# COMBINING MECHANISTIC AND DATA-DRIVEN MODELLING TECHNIQUES

## Introduction

Two main modelling paradigms exist: mechanistic and data-driven modelling. The mechanistic approach incorporates the available knowledge of the system into the model. In contrast, data-driven techniques search for relationships in the available data. Both approaches have advantages and disadvantages and combining them certainly creates synergy. However, this combination has hardly been explored.

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BACKGROUND

M, C&B, L&V, L&W, B&N, C&G

LANGUAGE

English/Dutch

MORE INFO

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## Methodology

Neural differential equations have recently been introduced as a data-driven variant of conventional differential equations. By formulating a neural network in this way, it can easily be combined with existing mechanistic models. This hybrid model combines the strength of both paradigms. It can be viewed as a mechanistic model whose *knowledge gaps* are filled by a data-driven component. Alternatively, it can be viewed as a data-driven model with incorporated domain knowledge.

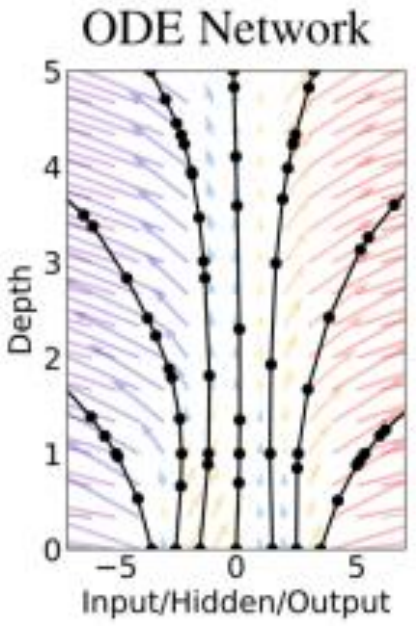
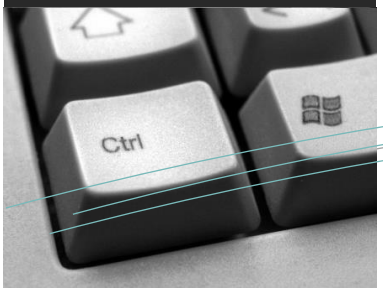



**Figure 1 – Vector field learned by a neural ODE.**

## Objectives of the thesis

The purpose of this thesis is an in-depth study of the possibilities of combining mechanistic and data-driven models by means of neural differential equations. The student can apply these techniques to a system of choice. The student should have a basic knowledge of programming and a motivation to learn about mechanistic and data-driven modelling techniques.

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