Quantitative biomedicine –interdisciplinary training for the clinician scientists of the future

CompBioMed 2019

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Medicine will become a science when doctors learn to count

Sir William Osler 1849 – 1914

Personal motivation : in order to address

- The complexity of the immune system
- The increased size and complexity of immunological data

we need to harness mathematics and computer science.

Where do I find these PhD students !

What will medicine be like in 2030 ?

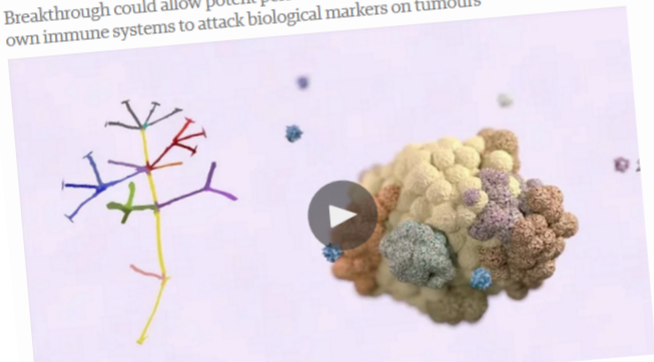
Brain Imaging Produces New Insights into Autism-Anxiety Connection

Studies find delays in how brain processes danger vs safety in adults with autism; implications for tailored interventions for anxiety

May 15, 2015

Cancer tumour genetics reveal possible treatment revolution

Breakthrough could allow potent personalised treatments which prime patients' own immune systems to attack biological markers on tumours



Cancer Research UK explains how immune cel... video

Revolutionary cancer imaging scan 'could save months of useless treatment

A CANCER imaging technique which could save months of unnecessary and damaging treatment has been used in Britain for the first time.

JOHNS HOPKINS MAGA...

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Recommend 363

Personalizing health care through big data

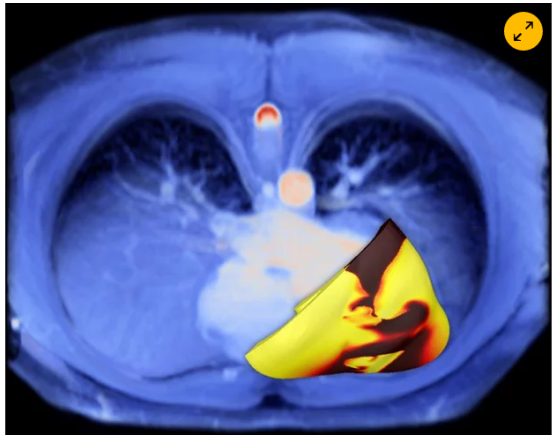
Jim Duffy / Spring 2015

Posted in Health

Tagged individualized health, personalized health care, big data, johns hopkins individualized health initiative, signature initiatives

Virtual hearts help doctors spot patients most at risk from fatal arrhythmias

Personalised 3D heart models more effective than standard tests at identifying cardiac patients at risk of developing lethal arrhythmias, new study shows



Aim – establish a new IBsc which will bridge the gap between medicine, computers and mathematics

Objective - to train a cohort of doctors who can be at the vanguard of exploiting the data-driven computational revolutions which will transform medical care in the 21st century

New iBSc – mathematics, computers and medicine

The degree is INTERDISCIPLINARY and is delivered by a joint initiative of Infection & Immunity and Computer Science

Cartooon by Anoushka Sharp; medical student

Maths
Mathematical Methods in Medical Physics (MPHY3893, Term 1)

Modeling
Mathematical modelling in biomedicine (INIM0004, Term 2)

Programming
Introductory Programming
(Comp0066, term 1)

Machine Learning and Big Data
Machine Learning for Domain Specialists (Comp0142, term 2)

Research project
INIM0038 Research Project in Computational Biomedical Sciences

Elective module in term 1 or 2

Research project

- Automatic detection and processing of sleep data from actigraphy
- Automated digital pathology : detecting relevant objects in malaria blood smears
- Comparing reinforcement learning models and humans
- Identification of functional molecular interactions in the immune system through eQTL data
- Modelling intra-individual variation in T-cell differentiation
- Optimisation of quantitation of early disease features on low dose CT

Challenges

- Strong institutional barriers to inter-disciplinary teaching
- A LOT to learn in a very short time !!

But

- Very high calibre of students - the iBSc students out-performed their peers
- Lots of enthusiasm
- Lots of interested academics

The future

- More quantitative and computational skills earlier in the curriculum
- But what can we leave out !

Acknowledgements

John Shawe-Taylor

former HOD UCL Computer Science

UNESCO professor of artificial intelligence