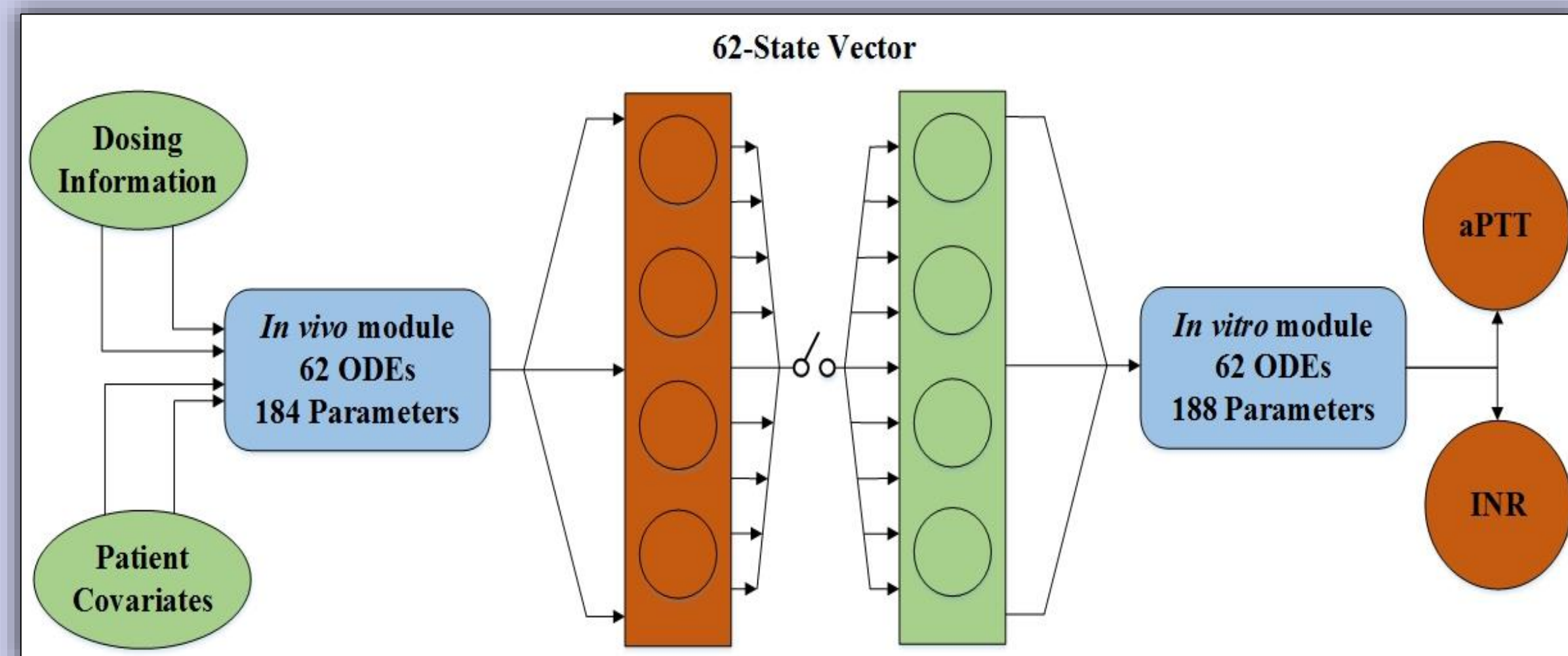


Artificial neural networks are machine learning techniques that can provide accurate, automatable, and efficient approximations to complex nonlinear input-output relationships within QSP models

The coagulation network model



- A QSP model that describes the dose-response relationship of heparin in children:
 - Multi-modular structure, with discontinuous interface
 - Complex to use in simulation, estimation, and control analyses
- We explored the use of artificial neural networks as structure-independent non-parametric model simplification approach.

Methods



Results

- Network architecture and corresponding approximation errors

| Network | MSE | Neurons/ Layers | Parameters | Training time | Simulation time |
|---------|-------------|--------------------|------------|------------------|--------------------|
| A | $< 10^{-3}$ | 7 / 2 | 43 | 2.8 | 0.018 |
| B | $< 10^{-4}$ | 11 / 2 | 77 | 6.5 | 0.018 |
| C | $< 10^{-5}$ | 14 / 3 | 90 | 16.3 | 0.027 |
| D | $< 10^{-6}$ | 25 / 4 | 179 | 51 | 0.022 |

- Error distribution in training, and evaluation data

