AI advance in premature baby care

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Credit: Dragos Gontariu

James Cook University scientists believe they have made an advance in the science of keeping premature babies alive.

As part of her Ph.D. work, JCU engineering lecturer Stephanie Baker led a pilot study that used a hybrid neural network to accurately predict

how much risk individual premature babies face.

She said complications resulting from premature birth are the leading cause of death in children under five and over 50 percent of neonatal deaths occur in preterm infants.

"Preterm birth rates are increasing almost everywhere. In neonatal intensive care units, assessment of mortality risk assists in making difficult decisions regarding which treatments should be used and if and when treatments are working effectively," said Ms Baker.

She said to better guide their care, preterm babies are often given a score that indicates the risk they face.

"But there are several limitations of this system. Generating the score requires complex manual measurements, extensive laboratory results, and the listing of maternal characteristics and existing conditions," said Ms Baker.

She said the alternative was measuring variables that do not change—such as birthweight—that prevents recalculation of the infant's risk on an ongoing basis and does not show their response to treatment.

"An ideal scheme would be one that uses fundamental demographics and routinely measured vital signs to provide continuous assessment. This would allow for assessment of changing risk without placing unreasonable additional burden on healthcare staff," said Ms Baker.

She said the JCU team's research, published in the journal Computers in Biology and Medicine, had developed the Neonatal Artificial Intelligence Mortality Score (NAIMS), a hybrid neural network that relies on simple demographics and trends in heart and respiratory rate to determine mortality risk.

"Using data generated over a 12 hour period, NAIMS showed strong performance in predicting an infant's risk of mortality within 3, 7, or 14 days.

"This is the first work we're aware of that uses only easy-to-record demographics and respiratory rate and heart rate data to produce an accurate prediction of immediate mortality risk," said Ms Baker.

She said the technique was fast with no need for invasive procedures or knowledge of medical histories.

"Due to the simplicity and high performance of our proposed scheme, NAIMS could easily be continuously and automatically recalculated, enabling analysis of a baby's responsiveness to treatment and other health trends," said Ms Baker.

She said NAIMS had proved accurate when tested against hospital mortality records of preterm babies and had the added advantage over existing schemes of being able to perform a risk assessment based on any 12-hours of data during the patient's stay.

Ms Baker said the next step in the process was to partner with local hospitals to gather more data and undertake further testing.

"Additionally, we aim to conduct research into the prediction of other outcomes in neo-natal intensive care, such as the onset of sepsis and patient length of stay," said Ms Baker.

More information: Stephanie Baker et al, Hybridized neural networks for non-invasive and continuous mortality risk assessment in neonates, *Computers in Biology and Medicine* (2021). DOI: 10.1016/j.compbiomed.2021.104521

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