

Supporting physical activity as part of intelligent digital management of chronic conditions

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Intelligent sensor networks for healthcare

- PAMBAYESIAN is an EPSRC funded project on intelligent sensor networks for healthcare
 - to start Summer/Autumn 2017
- Aim to provide intelligent technology that helps manage chronic conditions
 - Reduce load on clinicians by reducing dependency
 - Support both the clinician and the patient

Chronic disease and physical activity

- Physical activity is a major factor in much chronic disease
- A major impact of chronic disease is often that it restricts physical activity
- More physical activity can also be part of the solution

Help patients and clinicians

- Intelligent sensor-based technology may help clinicians and patients better manage conditions **together**.
- For patients allow them to rely less on advice from medical staff
 - Help take day-to-day decisions about their care and activity
 - Support still there when needed
- Allow clinicians to remote monitor when necessary and provide more support when they do intervene

Remote monitoring of patients

- Problems with existing approaches:
 - Relies too much on clinicians to **interpret** sensor readings
 - patients can be confused by information presented so become more reliant not less on medical staff
 - Can lead to higher loads for clinicians
- Our project will explore the use of **Bayesian Belief Networks** to address the issues

Bayesian Belief Networks

- Traditional machine learning builds predictive models based on patterns in data alone
- Bayesian Networks combine expert knowledge with collected data to create and adapt the model
- Create a network of causal links with probabilities
 - include factors that cannot be measured directly such as underlying disease state
 - Data eg from individual patients then modifies the probabilities leading to predictions to aid decision making
 - Scope for explanations
- How to present complex probabilistic information to non-experts and in a way that supports clinicians?

Case Studies

- the management of rheumatoid arthritis
 - restricts physical activity
 - ability to be active and pain involved critical inputs to system
- diabetes in pregnancy
 - alleviated through exercise

Interaction Design

Two inter-related problems

- Make it work for clinicians
- Make it work for patients

Make it work for clinicians?

- Study the way clinicians work
 - interviews, contextual design
- Understand clinical pathways
 - Determine critical points in clinical pathways where help has most effect
 - Design modified clinical pathways?
- Determine how and when information is needed and decisions taken

Make it work for patients?

- Study patient needs and goals
 - how it fits their lives
 - Develop example illustrative personas and scenarios
- Participatory design with patient groups
- How do we present data from Bayesian networks in a way that helps patients make day to day decisions.

Thank you