Machine Learning for Imaging

Coursework Introduction

Coursework: Self-supervised learning

The coursework is divided into three-parts:

- **Part A:** Implementation of a suitable dataset for contrastive model training;

- **Part B:** Implementation of the SimCLR loss and training step;

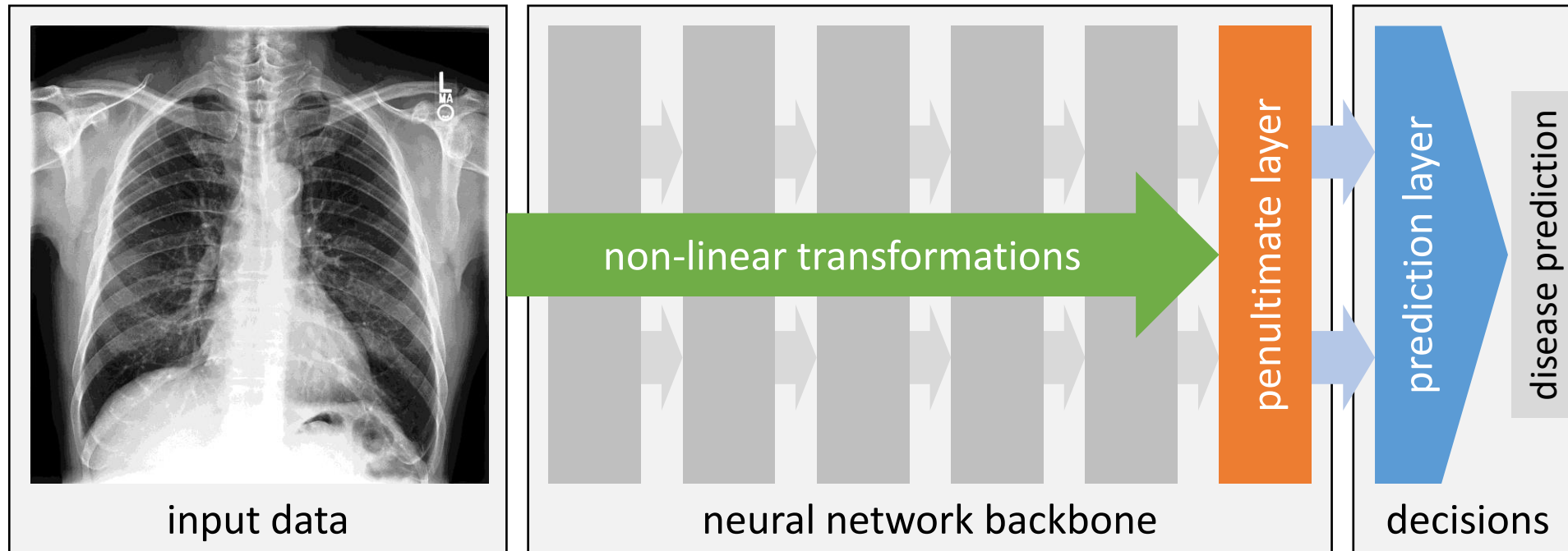- **Part C:** Implementation of transfer learning strategies (linear probing and finetuning).

Important:

- Read the text descriptions carefully and look out for hints and comments indicating a specific 'TASK'.

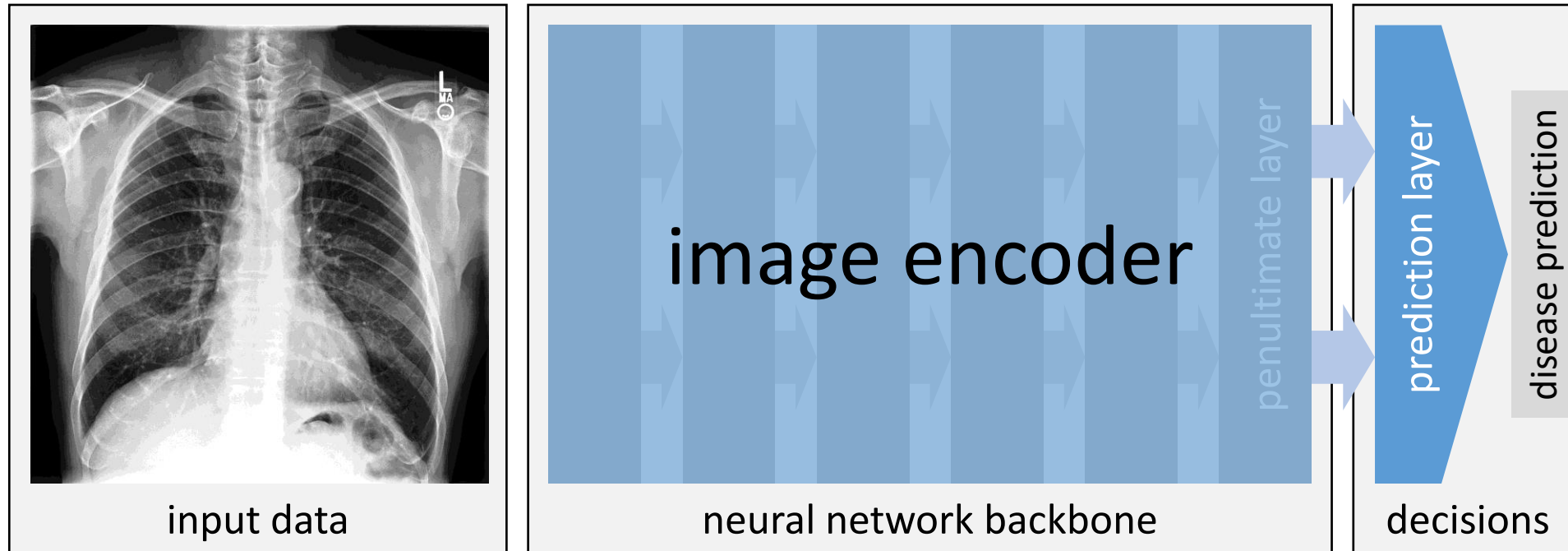- Make sure to add sufficient documentation to your code.

Submission: You are asked to submit two versions of your notebook:

1. Submit the raw notebook in `.ipynb` format with *all outputs cleared*.
   Please name your file `coursework.ipynb`.

2. Submit an exported version of your notebook in `.pdf` format, with *all outputs included*.
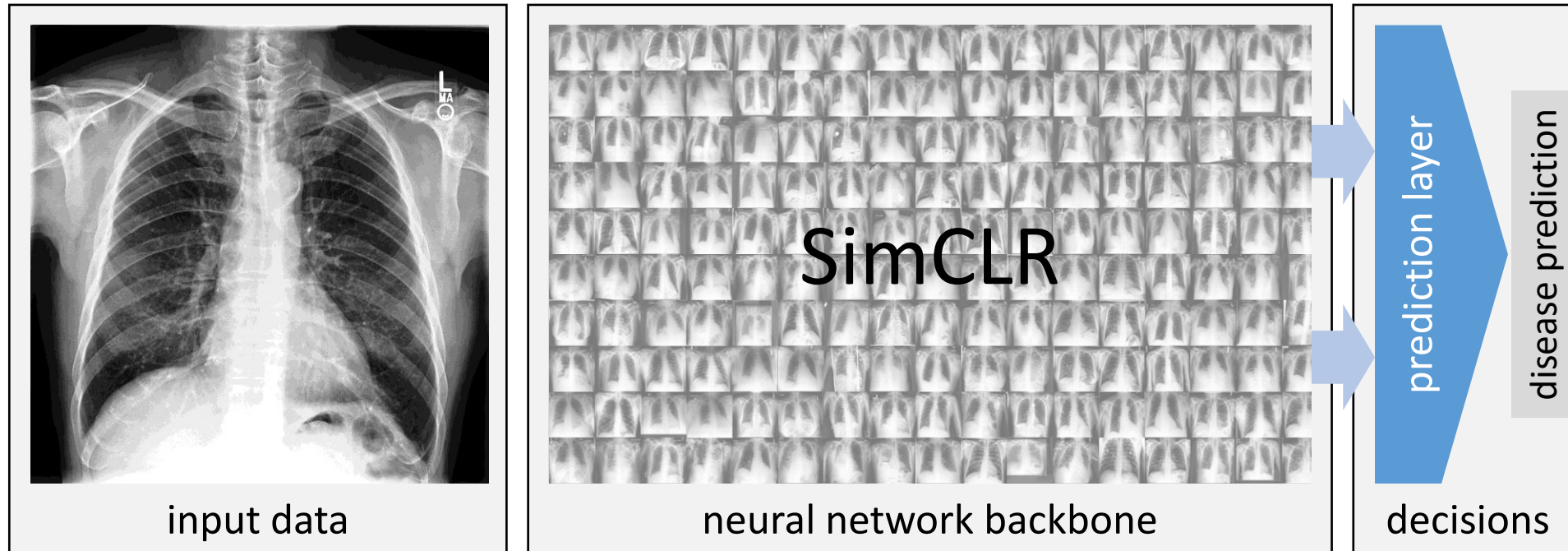   **Please name this file `coursework_export.pdf`.**

Pneumonia detection in chest X-ray

input data

non-linear transformations

penultimate layer

neural network backbone

prediction layer

disease prediction

decisions

Pneumonia detection in chest X-ray

input data

image encoder

penultimate layer

neural network backbone

prediction layer

disease prediction

decisions

Part A & B: SimCLR training

input data | SimCLR / neural network backbone | prediction layer → disease prediction / decisions
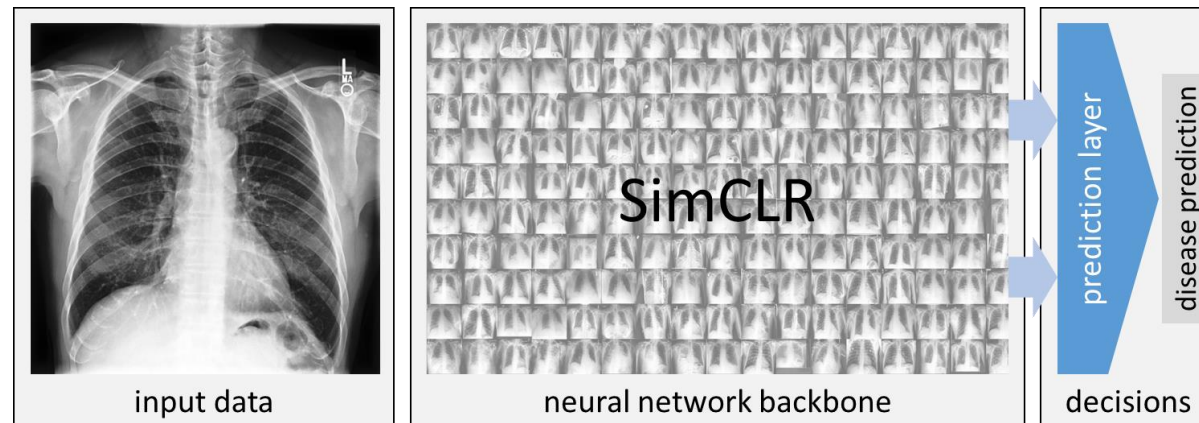
Part C: Model evaluation
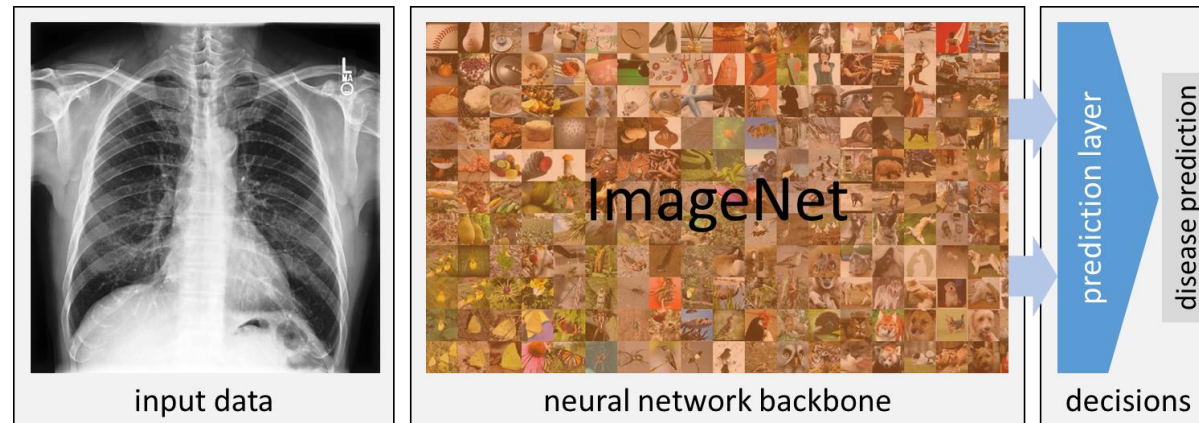
Coursework notebook

Available on Scientia

Coursework: Self-supervised learning

In this coursework, you will explore the popular self-supervised contrastive learning approach SimCLR.

You will be asked to implement some of the key components of SimCLR, including a suitable data augmentation strategy (for generating positive pairs), the SimCLR loss function, and the SimCLR training step. Additionally, you will be using transfer learning strategies for evaluating the performance of different pre-trained models for a downstream classification task.

The coursework is divided into three-parts:

- **Part A:** Implementation of a suitable dataset for contrastive model training;
- **Part B:** Implementation of the SimCLR loss and training step;
- **Part C:** Implementation of transfer learning strategies (linear probing and finetuning) for model evaluation.

Important: Read the text descriptions carefully and look out for hints and comments indicating a specific 'TASK'. Make sure to add sufficient documentation to your code.

Submission: You are asked to submit two versions of your notebook:

1. You should submit the raw notebook in `.ipynb` format with *all outputs cleared*. Please name your file `coursework.ipynb`.
2. Additionally, you will be asked to submit an exported version of your notebook in `.pdf` format, with *all outputs included*. We will primarily use this version for marking, but we will use the raw notebook to check for correct implementations. Please name this file `coursework_export.pdf`.

Your details

Please add your details below. You can work in groups up to two.

Authors: **firstname1 lastname1** & **firstname2 lastname2**

DoC alias: **alias1** & **alias2**

Coursework submission

Deadline
Thursday, 22 February, 19:00