Data science enables to predict mortality and medical complications of preterm infants

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In his Master’s thesis titled “Data-driven approach to predict neonatal medical diagnoses”, Life Science Technologies student Janne Myllärinen at Sensor Informatics and Medical Engineering Group, Aalto University, applies data science to improve the critical care at neonatal intensive care units where the smallest patients of all, the preterm infants, are treated. The thesis has been conducted in collaboration with Helsinki University Hospital.

The organs and vital functions of preterm infants are underdeveloped, which causes these infants to be prone to several life-threatening complications that can lead to death at worst. If these illnesses were predicted before their occurrence, the doctors could target the medical treatment to these patients in advance, preventing the complications from becoming too severe. In his thesis, Myllärinen reveals the predictability of neonatal mortality and a chronic lung disease called bronchopulmonary dysplasia.

The physiological parameters of the preterm infants are measured continuously during their stay at the neonatal intensive care unit. These measurements, such as blood pressure and heart rate, and other relevant information of the patient, such as birth weight, contain signs of the developing complications that can be revealed with machine learning algorithms. The most suitable algorithms are shown to include random forests and Gaussian processes classifiers.

Many aspects in the health data of the patients affect the predictive performance of the algorithms. In his thesis, Myllärinen demonstrates that birth weight and gestational age of the infant are fundamental parameters for the machine learning algorithms to make a good prediction. In addition, the length of the physiological parameter monitoring is required to be 36–48 hours to increase the prediction performance.

The results of this thesis both verify the findings of other researchers and introduce new approaches to enhance the neonatal health care. For example, random forests have not been recognised as one of the most promising algorithms to predict complications. However, more research is required to improve the predictions before they can be implemented as decision support tools in a hospital environment.

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