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Li Ka Shing Centre for Health Information and Discovery

Reproducible machine learning of wearables in healthcare

Medical

Council

MRC

novo nordisk

Research

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Sleep and Circadian **Neuroscience** Institute

Health Data Research UK

Reuben College







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Wearable sensors in health

- ~8 million people in UK use consumer wearables
- Collect information on a wide range of physiological traits, including physical activity, heart rhythms and sleep patterns
- Represents a huge wealth of largely unexploited information

THE INTERNAL IN WERKLY JOURNAL OF SCIENCE

UK BIOBANK Genetic and health data

from half a million people in the United Kingdom PAGES 194, 203 & 210 Socio-demographics D 🖸 抗

Brain imaging (MRI) Cognitive tests Hearing and eyesight measures

Linked to: Electronic health records Death register

Cancer register

monitoring

Physical activity

Markers within genomic regions of interest coding variation ~125,000 UK Biobank Axiom genotype array

Genome-wide coverage for improved performance of array-based imputation ~630,000

> Biochemical markers

Heart and lung function measures

> Biological samples (blood, saliva, urine)

Heart and body imaging (MRI)

Whole body dual-energy X-ray absorptiometry of bones and joints

 Body size and impedance measures

TECHNOLOGY

TIME TO THINK SMALL Fleets of tiny satellites could change space exploration PAGE 185 OPTOELECTRONICS TURNING UP THE LIGHT Boost in performance for perovskite LEDs PAGES 197, 245 & 249

TWO WAYS TO GROW A second source for the cells that line blood vessels PAGES 195 & 223

DEVELOPMENTAL BIOLOGY TWO WAYS TO C DOWN

AI to learn functional activities from wearables



Bao L., Intille S.S. Pervasive 2004, LNCS Staudenmayer et al J Appl Physiol 107: 1300–1307, 2009

Machine learning of behaviours from acc data

150 people – activity monitors + cameras

Unique behavioural & genetic insights (n=91,105)



Physical activity & incident Cardiovascular Disease



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Opportunities for collaboration

- Data: Wearables in large biobanks across nations
 e.g. Our Future Health (UK), FinnGen (Finland), HUNT (Norway)
- Methods: Reproducible machine learning to ensure trustworthy insights
- Industry partnership: Combine wearables & genomics to identify new therapeutic targets





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