# Summary

<placeholder>

Table of Contents

[Summary 1](#_Toc154066167)

[1. Introduction 3](#_Toc154066168)

[2. Notes on dataset 3](#_Toc154066169)

[3. Deep learning models 3](#_Toc154066170)

[3.1. CNN 3](#_Toc154066171)

[3.2. CNN-LSTM 4](#_Toc154066172)

[3.3. GNN 4](#_Toc154066173)

[4. Results 4](#_Toc154066174)

[5. Conclusions/recommendations 4](#_Toc154066175)

[References 5](#_Toc154066176)

[Appendix A: [placeholder] 6](#_Toc154066177)

# Introduction

# Notes on dataset

# Deep learning models

<placeholder>

## CNN

<placeholder>

There are 5 inputs in total:

A diagram of a mathematical equation

Description automatically generated  
*Figure x: Auto-regressive method   
applied during training*

* 3 static inputs: the DEM, Slope X and Slope Y
* 2 dynamic inputs: The WD and the q of the previous timestep

And 2 outputs:

* The predicted WD at the new timestep
* The predicted q at the new timestep

For training an auto-regressive method is used, where the target output of the current timestep is used as the input for the next timestep ; Figure x shows this concept schematically. Then, the difference between the targets and the predicted values may be computed through the loss function: .

During testing, the target outputs are unseen by the model. Now a sequential method is employed, where the predicted outputs of the current timestep are used as inputs for the next timestep ; this is illustrated in figure x. This introduces an error when compared to the true unseen targets. In the next timestep the model will use the predicted output (including the error term) as input, which introduces a new error term , where generally ; leading to an accumulation of errors.

A diagram of a mathematical equation

Description automatically generated  
*Figure x: Sequential method applied during testing*

## CNN-LSTM

<placeholder>

## GNN

<placeholder>

# Results

<placeholder>

# Conclusions/recommendations

<placeholder>

# References

**There are no sources in the current document.**

# Appendix A: [placeholder]

<placeholder>