



Hellenic Republic  
**National Commission**  
for Bioethics & Technoethics



THE CYPRUS  
NATIONAL  
**BIOETHICS**  
COMMITTEE

## **JOINT OPINION**

of the National Commission for Bioethics and  
Technoethics of Greece and  
of the Cyprus National Bioethics Committee

for the

**“Ethics of Predictive Analytics in Health”**

## 1. Introduction

The National Commission for Bioethics and Technoethics (NCBT) of Greece and the Cyprus National Bioethics Committee (CNBC) have decided to jointly issue an Opinion on the emerging and critical issue of ‘predictive analytics’ in the field of Health.

*Predictive analytics* is an approach to Artificial Intelligence (AI)<sup>1</sup> that aims to calculate the probability of future life events (predictions) using both historical and real-time data, statistical algorithms, and machine learning methods. Predictive analytics is primarily based on the synthesis of private heterogeneous data, such as healthcare data, residence, occupation and working conditions, educational background and socioeconomic profile, etc.

At present, we already live in the era of technological prediction for human behaviour and related activity. The reason for this evolution is the rich availability of big data on the one hand, and the development of powerful machine learning algorithms on the other.<sup>2</sup> Predictions generated range from the global and population level, such as the prediction of global warming and the prediction of the spread of infectious diseases like COVID-19 respectively,<sup>3</sup> to the individualised prediction of a patient’s risk of mortality, for example, due to chronic obstructive pulmonary disease.<sup>4</sup>

As such, this Joint Opinion attempts to highlight the benefits of predictive analytics and to identify problems that could potentially turn it into a risk.

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<sup>1</sup> According to the definition proposed by the OECD in 2019 and as adopted by the EU AI Regulation Act of 2023, an AI system is a computing system which is capable of inferring how to produce outputs (such as predictions, recommendations or other decisions) that can affect its environment, whether such an environment is physical or virtual. Outputs produced are affected by a given set of objectives and the specific data the AI system receives as input.

<sup>2</sup> Savcicens, G., Eliassi-Rad, T., Hansen, L.K. et al. (2024). Using sequences of life-events to predict human lives. *Nat Comput Sci* 4, 43–56.

<sup>3</sup> Alali, Y., Harrou, F. & Sun, Y. (2022). A proficient approach to forecast COVID-19 spread via optimized dynamic machine learning models. *Sci. Rep.* 12, 2467.

<sup>4</sup> Lovelace T. C., Hersh C. P., Benos P. V. Development and validation of a mortality risk prediction model for chronic obstructive pulmonary disease: a cross-sectional study using probabilistic graphical modelling. *eClinicalMedicine*, Vol. 75, 102786.

## **2. Benefits and challenges in the Health sector**

Looking at questions concerning the future evolution of life events as a starting point, predictive analytics attempts to contribute to proactive planning and optimal management of situations. Predictive analytics is thus applied in various fields, such as in health services in the public and private sectors, as well as in public and private insurance, human resources management, and even in public security.

### **A. Benefits**

Data used for the applications of predictive analytics are health data, including data from the genetic profile of individuals, which may in turn come from electronic health records, information extracted from medical devices, financial and insurance data, statistics concerning the flow of patients (including the admissions stage, discharges, stays in short-stay and intensive care units), staff, and logistical infrastructure.

Benefits derived from applying predictive analytics in the Health sector include predictions about the likelihood of occurrence or the course of a given disease, the results of a particular treatment or the likelihood of patients being readmitted to hospital after discharge. Predictive analytics can lead to an early diagnosis or prevention of a disease through appropriate actions based on predictions. In this way, predictive analytics can enhance preventative actions and precision medicine treatments. In addition, predictive analytics can contribute to the management of health services, particularly towards the equitable allocation of resources, ensuring logistical adequacy, the right of access to health, cost containment and systems resilience, especially when the system is under severe stress (pandemics, natural or human-made disasters, etc.). Furthermore, future predictions of a person's health status can help to assess their suitability for an insurance scheme or a job. Finally, predictive analytics can contribute to the prediction of cyber-attacks aimed at both the hijacking of personal data, as well as malicious interference with the functioning of medical instruments.

## **B. Challenges and risks**

The use of predictive analytics presents challenges related both to the use of AI in calculating the probability of future events and trends, as well as to the particular characteristics of this technique.

One of the main problems of AI applications in general is the validity and reliability of the data used. For example, the use of a health history for future predictions would most likely run into the limitations imposed by the lack of representativeness of population groups, as well as the non-systematic recording of social, psychological, and behavioural determinants beyond biomedical data. Moreover, the potential bias inherent in the algorithm training data poses an additional limitation on the ability to generalise predictions into the future, as predictions are based on data that may not be representative or inclusive. Furthermore, any ambiguities, the lack of commonly accepted terminology, different reporting scales, inaccuracies in diagnosis when performing tests and administering treatments, as well as acronyms in the completion of health records can all create inappropriate data sets.

Finally, it is noteworthy that because the data used in predictive analytics have been collected up to a given point in time, and thus cover a specific time period, any failure to update data as such in time may lead to an underestimation or overestimation of factors that may have influenced them up to the time of the prediction itself.

In addition to the challenges associated with the use of AI tools in general, particular attention should be attached to some specific features of predictive analytics.

The first challenge relates to making discrete decisions (e.g., to provide or not treatment) from data derived from continuous variables (e.g., the probability of a drug side effect). Moreover, since the prediction of an AI system is by definition linked to a future event, the question arises as to whether the prediction itself can influence the outcome of that event.

Another parameter to be taken into account is the risk of dependence on analytical forecasts. Human medical judgement can be compromised. As such, an over-reliance on the capabilities of machines can be cultivated. The prevalence of the doctrine that

everything can be solved by technology (*technological solutionism*) can shake trust in humans and lead to harmful consequences.

Finally, the risk arising from the use of predictive analytics with the so-called *predatory predictions*<sup>5</sup> by some companies, motivated by financial gain and the emergence of a power differential between similar companies, is considered to be particularly significant. Such predictions violate privacy, construct and exploit misleadingly inflated data and over-categorise individuals (for instance, the labelling of overweight people as 'obese') so that they bear the burden of the associated costs of 'treatments', with companies reaping the benefits of a 'predatory prediction'.

### 3. Ethical considerations

The use of predictive analytics raises complex and sophisticated ethical issues concerning both the freedom of the individual and the safety of decisions based on predictions.

To begin with, the use of predictive analytics in the Health sector must be consistent with the ethical principle of beneficence/well-being, as well as with the individual and social right to health. On the one hand, at an individual level, the provision of specialised and customised services for diagnosis, prevention and treatment of a disease, including the corresponding development of pharmaceuticals, is the greatest promise in the field of predictive analytics and technological predictions of life events. On the other hand, at a collective level, the use of predictive analytics tools can help to reduce costs, ensure beneficial and equitable allocation of resources, logistical adequacy, resilience and sustainability of the health system, particularly when it is under severe pressure (such as due to COVID-19 or disaster emergencies), and optimise the management of jobs throughout the year, taking into account geographical needs.

On the contrary, using the forecasts of predictive analytics without the consent of the persons concerned poses the risk of infringing the autonomy of the persons in

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<sup>5</sup> Martin K. (2023). Predatory Predictions and the Ethics of Predictive Analytics (2023). Journal of the Association for Information Science and Technology 74(5): 531-545.

question, their individual rights, including *the right to an open future*, and ultimately their dignity. The right of a person to know, in any case, should be combined with their right not-to-know either the present or the future.

The use of predictive analytics in the Health sector may affect patients' fundamental rights. In addition to the fact that predictions can influence decisions about patients' health, they can have an impact on quality of life and job opportunities. Cognitive, social and technical bias in data, models, and algorithms may lead to social inequalities related to social representation in data and access to both personalised diagnosis, prevention and treatment services and traditional healthcare structures.

#### **4. Conclusions and recommendations**

Predictive analytics as an approach to AI encapsulates and reproduces the challenges brought about by the use of AI itself. With the public interest in mind and with ethical principles and values as a common denominator, the present Joint Opinion attempts to highlight the opportunities that predictive analytics brings and to describe the challenges that could potentially turn predictive analytics from an opportunity to a risk. To the extent that commonly accepted values are incorporated into applications of predictive analytics as technical requirements, and are reflected in training and assessment data in an inclusive manner, the associated technologies for predicting life events can substantially promote health and well-being.

Efforts to regulate AI at both European and global level are also being made to respect and promote ethical principles in the use of AI systems. In particular, *both* the EU Regulation 2024/1689 on AI *and* the Council of Europe's Framework Convention on AI and Human Rights underline the urgent and pressing need to focus on responsible *human-centred and eco-centred AI*, in accordance with human rights, democracy and the rule of law.

A prerequisite is the establishment of a comprehensive and futures-oriented governance framework for these technologies, with a simultaneous updating of protocols and tightening up of the ethical and human rights impact assessment of predictive analytics. This governance framework should be based on the fundamental

ethical principles for the use of AI systems, as set out in the NCBT Opinion on '*Artificial Intelligence Applications in Health Care in Greece*'.

The NCBT and the CNBC jointly recommend that the governance framework is overseen by a National AI Authority, which, taking into account what is stated in this Opinion, will manage and allocate roles between relevant regulatory and supervisory authorities and will consult with healthcare providers, technology solution providers, and civil society representatives.

In the view of the two Committees, specific proposals for the Health sector are:

- (a) the design of protocols and training of all health professionals for the proper management of informing the patients,
- (b) the definition of technical requirements for transparency and explainability of the decisions of predictive analytics in medicine,
- (c) the detailed description of the set of variables that a predictive method must take into account depending on its subject matter, and
- (d) the continuous updating of predictive analytical models.

Finally, the two Committees consider that it is necessary to categorise applications that jeopardise fundamental rights and human dignity. The Committees thus recommend strict legislation on 'predatory predictions' in order to protect individuals from the serious risks they may entail.

**Athens and Nicosia,**

**31<sup>st</sup> of October, 2024**