Sea-ice Flow Simplified

Kecheng Zhang

November 25, 2023

Abstract

1 Introduction

This is an Introduction

2 Method

2.1 Mathematics

The speed of the piece can be modeled as

$$U = 0.5 + 0.3sin(2\pi x)$$

where x is the position of the piece, and we have data $x_1(0) = 0.3$, $x_2(0) = 0.7$, and $v_1(0) = v_2(0) = 0$. We want to calculate $x_k(t_j)$ and $v_k(t_j)$ for $k = 1, 2$ and $j = 1 \dots 10000$, where $\delta t = 10^{-3}$ and $t_j = \delta t j$, such that

$$\begin{cases} \frac{\partial x_k}{\partial t} = v_k \\ \frac{\partial v_k}{\partial t} = (u - v_k)|u - v_k| \end{cases}$$

and

$$\frac{x_k(t_{j+1}) - x_k(t_j)}{dt} = v_k(t_j)$$

2.2 Neural Network

The neural network is a feed-forward network with 2 hidden layers shown in Figure 1. The loss funciton used to train the model is

$$\Sigma_{k=1}^{2}(x_k - x_{k,in} - v_k \delta t)$$

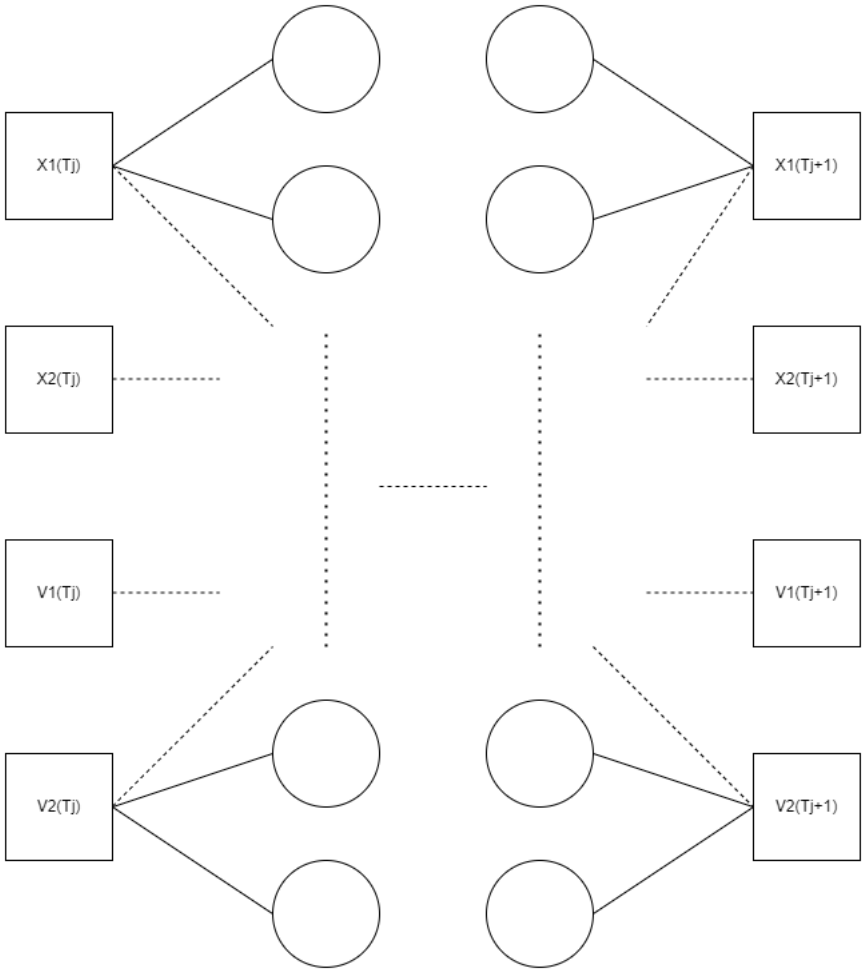

Figure 1: Neural Network structure

3 Discussion

The simle feed forward neural network used to model the position and velocity of sea ice has shown a