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Artificial Intelligence

The field of computer science that seeks to create intelligent machines that can replicate or exceed human intelligence

AI in medicine

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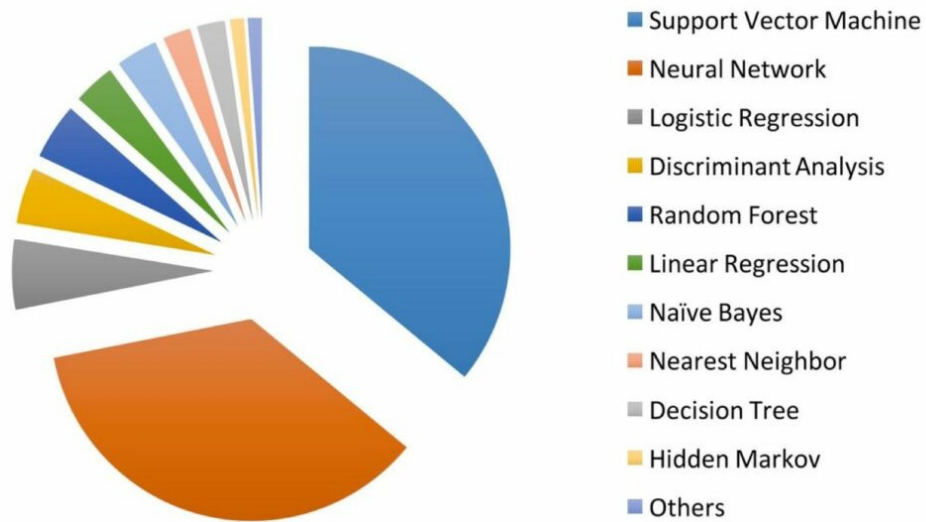
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Deep Learning
A machine learning technique in which layers of neural networks are used to process data and make decisions

Artificial intelligence (AI) and machine learning (ML) technologies

- methods

Legend:
- Support Vector Machine
- Neural Network
- Logistic Regression
- Discriminant Analysis
- Random Forest
- Linear Regression
- Naïve Bayes
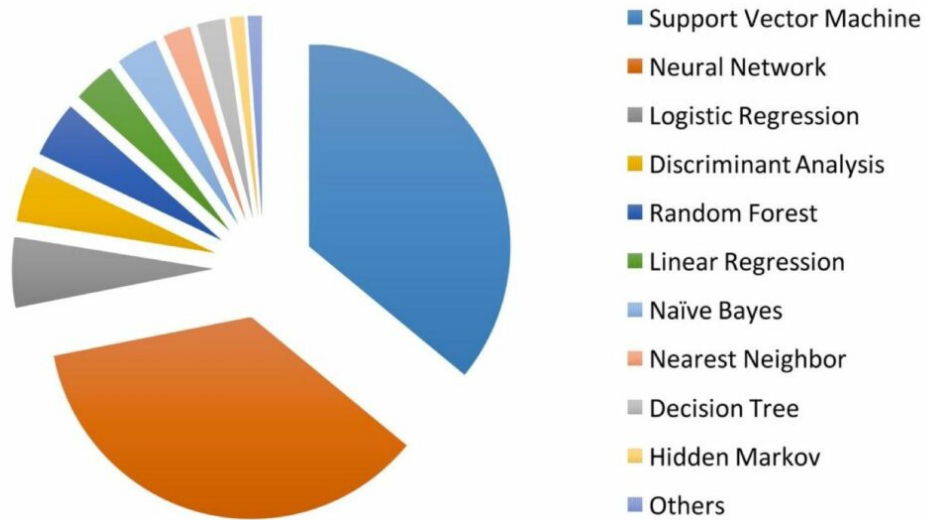- Nearest Neighbor
- Decision Tree
- Hidden Markov
- Others

Machine learning algorithms used in the medical literature
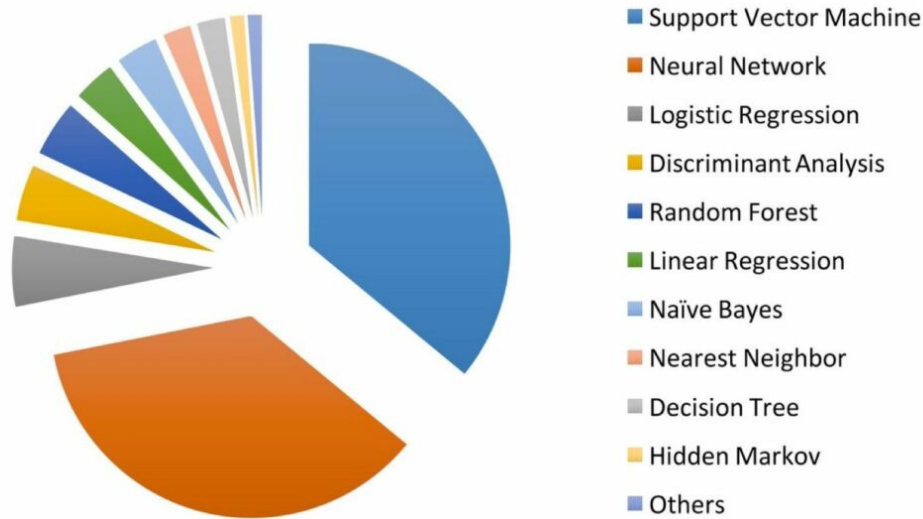Artificial intelligence in healthcare: past, present and future, svn-2017-000101

Artificial intelligence (AI) and machine learning (ML) technologies

- **methods**

Support Vector Machine
Neural Network
Logistic Regression
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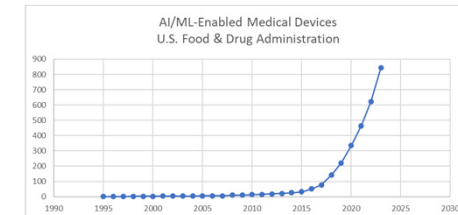Naïve Bayes
Nearest Neighbor
Decision Tree
Hidden Markov
Others

Machine learning algorithms used in the medical literature
Artificial intelligence in healthcare: past, present and future, svn-2017-000101

- **disease detection**
  - Bladder tumor
  - Alzheimer
  - Breast cancer
  - Tuberculosis
  - Cardiac arrest
  - Skin lesion
  - Artery occlusion
  - Diabetic retinopathy
  - Hypertension
  - Vertical root fracture
  - …

Artificial intelligence in disease diagnosis: a systematic literature review, …
J Ambient Intell Humaniz Comput. 2023; 14(7): 8459–8486
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8754556/

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- AI/ML-Enabled Medical Devices
  - Detection of bladder tumor
  - Counting and recognizing specific cell types
  - Diagnosis of infarcts, Alzheimer's, cancer, etc.
  - Detection of depression
  - Choice and dosing of drugs
  - Diagnosis of heart diseases, degenerative diseases of the brain, etc.
  - Detection of epidemics
  - Prognosis of the time of death of intensive care patients
  - …

Artificial Intelligence and Machine Learning (AI/ML)-Enabled Medical Devices
U.S. Food & Drug Administration, 950 entries, 08/07/24
www.fda.gov/medical-devices/software-medical-device-samd/artificial-intelligence-and-machine-learning-aiml-enabled-medical-devices

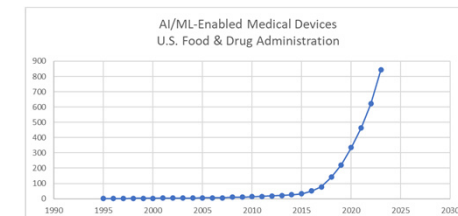AI/ML-Enabled Medical Devices
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Artificial intelligence (AI) and machine learning (ML) technologies

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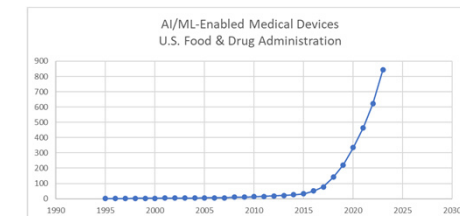

AI/ML-Enabled Medical Devices
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Artificial intelligence (AI) and machine learning (ML) technologies

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- Medical device manufacturers are using these technologies to innovate their products to better <mark>assist</mark> health care providers and improve patient care.

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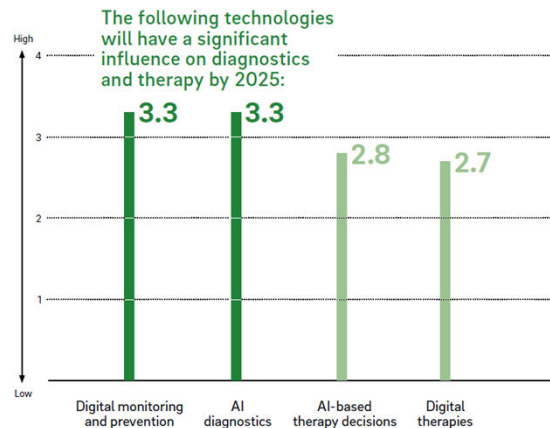 - Prognosis of the time of death of intensive care patients
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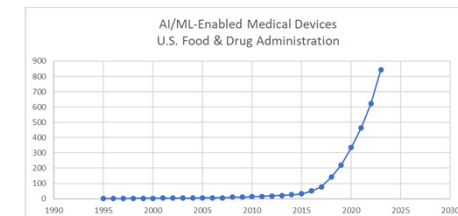

The following technologies will have a significant influence on diagnostics and therapy by 2025:

3.3 Digital monitoring and prevention
3.3 AI diagnostics
2.8 AI-based therapy decisions
2.7 Digital therapies

It's unlikely that AI will replace doctors outright. Instead, AI systems will be used to highlight potentially malignant lesions or dangerous cardiac patterns for the expert – allowing the doctor to focus on the interpretation of those signals.

https://content.rolandberger.com/hubfs/Roland-Berger_Future-of-health.pdf, 2019
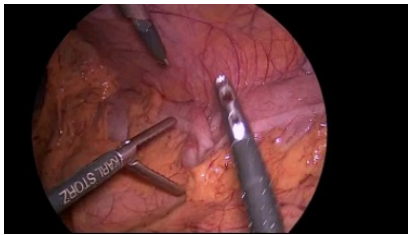
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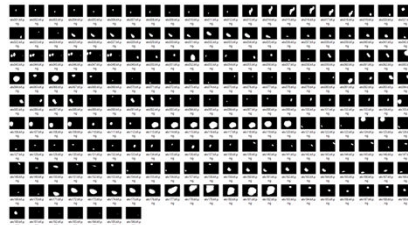U.S. Food & Drug Administration, 950 entries, 08/07/24
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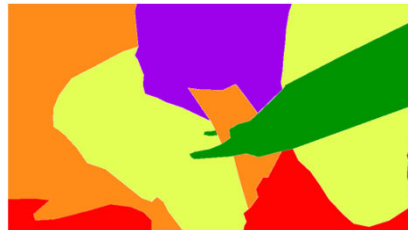U.S. Food & Drug Administration

Data matter

Annotated data

Robust Medical Instrument Segmentation (ROBUST-MIS)

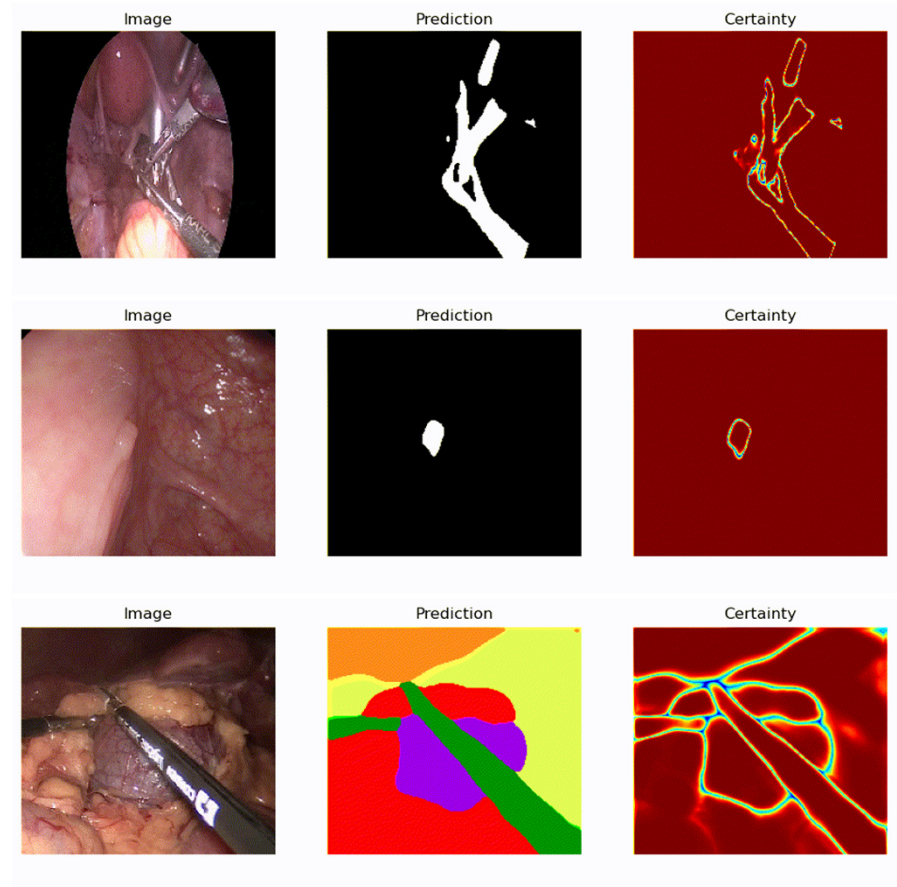Gastrointestinal Image ANAlysis (GIANA)

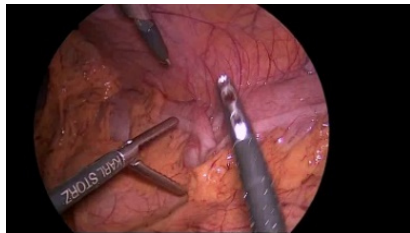HeiChole Surgical Workflow Analysis and Full Scene Segmentation (HeiSurF)

Image   Prediction   Certainty

Data matter

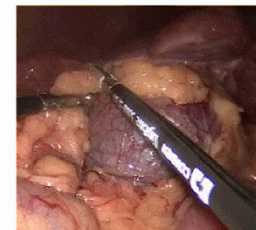Annotated data

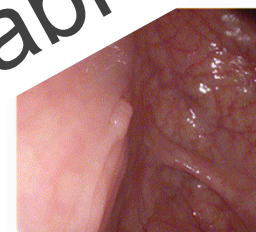Robust Medical Instrument Segmentation (ROBUST-MIS)

Gastroint...

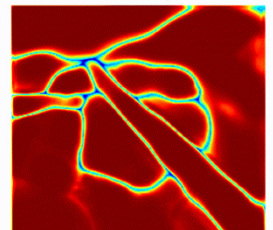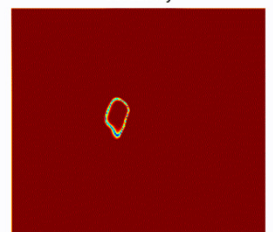HeiChole Surgical Workflow Analysis and Full Scene Segmentation (HeiSurF)

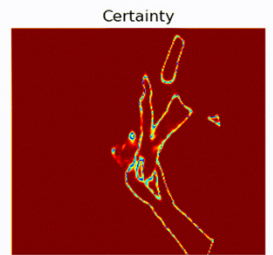Image   Prediction   Certainty

AI is an enabler for assistance
data is an enabler for AI

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- Definition: Generative AI (Source: TechExperts)
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Generative AI
Create new written, visual, and auditory content given prompts or existing data
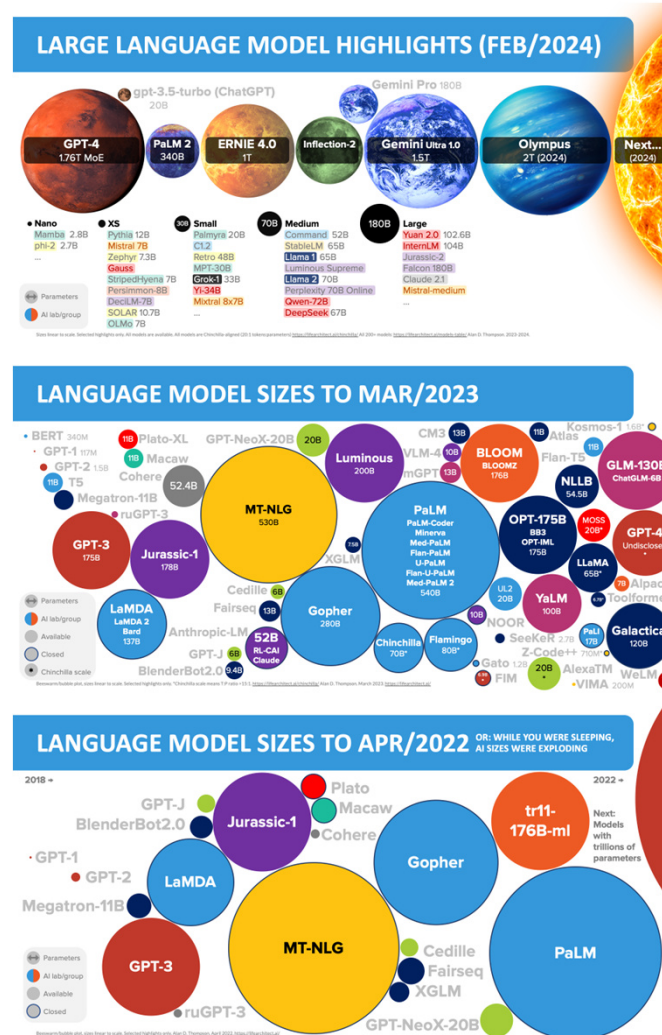
AI in medicine – LLMs (Large Language Models)

	Olympus	Amazon	
	GPT-5	OpenAI	
	Grok-3	xAI	
	MAI-1	Microsoft	
2024	Grok-2	xAI	600B
2024	Llama 3.1	Meta AI	405B
2024	Claude 3.5	Anthropic	
2024	Nemotron-4	NVIDIA	340B
2024	Llama 3.1	Meta AI	70B
2024	Grok-1.5	xAI	314B
2024	Claude 3	Anthropic	2T
2024	Gemini 1.5	Google	
2023	ERNIE 4.0	Baidu	
2023	Llama 2	Meta AI	70B
2023	Claude 2	Anthropic	
2023	GPT-4	OpenAI	1T
2023	Llama	Meta AI	65B
2022	GPT-3.5	OpenAI	
2022	PaLM	Google	540B
2021	ERNIE 3.0	Baidu	260B
2021	NLG	NVIDIA	530B
2020	GPT-3	OpenAI	175B
2020	BlenderBot 1.0	Facebook	
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LARGE LANGUAGE MODEL HIGHLIGHTS (FEB/2024)

LANGUAGE MODEL SIZES TO MAR/2023

LANGUAGE MODEL SIZES TO APR/2022

adapted from https://lifearchitect.ai

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adapted from https://hub.baai.ac.cn/paper/164bcf3f-6c34-4007-a50f-382bd1abd70f