The Alan Turing Institute

SPARRA: using AI to predict emergency hospital admissions in Scotland

What happened?

ASG-funded researchers have been working with Public Health Scotland (PHS) to improve its pioneering SPARRA tool for predicting emergency hospital admissions. GPs in Scotland have been using SPARRA since 2011 to identify patients at high risk of emergency admission, intervening early to try to reduce this risk by, for example, adjusting medication or making targeted referrals. The upgraded tool will help PHS to further improve patient care by better identifying at-risk patients, potentially leading to reduced pressure on hospitals.

What are the real-world impacts?

- Developed by ASG, SPARRA v4 is expected to be deployed in 2023. It will provide GPs with monthly risk scores for around 80% of the Scottish population.
- SPARRA v4 refines the previous tool (SPARRA v3) by using cutting-edge machine learning techniques to improve the algorithm's risk prediction. For the 10,000 patients deemed most at risk, calculations with historic data show that v4 could have pre-empted around 1,000 additional emergency admissions.
- The researchers created a data science environment in Docker that was deployed in the Scottish National Safe Haven to allow analysis of sensitive patient data. This reproducible methodology could be used for other data-intensive projects within PHS and other UK health bodies, and is aligned with aspirations in the Goldacre review.
- The transfer of knowledge and skills between SPARRA researchers and NHS data analysts enabled PHS to apply advanced analytics to its rich health data, generating insights which could inform future policy and improve operational efficiencies.

Why was the Turing's ASG programme uniquely placed to do this?

- PHS's Information Services Division (at the time part of NHS Scotland) engaged with the Turing via a successful Data Study Group in 2017.
- ASG was well placed to drive forward this collaboration, using the funding under its Health theme to bring together leaders in machine learning from University of Edinburgh and Durham University, alongside others from the wider Turing network.
- ASG facilitated access to a variety of experts at the Turing, including the team behind *The Turing Way* (who informed the project's reproducibility), the communications team (who developed a public-facing impact story), and the partnerships team (who were instrumental in developing the relationship with PHS).

What's next?

- The project's success has led to further research, including an initiative funded by the Health Foundation examining the fairness of SPARRA across different ages, sexes and ethnicities, and a collaboration between several universities that has developed a green paper on the release of machine learning models from safe havens.
- The Turing and PHS are now investigating ways to extend this fruitful collaboration.

> **"[This] strong collaboration will make a real difference to the way data science informs and influences the delivery of health and care services in Scotland."**
> Scott Heald, Director of Data and Digital Innovation, Public Health Scotland

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