Centre for Health Technologies
Dr. Adriane Chapman, Professor Neil White

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https://www.cht.ecs.soton.ac.uk/
The Centre will aim to provide a focus for variety of activities that currently take place in the existing research groups in the field of e-health, healthcare technologies, wellbeing and rehabilitation.

Our Purpose

- Matchmaker with clinicians
  - Marketplace for problems and solutions
  - Communication links
  - Assistance with collaboration expectations
- Spotlight on individual work and framework to share successes
- National conversation on focus, impact, transition and goals
Optimizing Treatment and Behaviours

Novel Medical Devices and Systems

Community Health and Wellness

AI and Health
The Research

OPTIMIZING TREATMENT AND BEHAVIOURS
My research interests include:

- Digital Behavioural Interventions
- Web Science
- New Forms of Data
- Semantic Annotation and Provenance
- Telemedicine
- App-based delivery of public health information
- Narrative systems

Mark is an Associate Professor in the Web and Internet Science Group. He is the technical lead for the LifeGuide programme of research, a multimillion pound, multidisciplinary initiative to research and develop online digital public health interventions such as weight management, stroke rehabilitation and cochlear implant home care.

He is the Director of the Centre for Doctoral Training in Web Science and Innovation.

His research interests also include new methodological approaches for emerging forms of data, and their application in areas as diverse as Telemedicine, disaster management and food provenance.
My research interests include:

- Personal consent that enables individuals to express more fine-grained consent than opt-in/-out
  - Effectively maintain and utilize data to honor consent
  - Understand how personal, fine-grained consent impacts data sharing by patients
  - Extending health data exchange standards, e.g. FHIR, to encapsulate fine-grained consent

- Provenance that tracks the history of creation and updates of information
  - Using this information to identify possible areas of good practice for future training
  - Security and privacy concerns with provenance sharing
My research interests include:

- **Medical information systems**
  - A Step Change in LMIC Prosthetics Provision through Computer Aided Design, Actimetry and Database Technologies
  - Electronic Health Records implementation
  - Data Quality of electronic health record systems
  - The introducing of Telemedicine in rural Sri Lanka

- **Gamification in**
  - Gamification for the Self-Management of Chronic-Illnesses
  - Gamification in Nursing Education
  - Games for transitional care.

I am an associate professor in the cyber physical research group in the school of electronics and computer science.

The focus of my research is in Secure Information Systems. This is underpinned by technologies such as blockchain, machine learning, cloud, and applied to information systems.

I specialise in building the complete system, from adaptable user interface, secure middleware and secure storage. This also takes into account Privacy and Security of data. I am also a qualified auditor for Information Assurance and Data protection. Example systems include the Virtual Orthopaedic European University, Life Guide, MS Fatigue Website and Virtual Research Integration Collaboration.
The Cyber Security group research interests include:

- **Cyber security awareness / training**
  - gamification of cyber security training
  - professional cyber security training courses

- **DLT/blockchain solutions for clinical trials**
  - facilitating discovery/recruiting and on-boarding of patient via DLT-based procedures
  - enabling secure sharing and reuse of trial data

- **Data sharing and management solutions**
  - secure authentication / authorisation systems for IoT-based solutions (wrt FHIR, HL7 & IHE standards)
  - consent management and informed-consent authorisation systems
My research interests include:

- Learning models for patients’ symptoms related to a specific condition.
  - Linking patients’ symptoms to possible environmental drivers and also wider determinants of health including socio-economical data.
  - Feature extraction and selection
- Clustering of patient behaviour groups
- Feature extraction for medical image processing
The Research

NOVEL MEDICAL DEVICES AND SYSTEMS
My research interests include:

- **Sensor technologies**
  - Printed devices
  - Thick-film sensors
  - Intelligent sensors

- **Medical devices**
  - Novel respiration sensors
  - Prosthetic hands
  - Measurement systems for orthopaedic patients
  - Low-cost sensors for smart homes
My research interests include:

- **Wearable assistive and rehabilitative technology, e.g.**
  - Use of functional electrical stimulation arrays in clothing for home-based upper limb stroke rehabilitation
  - Wearable soft robotics for drop-foot
  - Sleeves to suppress Intention Tremor in MS
  - Clothing with electromyography (EMG) arrays for rehabilitation training and monitoring

- **Modelling and control of human movement**
  - Biomechanics, capture and analysis of human motion
  - Developing dynamic models of motion using FES & EMG
  - Modelling human motor control and motor learning
  - Sensor fusion, analysis and model integration
Dr Kai Yang  
ky2e09@soton.ac.uk

I obtained my Ph.D in 2009 from the University of Leeds. I have been worked on e-textiles from 2009. I am an Principal Research Fellow in Smart Electronic Materials and Systems (SEMS) Research Group, Electronics and Computer Science at the University of Southampton. I am a material scientist working on multidisciplinary research to develop wearable technologies for healthcare applications. I have been awarded an EPSRC-UKRI Innovation Fellowship to develop “Advanced e-textiles for Wearable Therapeutics”. I am also PI on the MRC SMARTmove grant to develop a textile based wearable Functional Electrical Stimulation (FES) training system for stroke upper limb rehabilitation.

My research interests include:

- **Wearable healthcare/medical devices**
  - Functional electrical stimulation (FES) for rehabilitation
  - Wearable digital healthcare for pain relief
  - Others (e.g. muscle exercise, vein thrombosis prevention)

- **Ink formulations for printing electronics on textiles**

- **Others: biocompatible materials, smart fabrics.**
My research interests include:

• **Single-molecule / single-cell biomedical analytics**
  – Nanopore resistive pulse sensing of microRNA
  – Ion channel drug screening
  – Microfluidic cell arrays / imaging cytometry
  – Intracellular nanoparticle drug delivery, e.g. to guide stem cell differentiation

• **Biosensor development**
  – Biofunctionalization of semiconductor materials
  – Microfluidic integration of transducer elements
  – Field effect transistor biosensing of DNA
Dr Daniel Spencer
D.c.spencer@soton.ac.uk

I am a lecturer in the Biomedical Electronic Engineering research group (BEE) in Electronics and Computer Science at the University of Southampton.

I am working with a spinout company based in India to develop a miniature, point of care full-blood count system for the developing world. I am also working with microbiologists at Public Health England and the University of Western Australia to develop rapid phenotypic antibiotic susceptibility testing. Using similar technology platform, I am collaborating with Ophthalmology at University Hospital Southampton.

My research interests include:

• Single cell biophysical analysis
  – Label free, phenotypic characterisation of a variety of cell types including mammalian cells, parasites and bacteria
  – Rapid electrical and mechanical fingerprinting
  – Point of care testing and low cost diagnostics

• Microfluidics and lab-on-a-chip
  – Cell enrichment and separation using microfluidic technologies
  – Automated sample preparation assays
  – Integrated systems combining sample separation, processing and detection
My research interests include:

- Smart Fabrics: fabrics with integrated electronic functions (e.g. sensors)
- Wearable Technology
- Printing Technology (screen, dispenser, 3D)
- Sensors
- Energy Harvesting
- Microfabrication and MEMS
- Materials

I have undertaken many healthcare related projects. Recent examples:

- Battery Free Smart Bandage
- Fabric-based Functional Electrical Stimulation
- Wearable movement sensor
- Wearable pulse oximetry and pulse measurement via video magnification
- Wearable EEG, ECG, EMG, EOG measurement

I have written and led many proposals in healthcare.
COMMUNITY HEALTH AND WELLNESS

The Research
My research interests include:

- Digital accessibility, use of assistive technologies and those supporting technologies that may be considered mainstream such as mobile devices, their applications and other online resources, communication and disability related issues and the use of technology as well as the usability of applications and online services.

Advice and guidance can be offered on any aspect of digital accessibility and information about current and previous projects can be found at:

https://access.ecs.soton.ac.uk/
The focus of the WellthLab’s research is to \#makeNormalBetter @ scale for all

To design technology— that helps people get off technology.

A focus is how to help people build the Knowledge Skills and Practice they need to thrive in health hostile environments

and to build Health Support from Individuals to infrastructure for Health Resilience at Scale
Dr Stephen Snow  
s.snow@soton.ac.uk

I am a researcher interested in helping people better manage their indoor air quality, with the goal of improving the health and cognitive performance of office workers and students.

My research interests include:

• Improving user awareness of indoor air quality
• Supporting healthier ventilation behaviour
• Helping people help themselves
• Improving cognitive performance of school students
The Research

AI AND HEALTH
My research interests include:

- Developing generic, yet domain-specific, feature extraction methodologies for record classification
  - Applying to electronic patient records and first diagnosis prediction
  - Plan to apply to repeated medical events, such as myocardial infarction, COPD exacerbation events
- Pseudonymisation/replication of personal data for machine learning
- Application of machine learning to personalised medicine
  - Linking environmental data to health records
  - Giving specific health advice to patients based upon patient activity in monitoring app

I am a Research Engineer as part of the IT Innovation group in Electronics and Computer Science at the University of Southampton.

I hold a PhD in Theoretical Particle Physics since 2015 from the University of Manchester. My primary line of work is within data science, particularly in the development of prediction models using patient records within the health domain. Other work involves producing models for the classification of images, and the future prediction of more general time series data from medical monitoring apps.

Outside of data science, I have worked in several EU H2020 projects looking at user privacy and risk analysis. I have also worked closely with the UK Home Office as part of commercially funded work.
My research interests include:

- Microsystems (Optomechanics and MEMS)
- Sensors systems (such as Wireless Sensor Network, Energy Harvesters, Distributed Fibre Optic Sensors and Digital Tracking) for industrial applications
- Big data and AI for healthcare applications
Contacts and Outreach

• Please contact us for:
  – Help finding a collaborator to help with a technology problem
  – Interdisciplinary PhD projects
  – Short term fast prototyping projects using ECS Group Design Project students
  – Outreach and coordination events

• ecscht@soton.ac.uk

• https://www.cht.ecs.soton.ac.uk/
Thank you

**Advisory Board**
- Professor Harry Ackerman
- Professor George Attard
- Mr. Philip Chapman-Sheath
- Professor Mandy Fader
- Professor Salim Khakoo
- Professor Peter Smith
- Mr. David Rew
- Professor Jeremy Wyatt

**ECS Steering Committee**
- Dr Kate Farrahi
- Professor Chris Freeman
- Professor m.c. Schraefel
- Dr Dan Spencer
- Dr Mark Weal
CHT Activities to Date

- Outreach to NHS Imaging (13 Mar 2019)
- Advisory Board Meeting (26 Feb 2019)
- Represented at Turing Health (7 Mar 2019)
- Fortisnet Official CHT Launch event (24 Jan 2019)
- Joint Workshop with USH Trust “Clinicians meet Engineers” (9 Nov 2018)
- Sandbox event to pair ECS with commercial groups “Healthy Aging”, with £10K ESRC IAA funds available (6 Nov 2018)
- Cabinet Office’s Open Innovation Team and Department of Health workshop on “Health and AI” (3 Sept 2018)
- GDP
  - 2 health-based projects
- Matchmakers
  - 2 CS academics + 1 clinician (fertility)
Upcoming Activities

• EPSRC Informational on Transformative Health Technologies Proposal (27 Mar 2019)
• EPSRC Proposal Outline Formulation (April)
• Clinicians Meet Engineers Part 2 (2 May 2019)
  – GDP projects
  – PhD studentships
  – Relationship Building. Joint event with UHS Trust
• PhD recruitment Event (early May)