Forecasting winter hospital admissions due to COVID-19 in the United Kingdom using art generated by artificial intelligence

Author: Joel Hellewell
Institution: Department of Infectious Disease Modelling, Nottingham Institute of Studies for the Administration of Overseas Royal Land Assets

Introduction

Producing forecasts of hospital admissions due to COVID-19 in the United Kingdom is vital for operational planning to ensure that the bed capacity of the National Health Service (NHS) is not exceeded[1]. This is a particular concern during winter, when hospital admissions due to other circulating respiratory viruses are also at their highest[2]. However, established mathematical models of infectious disease transmission have struggled to accurately forecast the disease burden of SARS-CoV-2 infections over the course of the COVID-19 pandemic in the United Kingdom[3]. Infectious disease outbreaks are inherently difficult to forecast since they involve the interaction of many biological and behavioural factors such as: the level of vaccination coverage in the population[4], new genetic viral variants with varying levels of infectiousness[5], the presence or absence of other non-pharmaceutical interventions[6,7], and the effort put into testing and surveillance systems.

This analysis utilises an alternative method of directly generating the plot of a forecast of hospital admissions due to COVID-19 using an artificial intelligence software that produces images from strings of text. The advantage of this method is that it leaves the decision over how to model the multiple factors described above to the artificial intelligence, which is faster and less prone to error than human intelligence. It also directly produces a plot of the forecast, which is the part of the scientific process most relevant to policy and reducing transmission.

Methods

The plot of the forecast was generated using the Zoetrope 5.5 software developed by Bearsharktopusdev (@curio_ai on twitter.com)[8,9]. The text prompt “a graph forecasting covid hospitalisations in the UK this winter” was sent to be automatically processed by the software at 18:59 on October 30th 2021. The completed forecast was returned 15 minutes later at 19:14 in the form of a 512 by 288 pixel PNG image and posted on twitter.com by the bot @ai_curio_bot. The plot was then edited to include labelled axes to improve legibility.

Results

The plot of the forecast generated by Zoetrope 5.5 is shown in Figure 1. Hospital admissions are expected to undergo a stochastic increase for a brief period before plateauing and eventually reducing unsteadily.

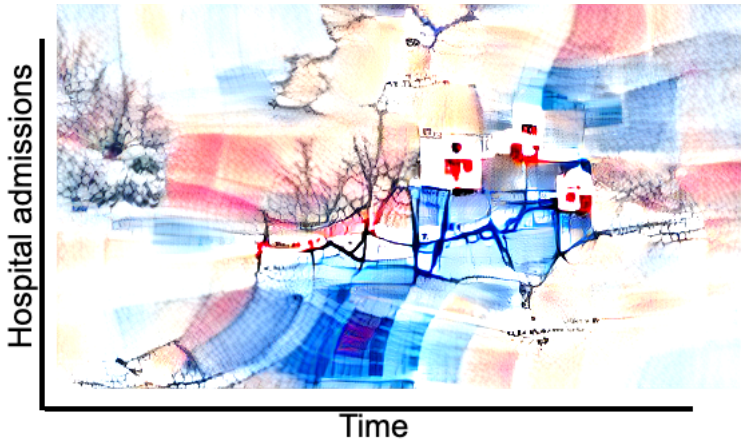

Figure 1: Forecasted winter hospital admissions due to COVID-19 in the United Kingdom. The x-axis shows the time since the forecast was made and the y-axis shows the corresponding level of hospital admission.

Discussion

While some modelling work has been operationally useful during the pandemic[10], this approach of quickly generating forecast plots using artificial intelligence has several distinct advantages. The plot of model output is uploaded directly to the internet for all to view, keeping science transparent. This also allows for easy viewing of the results by other scientists and scientific advisory board members who might be on Twitter to share new results or politely disagree with each other. The speed at which forecasts are produced also allows for the possibility of generating new forecasts each day. Future work could involve automating the tweet that automatically generates the forecast plot so that the data used in the forecasting procedure is as up to date as possible.

Another advantage is the lack of uninteresting equations that detail model structure, citizens of the United Kingdom can sleep soundly knowing that our medium-term future is being ruthlessly unearthed by the unwavering cold gaze of machines. Of course, these forecasts will eventually have to be evaluated against the ground truth to determine the accuracy of this method. Unlike the projections produced for the Scientific Advisory Group for Emergencies (SAGE), this method has the required bravery to peer into the nebulous web of probable futures and forge a guess at the one that will take place. Meanwhile, the SAGE projections make predictions for a comfortable simplified world that will never obtain so their predictions can never be verified (although they could at least re-run their models to show that, had we known vaccine uptake and changes in policy etc in advance, their model predictions are accurate).

References

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