Digital Sensing Technologies, Mental Capacity and the Judicial Process

Reuben Kirkham
Open Lab, Newcastle University
United Kingdom
reuben.kirkham@newcastle.ac.uk

Submitted to the Computing and Mental Health symposium at Chi 2018

Abstract
Impairments that relate to mental health can sometimes relate to the legal concept of mental capacity, namely the ability to make decisions for oneself. Accordingly, a range of self-tracking technologies for mental health are also measuring mental capacity. It is a matter of time before such evidence is used in the legal process in order to make decisions about individuals that could impact upon individual liberty. Based on Information Rights litigation which the author was involved in, this paper explores how the judiciary are ill-prepared to address these technologies, as well as how the data generated by these systems might be managed in order to manage this particular risk.

Author Keywords
Mental capacity; Activity Tracking.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

Introduction
There has been a recent emergence of activity tracking systems which seek to measure the effect of a disability, by tracking the manifestation of its symptoms within the activities of an individual. Most

relevant is the recent emphasis on tracking mental wellbeing (and thus capacity) using digital sensing to maintain behavioral logs to assist with mental health treatments and the management of a mental health condition [6]. This has reached the point where consumer technologies (e.g. wearable fitness trackers or smartphones) can now make inferences about mental health with a reasonable degree of accuracy: for bi-polar disorder it is now possible to identify manic and depressive states, as well as the transitions between them using smartphones with a "state change detection precision and recall of over 97%" [1] and people with this disability now regularly use biometric trackers as a therapeutic tool to self-manage their condition [8]. These inferences will only be more detailed and more accurate as research progresses: Human Activity Recognition systems and algorithms are becoming increasingly sophisticated (e.g. with the use of deep learning [2] or novel feature representations [3]).

This is also evidence that might, in the abstract, be used in the assessment of mental capacity. In the UK, a person is said to lack "[mental] capacity in relation to a matter if at the material time he is unable to make a decision for himself in relation to [a given matter] because of an impairment of, or a disturbance in the functioning of, the mind or brain" (Mental Capacity Act (2005), s.2). Similar definitions can be found in other jurisdictions: this is because of the UN Convention on the Rights of Persons with Disabilities, which has come into force in the vast majority of countries (with the resulting effect that laws surrounding mental capacity have been largely harmonized across jurisdictions).

The fact that there might be information that can be used does not mean it will be used fairly. The risk of *inappropriate statistical interpretation* is particularly pronounced in legal and quazi-legal settings, with even basic statistical errors being pervasive within the legal system, such as false independence assumptions including Meadows Law, the use of arbitrary multipliers in asserted probability formulas [11], or the (undetected) use of poorly trained forensic scientists, some of whom have been individually responsible for hundreds of false convictions or adverse civil findings (including children being taken away from their parents) [5,9]. This is a particularly concerning risk in respect of mental capacity: these are civil proceedings, where the balance of probability is sufficient to deprive someone of their liberty, or to make certain decisions about their own life.

Can the Judiciary understand statistics relating to Activity Tracking Systems?

The most elementary statistics for measuring the efficacy of an activity tracking system are Precision and Recall. In the context of an Information Search case (against the UK Information Commissioner[1]), where the question of search time was in issue (the question was whether a public authority could refuse to disclose documents on the basis that it would be unduly burdensome for them to perform electronic searches to locate them), the author has litigated the use of these statistics before four different Judges (this case still

[1] The Information Commissioner is the regulator who addresses both Freedom of Information and Data Protection concerns.

remains unresolved, with a final hearing due in late February).[2] This has generated a broad range of data about the types of errors and misunderstandings that can be made, including how they arise, as well as what strategies might be used to explain this issue. The general picture is that the Judges in question could obtain and present a superficial understanding of the concepts in question, but lacked a genuine knowledge of how these concepts could be manipulated. To use the phraseology of the late Mathematics educator Richard Skemp: the judges had an instrumental understanding of the concepts in question, but not the necessary relational understanding to grasp what they truly mean [10]. This is troubling, because it is likely that the Judiciary would issue decisions where they have appeared to understand the matters in issue, but the full documentary record (which is not normally published) would suggest otherwise.

There is a related problem. Many mental health and disability cases are presented by litigants in person, often in a less formal Tribunal setting (these are still Courts, but are designed so legal representation is not necessary). Another concern identified in this litigation is that there is a lack of a formal or effective procedure for the presentation of questions of science to a Tribunal, at least in the context of the UK Tribunal system. This compound the problem of Judicial misunderstanding, because this is difficult to overcome where the judiciary are unable or unwilling to accept the limitations of existing processes. As well as increasing the risk of judicial error, this has significantly lengthened the proceedings: for example, one of this authors cases is on its fourth judge in succession (in part, because two Judges resigned from addressing it at various stages). It is also worth noting that the lawyers involved in this case have been similarly problematic, even though they are supposed to be experts in Information Rights: the Information Commissioner's present argument is that an 'error of mathematics' is an 'error of fact', rather than being one of reasoning.

Why this amounts to a significant challenge for Mental Health Tracking?

The inability of the regular judiciary to fully understand the relevant statistics is a fundamental concern for individual liberty, such is the nature of the decisions that they take. However, perhaps a more fundamental problem is *Trust*. People who may have impairments relating mental health, or a fear of losing capacity are likely to have concerns in trusting these healthcare (or other) technologies arising from their disabilities [4,7]. It raises an obvious question: *if I use this technology, might the data within it be used in order to determine that I lack capacity to make decisions about my life?* If the use of this data is perceived (or is) unfair, then potential users with relevant disabilities are less likely to engage with these (otherwise beneficial) systems, even where these technologies could otherwise make a profound difference to their lives and wellbeing. Not only could this deprive people of life opportunities, but these systems can actually support certain people to obtain or increase their mental capacity, especially

[2] It is notable that (i) these cases often take place before the same group of Judges who hear mental capacity cases and (ii) search is essentially the same problem as classification (with some added complexity in relation to activity trackers). These cases therefore raises the same practical issues that arise in respect of activity tracking for mental health.

under the supportive decision making paradigm of the UN CRPD. This raises the potential for an unconscionable result: the *fear* that these systems could incorrectly label someone as having reduced mental capacity could reduce engagement with would otherwise be beneficial interventions, thus *de facto* minimising the capacity of the individual in question (so it would be in turn justifiable to restrict or limit their liberty).

Conclusion

This paper has identified a significant challenge that applies to technologies that aim to track the effects of a mental health condition. As well as a fully account, there are two new concerns that would be raised and concreted in the full version of this paper: (i) how to design information management and retention to avoid the risk arising in the first place and (ii) the approaches which might be used in order to minimize the risk of scientific misunderstandings on the part of the Judiciary in the implementation of such technologies. This is not simply the minimization of risk: with careful management, the assessment of mental capacity implicit in mental health tracking technologies could be used to the advantage and benefit of people with related disabilities.

References

1. Agnes Grünerbl, Amir Muaremi, Venet Osmani, et al. 2015. Smartphone-based recognition of states and state changes in bipolar disorder patients. *IEEE Journal of Biomedical and Health Informatics* 19, 1: 140–148.
2. Yu Guan and Thomas Ploetz. 2017. Ensembles of Deep LSTM Learners for Activity Recognition using Wearables. *arXiv preprint arXiv:1703.09370*.
3. Nils Y Hammerla, Reuben Kirkham, Peter Andras, and Thomas Ploetz. 2013. On preserving statistical characteristics of accelerometry data using their empirical cumulative distribution. *ISWC 2013*, ACM, 65–68.
4. Annie Irvine. 2011. Something to declare? The disclosure of common mental health problems at work. *Disability & Society* 26, 2: 179–192.
5. Alex Kozinski. 2015. Criminal Law 2.0. *Ann. Rev. Crim. Proc.* 44: iii.
6. Mark Matthews, Saeed Abdullah, Geri Gay, and Tanzeem Choudhury. 2014. Tracking mental well-being: Balancing rich sensing and patient needs. *Computer* 47, 4: 36–43.
7. Ramin Mojtabai, Mark Olfson, Nancy A Sampson, et al. 2011. Barriers to mental health treatment: results from the National Comorbidity Survey Replication. *Psychological medicine* 41, 8: 1751–1761.
8. Elizabeth L Murnane, Dan Cosley, Pamara Chang, et al. 2016. Self-monitoring practices, attitudes, and needs of individuals with bipolar disorder: implications for the design of technologies to manage mental health. *Journal of the American Medical Informatics Association* 23, 3: 477–484.
9. Paul Roberts. 2016. LTDNA evidence on trial. *Frontiers in genetics* 7.
10. Richard R Skemp. 1976. Relational Understanding and Instrumental Understanding. *Mathematics Teaching* 77: 20–26.
11. William C Thompson. 2012. Discussion paper: Hard cases make bad law—reactions to R v T. *Law, Probability and Risk* 11, 4: 347–359.