



UNIVERSITÀ
DEGLI STUDI DI TRIESTE

Matematica, Computer e Medicina

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descrizione ed
esplorazione
dei dati

decisioni in
condizioni di
incertezza

innovazione
terapeutica

cosa hanno in comune?

- matematica
- informatica
- medicina

quando andavo all'Oberdan



Figure: Apple II

quando andavo all'Oberdan

Maturità Scientifica 1983-84

- . Si studi la funzione:

$$y = 2x^3 - 3x^2 + 1$$

e se ne disegni il grafico. Si individui la traslazione di assi:

$$x = X + a \quad , \quad y = Y + b$$

che rende la curva simmetrica rispetto all'origine e si scriva l'equazione della curva trasformata. Si determinino le coordinate dei punti in cui la curva data incontra la bisettrice del primo e del terzo quadrante e si calcoli l'area di una delle regioni finite di piano delimitate dalla curva e dalla bisettrice stessa.

Figure: .. dicesi: *picon*

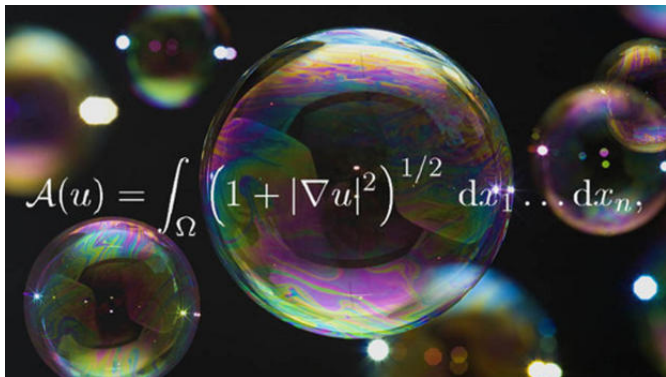


Figure: The 11 most beautiful mathematical equations

matematica, computer e medicina

matematica

medicina

biostatistica

informatica

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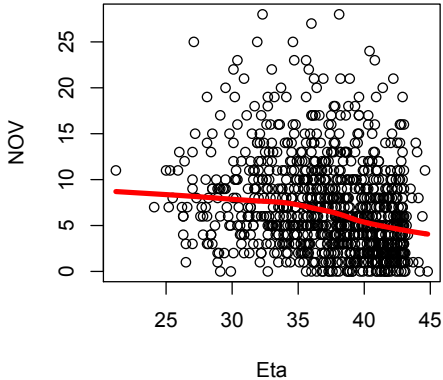


Figure: modelli di regressione

valutazione di metodologie

Massimo Borelli, Lluís Blanch and Umberto Lucangelo

Pressure-volume curves: Useful in clinical practice

Introduction

Translational research has shown that overdistension and repetitive opening and closing of alveolar units contribute to progressive lung injury, and this damage is not distinguishable from the original disease in patients with acute respiratory distress syndrome (ARDS) receiving mechanical ventilation. Ventilator strategies focused on preventing alveolar end-expiratory collapse and limiting the tidal volume (VT) of each breath can attenuate overdistension and ventilator-induced lung injury (VILI). Pressure-volume (PV) curves of the respiratory system performed at the bedside can help clinicians to accomplish

Mathematical approximation to respiratory system pressure-volume curves

The respiratory PV curve is the result of the elastic behavior of the lung and the chest wall. The basic principle of elasticity is explained by Hooke's law, which adapted to the respiratory system can be written in the form:

$$\frac{F}{S} = Y \cdot \left(\frac{\Delta L}{L_0} \right)$$

where the tension developed by the stretching

terapia intensiva

- **respirazione**
- ...
- ...

la mia ricerca: neuroscienze computazionali



Figure: il tronco encefalico

la mia ricerca: neuroscienze computazionali

terapia intensiva

- respirazione
- **ventilazione meccanica**
- ...

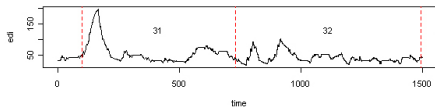
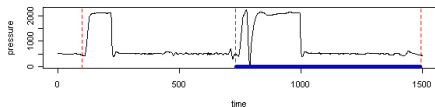
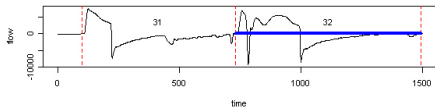


Figure: Journal of American Medical Association

la mia ricerca: neuroscienze computazionali

terapia intensiva

- respirazione
- ventilazione meccanica
- **dissincronie**



la mia ricerca: neuroscienze computazionali

terapia intensiva

- respirazione
- ventilazione meccanica
- **dissincronie**

Validazione clinica:

- 10 pazienti, 521 atti respiratori

	allarme	no	totale
dissinc.	321	0	321
regolare	1	199	200
totale	322	199	521

- falsi allarmi: 0
- mancati allarmi: 0.5 %
- p-value $< 2.2 \times 10^{-16}$

la mia ricerca: neuroscienze computazionali



The screenshot displays a medical monitoring interface with multiple data panels. On the left, there are two tables of vital signs:

INTERNAL VITAL DATA	
FC	spm 125
SPO2	% 97
PRSB	cmH2O 0
RESP RATE	spm 27
PEAK PAW	cmH2O 25
VT INSP	ml 440

INTERNAL VITAL DATA	
FC	spm 59
SPO2	% 97
RESP RATE	spm 17
PEAK PAW	cmH2O 13
VT INSP	ml 386

On the right, there are several waveform plots for ECG, PLETH, AIR FLOW, and PAV. A central banner reads "Common Interface" and "Designed for easy reading, homogenizing all the integrated devices." Below the banner, a table shows additional vital signs:

VT INSP	ml 481
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Better Care

Better Care, S.L. (Company born at [Corporació Sanitaria Parc Taulí](#)) allows the capture of signals from a **wide range of medical devices** (monitors, respirators, ...) with a **large cost savings** for hospitals and clinics in the **integration and centralization** of these waves. The platform incorporates Better Care medical knowledge through the implementation of **configurable alarms**. The biomedical signals are captured, stored and analyzed **cycle by cycle** being able to view in real time via Internet, and the possibility of further data exploration (off-line) and export these to a file for **analysis**.

Common interface for a wide range of devices

The *Better Care* platform provides a common interface, homogeneous and fully configurable for a wide variety of medical devices. New equipment can be add quickly and reliably thanks to our broad expertise integrating medical devices.

il software che utilizzo

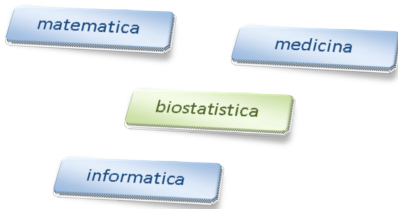


Figure: <http://www.r-project.org>

conclusione

la biostatistica aiuta la medicina a:

- **sintetizzare** i dati osservati
- **inferire** dal campione alla popolazione
- **modellare** un fenomeno aleatorio