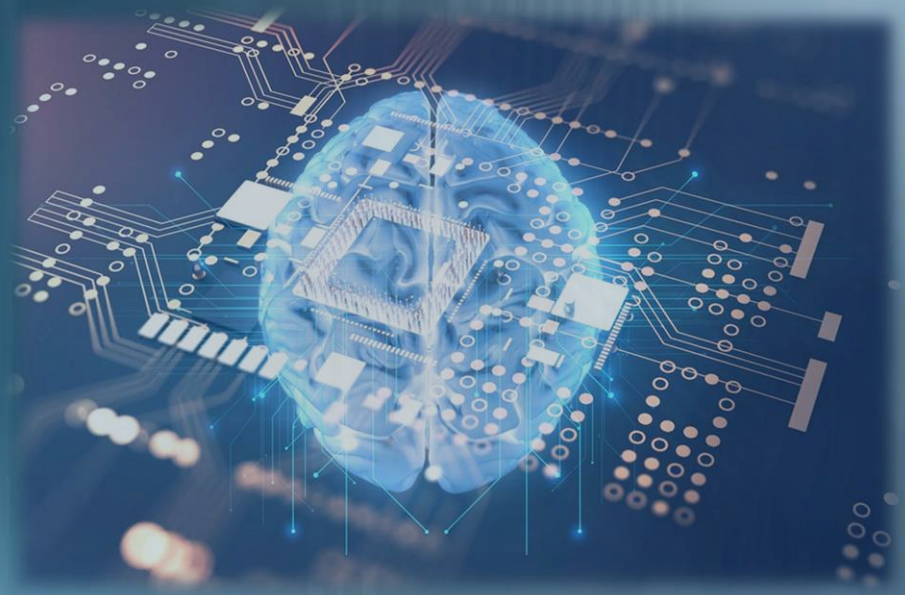
Artificial intelligence in Odontology
- a modern revolution -

Anaëlle MAZÉ (33275)
Orientador: José FRIAS
Coorientador: Luis Borges GOUVEIA

Mestrado em **MEDICINA** Dentária

Introduction to Artificial Intelligence (AI)

- "*Set of theories and techniques used to create machines capable of simulating human intelligence*"
- Technological revolution
- Surgical robotics, augmented reality, health smartphone apps, virtual assistants…
- Cannot replace human intelligence



Materials and Methods

- This dissertation is a bibliographic review carried from:
  - **PubMed** (*https://www.ncbi.nlm.nih.gov/pubmed*);
  - **B-on** (*https://www.b-on.pt/*), and
  - the **Fernando Pessoa University institutional repository** (*https://bdigital.ufp.pt/*).

- **Keywords** :
  - *« Artificial intelligence »*
  - *« Clinical Decision Support System»*
  - *« Neural Networks»*
  - *« Dental Image »*

Origins of AI

- **1950**: Alan Turing's work;
- **1960**: Expertise diagnosis systems for medical interest;
- **90's**: First warning tools;
- **21th century**: self-monitoring software for patients.

Alan Turing
(1912, 1954)

Application to dentistry

- **85%** of dentists use computers for management and scheduling of patients
- Boom of dental technologies: diagnosis, radiographic interpretations, craniofacial analysis
- AI will outperform human performance in transcription and data translation

Operation

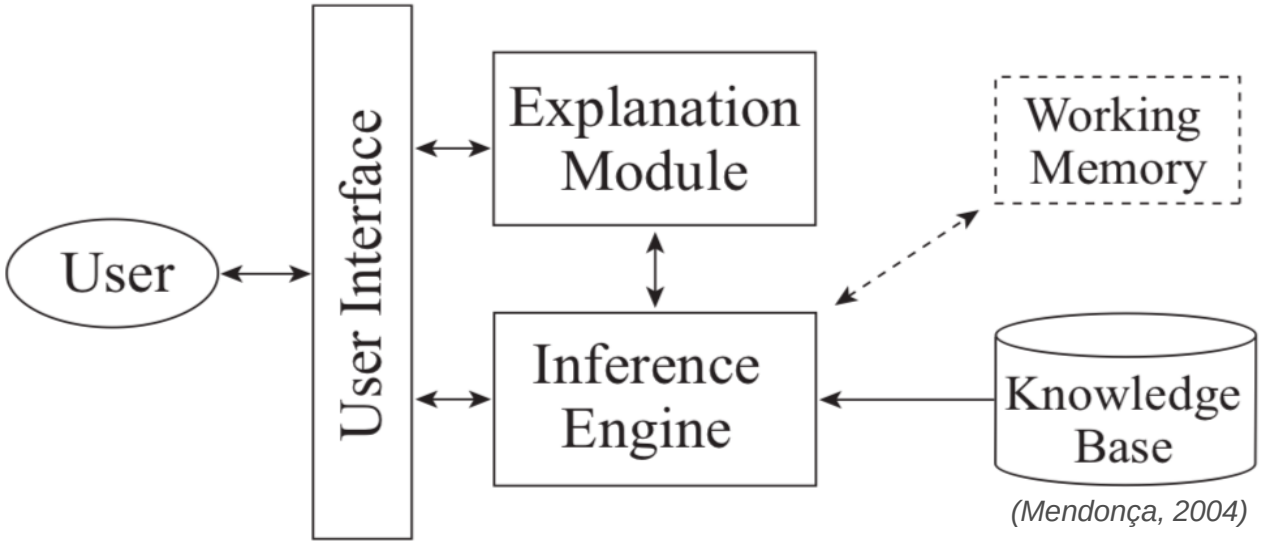
- Creating its own internal rules
- Uncomfortable situation for the doctors and the patient
- Cannot say what exact machine’s

CDSS (*clinical decision support systems*)

- Analysis of patient data and provide diagnosis, prevention and treatment
  - IE: decide actions as diagnostic alerts or diagnosis conclusions;
  - KB: articles, databases or books information;
  - WM: patient information;
  - EM confirms the findings of the MI.

CDSS

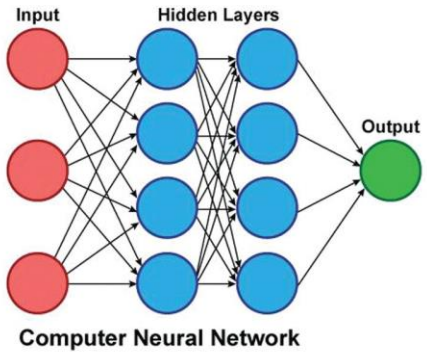
- Make recommendations regarding the treatment of the patient
- Alerts (drug allergies)
- Routine tasks remind screening for oral cancer in the smoker or periodontal disease in a diabetic patient
- Calculate carries risk : sugar consumption, inadequate fluoride exposure, recent caries cases, last visit to the dentist, etc.

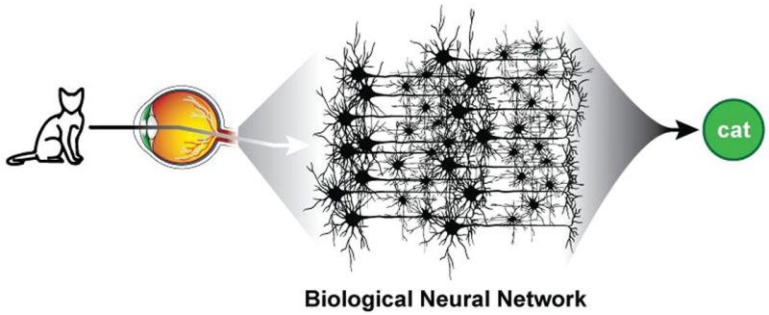


(Mendonça, 2004)

Artificial Neural Networks

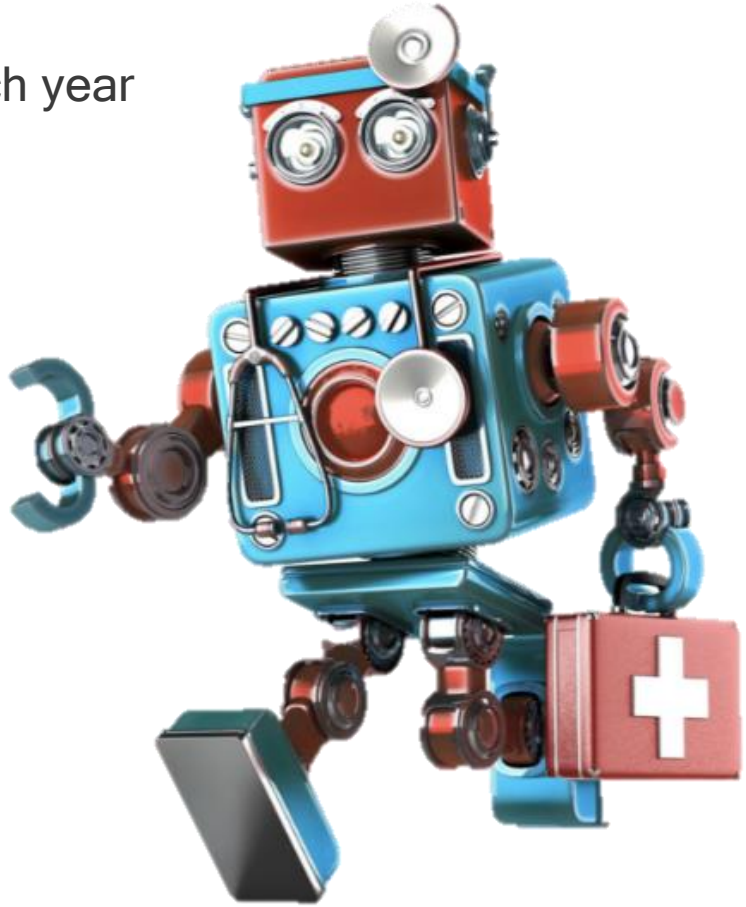
- Pattern recognition
- "*Trained*" on image databases
- Identify risk for oral cancer, pre-cancer and also for third molar treatment plans
- Most commonly used analytical tool in medicine





Artificial Neural Networks

- 1.8 million new articles published each year
- 250 to 300 articles read by the regular researcher
- Volume increases by 9% each year



Benefits for the Dentist

Odontology training

- Powerful tool for medical education
- Augmented reality and virtual
- Simulate clinical work situations without risks
- More effective than traditional simulators

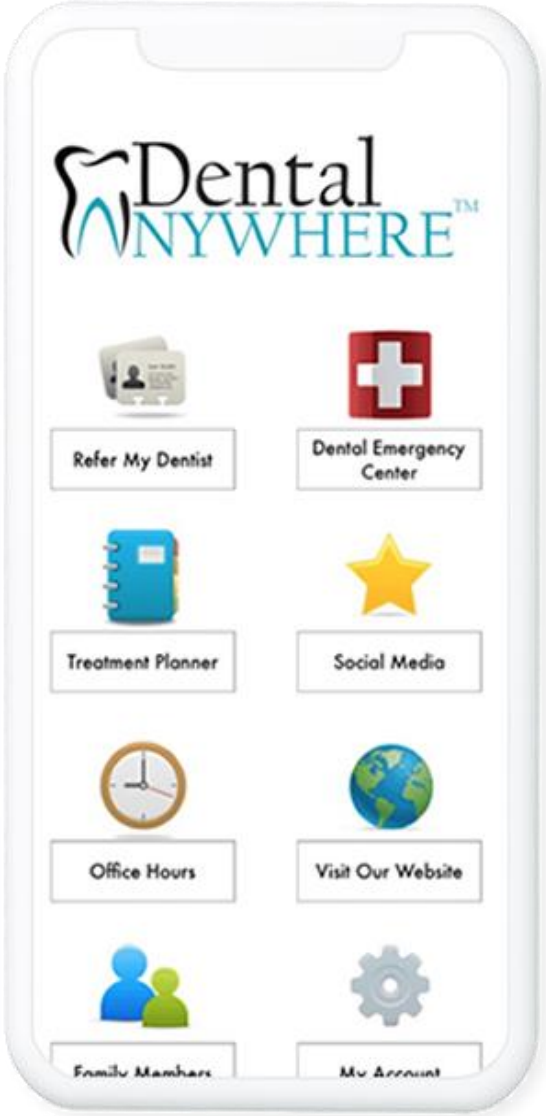
Benefits for the Dentist

Medical errors

- 32% of medical errors from decreased physician interaction time with patients, resulting in misdiagnosis
- Urgent to re-evaluate the consultation time
- Clinician's state of mind
- AI is systematic with big operational memory
- Eliminate most repetitive tasks

Benefits for the patient

- Particular affinity for technical advances
- 2012: more than 13 000 health applications
- Better informing the patient
- Consult usefully (anywhere, anytime)
- Not a substitute for consultation



Issues related to AI

Improved equipment and clinical studies

- Cost: about US $8,000 for the installation of a CDSS
- Data related size of AI: 150 Exabytes (10^{18} bytes)
- Focus on avoiding computer bugs
- Clinician becomes "*IA-dependent*"

Issues related to AI

Improved training of health professionals

- Adaptation challenge is raised
- New challenge: degree of empathy
- Not just a disease but a human being
- Medical empathy helps to heal

Issues related to AI

Societal impact of AI

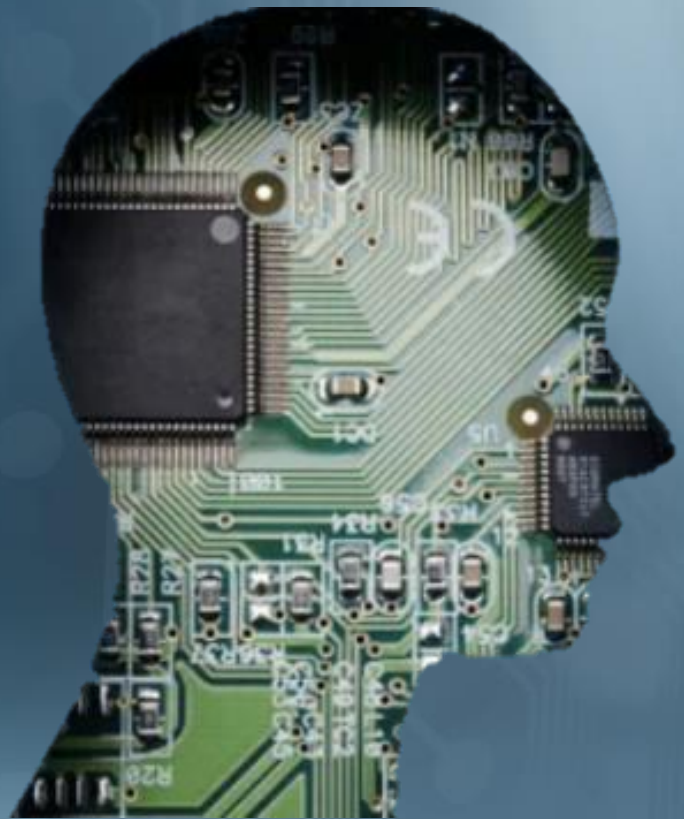
- Jobs destruction ?
- AI in the delivery of care and care of people
- More engineers, computer scientists, "data scientists" (*and the human side of it?…*)
- Interface in the IA-patient relationship
- Fast evolution & adaptation

DISCUSSION

- Legal and economic implications
- Repayment systems
- Guilt and responsibility
- Privacy and personal data
- Loyalty of self-entrepreneurial machines
- Not a factor of discrimination
- Commission on Ethics in Science and Technology (and also in Health)

CONCLUSION

- 54% of patients would agree to be served by a robot with AI support
- Will AI improve the health of patients?
  (still an open question…)
- Smart machines can help for a longer and healthier life



OBRIGADA PELA VOSSA ATENÇAO !