisions.

Artificial Intelligence Timeline

1955: John McCarthy coins the term “Artificial Intelligence”

1964: First chatbot created

1986: First self-driving car

1997: Deep Blue beats Kasparov

2008: Siri lets us talk to our smartphones

2011: IBM Watson

2012: Neural networks and deep learning (beginning of current statistical computing model)

2014: Amazon Alexa

2020: OpenAI releases GPT-3 (text-to-text)

2021: OpenAI releases DALL-E (text-to-image)

Strong vs. Weak Artificial Intelligence

Human intelligence and consciousness are the benchmarks used to measure AI capabilities.

“Weak” AI is AI that can perform specific, limited tasks, such as play chess, generate text or images, or translate languages.

“Strong” AI is AI that can match or exceed human performance in every way.

IS THE HUMAN BRAIN A KIND OF LIVING COMPUTER?

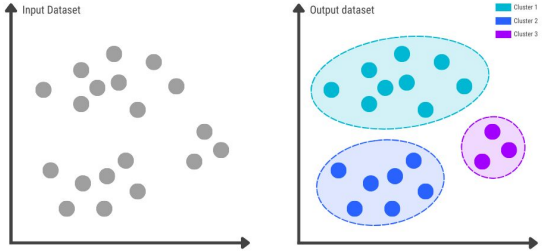
WOULD A STRONG AI BE CONSIDERED CONSCIOUS?

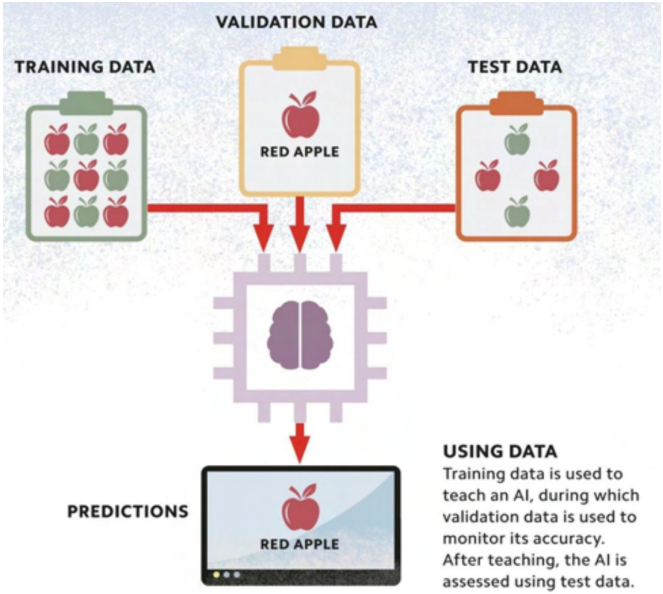
Types of Learning

AI can operate using either Supervised Learning or Unsupervised Learning.

With Supervised Learning, data scientists use structured and unstructured data to build (“train”) a model that is then used to classify things into categories.

With Unsupervised Learning, the algorithms find patterns in data on their own. This typically involves “clustering.”





Role of Data

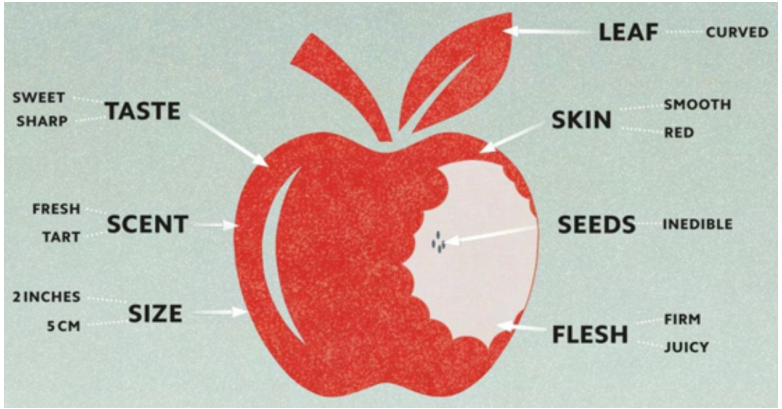
Without good data, AI-based systems will not work. Data needs to be “clean” and “complete” and you need to have enough to create three distinct pools: training data, validation data, and test data.

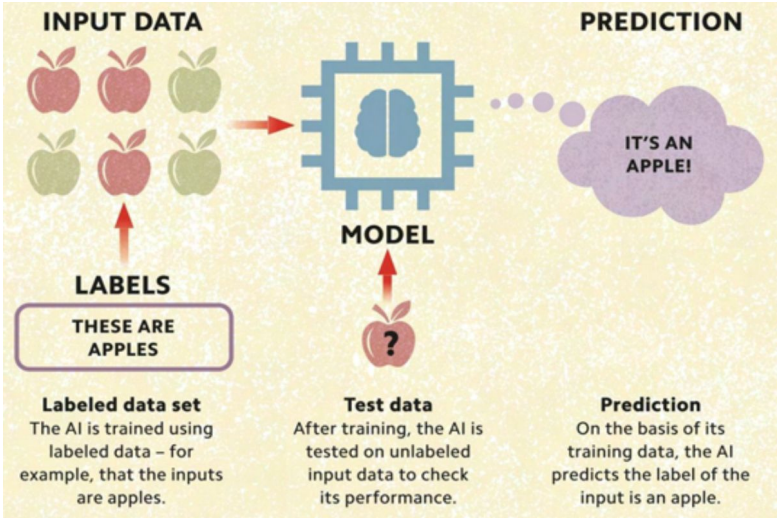
Failing to create and enforce good data governance is the single most prevalent cause of failure in AI-based systems.

Data Readiness

Data scientists identify/define "features" within data. A feature is a characteristic, such as a pattern of pixels, that an AI-based system can use as an input to predict a label, which becomes the output.

In Supervised Learning, particular features are associated with labels by processing training data sets that have already been labeled - typically by a human.



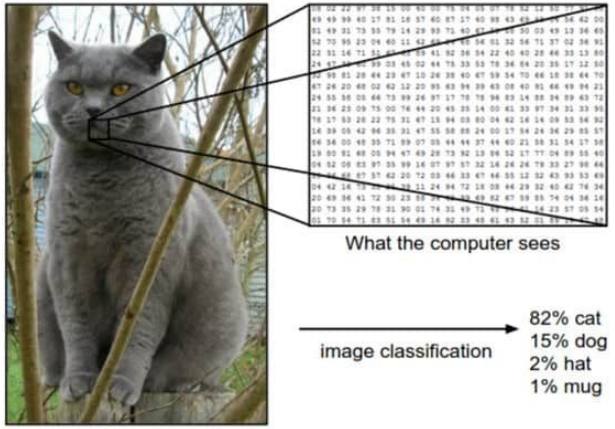


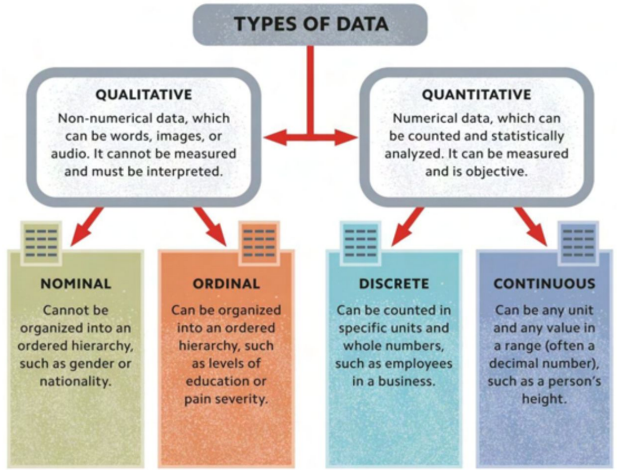
Types of Data

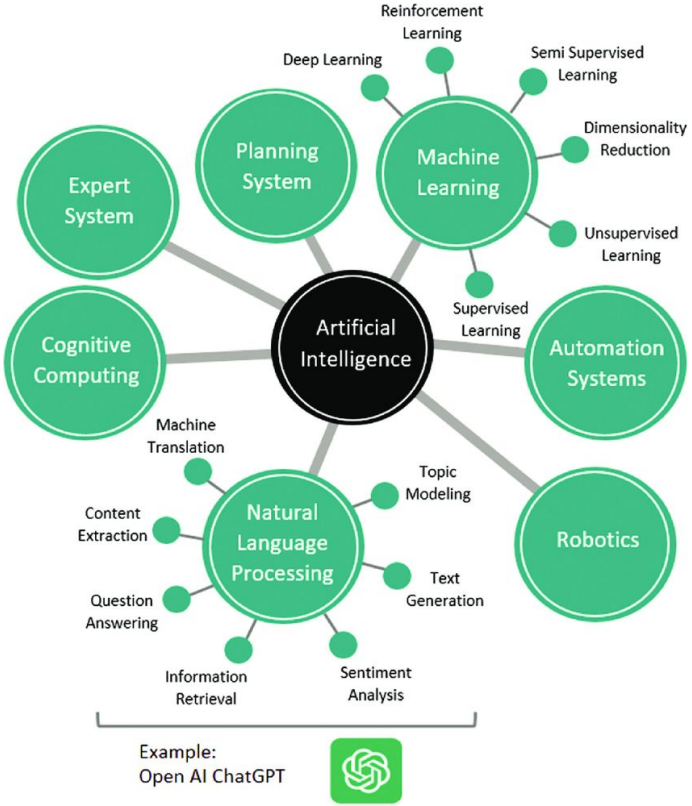
Data takes many forms, including numbers, text, sounds, and images.

Computer data is all numbers - sequences of 1s and 0s - that are collected and processed according to the program.

Data is classified according to whether it can be measured and how that measurement is done.







Using Artificial Intelligence

There are many different kinds of AI-based systems.

The focus on AI today is driven mainly by the availability of effective generative AI, which are primarily powered by Large Language Models (LLMs) such as OpenAI's ChatGPT.

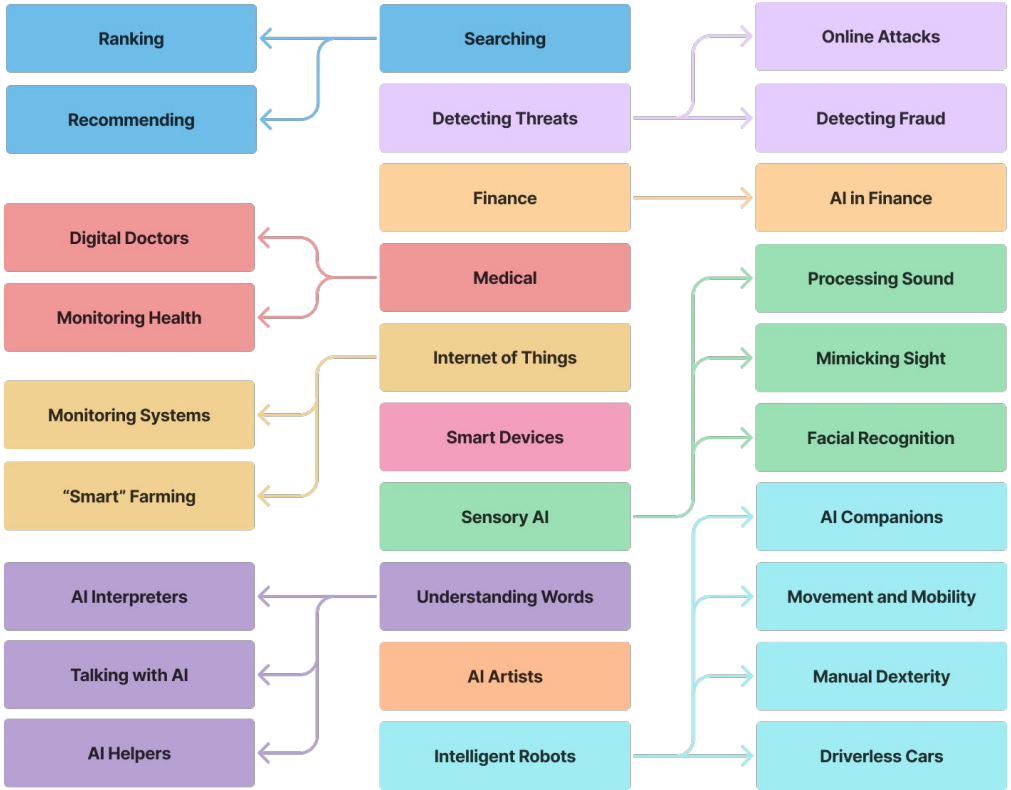
There are many existing AI-based systems in the state already, but they are mostly called "analytics" or "machine learning" systems.

Using Artificial Intelligence

Both Citizen Engagement and Operational Efficiency improvements are straightforward targets for AI-based systems.

The current largest barrier to adoption of AI-based systems across state departments (in all states, not just Idaho) is the lack of data sharing, data standards, and focus on tailoring data collection with the goal of creating operational efficiencies.

The possible universe of new systems and system enhancements is large.



AI Application Domains

Transportation

Fully autonomous vehicles coming online

Will create additional opportunities: flying vehicles such as delivery drones, personal robots

Will impact vehicle ownership trends, urban organization, and individual use of time in the short and medium terms

Healthcare

Changes in clinical diagnostic workflow

Increased data mobility plus personal control over health data

Clinician cognitive support based on free-form dialogue systems

Healthcare robotics and improved analysis of imaging trending towards mostly-automated radiology

Increased availability and use of healthcare analytics with a bent towards patient self-direction

Increased use of AI (robotics, data mining, mobile applications, assistive devices) in elder care

Education

Intelligent tutoring systems, teaching robots, and learning analytics

Employment & Workplace

Skill shift as AI assistance is adopted into the workplace

Cognitive support for most or all knowledge work

Wholesale replacement of certain job categories with AI-based systems

Public Safety & Security

Increased use of CCTV and other sensor platforms with onboard anomaly detection

Drones

Predictive policing

Home/Service Robotics

Vacuum cleaners, mowers, pet care, home care assistance, low cost and safe robot arms

Most Promising Opportunities in the Near Term

AI FOR AUGMENTATION / COGNITIVE ASSISTANCE

Drawing Insights: chemical informatics, drug discovery, identification of operational bottlenecks

Decision-Making Support: deep mining of patient history to discover undesirable drug interactions, more highly-integrated driving assistance, data summarization (medical, research, legal), prediction and risk-scoring (medical, agriculture), operational triage and streamlining

AI Assistants: text recognition from images or the ambient environment, real-time translation, research support, dexterity support (surgical robotics, disability support)

AI AGENT SYSTEMS

AI-based automation in chemistry and biology

Automation of medical billing (conversion of handwritten forms into structured fields, interpretation of other unstructured data)

Monitoring and adjustment of operations in fields like clean energy, logistics, and communications

Tracking and communication of health information to the public

Smart cities

Primary limiting factors are availability and quality of data, malpractice and other compliance concerns, and regulatory requirements.

Most Pressing Dangers in the Near Term

TECHNO-SOLUTIONISM

AI is a tool, not a panacea

Data is always the limiting factor

Monitoring and an ombuds process are critical safety valves

STATISTICAL JUSTICE / HEALTHCARE

Predictive policing, AI-driven sentencing, and diagnostics are all very sensitive to the content of their training data

Due process and access to redress often require insight into AI-systems that is not available

AUTOMATED/SCALED DISINFORMATION

Wide availability of video and voice generation tools is already enabling “deep fake” video and audio

Neither technical expertise nor access to special technical infrastructure is required to deploy bot networks on social media platforms

Do Big Things With Confidence

Artificial Intelligence

VYNYL

Your Strategic Technology Partner

vynyl.com