AI World

AI in Computer Science

Operating Systems (OS)

Database (DB)

Computer Networks (CN)

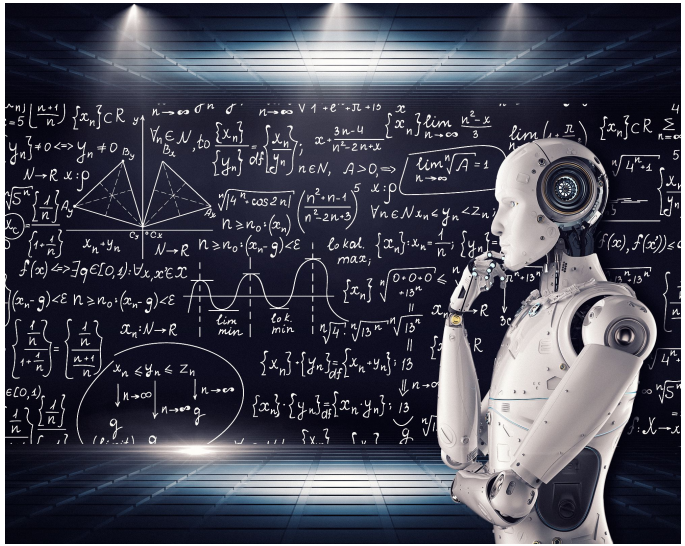
Security

Software Engineering (SE)

Artificial Intelligent (AI)

What is AI?

AI (Artificial Intelligence) is a field of computer science focused on creating intelligent machines capable of mimicking human-like behavior and problem-solving.



Shortly, can be defined as

A software or machine that **thinks like human or acts like human**

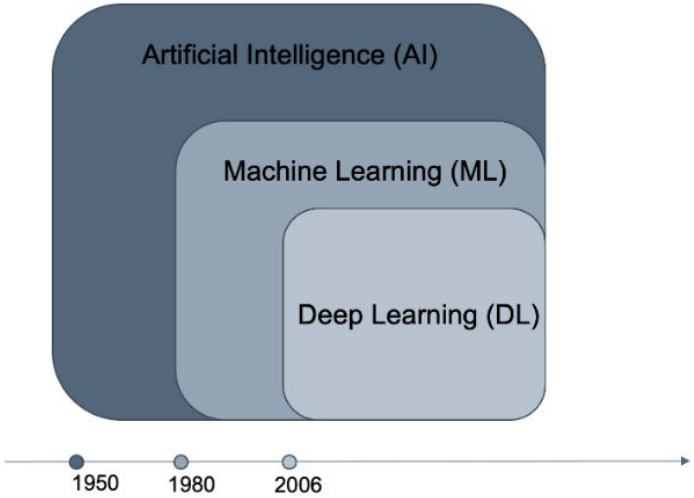
AI vs Data Science and Data Analytics

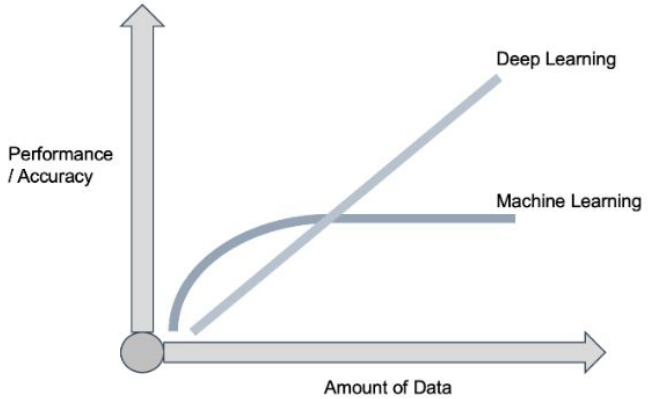
Artificial Intelligence (in Computer Science) is a broad field that focuses on creating intelligent machines capable of performing tasks that typically require human intelligence.

Data science (in Statistics) involves extracting insights and knowledge from data using various techniques, such as statistical analysis, machine learning, and programming, to solve complex problems and make informed decisions.

Data analytics (in Business) is the process of examining large datasets to uncover patterns, trends, and insights that can inform decision-making and drive business strategies.

In summary, AI is the broader concept of creating intelligent machines, while data science and data analytics are specific approaches for extracting insights and making use of data.


Artificial Intelligence (AI)
Machine Learning (ML)
Deep Learning (DL)
1950
1980
2006


Deep Learning
Performance
/ Accuracy
Machine Learning
Amount of Data

What is **Learning**?

Using past experiences to improve future performance

What is Machine Learning?

Experience for Machines:

In the context of machine learning, experiences are represented by **data**.

This data can be collected from various sources and in different forms like numerical, categorical, text, image, etc.

Performance Improvement:

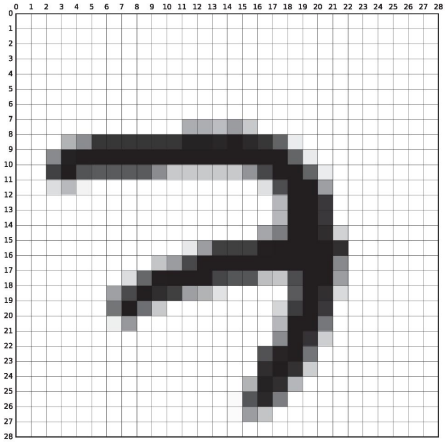
The goal of machine learning is to improve the **accuracy** of predictions or decisions made by the model over time.

The concept of 'improvement' is determined based on the specific task at hand. It could mean reducing error rates in predictions, increasing accuracy, or optimizing towards a particular goal.

Learning from data

Why learning approach?

- Why not rule-based approach?
  - Handwritten digit recognition



(**a**) MNIST sample belonging to the digit '7'.

(**b**) 100 samples from the MNIST training set.

Top 10 Algorithms every Machine Learning Engineer should know

1. Naïve Bayes Classifier Algorithm

2. K Means Clustering Algorithm

3. Support Vector Machine Algorithm

4. Apriori Algorithm

5. Linear Regression Algorithm

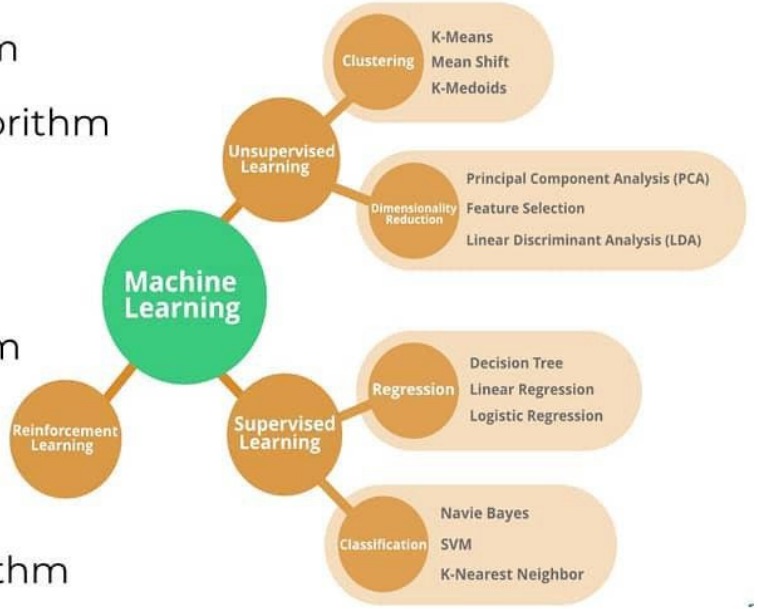
6. Logistic Regression Algorithm

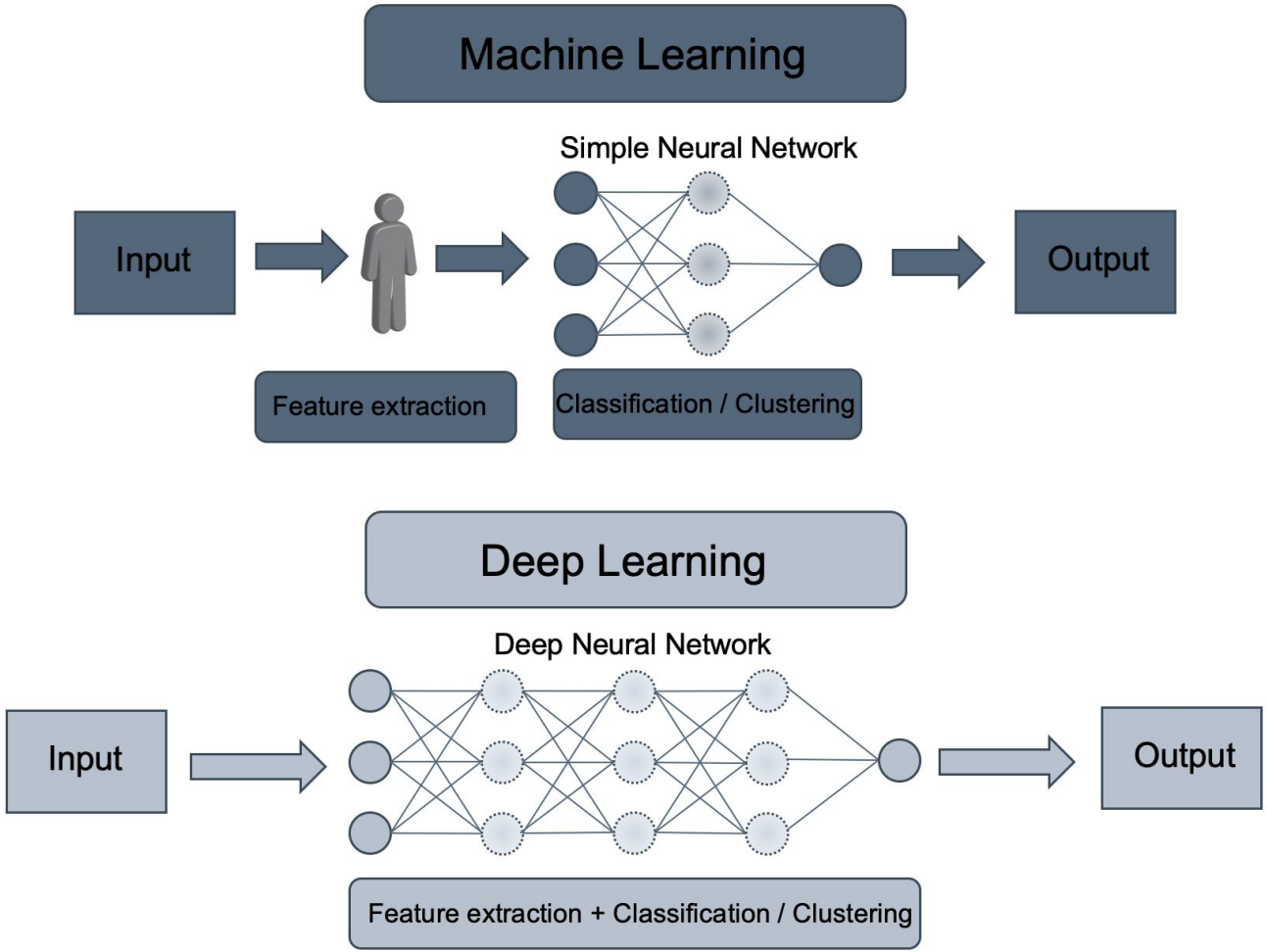
7. Decision Trees Algorithm

8. Random Forests Algorithm

9. K Nearest Neighbours Algorithm

10. Artificial Neural Networks Algorithm

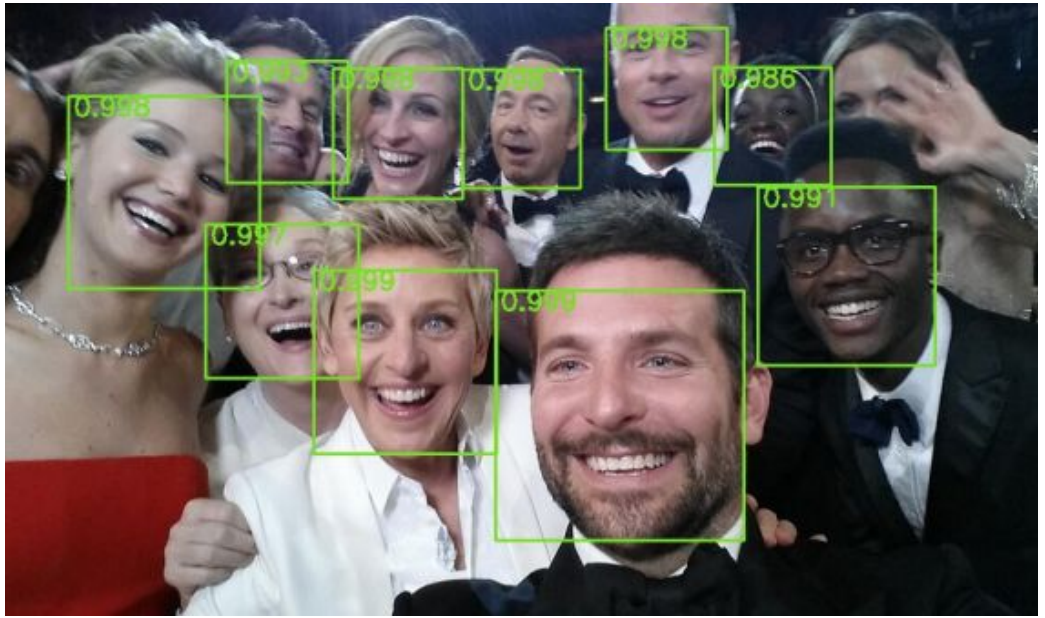



Machine Learning
Simple Neural Network
Input
Output
Feature extraction
Classification / Clustering
Deep Learning
Deep Neural Network
Input
Output
Feature extraction + Classification / Clustering

Let's see what we can do with AI by looking at examples.

Examples

Object Detection



Object Recognition

https://www.youtube.com/watch?time_continue=1&v=MPU2HistivI

Machine Learning in Finance and Business

9 Out Of 10 Hedge Fund Stars Will Use Ai In 2023. (New Market Makers Survey Revealed)

NEWS PROVIDED BY
Market Makers →
Jan 17, 2023, 05:00 ET

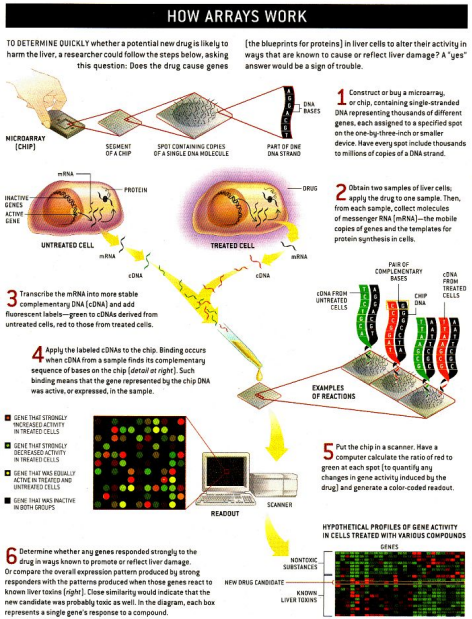
LONDON, Jan. 17, 2023 /PRNewswire/ -- In a new survey by Market Makers, the top 50 hedge fund traders are off to a great start in 2023 and their portfolios are set to surpass benchmark returns once again.

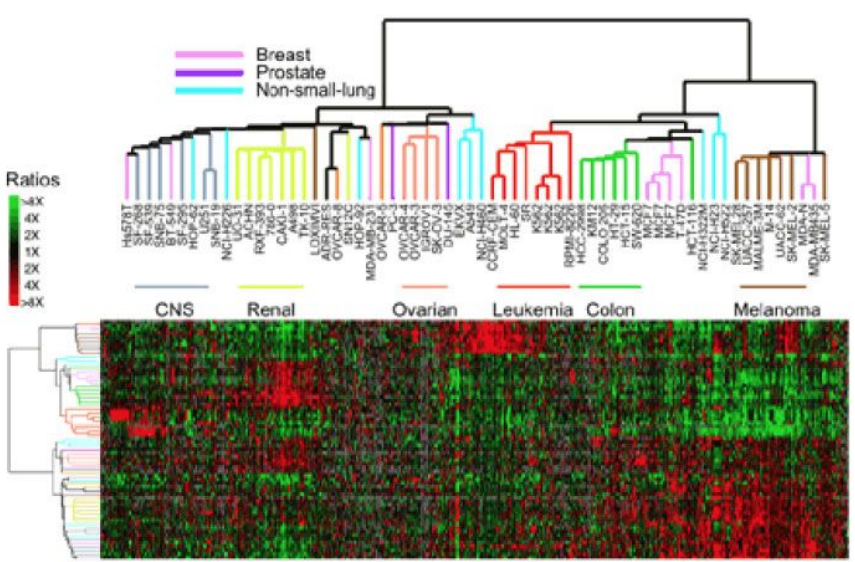
A new analysis of the top 50 hedge funds was conducted by Market Makers this year. In 2023, nine out of ten hedge fund traders will use artificial intelligence to achieve portfolio returns. As interest rates soar, even cash-rich investors are pulling back on risky human powered trading and investing in Ai.

Microsoft's $1 billion investment into OpenAI may be one of the shrewdest bets in tech history. OpenAI released AI ChatGPT and is in discussions to

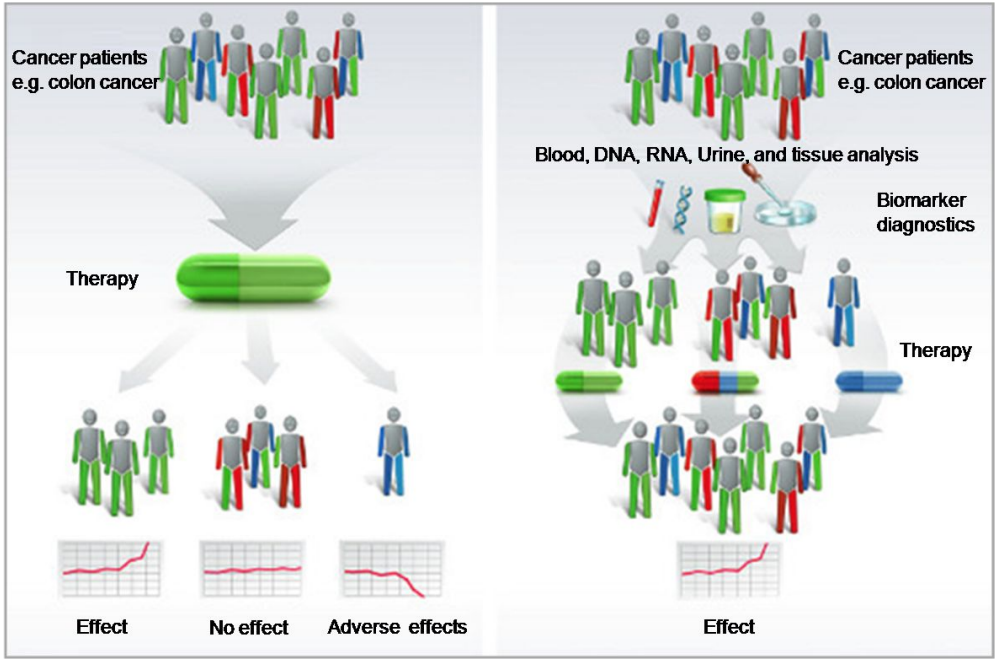
In a new survey by Market Makers, the top 50 hedge fund traders are off to a great start in 2023

Bioinformatics





Bioinformatics

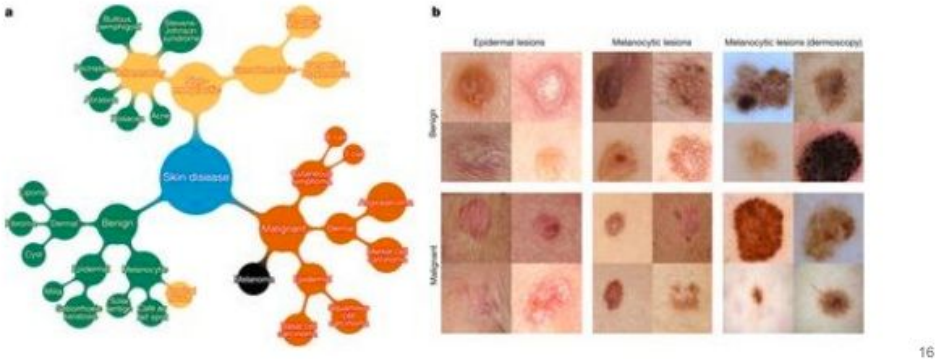


Medical Image Analysis

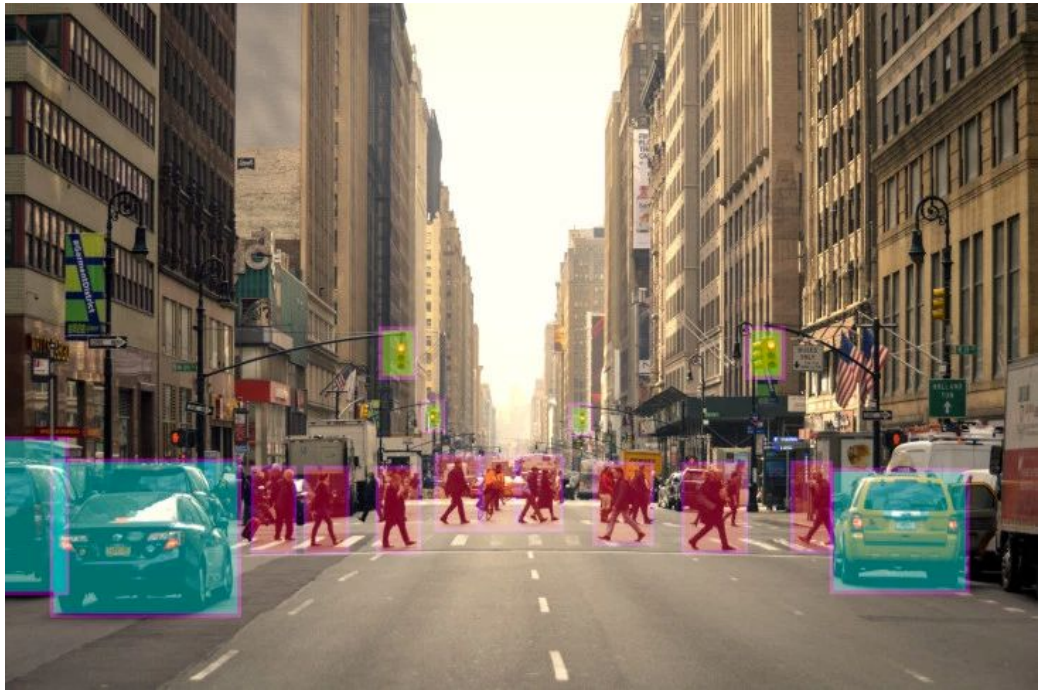
Classification: skin cancer detection

Images organized in a tree taxonomy of 2032 diseases (by medical experts)

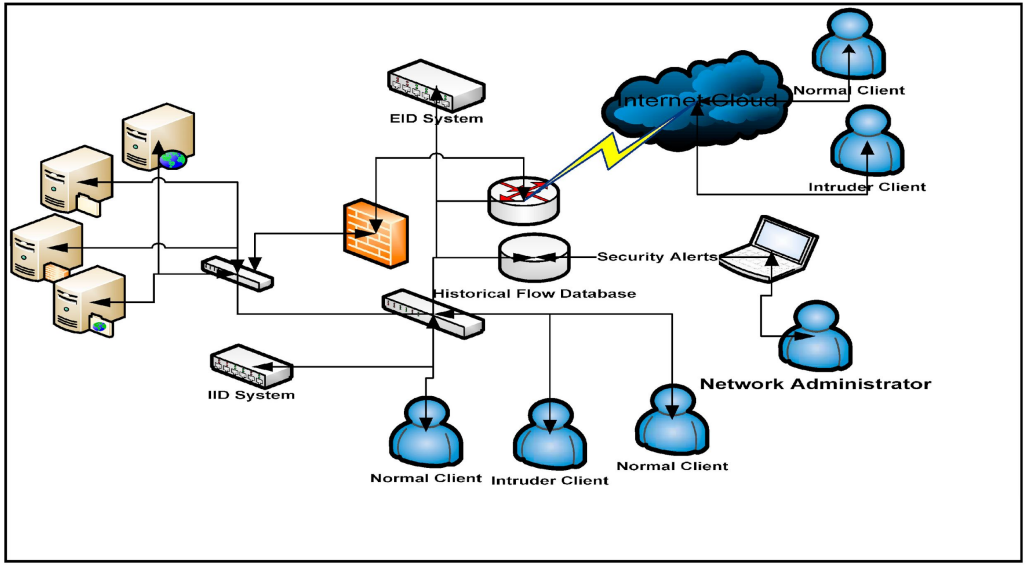
CNN trained **757** disease classes: a disease partitioning algorithm to generate classes clinically and visually similar



Robotics



Security


EID System
Internet Cloud
Normal Client
Intruder Client
Security Alerts
Historical Flow Database
IID System
Network Administrator
Normal Client
Intruder Client
Normal Client

Recommender System

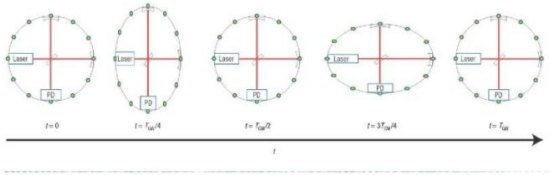
Not only Computer Science

- Physics
- Psychology
- Biology
- Chemistry
- Civil Engineering
- Electrical Engineering
- Mechanical Engineering
- Education
- Business
- Sports

Physics:
GW detection

Brief introduction to GW astronomy

Gravitational waves, along with black holes and the expansion of the Universe, are among the key predictions of Einstein's general theory of relativity (GR), our best theory to date for gravitation. GWs are emitted by time-varying configurations of mass-energy and propagate outwards from the source at the speed of light. The effect of a passing GW is to stretch and squeeze space itself.



The NSF funded twin Laser Interferometer Gravitational-Wave observatory (LIGO) detectors are pioneering the observation of astrophysical phenomena through the GWs they emit. GWs are extremely hard to detect: the LIGO detectors need to measure the stretching and squeezing of space by 10^{-18} m, one-thousandth the diameter of a proton, to be able to detect incoming GWs from distant astrophysical sources.

Figure 3 The two LIGO detectors at Hanford, Washington (left) and Livingston, Louisiana (right). Each L-shaped interferometer has 4 km long optical cavities.

The LIGO detectors discovered their first GW signal, produced by the collision and merger of two black holes, in 2015. This was such a long-awaited and momentous event in 21st century science that it took just

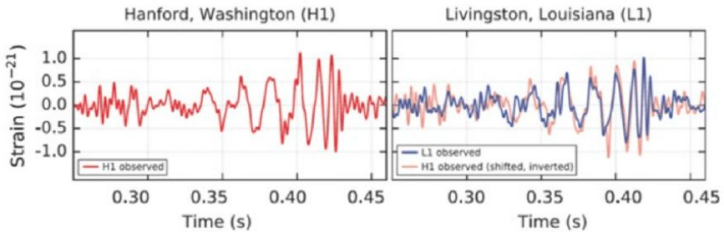
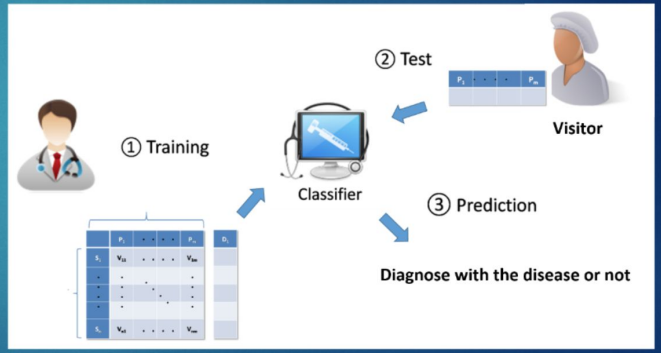


*Figure SEQ Figure * ARABIC 2 The LIGO detectors continuously measure*

Psychology: Prognosis of Psychiatric disease

Application to Prognosis of Psychiatric Disease using genotype data

- Prognosis System
  - Classifier: Support Vector Machine
  - Training data
    - 155 patients (samples)
    - 1029 CNVs (features)
  - Test
    - Leave-one-out
  - Accuracy
    - Around 75%

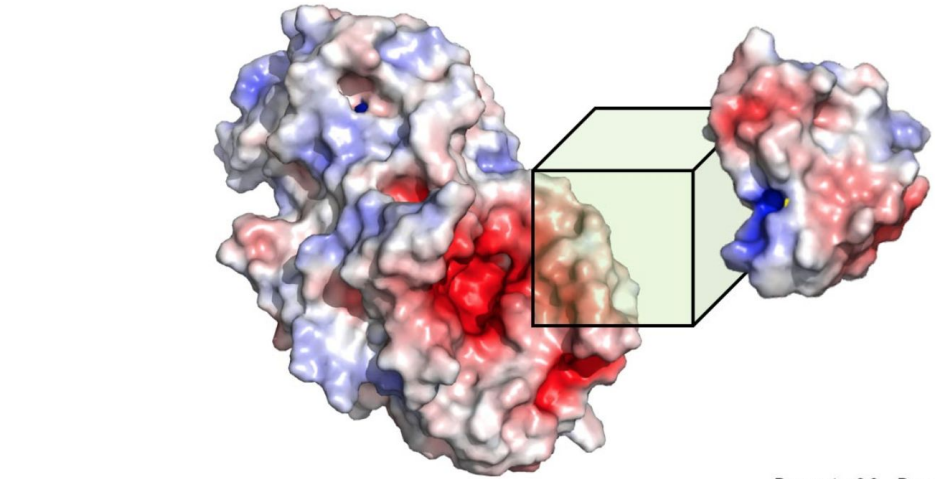


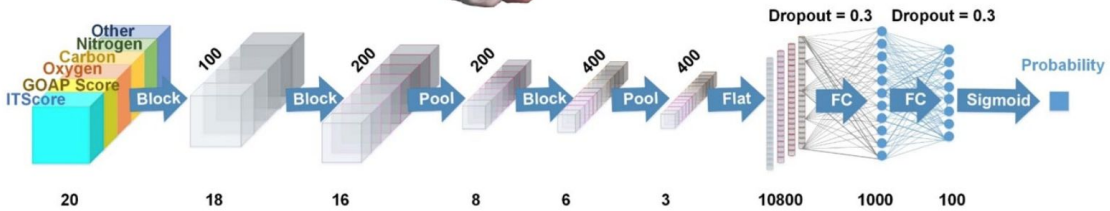
Biology:
Drug Design

Creating Better Drugs With Deep Learning, 3D Technology and Improved Protein Modeling

TOPICS: Machine Learning Pharmaceuticals Purdue University

By PURDUE UNIVERSITY JANUARY 9, 2020





Chemistry: Material Design

Article | Open Access | Published: 27 August 2019

A property-oriented design strategy for high performance copper alloys via machine learning

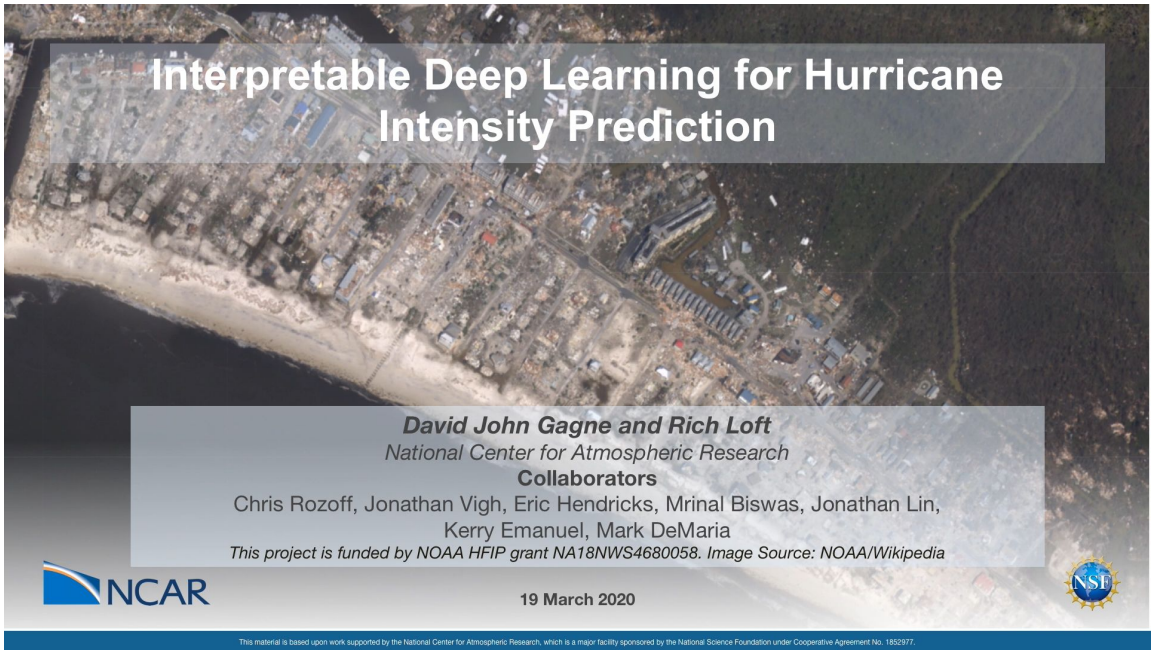
Changsheng Wang, Huadong Fu, Lei Jiang, Dezhen Xue & Jianxin Xie

npj Computational Materials **5**, Article number: 87 (2019) | Cite this article

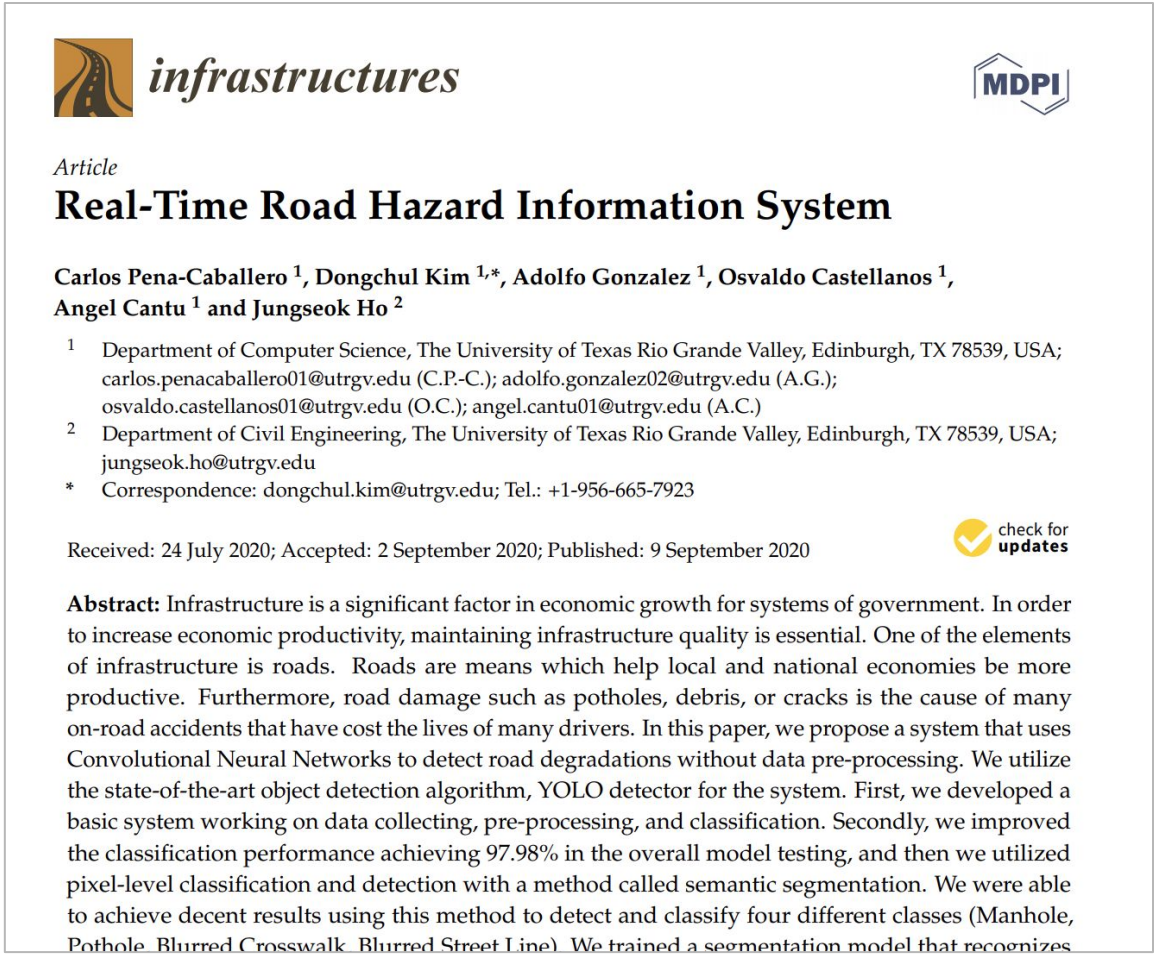
Abstract

Traditional strategies for designing new materials with targeted property including methods such as trial and error, and experiences of domain experts, are time and cost consuming. In the present study, we propose a machine learning design system involving three features of machine learning modeling, compositional design and property prediction, which can accelerate the discovery of new materials. We demonstrate better efficiency of on a rapid compositional design of high-performance copper alloys with a targeted ultimate tensile strength of 600–950 MPa and an electrical conductivity of 50.0% international annealed copper standard. There exists a good consistency between the predicted and measured values for three alloys from literatures and two newly made alloys with designed compositions. Our results provide a new recipe to realize the property-oriented compositional design for high-performance complex alloys via machine learning.

Civil Engineering: Forcast



Civil Engineering: Pothole detection



infrastructures

MDPI

Article

Real-Time Road Hazard Information System

Carlos Pena-Caballero [1], Dongchul Kim [1,*], Adolfo Gonzalez [1], Osvaldo Castellanos [1], Angel Cantu [1] and Jungseok Ho [2]

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[2] Department of Civil Engineering, The University of Texas Rio Grande Valley, Edinburgh, TX 78539, USA; jungseok.ho@utrgv.edu

* Correspondence: dongchul.kim@utrgv.edu; Tel.: +1-956-665-7923

Received: 24 July 2020; Accepted: 2 September 2020; Published: 9 September 2020

check for updates

Abstract: Infrastructure is a significant factor in economic growth for systems of government. In order to increase economic productivity, maintaining infrastructure quality is essential. One of the elements of infrastructure is roads. Roads are means which help local and national economies be more productive. Furthermore, road damage such as potholes, debris, or cracks is the cause of many on-road accidents that have cost the lives of many drivers. In this paper, we propose a system that uses Convolutional Neural Networks to detect road degradations without data pre-processing. We utilize the state-of-the-art object detection algorithm, YOLO detector for the system. First, we developed a basic system working on data collecting, pre-processing, and classification. Secondly, we improved the classification performance achieving 97.98% in the overall model testing, and then we utilized pixel-level classification and detection with a method called semantic segmentation. We were able to achieve decent results using this method to detect and classify four different classes (Manhole, Pothole, Blurred Crosswalk, Blurred Street Line). We trained a segmentation model that recognizes

Electrical Engineering: Analysis of Radar Signal

A Multiple Radar Approach for Automatic Target Recognition of Aircraft using Inverse Synthetic Aperture Radar

Carlos Pena-Caballero*, Elifaleth Cantu*, Jesus Rodriguez*
Adolfo Gonzales*, Osvaldo Castellanos*, Angel Cantu*
Megan Strait*, Jae Son† and Dongchul Kim*
*Department of Computer Science
†Department of Electrical Engineering
University of Texas Rio Grande Valley, Edinburg, Texas 30332–0250
Email: dongchul.kim@utrgv.edu

***Abstract*—Following the recent advancements in radar technologies, research on automatic target recognition using Inverse Synthetic Aperture Radar (ISAR) has correspondingly seen more attention and activity. ISAR automatic target recognition researchers aim to fully automate recognition and classification of military vehicles, but because radar images often do not present a clear image of what they detect, it is considered a challenging process to do this. Here we present a novel approach to fully automate a system with Convolutional Neural Networks (CNNs) that results in better target recognition and requires less training time. Specifically, we developed a simulator to generate images with complex values to train our CNN. The simulator is capable of accurately replicating real ISAR configurations and thus can be used to determine the optimal number of radars needed to detect and classify targets. Testing with seven distinct targets, we achieve higher recognition accuracy while reducing the time constraints that the training and testing processes traditionally entail.**

I. Introduction

Along with the improvement of radar technologies, as well as high demands in target identification in radar application, the Synthetic Aperture Radar (SAR) and ISAR automatic target recognition are powerful techniques to generate high-

successfully validated our simulator comparing visually the resulting images from our simulator versus the MSTAR dataset.

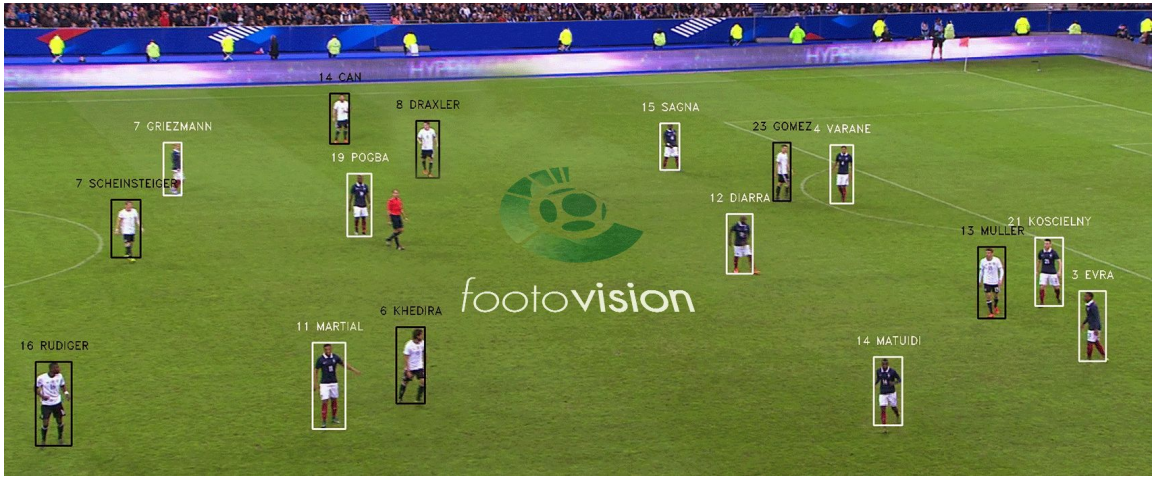
In this paper we present a novel approach to process and classify military aircraft in real time, which will effectively eliminate the necessity of human operator sift through all the generated images of the radar; our approach will consist in a multiple array of radars strategically place in an area that will help maximize the area of cover for target recognition giving almost a full 360 degrees of coverage around any one target, thus resulting in higher accuracies and faster classification, even when the weather conditions are not favorable (i.e. noise in the image).

Normally the ISAR methods include only one radar sending and receiving the electromagnetic waves bouncing off of a target (see Figure 2.a) this approach is called Mono-static radar, but our approach includes an array of strategically placed radars, where one send signals to the target and the rest receive the signal, in Figure 2.b we have mocked-up a possible scenario of this approach. We call our approach Multiple Mono-static radar. The arrangement of this paper is

Education:


How Machine Learning is revolutionizing Education Sector?
• Adaptive Learning
• Predictive Analytics
• Increasing Efficiency
• Personalized Learning
• Learning Analytics
• Accurately grading Assignments

Sports:


14 CAN
8 DRAXLER
15 SAGNA
7 GRIEZMANN
23 GOMEZ
4 VARANE
19 POGBA
7 SCHEINSTEIGER
12 DIARRA
21 KOSCIELNY
13 MULLER
3 EVRA
footovision
6 KHEDIRA
11 MARTIAL
16 RUDIGER
14 MATUIDI


FULAM SWANS
Goal Prob Actual: 66.1%
Actual Game Sequence
FULAM SWANS
Goal Prob Ghosting: 71.8%
League Average Ghost
FULAM SWANS
Goal Prob Ghosting: 41.7%
Manchester City Ghost

Applications

https://bee.utrgv.edu/share/deeplearningcustomerstories.pdf

https://data-flair.training/blogs/deep-learning-project-ideas/

https://www.pantechsolutions.net/blog/top-25-deep-learning-projects-for-engineering-students/

https://magpi.raspberrypi.org/articles/top-10-ai-projects

https://elitedatascience.com/machine-learning-projects-for-beginners

Applications

Legal
- Legal search
- Predicitve litigation
- eDiscovery

Energy & Utilities
- Pricing specific to customers
- Analytics on power consumption & demand
- Smart grid management

Hospitality
- Dynamic pricing
- Customer complaint resolution
- Social media feedback

Medical
- Diagnosis of diseases and medicine required
- Analysis of real time patient data
- Patient triage
- Speeding drug development

Financial
- Trading Algorithns
- Risk & Fraud analytics
- Credit & financial worth analysis

Manufacturing
- Telematics
- Operational monitoring
- Predictive Monitoring


FINTECH & INSURANCE
zestfinance
NUMERAI
Upstart
affirm
CAPE
ENDGAME.
DARKTRACE
cybereason
CROWDSTRIKE
OBSIDIAN
sparkcognition
Shift Technology
appthority
VERSIVE
SHAPE
perimeterx
vicarious
KINDRED
anki
UBTECH
brain corp
neurala
CloudMinds
HARDWARE
GRAPHCORE
Cerebras
Cambricon
EDUCATION
英语流利说 Liulishuo
Osmo
HR TECH
mya
textio
workey
ENTERPRISE
DataRobot
algolia
tamr
LEAPMIND
PETUUM
ELEMENT AI
TRIFACTA
CBINSIGHTS
ai.100
2018
HEALTHCARE
freenome
BABYLON
RECURSION
HEALTHCARE
TEMPUS
ARTERYS
AiCure
flatiron
AUTO TECH
Mighty AI
drive.ai
AEYE
COMMERCE
BQUIFI
Qapier
AGRICULTURE
BENSON HILL
prospera
PHYSICAL SECURITY
SHIELD AI
Deep Sentinel
RISK & REGULATORY COMPLIANCE
WorkFusion
SOCURE
onfido
text IQ
Merlin Intelligence
MARKETING, SALES, CRM
Amplero
INVOCA
afiniti
INSIDE SALES.COM
conversica
IOT
MAANA
Preferred Networks
FOGHORN
ORCAM
NEWS & MEDIA
SoundHound Inc.
BYTEDANCE
GEOSPATIAL ANALYTICS
Orbital Insight
Descartes Labs
LIFE SCIENCE
zymergen
LEGAL TECH
casetext
IT & NETWORKS
Moogsoft
SPORTS
SPORTLOGIQ
ESPORTS
MOBALYTICS
PERSONAL ASSISTANTS
sherpa
TRAVEL
FLYR
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applitools eyes


AGRICULTURE
TARANIS
BENSON-HILL
AUTO
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nuro
nexar
Mapillary
PERCEPTIVE AUTOMATA
pony.ai
DEEPMAP
MOMENTA
Iris Automation
AEYE
DEEPSCALE
HEALTHCARE
Butterfly Network
PAIGE
IDx
Atomwise
insitro
iz.ai
Ninamai
LeanTaaS
ARTERYS
mindstrong
Qventus
gauss
OWKIN
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SHIELD AI
FORTEM TECHNOLOGIES
依图 | YITU
商汤 SenseTime
2019
AI 100
CBINSIGHTS
FINANCE & INSURANCE
4Paradigm
DATAVISOR
BEHAVOX
AppZen
BIOCATCH
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HYPERSCIENCE
SEMICONDUCTOR
cerebras
Horizon Robotics
GRAPHCORE
MYTHIC
habana
thinci
SYNTIANT
TELECOM
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falkonry
C3.ai
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SIGNIFYD
ABEJA
AiFi
sift
MEDIA
AI FOUNDATION
ARRAIY
New Knowledge
REAL ESTATE
HOVER
SKYLINE
LEGAL, COMPLIANCE, & HR
EigenTechnologies
onfido
{LawGeex}
textio
ENTERPRISE TECH
TRAINING DATA
AI.REVERIE
defined crowd
Mighty AI
DATA MANAGEMENT
dataiku
dremio
MACHINIFY
H2O.ai
TRIFACTA
tamr
DataRobot
SIGOPT
CYBERSECURITY
AGARI
anodot
AREA 1
perimeterx
JASK
DEMISTO
VECTRA
SHAPE SECURITY
ADS, SALES, & MARKETING
GONG
Unbabel
gamalon
fullstory
bouncex
OTHER APPLICATIONS
AUTOMATION ANYWHERE
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ELEMENT AI
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sparkcognition
Orbital Insight
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SOFTWARE DEVELOPMENT
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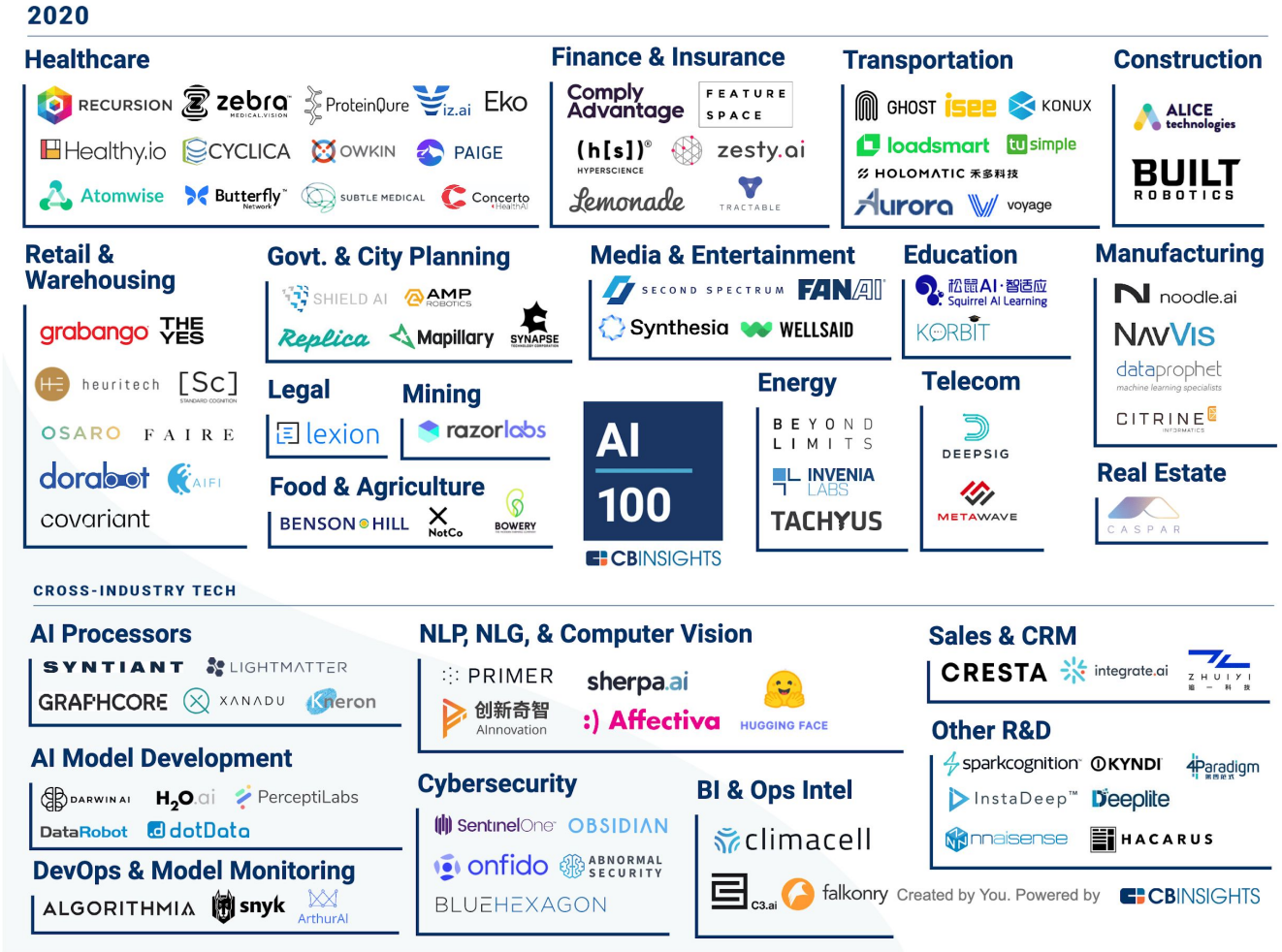
2020
Healthcare
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Eko
Healthy.io
CYCLICA
OWKIN
PAIGE
Atomwise
Butterfly Network
SUBTLE MEDICAL
Concerto HealthAI
Finance & Insurance
Comply Advantage
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Lemonade
TRACTABLE
Transportation
GHOST
isee
KONUX
loadsmart
tusimple
HOLOMATIC 禾多科技
Aurora
voyage
Construction
ALICE technologies
BUILT ROBOTICS
Retail & Warehousing
grabango
THE YES
heuritech
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OSARO
FAIRE
dorabot
AIFI
covariant
Govt. & City Planning
SHIELD AI
AMP ROBOTICS
Replica
Mapillary
SYNAPSE
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lexion
Mining
razorlabs
Food & Agriculture
BENSON HILL
NotCo
BOWERY
Media & Entertainment
SECOND SPECTRUM
FANAI
Synthesia
WELLSAID
Education
松鼠AI·智适应 Squirrel AI Learning
KORBIT
Manufacturing
noodle.ai
NAVVIS
dataprophet machine learning specialists
CITRINE INFORMATICS
AI 100
CBINSIGHTS
Energy
BEYOND LIMITS
INVENIA LABS
TACHYUS
Telecom
DEEPSIG
METAWAVE
Real Estate
CASPAR
CROSS-INDUSTRY TECH
AI Processors
SYNTIANT
LIGHTMATTER
GRAPHCORE
XANADU
Kneron
AI Model Development
DARWIN AI
H2O.ai
PerceptiLabs
DataRobot
dotData
DevOps & Model Monitoring
ALGORITHMIA
snyk
ArthurAI
NLP, NLG, & Computer Vision
PRIMER
sherpa.ai
创新奇智 AInnovation
:) Affectiva
HUGGING FACE
Cybersecurity
SentinelOne
OBSIDIAN
onfido
ABNORMAL SECURITY
BLUEHEXAGON
BI & Ops Intel
climacell
C3.ai
falkonry
Sales & CRM
CRESTA
integrate.ai
ZHUIYI 追一科技
Other R&D
sparkcognition
KYNDI
4Paradigm 第四范式
InstaDeep™
Deeplite
nnaisense
HACARUS
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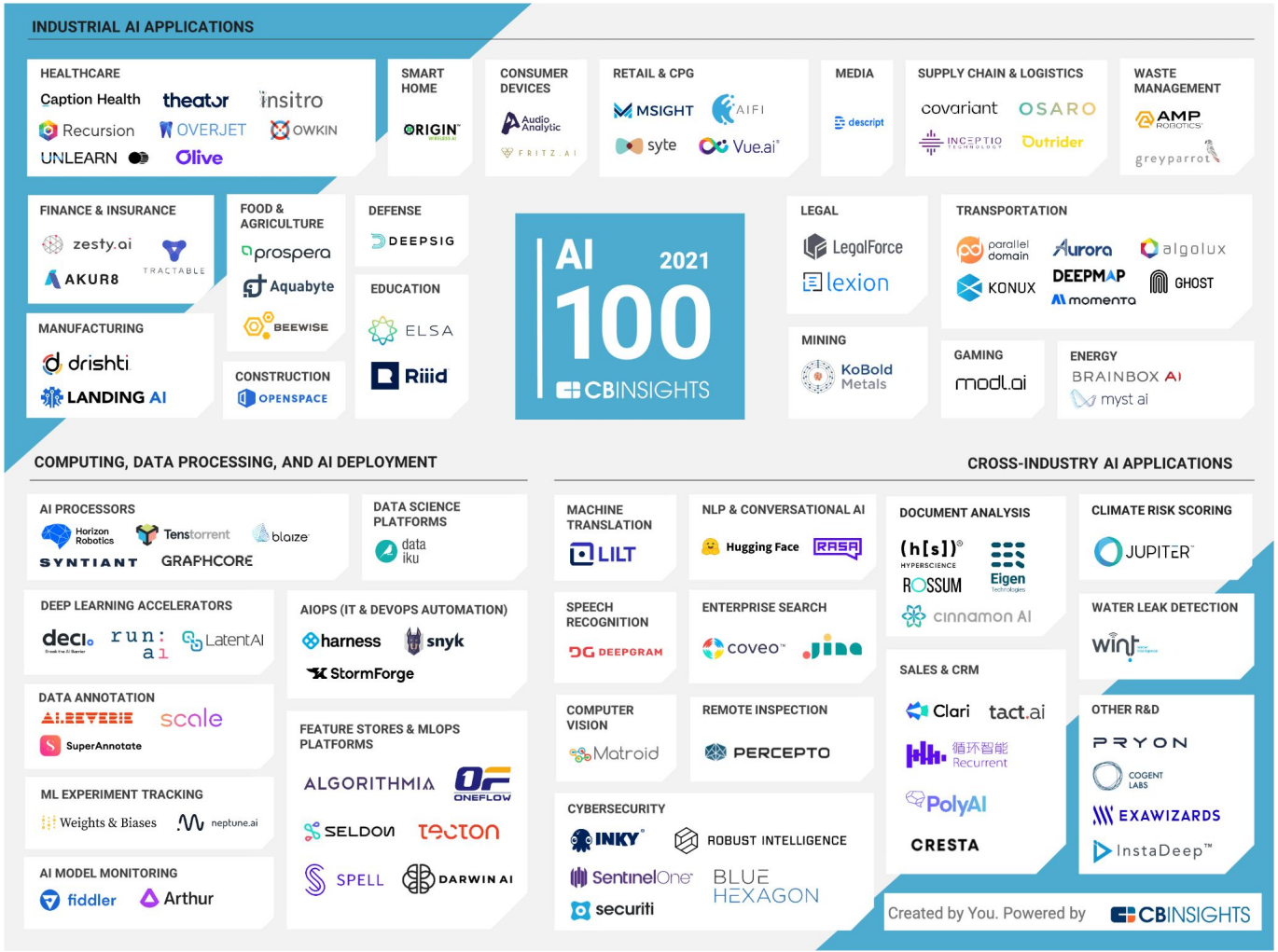
INDUSTRIAL AI APPLICATIONS
HEALTHCARE
Caption Health
theator
insitro
Recursion
OVERJET
OWKIN
UNLEARN
Olive
SMART HOME
ORIGIN
CONSUMER DEVICES
Audio Analytic
FRITZ.AI
RETAIL & CPG
MSIGHT
AIFI
syte
Vue.ai
MEDIA
descript
SUPPLY CHAIN & LOGISTICS
covariant
OSARO
INCEPTIO TECHNOLOGY
Outrider
WASTE MANAGEMENT
AMP ROBOTICS
greyparrot
FINANCE & INSURANCE
zesty.ai
AKUR8
TRACTABLE
FOOD & AGRICULTURE
prospera
Aquabyte
BEEWISE
DEFENSE
DEEPSIG
EDUCATION
ELSA
Riiid
AI 100 2021
CBINSIGHTS
LEGAL
LegalForce
lexion
TRANSPORTATION
parallel domain
Aurora
algolux
KONUX
DEEPMAP
momenta
GHOST
MANUFACTURING
drishti
LANDING AI
CONSTRUCTION
OPENSPACE
MINING
KoBold Metals
GAMING
modl.ai
ENERGY
BRAINBOX AI
myst ai
COMPUTING, DATA PROCESSING, AND AI DEPLOYMENT
AI PROCESSORS
Horizon Robotics
Tenstorrent
blaize
SYNTIANT
GRAPHCORE
DATA SCIENCE PLATFORMS
data iku
DEEP LEARNING ACCELERATORS
deci
run:ai
LatentAI
AIOPS (IT & DEVOPS AUTOMATION)
harness
snyk
StormForge
DATA ANNOTATION
AI.REVERIE
scale
SuperAnnotate
FEATURE STORES & MLOPS PLATFORMS
ALGORITHMIA
ONEFLOW
SELDON
tecton
SPELL
DARWIN AI
ML EXPERIMENT TRACKING
Weights & Biases
neptune.ai
AI MODEL MONITORING
fiddler
Arthur
CROSS-INDUSTRY AI APPLICATIONS
MACHINE TRANSLATION
LILT
NLP & CONVERSATIONAL AI
Hugging Face
RASA
DOCUMENT ANALYSIS
(h[s])
HYPERSCIENCE
ROSSUM
Eigen Technologies
cinnamon AI
CLIMATE RISK SCORING
JUPITER
SPEECH RECOGNITION
DEEPGRAM
ENTERPRISE SEARCH
coveo
jina
WATER LEAK DETECTION
wint
COMPUTER VISION
Matroid
REMOTE INSPECTION
PERCEPTO
SALES & CRM
Clari
tact.ai
循环智能 Recurrent
PolyAI
CRESTA
OTHER R&D
PRYON
COGENT LABS
EXAWIZARDS
InstaDeep
CYBERSECURITY
INKY
ROBUST INTELLIGENCE
SentinelOne
BLUE HEXAGON
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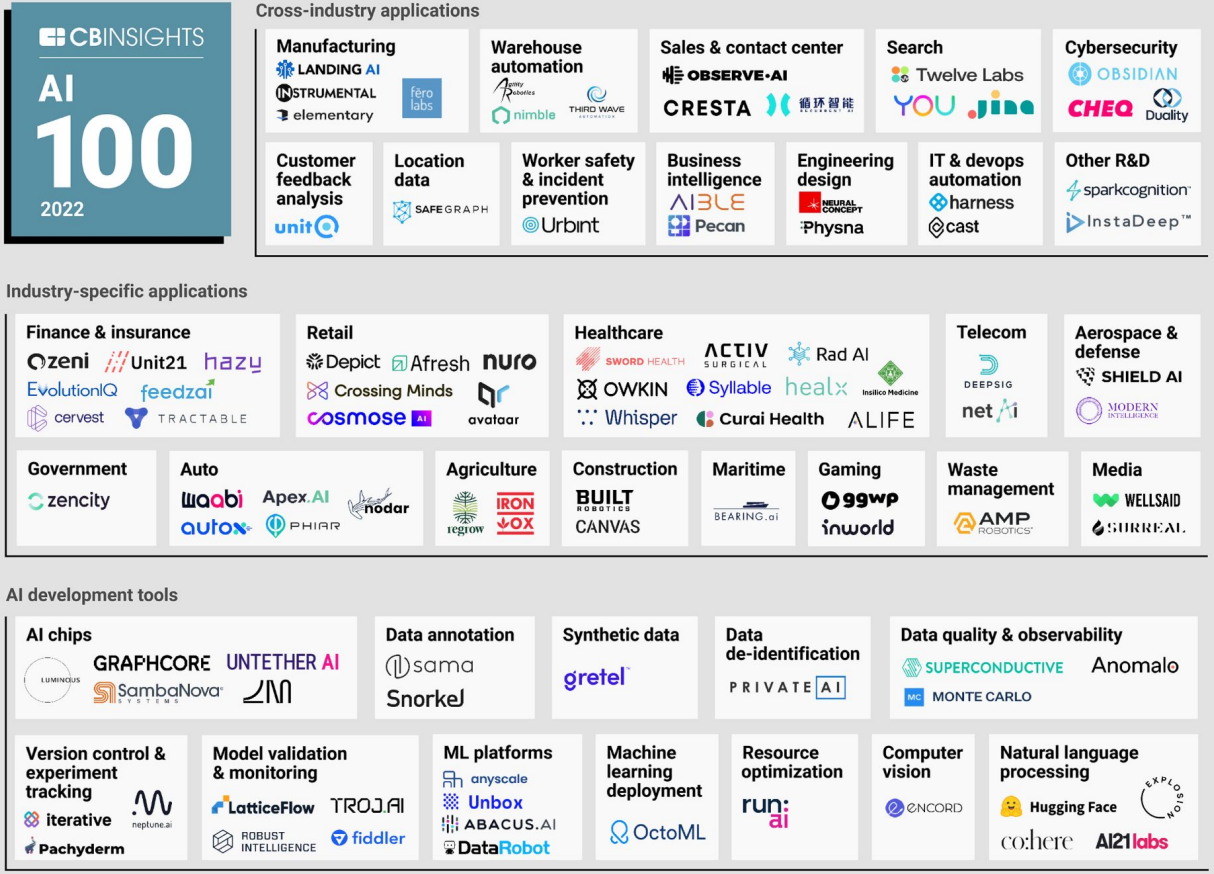

Note: Companies are private as of 4/29/22