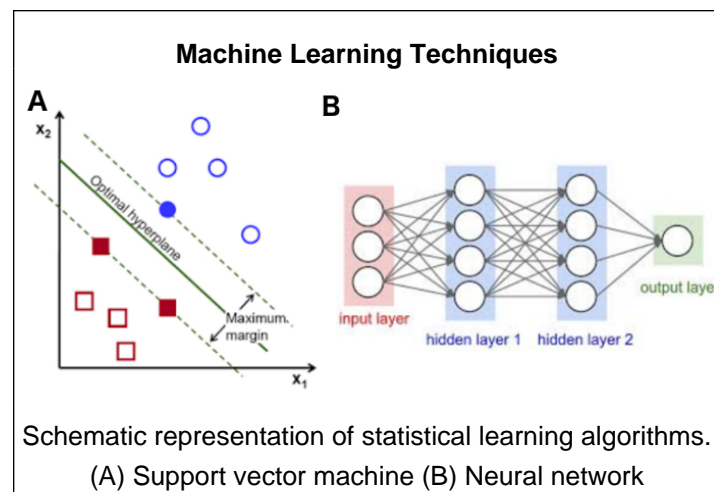


Introduction

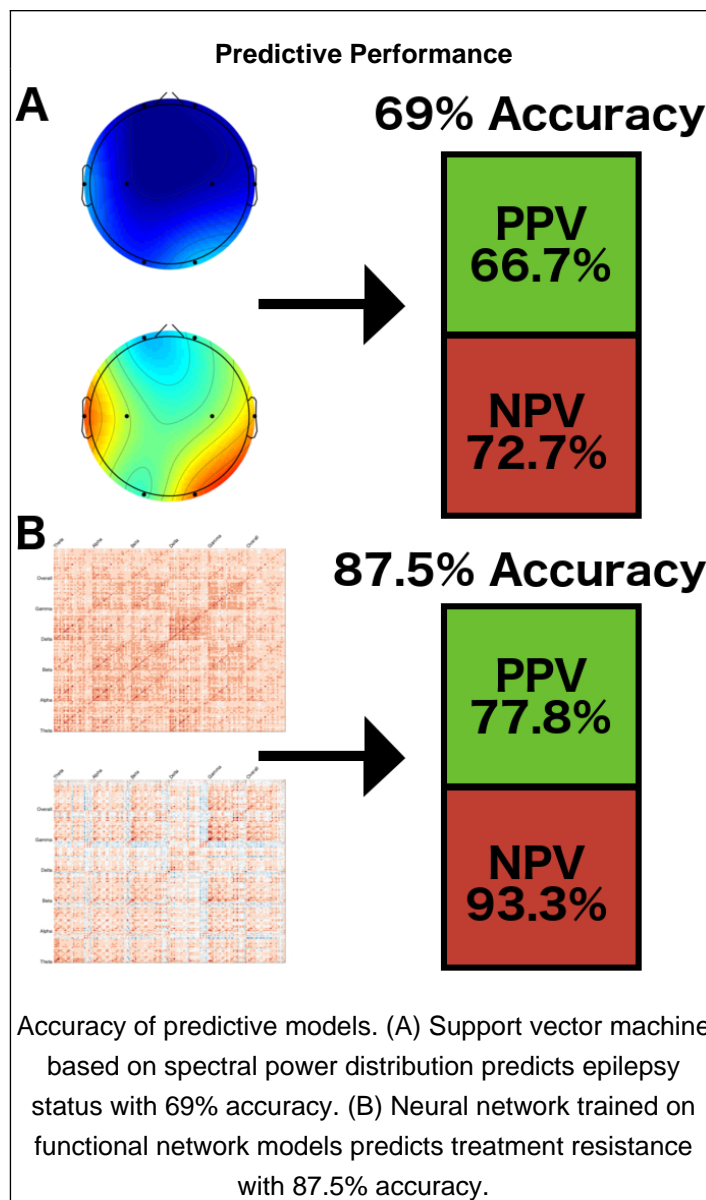
Paediatric epilepsy represents a major clinical burden, particularly among children with developmental disorders. Surgical interventions have demonstrated benefit in reducing seizure burden. Identifying patients at risk of developing epilepsy and those likely to fail medical treatment could aid surveillance and earlier identification of surgical candidates. Artificial intelligence based methodologies offer a promising means of integrating high-level disease models to predict treatment outcomes.



Methods

We collected EEG data from a cohort ($n = 42$) of patients at high risk of epilepsy (Rett Syndrome). Patients were divided based on whether they developed epilepsy (no epilepsy: $n = 18$, epilepsy: $n = 24$), with the epilepsy group subdivided based on treatment response (treatment responsive: $n = 16$, treatment resistant: $n = 8$).

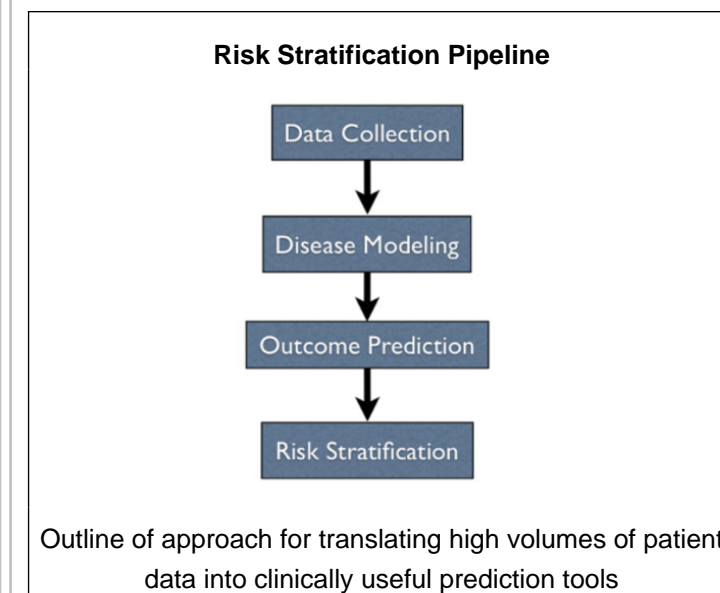
Electrophysiological features were characterised by deriving measures of spectral power distribution and functional network connectivity.



Results

A support vector machine trained on spectral power distribution identified asymmetry of power distribution as a marker of epilepsy, predicting epilepsy status with 69% accuracy (PPV 66.7%, NPV 72.7%).

A neural network classifier trained to integrate high-dimensional models of cortical network function based on inter-electrode coherence measures predicted treatment resistance with 87.5% accuracy (PPV 77.8%, NPV 93.3%).



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Conclusions

Artificial intelligence methods offer a promising means of integrating many features into a predictive model in order to better predict epilepsy status and treatment outcomes. This facilitates the use of richer characterisations of disease in clinical decision-making, allowing treatment options to be informed by high-level models of the underlying disease.