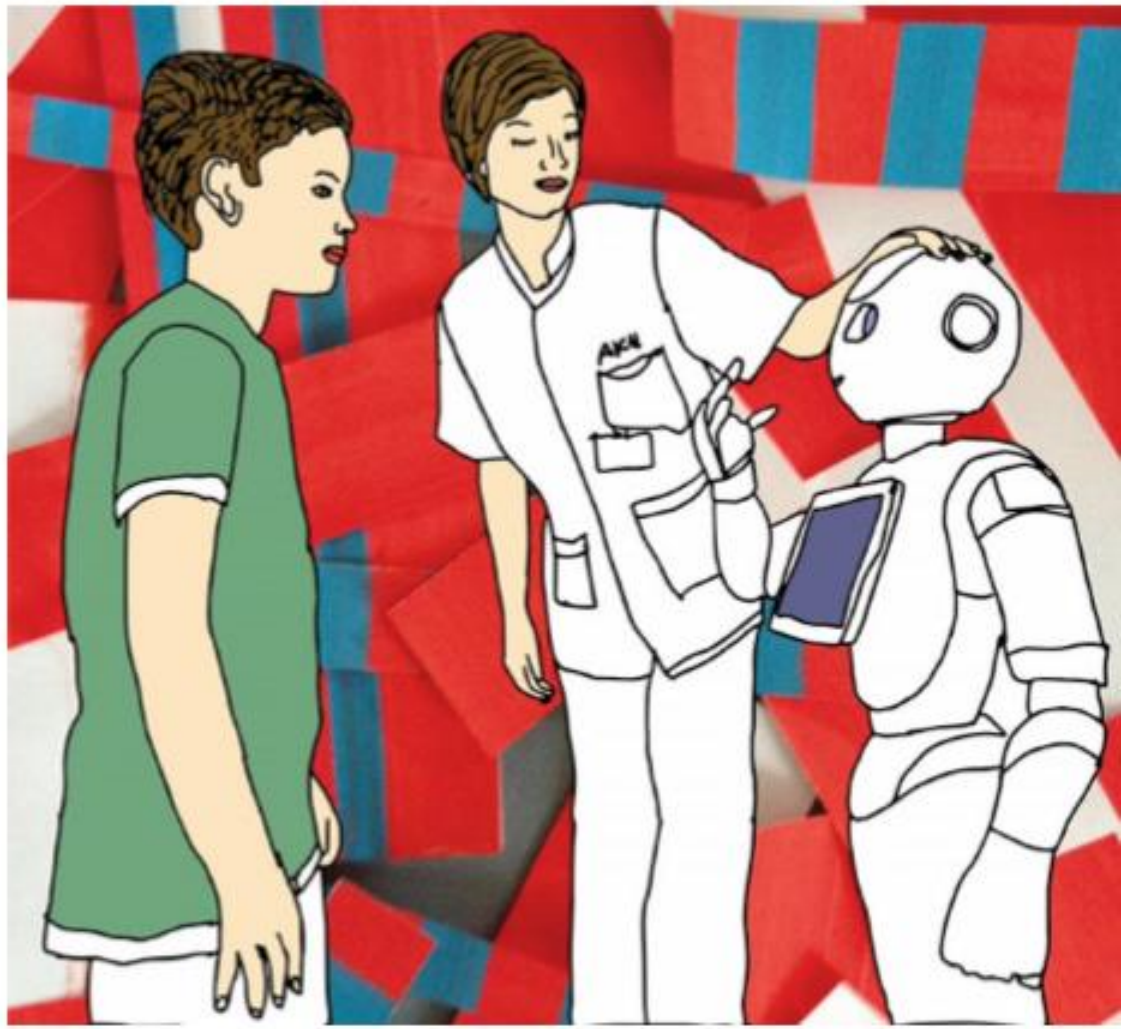


L’INTELLIGENZA ARTIFICIALE IN MEDICINA

Stefano Grossi

Intelligenza artificiale, così un robot è diventato un medico abilitato

Xiao Yi, questo il nome della macchina 'made in Chin', è il primo dispositivo al mondo ad aver superato la prova scritta del Chinas National Medical Licensing Examination

GREEN 12/13/2017 04:43 pm ET

Arctic Temperatures Are Rising So Fast Computers Don't Believe They're Real

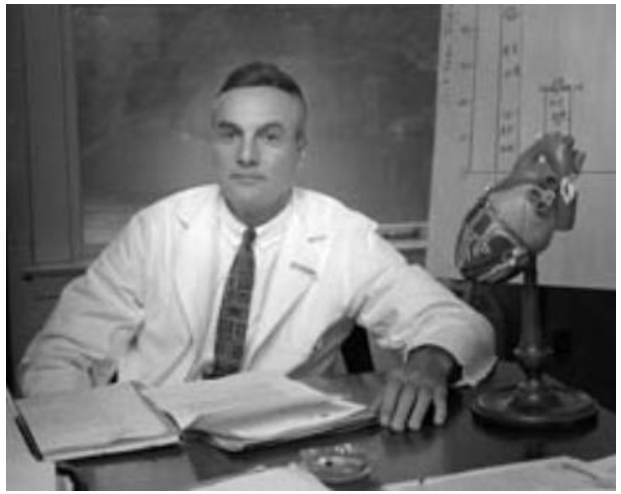
An algorithm concluded a weather station in northern Alaska must have broken because it was reporting such high temperatures.

By Ryan Grenoble

After World War II ***cardiovascular diseases*** emerged and replaced infectious diseases as major killers

Epidemiological study was planned in a 10 to 20-year period to define risk factor for death from heart attack. This resulted in a plan to recruit a sample 5000 to 6000 people, ages 30-59.

The study was set up in 1948 in Framingham, MA, a Boston suburb



Framingham Heart Study
Study Category: The Cohort Studies (1947-1972)
Year Begun: 1948
Location: Framingham, Massachusetts, USA
Principal Investigator: Dawber, T. Royle

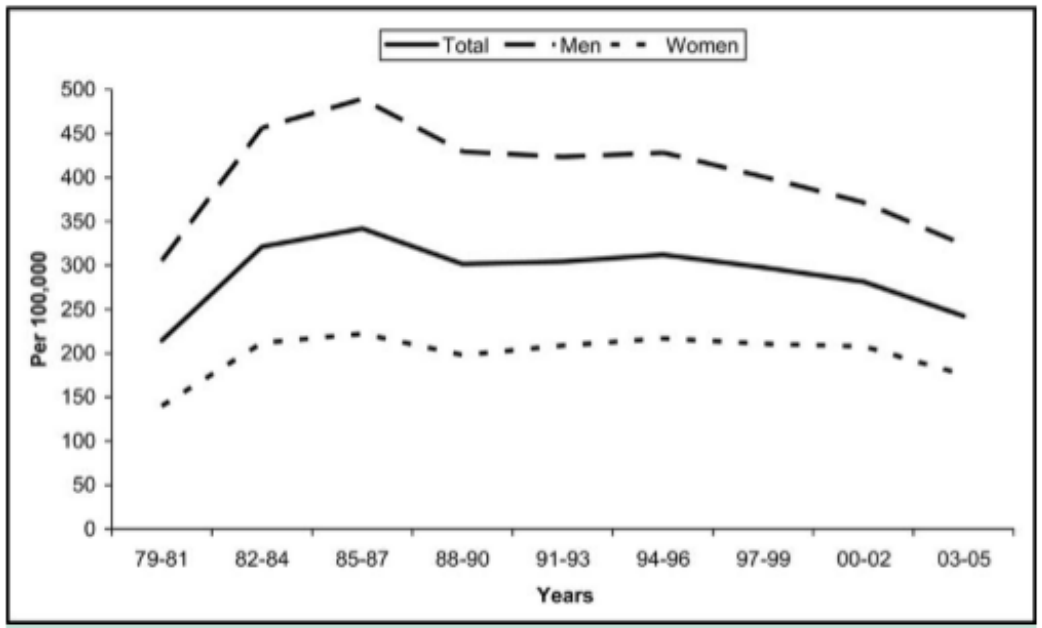
Reduction of Mortality Rate in Coronary Atherosclerosis by a low Cholesterol-low Fat Diet. (1951) Am. Heart J. 42: 538-545.

.

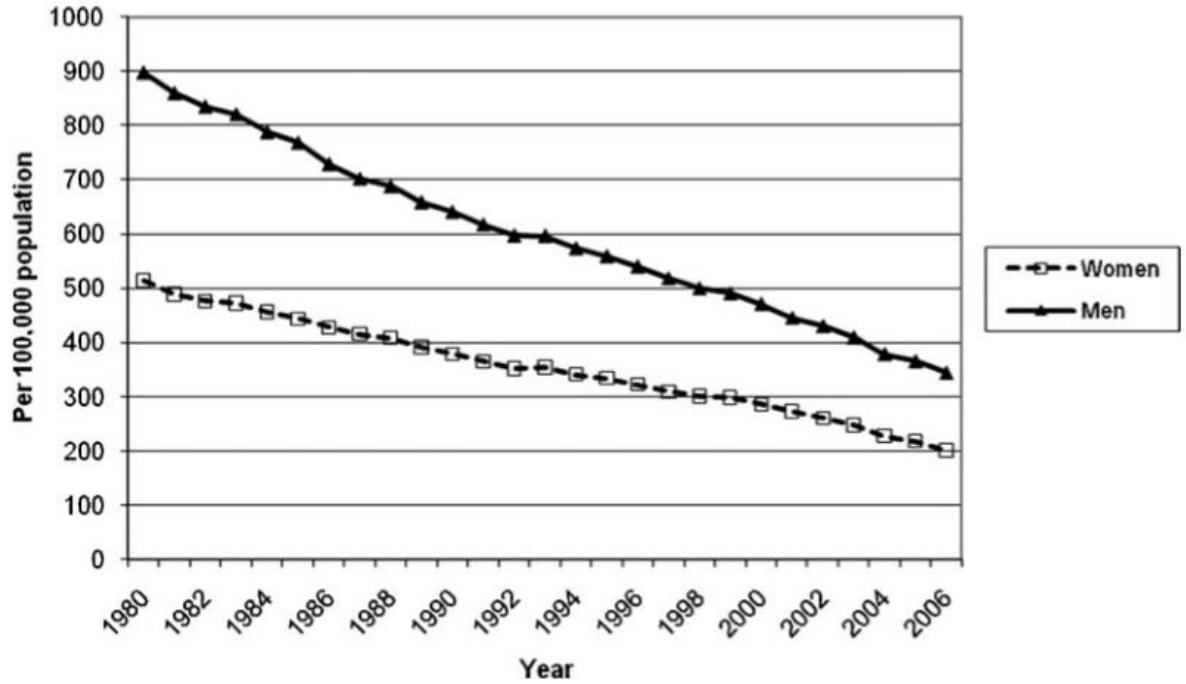
The Framingham Study was among the first groups that showed the predictive power of ***blood pressure, blood cholesterol level, diabetes, left ventricular hypertrophy, and cigarette smoking*** habit for heart and blood vessel diseases

Acute Myocardial Infarction Hospitalization in the United States, 1979 to 2005

Jing Fang, MD,[a] Michael H. Alderman, MD,[b] Nora L. Keenan, PhD,[a] Carma Ayala, PhD[a]



Annu. Rev. Public Health 2011.32:5–22



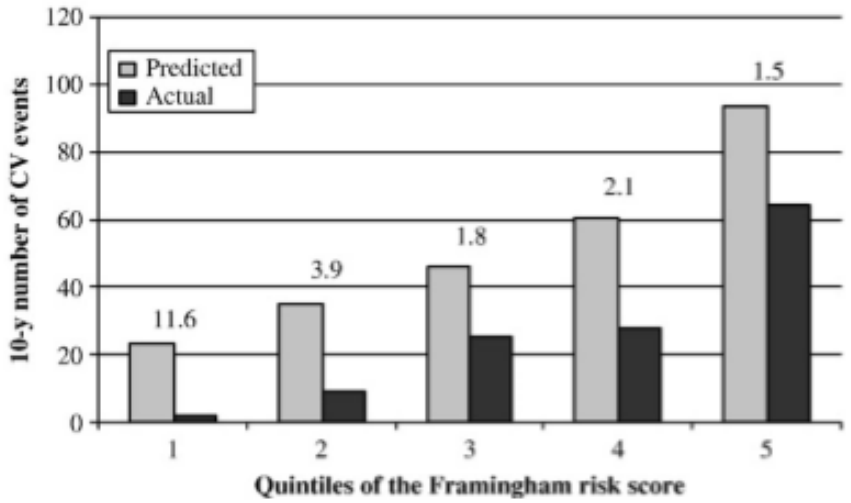
Cardiovascular mortality

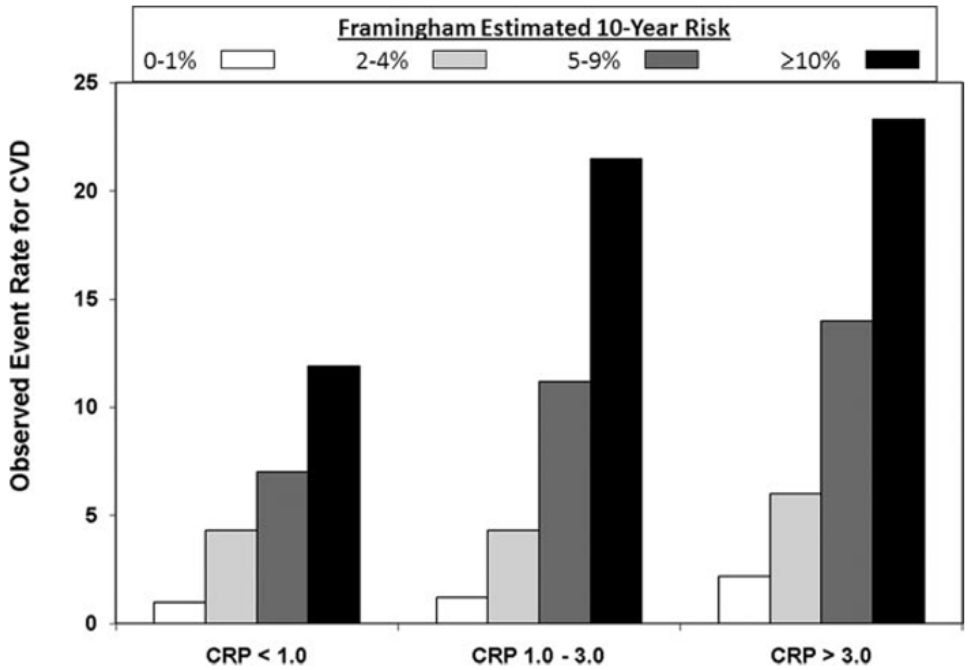
Ten-year risk prediction in French men using the Framingham coronary score: Results from the national SU.VI.MAX cohort

A.-C. Vergnaud [a,*], S. Bertrais [a], P. Galan [a], S. Hercberg [a,b], S. Czernichow [a,b]

[a] INSERM, U557, Bobigny, France; INRA, U1125, Bobigny, France; CNAM, EA3200, Bobigny, France; Univ Paris13; CRNH-IdF, Bobigny, F-93017, France
[b] Departement de Santé Publique, Hôpital Avicenne (AP-HP), F-93017 Bobigny, France

Available online 10 March 2008

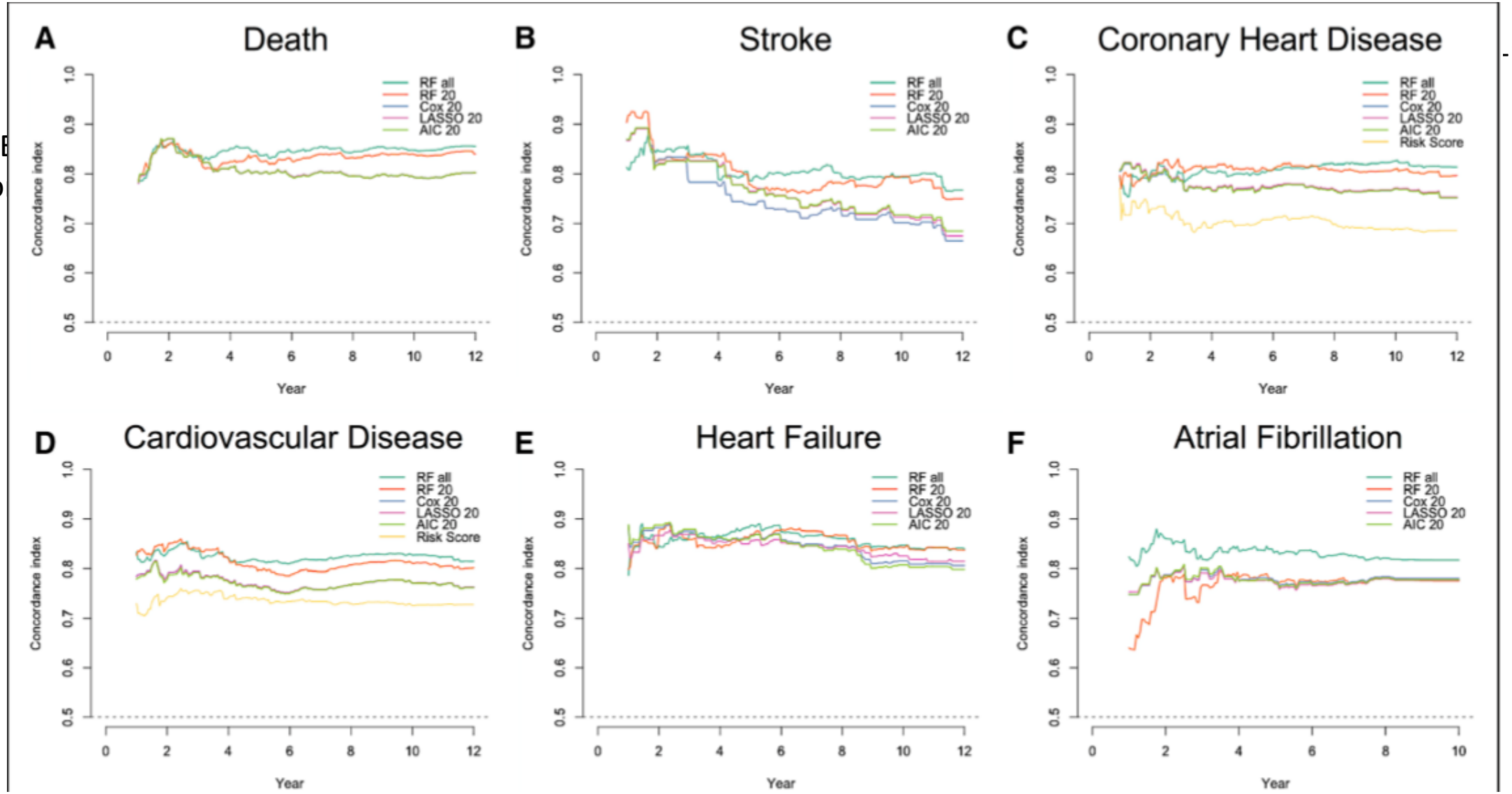




Lloyd-Jones 2006, American College of Physicians

Cardiovascular Event Prediction by Machine Learning

The Multi-Ethnic Study of Atherosclerosis



-1101.

ME

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POPULATION

evidence based medicine

biostatistic

INDIVIDUAL

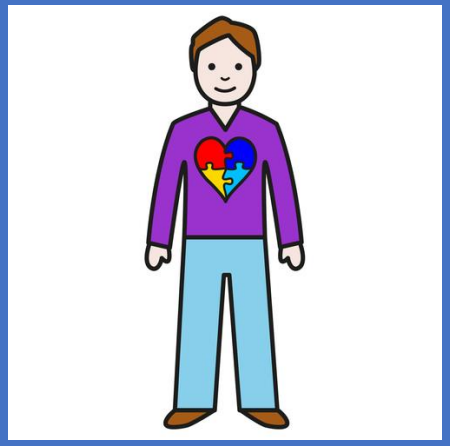
precision medicine

LARGE AMOUNT OF DATA

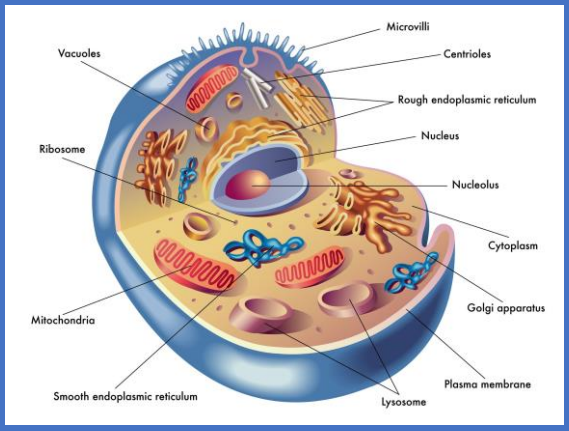
Genetic Polymorphisms based Drug Resistence
DNA mapping
tailored treatement

ambiente

società



individuo



cellula

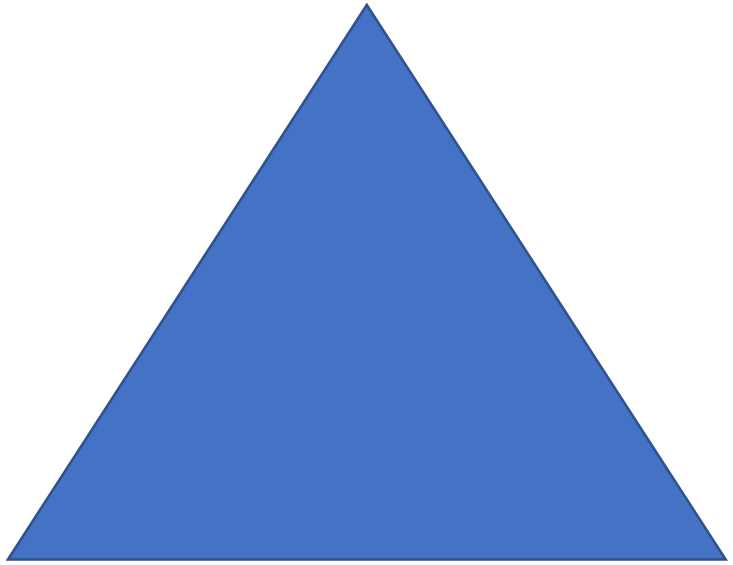
This amount of data overwhelms human intelligence,

may structured by Machine Learning

MEDICAL DECISION MAKING

AVAILABLE DATA

AI medical image analysis SPEED ACCURACY
NLP to ‘read’ EHRs



STRUCTURED KNOLEDGE

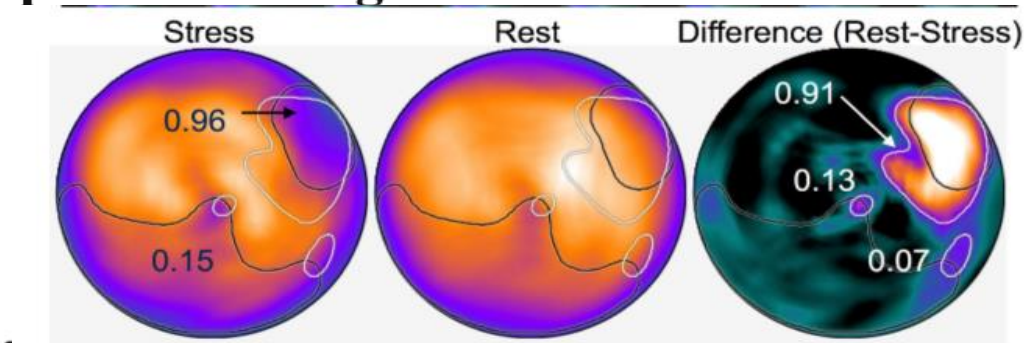
Mashine reading/learning : up grade level of knoledge
Machines learning from medical data avert human cognitive biases
Machine learning from data : new unexpeceted relationship , risk factors, pathophysiological mechanisms

CONTEXT OF INDUVIDUAL PATIENT

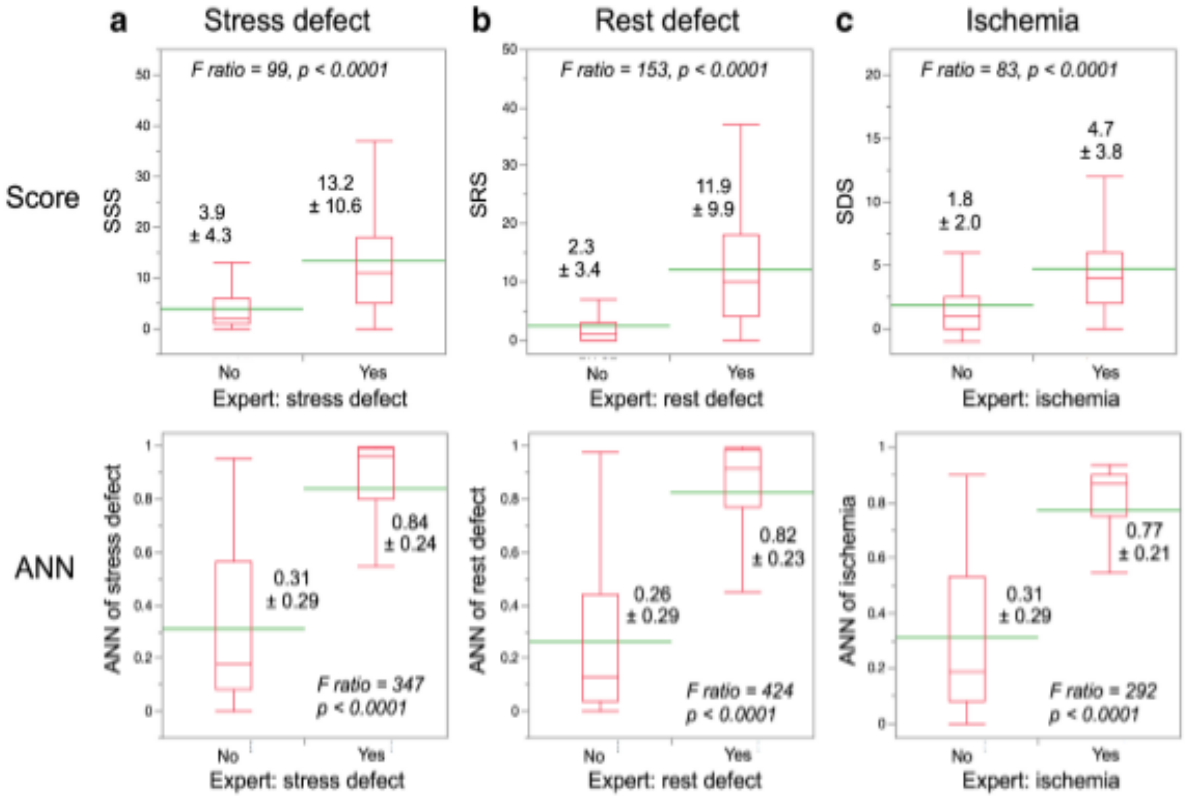
Social , economical , demografics etc data

AI OUTPERFORM UMAN SKILLS: IMAGES ALALYSIS

Diagnostic accuracy of an artificial neural network compared with statistical quantitation of myocardial perfusion images: a Japanese multicenter study



ANN was trained to classify potentially abnormal areas as true or false based on the nuclear cardiology expert interpretationof 1001 gatedstress/rest 99mTc-MIB



Eur J Nucl Med Mol Imaging (2017) 44:2280–2289
DOI 10.1007/s00259-017-3834-x

Transductive reliability estimation for medical diagnosis

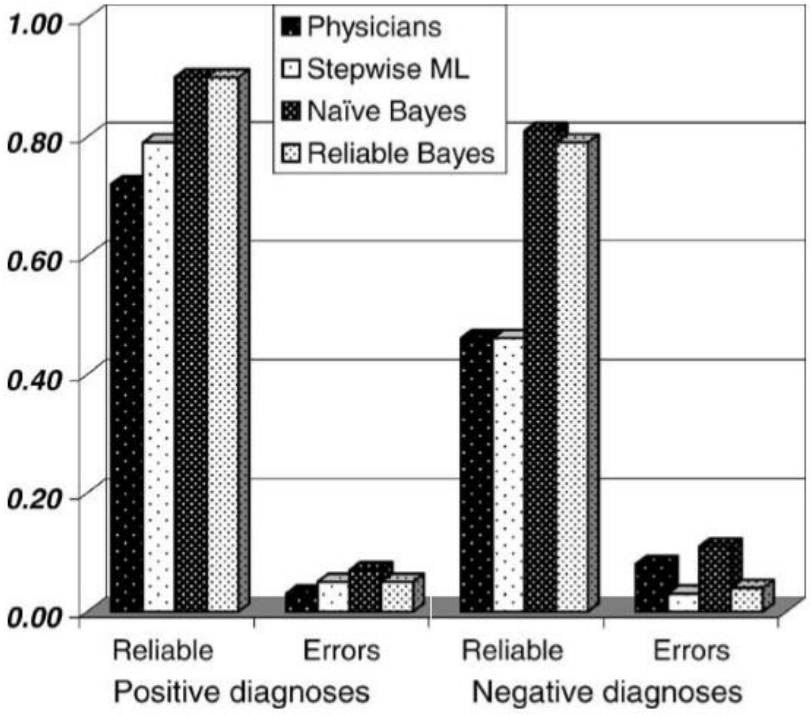
Matjaž Kukar*

Faculty of Computer and Information Science, University of Ljubljana, Tržaška 25, SI-1001 Ljubljana, Slovenia

Received 15 January 2002; received in revised form 4 December 2002; accepted 17 March 2003

327 patients (250 males, 77 females) : suspected CAD
ECG
exercise ECG
myocardial scintigraphy
coronary angiography

33% improvement of true negative diagnoses means that overall almost 10% more patients could be reliably diagnosed for CAD absence without performing coronary angiography



MIGLIORE PERFORMANCE RISPETTO AL MEDICO ?

- Significato scientifico ? Riproducibilita’ / appilcabilita’ in setting diversi
- Validazione societa’ scientifiche mediche/informatiche?
- Chi sceglie algoritmo da utilizzare? Medico/paziente/istituzione
- Responsabilita’ medico legale dei risultati/errori
- Comportamento in caso di divergenza di risultato

LIMITI AI

- Rapporto empatico medico/paziente (es valutazione del dolore)
- Confine tra diagnosi/terapia decisione terapeutica tiene conto molteplici fattori sociali-culturali-psicologici-etc etc

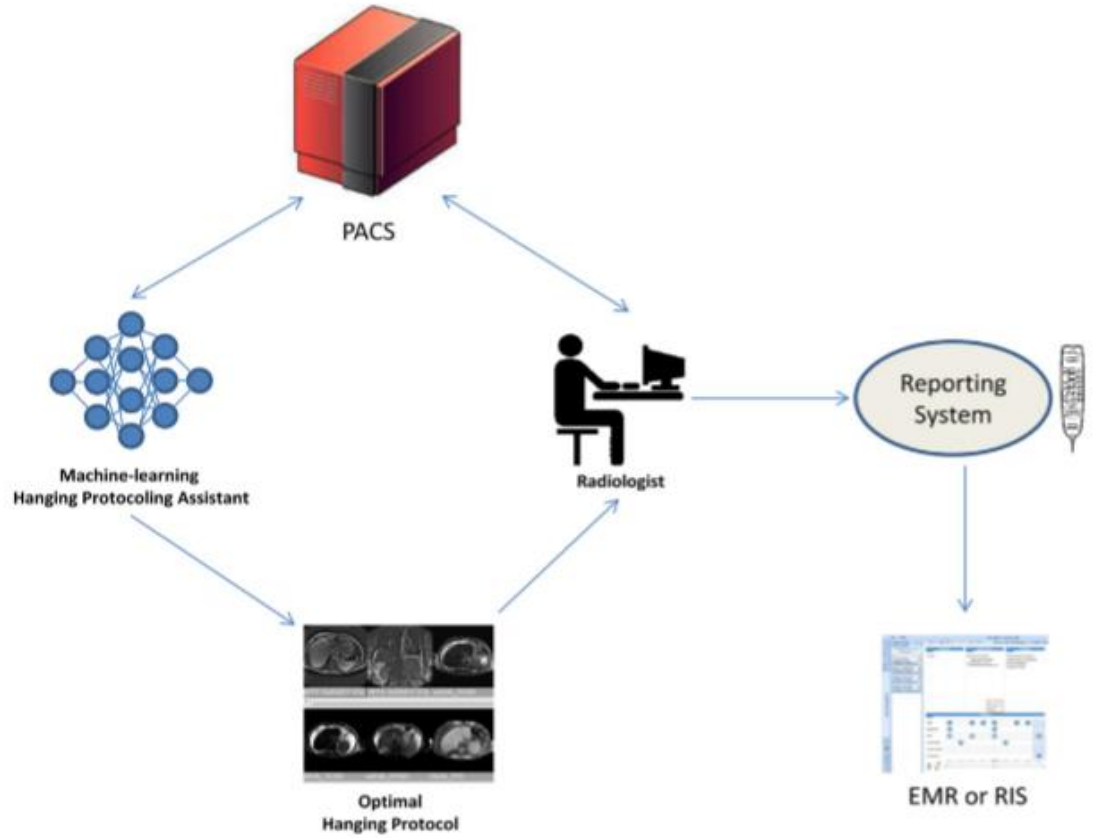
AI OUT PERFORM UMAN SKILLS: IMAGES ALALYSIS

SA-CME

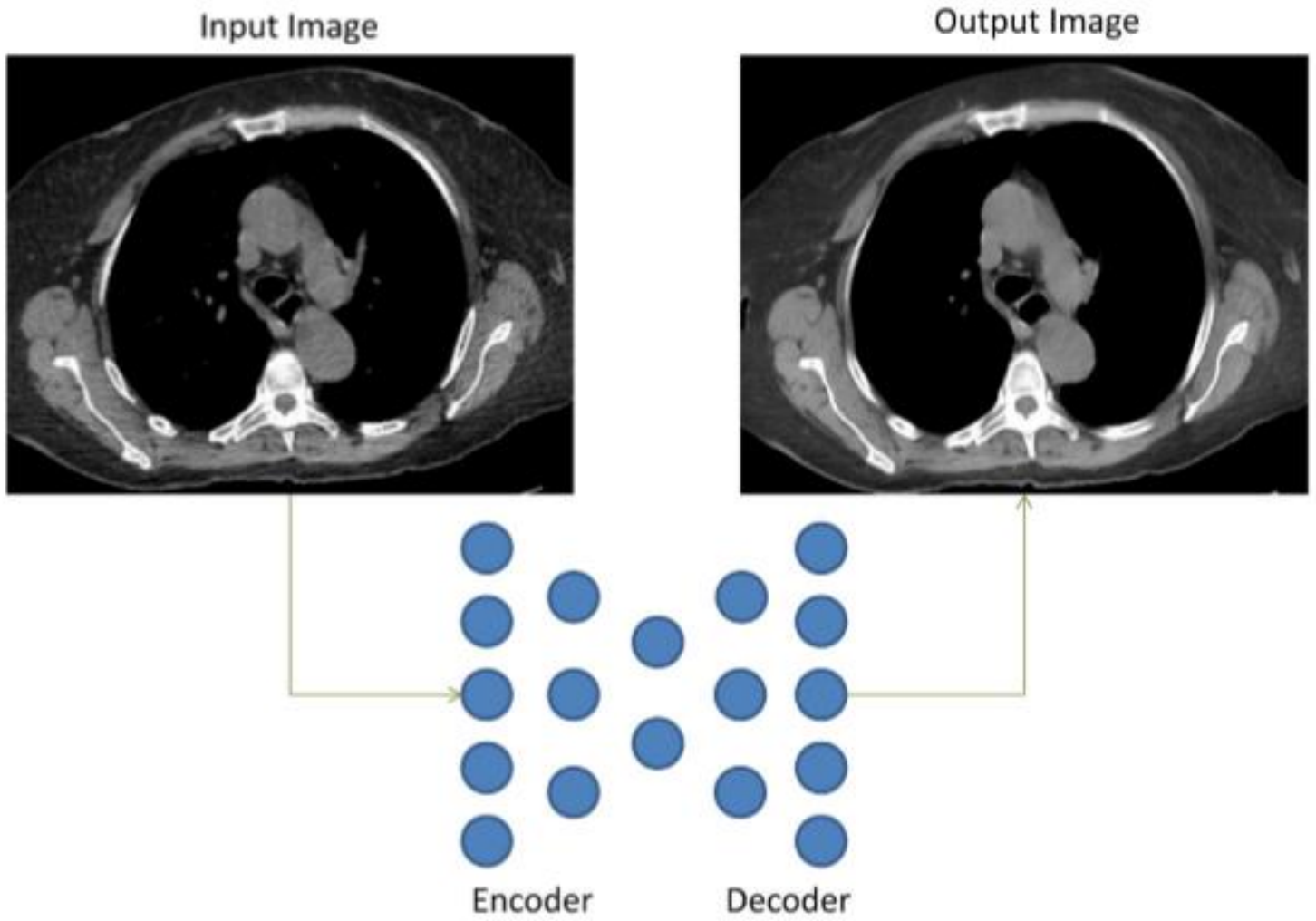
Machine Learning in Radiology: Applications Beyond Image Interpretation

Paras Lakhani, MD[a], Adam B. Prater, MPH, MD[b], R. Kent Hutson, MD[c,h], Kathy P. Andriole, PhD[d], Keith J. Dreyer, DO, PhD[e], Jose Morey, MD[f,g,h], Luciano M. Prevedello, MD, MPH[i], Toshi J. Clark, MD[j], J. Raymond Geis, MD[j], Jason N. Itri, MD, PhD[g], C. Matthew Hawkins, MD[b]

J Am Coll Radiol 2017



AI OUT PERFORM UMAN SKILLS: IMAGES ALALYSIS

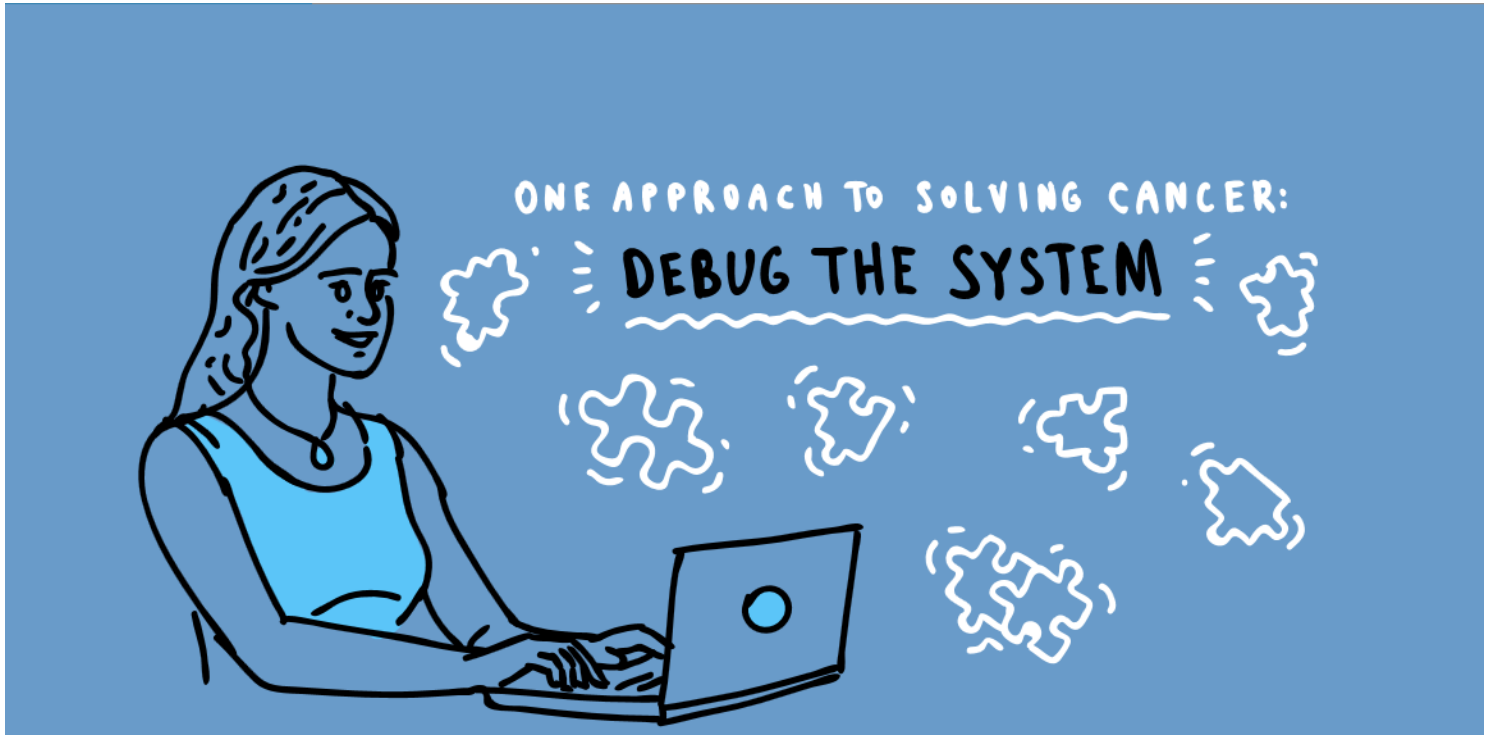


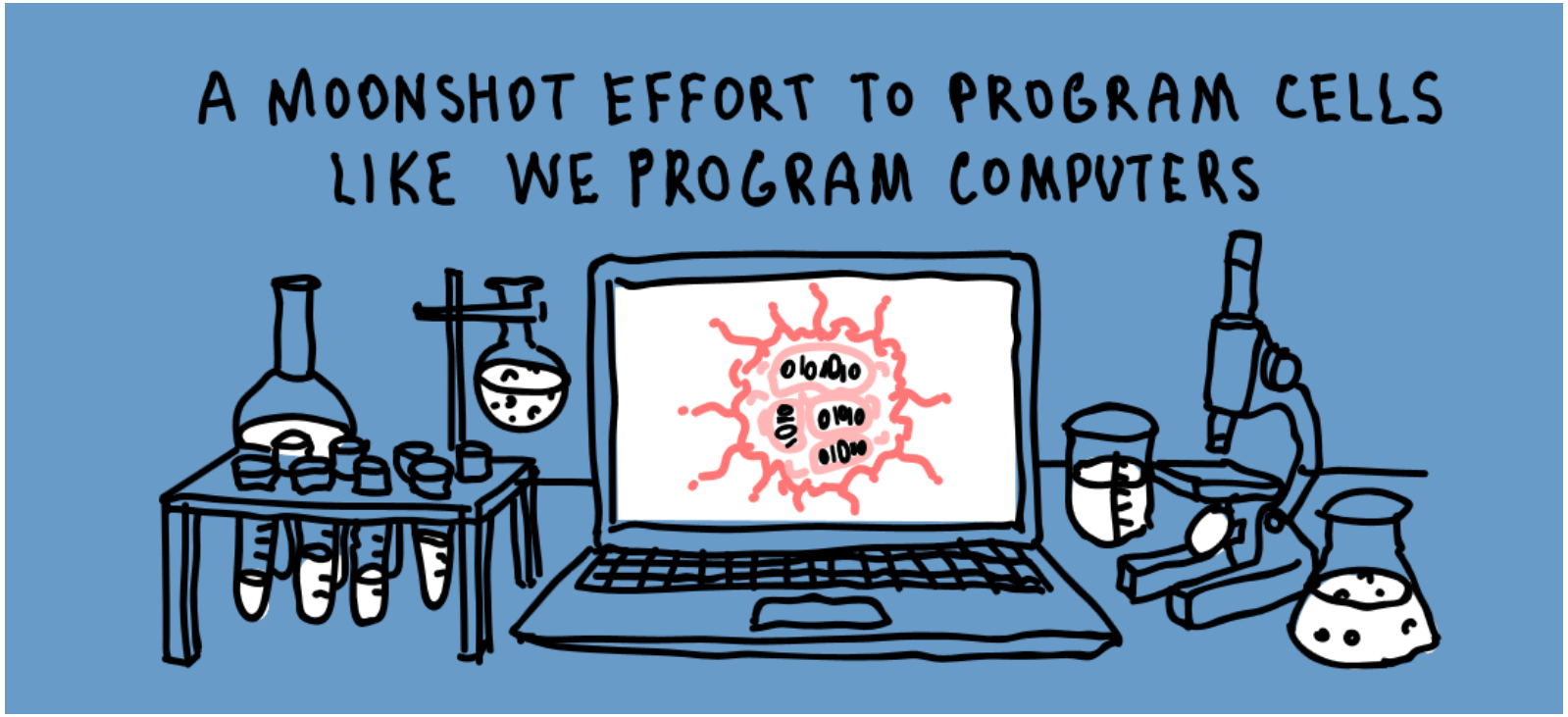
Elon Musk, the entrepreneur behind Space-X and Tesla, has recently pointed out that thinking machines might pose an existential danger to mankind and called for regulatory monitoring on national and international levels

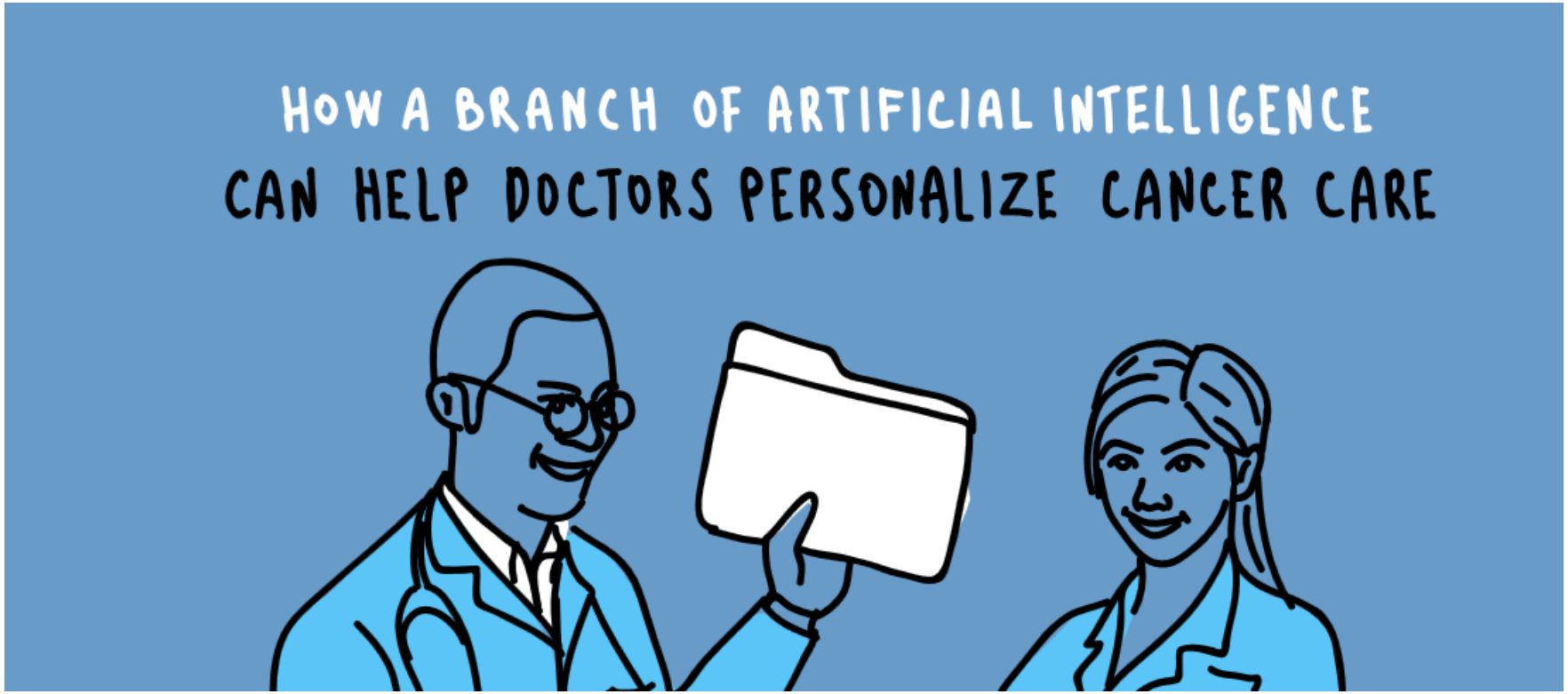
human intelligence will not be able to outperform artificial intelligence with respect to knowledge or accuracy in decision making

Developments in robotics may replace practical skills one day; however, our inborn capability to be empathic is probably unbeatable by machine

Our professional ethical codes have a long-standing tradition as documented by the Hippocratic Oath and its modifications as well as more modern codes, e.g. the Declaration of Geneva. We are well advised to follow these, no matter how the medical landscape changes


ONE APPROACH TO SOLVING CANCER:
DEBUG THE SYSTEM


A MOONSHOT EFFORT TO PROGRAM CELLS
LIKE WE PROGRAM COMPUTERS


HOW A BRANCH OF ARTIFICIAL INTELLIGENCE
CAN HELP DOCTORS PERSONALIZE CANCER CARE

AVAILABLE DATA → **MASSIVE**

BIG DATA SOURCES IN CARDIOVASCULAR MEDICINE

Functional phenotypes
demographics
hemodynamics
electrocardiography
echocardiograms
imaging data

Molecular profiles
large-scale panomics data
Clinical setting

Literature knowledge:
in cardiovascular medicine
a new publication every
2.7min

Medical records:
patient electronic medical records
physician's notes
laboratory test results
other information on disease, treatment

This amount of data overwhelms human intelligence,
may structured by deep learning algorithms

La scienza e’ solo il progressivo accostamento al mondo reale

Max Plank