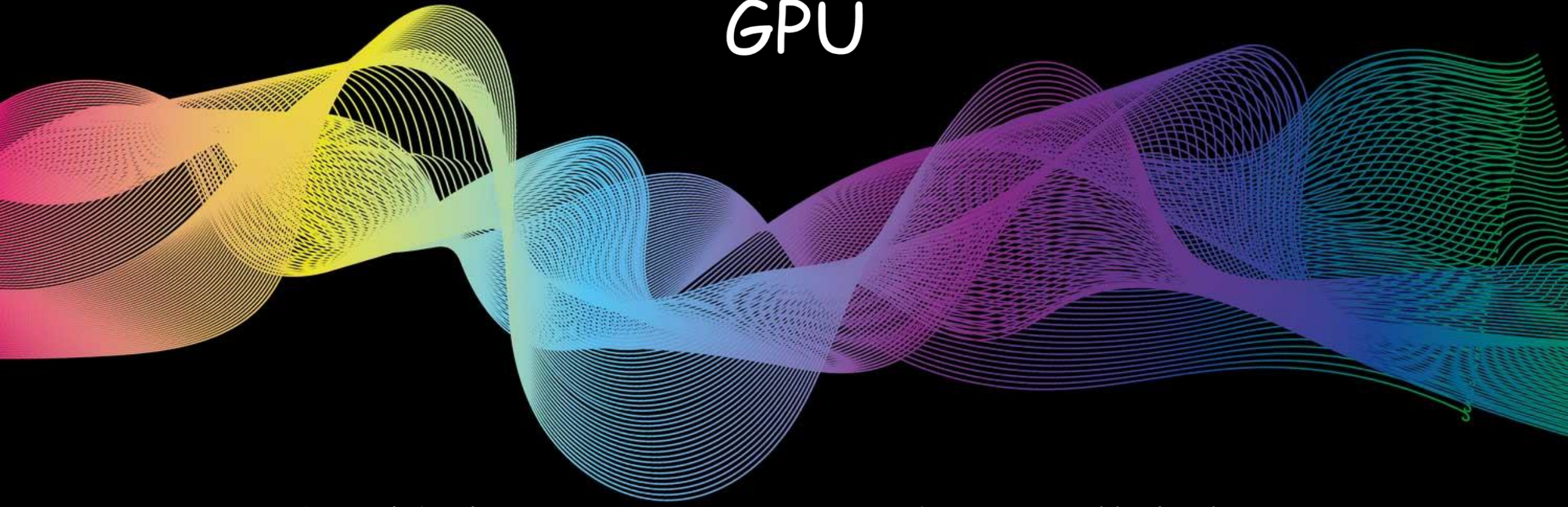
Data driven online assessment of 2D particle image displacements using GPU



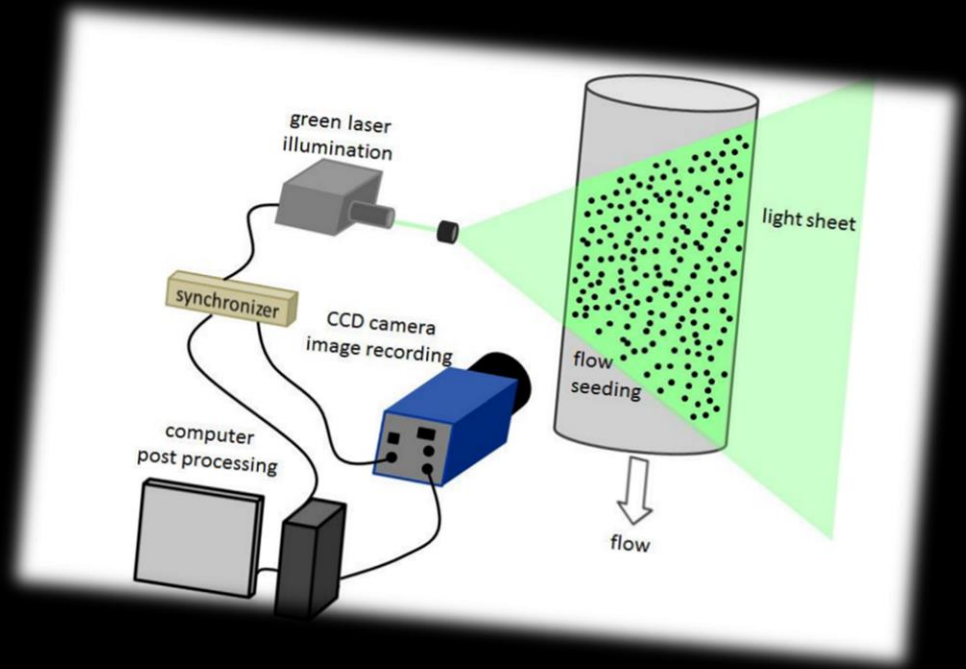
By Walid Koliaï

Advisor Mr. Mikhail Tokarev

Reminder

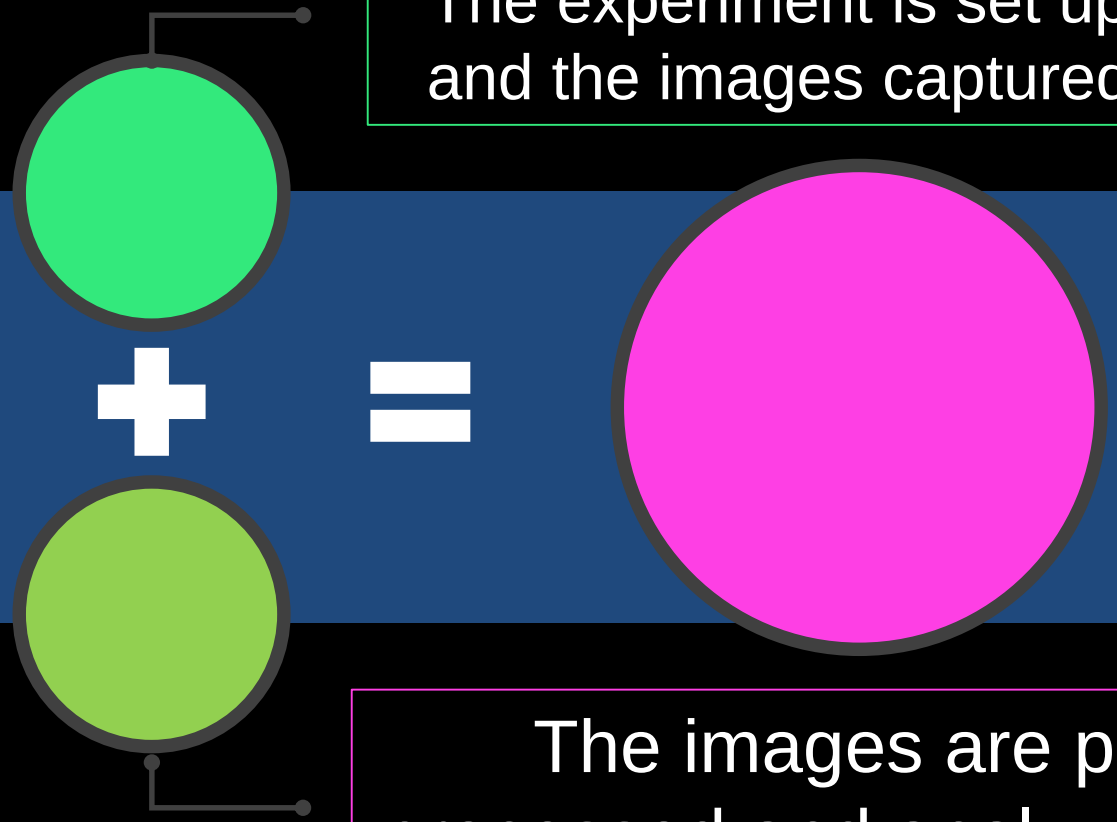
Flow (F) = Quantity (Q) / Time (t)

Particle image velocimetry (PIV) is a flow visualization technique, it is not based on any simulation, we actually perform an experiment to see the flow. It also allows us to get quantitative information on flow characteristics (values of velocity components for selected points).



Reminder

The experiment is set up and the images captured

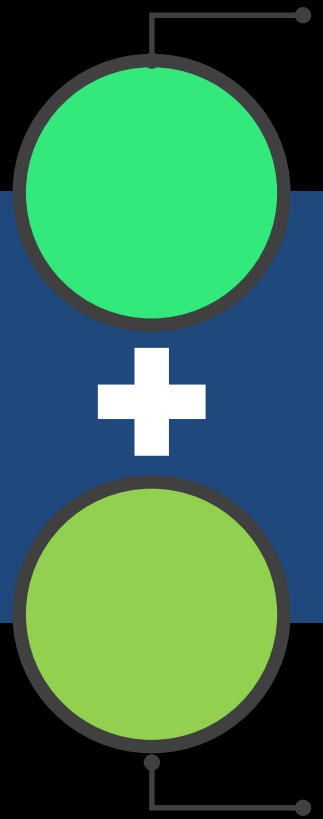


PIV

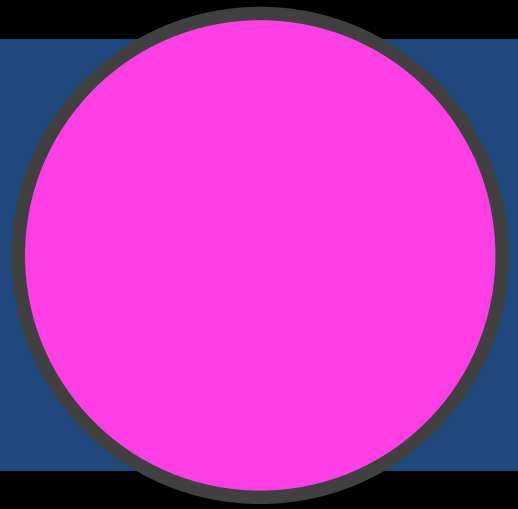
The images are post-processed and analyzed using the cross-correlation approach

Reminder

The experiment is set up and the images captured



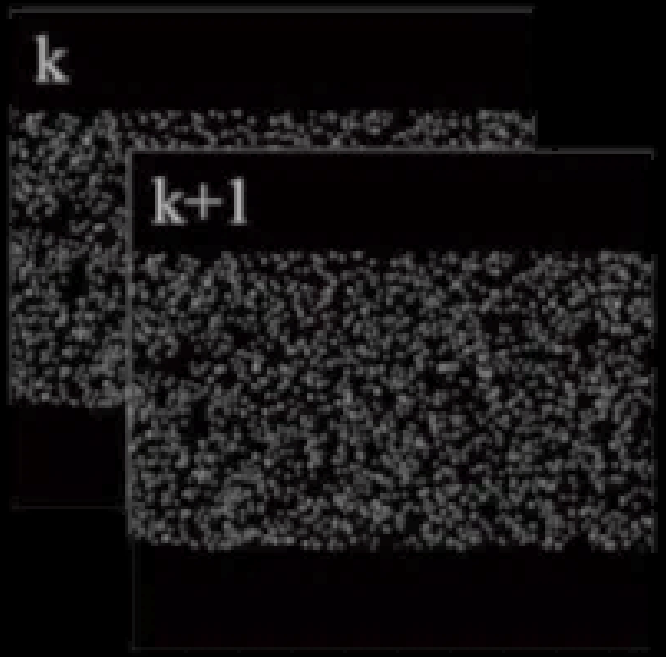
=



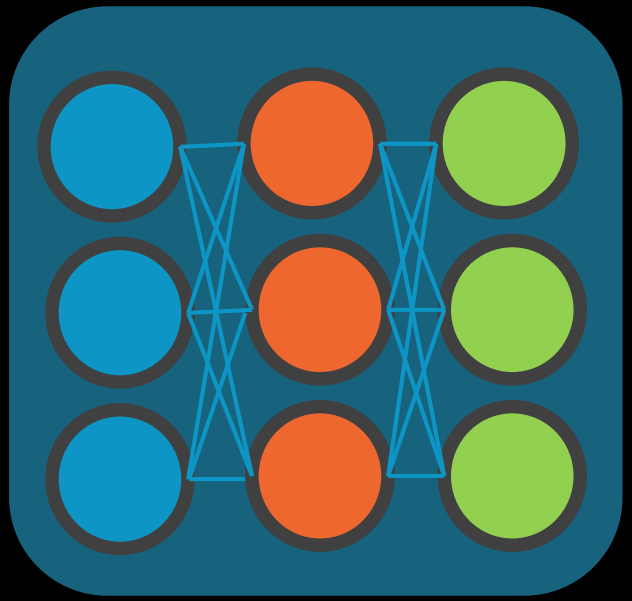
RT-PIV

The images are automatically post-processed and analyzed using a trained NN model

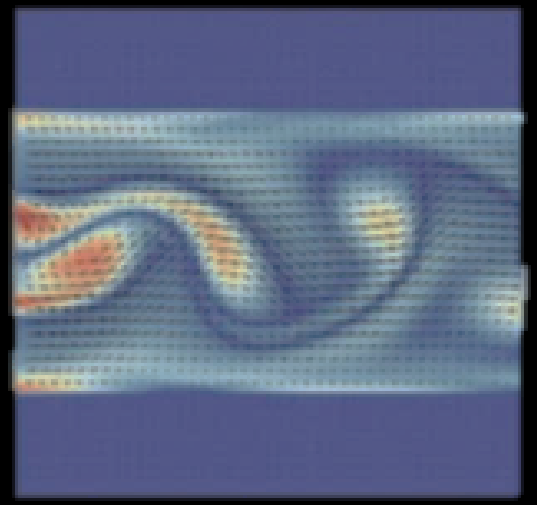
Reminder



Particle image pair



NN Model

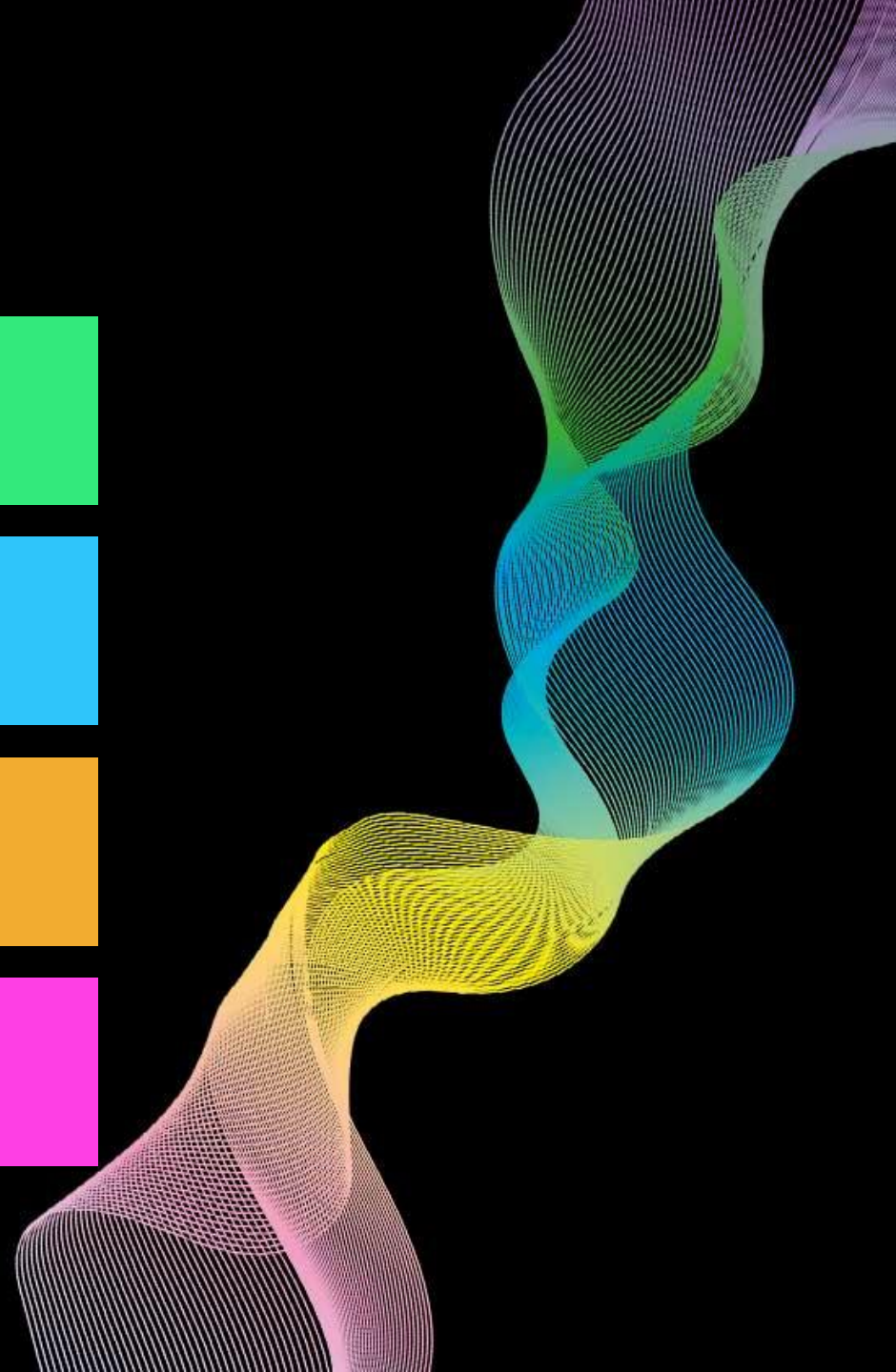


Velocity field with displacement vectors

Reminder

TASKS

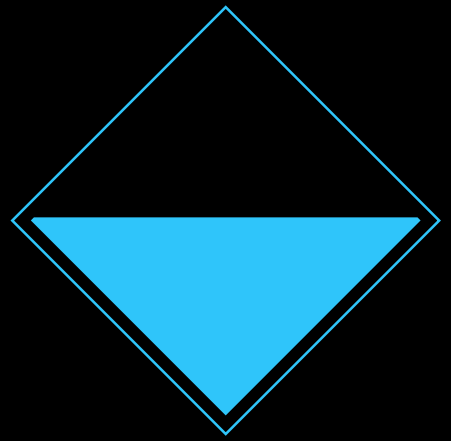
- Selection of an appropriate NN model(s) satisfying speed and accuracy constrains.
- Training and assessment of the model.
- Implementation of the software for image streaming from the CCD camera.
- Time & accuracy tests and analysis.



Selection of an appropriate NN model(s)

PIV-Nets

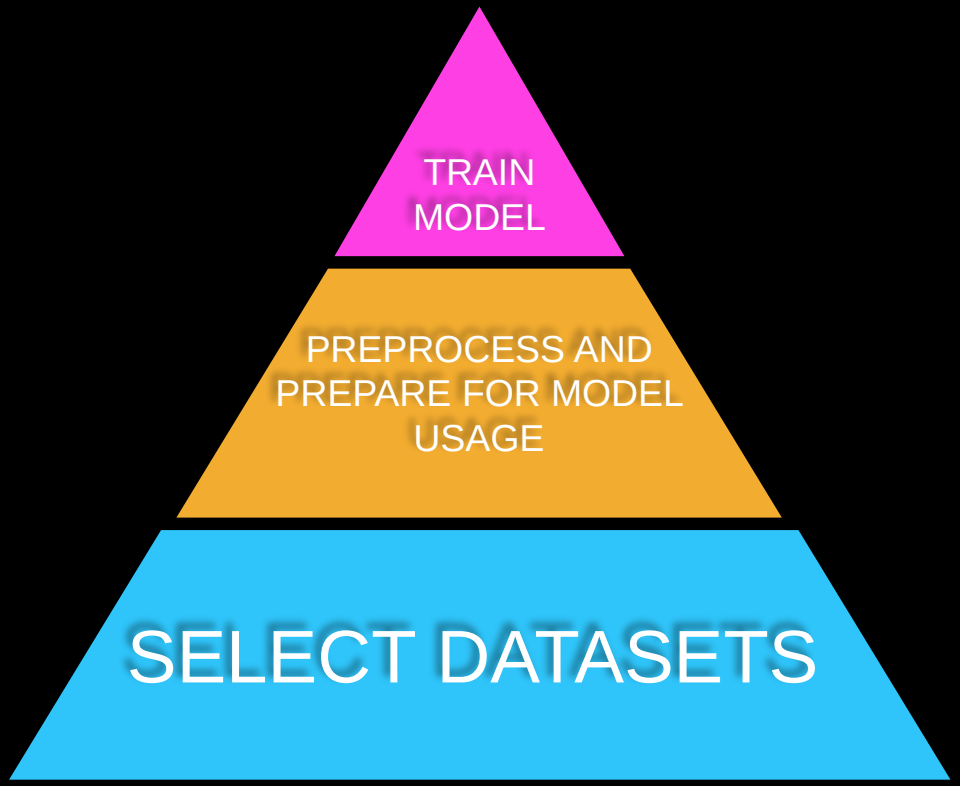
PWC-Net

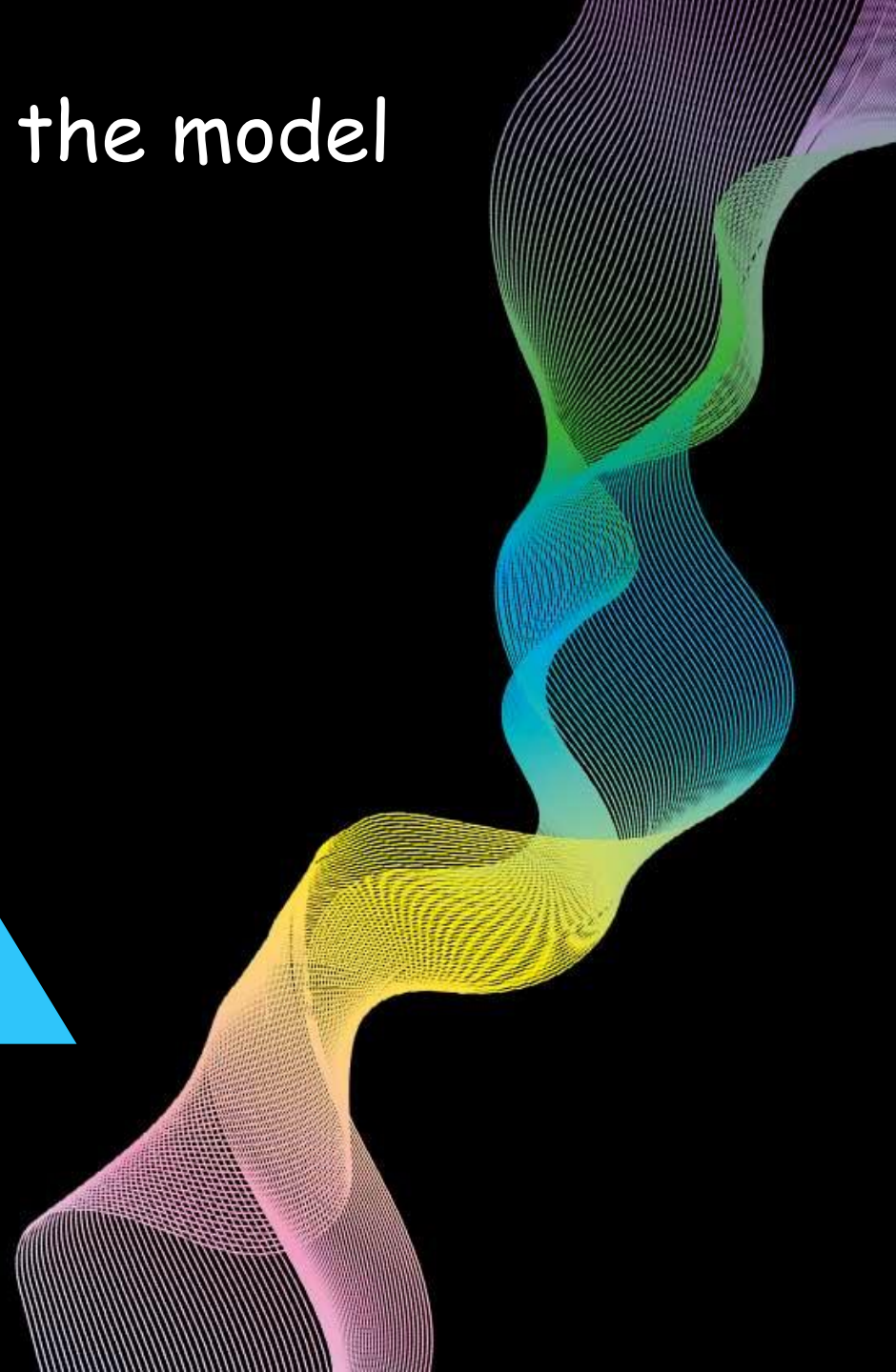


A proof-of-concept

Training and assessment of the model

PWC-Net





SELECT DATASETS

Multiple datasets have been selected.

We found some datasets that only contains input data, so it didn’t come with the flow results (predictions).

We thought to use an algorithm that would give us the flow velocity in order to add those to our training datasets.

PREPROCESS AND PREPARE FOR MODEL USAGE

For this phase, the processing was about analyzing data to prevent misleading results.
This consisted of basic methods like cleaning, Instance selection, and data transformation.


THANK YOU