

Who am I?

Dr Sarah V Stevenage and Professors Monica Whitty and Steve Saxby from the SuperIdentity project discuss relationships between real-world and online identities and the challenge to improve identity verification across both settings



DR SARAH V STEVENAGE

To begin, what does the SuperIdentity project aim to achieve?

SVS: Advances in technology mean that we can now have multiple roles in both the physical and digital world. The SuperIdentity project is the first, to our knowledge, to explore identity across both contexts.

In particular, we are trying to link cues across physical and digital contexts so that knowledge of one piece of information might help us to predict other pieces of information. As a consequence, the SuperIdentity project will help us to understand identity in all its dimensions and boost confidence in our capacity to verify identity and avoid identity-related fraud.

How do you hope to achieve these aims?

SVS: The project encompasses two critical strands of work. The first involves testing biometric and cybermetric cues to identity so that we understand the reliability of each cue in isolation and in combination. This work is facilitated by the collection of a unique database of information – the SuperIdentity Stimulus Database (SSD) – which collates identity cues in four information domains: biographic, biometric, cybermetric and psychological. The combination of all these measures for a set of individuals allows us to explore how one measure may link with another.

Our second strand is a two-year programme of social acceptability workshops led by Professor Danaë Stanton Fraser at the University of Bath. We are working with a cohort of 15-19 year olds (selected because of their high internet usage) to explore attitudes to issues such as password

privacy, internet legacy and ownership of information. We will also look at creative aspects such as the use of technology for social purposes and novel identity tokens like customisable avatars for personal representation.

Do you think that the distribution of identity across real and cyber domains poses any threats to the wellbeing of individuals?

MW: It is worth noting that we have real identities in both the physical world as well as online spaces, but they can sometimes differ whilst both being authentic. There is some evidence to suggest that lack of consistency of identity across different spaces and contexts could be detrimental to wellbeing. I believe that the picture is more nuanced than this though, and depends on the online space and on what that space is used for. We found that individuals who show large discrepancies between their everyday self and their ideal self were more likely to be depressed and anxious; however, these results did not hold true when comparing one's everyday self and online selves in spaces such as LinkedIn, Twitter, online dating sites and Facebook.

Can you foresee any challenges associated with identity when open data becomes mainstream?

SS: The implications for identity from open data initiatives hinges on their ability to safeguard people's data from misuse, including rigorously protecting the public's right to privacy and the confidentiality of data held. The UK Government recognises that privacy must not be an afterthought but should be at the beginning of all discussions concerning the release of an open dataset. To this end, the key challenge is to assure individuals that anonymised datasets will remain anonymised and personal data will remain personal, while recognising the value of data sharing in appropriate circumstances. Despite inherent challenges in trying to find an appropriate balance, initiatives such as the Identity Assurance Privacy and Consumer Advisory Group suggest that progress is being made towards helping users to control their identifying information.

What areas of expertise does your multidisciplinary team represent?

SVS: Our team includes key academics with experience in forensic anthropology (Professor Sue Black), automated biometric recognition (Dr Richard Guest), human cognitive processes

(Dr Sarah V Stevenage), human-computer interaction (Professor Danaë Stanton Fraser) and cyberpsychology (Professor Monica Whitty). Together, these teams provide the empirical demonstration of biometric and cybermetric reliability. In addition, we maintain a strong focus on social acceptability, privacy, law and ethics, and this work is informed by our experience in internet law (Professor Steve Saxby).

All empirical and social acceptability work feeds the SuperIdentity framework developed by Professor Sadie Creese, and shaped with understanding of the needs of key stakeholders. Finally, the team would not be complete without dedicated experience in visualisation methods. Dr Bill Pike and Oriana Love from the Pacific Northwest National Laboratory in the US lead this initiative for us without which it would be very difficult to see, understand and query the depth of information that sits behind the SuperIdentity concept.



SuperIdentity: battling identity fraud

An international project combining research into online and offline identities is attempting to increase identity security and combat identity fraud, whilst exploring the nature of identity itself in the Digital Age

AT A TIME when people are sharing more personal information online than ever before and access to the latest technology is a given, it is evermore common that unscrupulous people obtain and use this information to commit fraud and other malicious acts. According to the National Fraud Authority, the effects of identity theft and fraud currently cost the UK more than £2.7 billion per year and continue to present an enormous problem to private individuals, businesses and national security.

TOWARDS SUPERIDENTITY

Dr Sarah V Stevenage is Principal Investigator for the SuperIdentity project, an ambitious study looking to change the way that people think about identity and identification: "We believe that the benefits from this research will be substantial. With better tools for human identification, we will be more able to protect our personal privacy and data security, whilst improving our ability to identify the true suspects in crimes against society".

The fusion of physical and digital identities is what Stevenage and her collaborators refer to as SuperIdentity – the core identity of an individual to which all of their personas and physical traits belong. They believe that the more accurate and efficient we can become in recognising SuperIdentity, the more confident we can be in correctly identifying individuals, making it harder for any criminal to hijack an identity.

THE STORY SO FAR

In the investigation, biometric (physical) and cybermetric (digital) identity data are used as raw input for modelling and data visualisation. The mathematical model that the researchers have developed combines this information so that logical questions can be asked.

Year one of the study has focused on how people represent themselves both online and offline. Biographic, biometric, cybermetric and psychological data collected from 120 individuals have been used to compile a database with the aim of developing a framework from which law enforcement

and intelligence agencies can utilise known information to predict unknown information, link previously isolated indicators, or for direct intelligence gathering.

A practical example shows the identification of a personality trait such as extroversion and the combination of identity cues that this can predict. "The personality characteristic of extroversion may predict the biometric of long stride length, the cybermetric of firm pressure in a mobile phone swipe gesture or the cyberbehaviour of a large and active friend set online," highlights Stevenage. "If such a linkage is proven, then demonstration of any one metric can lead to the prediction of the other related metrics, targeting of information searches or triangulation of identity across diverse cues."

NOVEL BIOMETRIC DATA

SuperIdentity addresses the problems currently experienced with identification of individuals, as it considers measures in isolation – such as fingerprints, DNA or retinal scans – and combines this information with more novel biometrics, such as hand geometry and vein patterns or ear prints, highlighting the systemic linkages between them. "This understanding enables the team to articulate not only the individual contribution of each biometric given its reliability over time, but also the linkage across biometrics so that knowing one piece of information can enable us to predict another," summarises Stevenage.

The hypothesis is that this will make it infinitely more difficult for anyone trying to trick an identification system as they would find it almost *impossible* to accurately mimic or mask the many physical cues that make up a SuperIdentity.

RESEARCH IN CYBERMETRICS

Cybermetrics is the term used to describe the identity traits that individuals exhibit online. It can be used to show how they represent themselves in different online settings. Modern technology can foil a criminal by providing unusually nuanced data

Weighting the value, source and contextual influences of information allows a judgement to be made about the strength or confidence of that information, which is crucially important when considering the value of a potential piece of intelligence

INTELLIGENCE

AN EXPLORATION OF SUPER-IDENTITY

OBJECTIVES

To work towards a rich understanding of identity which encompasses aspects that we reveal both in the real world and the cyber world. The result will be a more complete and dynamic picture of who someone is, enabling greater input into the identity decision.

PROJECT PARTNERS

University of Bath, UK

University of Dundee, UK

University of Kent, UK

University of Leicester, UK

University of Oxford, UK

University of Southampton, UK

Pacific Northwest National Laboratory,
USA

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CONTACT

Dr Sarah V Stevenage

Principal Investigator

Psychology
Shackleton Building (B44)
University of Southampton
Highfield Campus
Southampton
SO17 1BJ, UK

T +44 23 8059 2973

E s.v.stevenage@soton.ac.uk

www.southampton.ac.uk/superidentity

DR SARAH V STEVENAGE is a cognitive psychologist at the University of Southampton, specialising in forensic psychology. She completed her degree, and later a PhD, at Exeter University. In 1993, she moved to the University of Southampton where she has fulfilled several roles; notably, Director of Postgraduate Research, Deputy Head of School for Education, Head of Psychology and, currently, Associate Dean.

As the lead investigator in the SuperIdentity project, Stevenage is responsible for coordinating all project activities. In addition to this, her years of experience in forensic psychology are invaluable for guiding work on physical biometrics.

through devices such as touchscreen mobile phones, greatly enhancing the potential for accurate identification. Phone gestures such as length and weight of a screen swipe can be used to predict personality traits or to determine linked biometrics such as gait, or biographical data such as height or gender, notes Stevenage: "Using four simple feature extractions – gesture length, completion time, touch pressure and gesture thickness – we were able to distinguish users by their gender, age range and by the hand used to create the swipes".

Cognitive psychological cues are also of great interest in cybermetrics and the development of SuperIdentity. Additional areas that the team is keen to investigate include:

- **Password riskiness** – the extent to which personality and experience inform the ways we create and keep passwords. Knowing this connection allows the SuperIdentity team to make confident associations between aspects of personality and password behaviour
- **Social education** – how people might choose to alter or censor their online profiles
- **Deception** – examining differences in both online and offline deception to help determine the reliability of information

THE MATHEMATICS OF SUPERIDENTITY

A complex mathematical model underpins the whole project. It is used as a framework that links information in a meaningful way to support identity decisions. The model has a hierarchical organisation which means that elements can be clearly defined and the links between them can be made explicit through biological, behavioural or experimentally tested hypotheses. Available biographic, biometric, cybermetric and psychological data can then be used in the model so that one element can predict, converge with (or refute) another.

The uniqueness of the model lies in the value of an intelligent and powerful combination of all pieces of information. Using this approach, the team is moving closer and closer to being able to say that an identity in the online world and an identity in the physical world represent one and the same person. Weighting the value, source and contextual influences of information also allows a judgement to be made about the strength or confidence of that information, which is crucially important when considering the value of a potential piece of intelligence.

MOVING FORWARD

To be able to conduct such wide-reaching and impactful research requires the expertise of more than one group of researchers. Stevenage and her team work alongside a network of UK universities in the SuperIdentity project. In addition, international backers and collaborators have shown a keen interest. Alongside the UK Engineering and Physical Sciences Research Council (under the Global Uncertainties Programme), the SuperIdentity project has the backing of the US Department of Homeland Security's Science and Technology Directorate. In addition, a group of scientists from Pacific Northwest National Laboratory in the US has offered invaluable expertise in visualisation techniques. "This has provided a user-friendly and user-driven interface which makes it easy to see how individual elements of identity combine to give a rich, reliable and robust basis for identification," adds Stevenage.

The research is just entering year two, and the scientists continue to consolidate the SuperIdentity approach through further empirical research and refining their mathematical framework. Stevenage and her team have already added to understanding of identity in both the real and cyber worlds, and the continuation of the project should see further insights into what identity means in the Digital Age.