Transformer-Based Architecture of Real Time Maternal Health Monitoring System

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Preface

Maternal health is a critical measure of the quality of healthcare and social progress. Although there are improvements in medical care, the situation with the preventable complications of the mother and fetus is a worldwide issue, especially in the high-risk environments with limited resources. Constant and live tracking of the maternal and fetal parameters can greatly decrease the adverse effects. The technology-based way of dealing with limited challenges is given in this book.

Traditional systems of maternal care are mostly based on the periodic clinical examination and manual observations. As much as these are effective, most of the time these techniques do not help to detect the subtle physiological changes that may exist between visits. With the advent of wearable devices, sensor technologies, and telehealth platforms, it is possible to collect data continuously. Nonetheless, time-series health data that is complex and of large scale must be analyzed using sophisticated computational models that can be used to detect long-term associations and dynamic risk patterns.

The transformer-based architectures, which were initially designed to perform sequence modelling tasks, have been shown to be particularly effective when it comes to large-scale sequence data. Their mechanisms of attention enable them to record complex associations between physiological parameters and thus is very appropriate in real time applications of maternal monitoring. This book talks about how the transformer models can be adapted to biomedical time-series data, predicting risks, generating alerts, and clinical decision support.

The chapters move through introductory materials on the topic of maternal health and smart monitoring systems, transformer architecture concepts, real-time system architecture, system deployment plans and ethics. Such hands-on issues as scalability, latency, data privacy, and regulatory compliance are also addressed.

This book is meant to fill the gap between artificial intelligence and maternal healthcare practice and therefore targets researchers, clinicians, engineers, and students. It underlines that technology must complement and not substitute clinical expertise, which will end up in safer pregnancies and better birth and maternal outcomes.

Acknowledgement

Real-Time Maternal Health Monitoring Systems would not have been able to be completed as the Transformer-Based Architectures without the use of the support and encouragement of many people.

We would like to say a huge thank to our scholarly colleagues, research associates and postgraduate students whose discussions, technical know-how, and positive feedbacks are so valuable. This work was much enhanced by their work in the fields of machine learning, time-series analysis, and intelligent system design.

We also take note of the wider research community of which ongoing developments in the field of artificial intelligence and transformer architectures provided the groundwork upon which these concepts in this book are based.

We owe our family members and friends a deep sense of gratitude who were patient, motivating, and supported us without doubts to go through the writing process.

The book is a unique piece of work that is motivated by teamwork, creativity, and knowledge.

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