GENERIC PIPELINE FOR PRODUCTION OF OFFICIAL STATISTICS USING SATELLITE DATA AND MACHINE LEARNING

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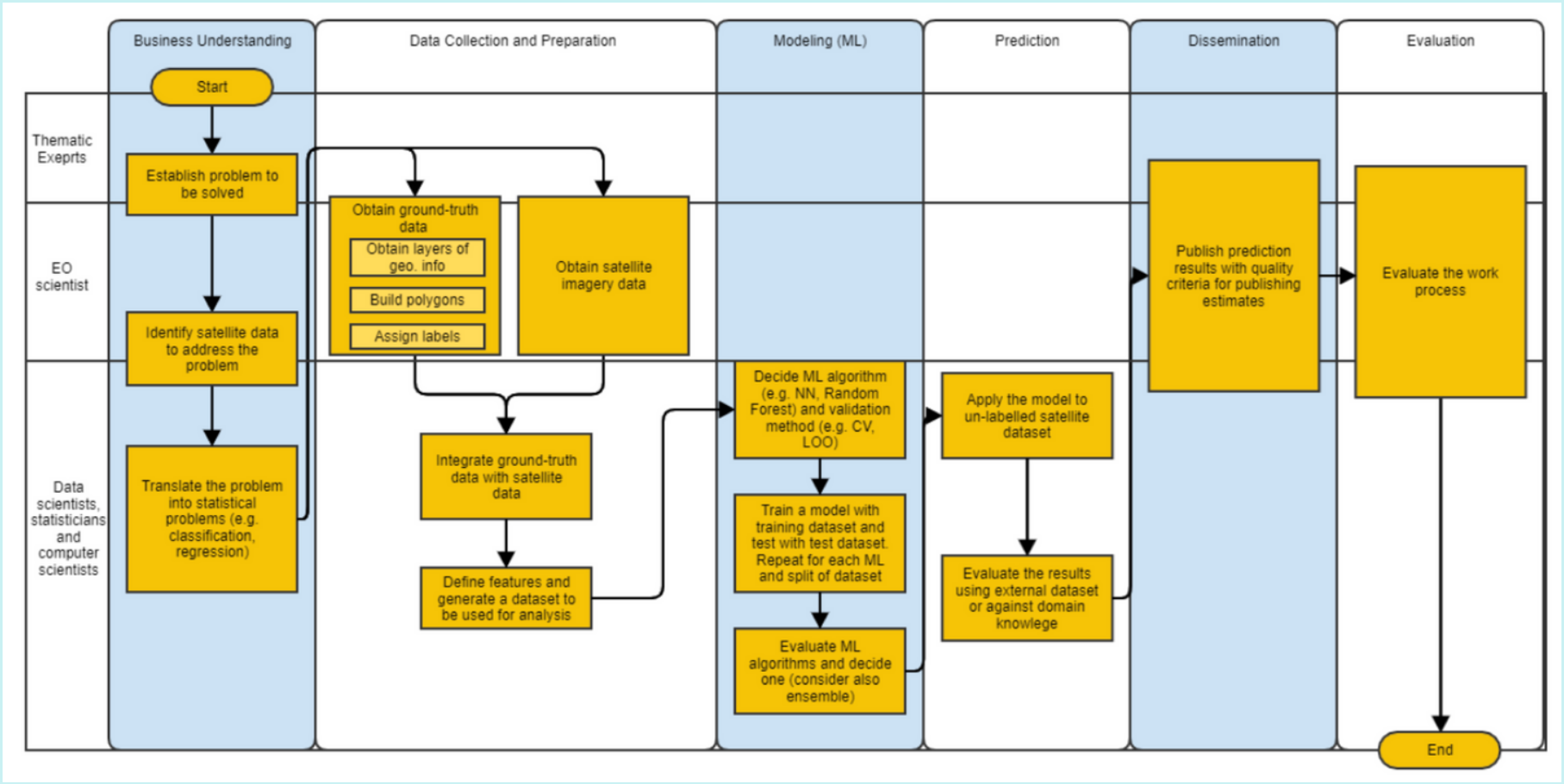
UNECE

modernstats BY HLG - MOS

WHAT IS IT?



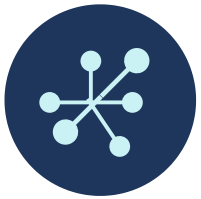
* In collaboration with INEGI

** Work in progress

CHALLENGES

Data is
big and different

Capability not in
place



Institutional
arrangement

Lack of
generalized
approach

CHALLENGES

Data is
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Capability not in
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Institutional
arrangement

Lack of
generalized
approach

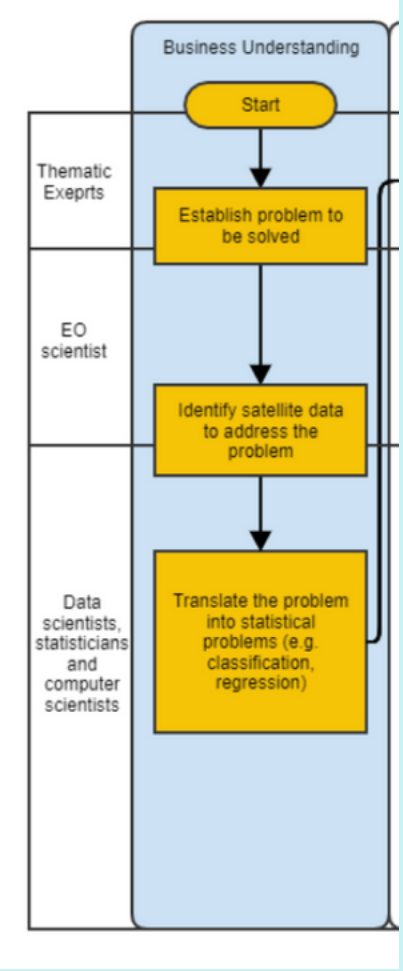
- Lack of understanding about process needed to use satellite data for statistical production
- Unclear scope and boundary of works
- No common reference points to link

GENERIC PROCESS MODEL

Generic process model describes high-level activities that need to be followed to achieve a certain objective

Provides **common language** that facilitate communication and sharing knowledge within and between organisations

PIPELINE



Business understanding

- Establish problems to be solved
- Identify satellite and ground-truth data to address the problem
- Translate the problem into statistical problem

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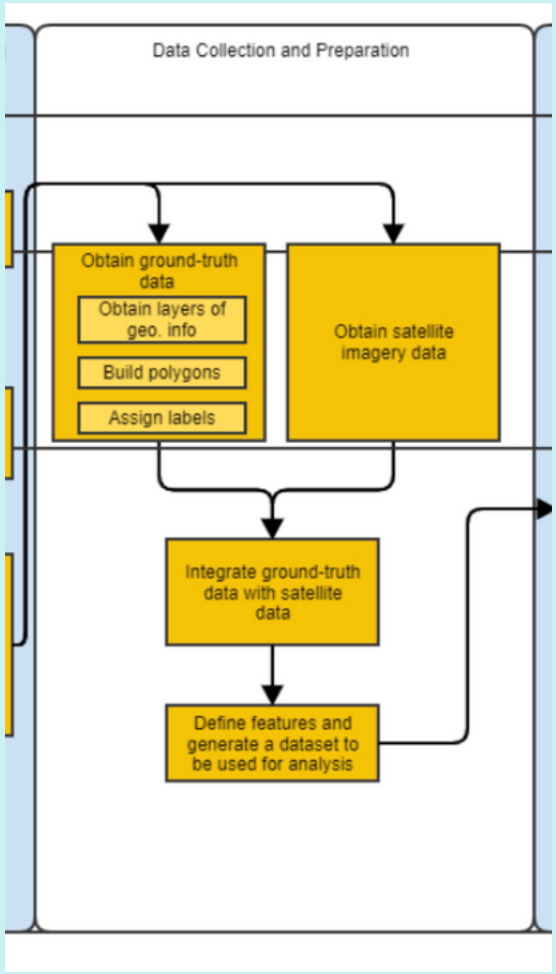

Data collection and processing

- Obtain ground-truth data
- Obtain satellite data
- Integrate ground-truth data with satellite imagery data
- Define features and generate a dataset to be used for analysis

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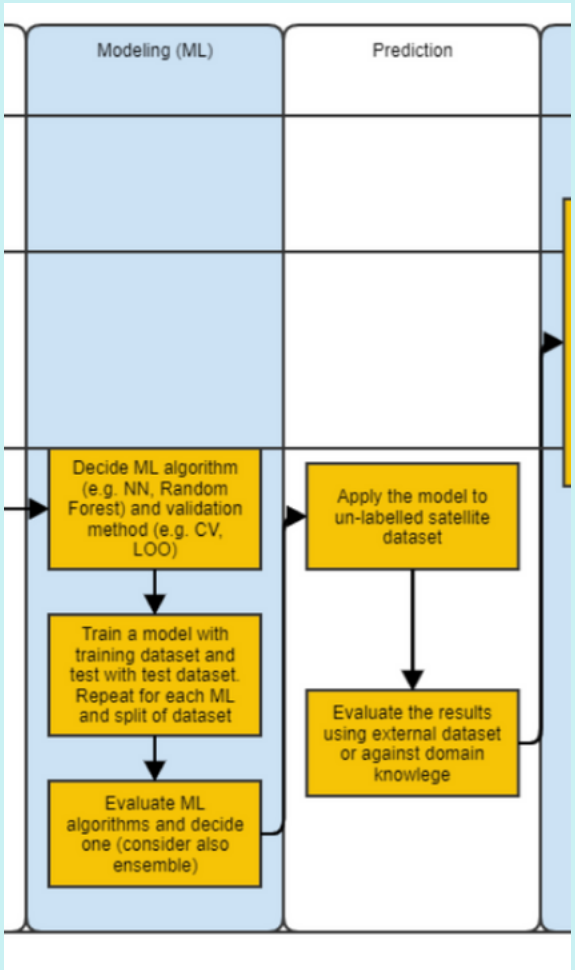

Modeling and prediction

- Decide ML methods and validation method
- Train ML and test
- Evaluate
- Apply model to un-labelled data
- Evaluate using external source

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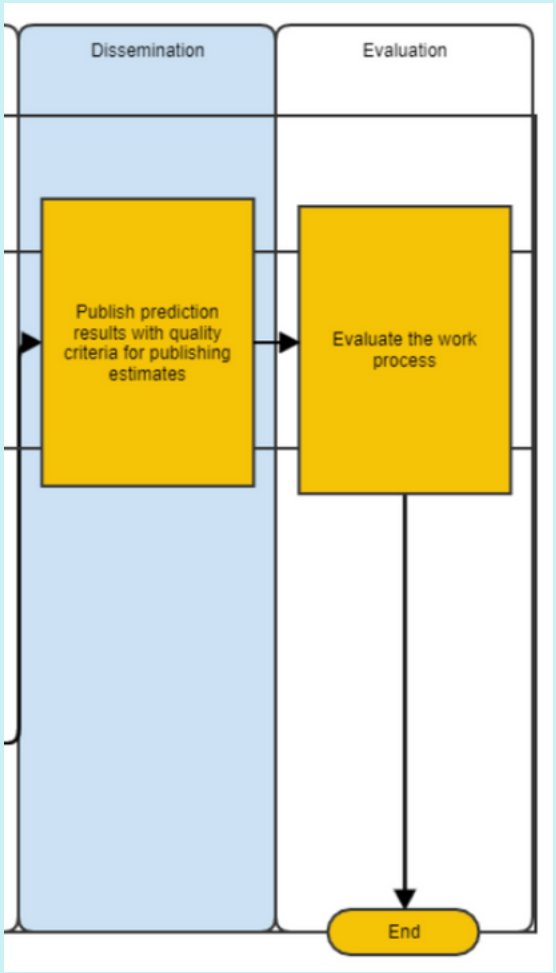


Dissemination and evaluation

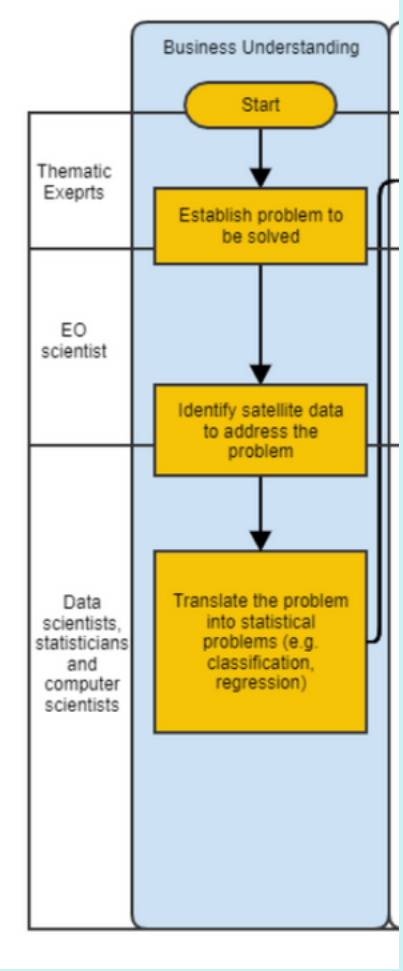
- Publish the output
- Evaluate the work process

EXAMPLE

Modelling crop yield (Statistics Canada)

- Until 2015, the survey was conducted at six time points throughout the year: March, June, July, September, November and December
- From 2012-13, started collaborating with EC) on a model development
- In 2016, September estimates were replaced by this model-based estimates

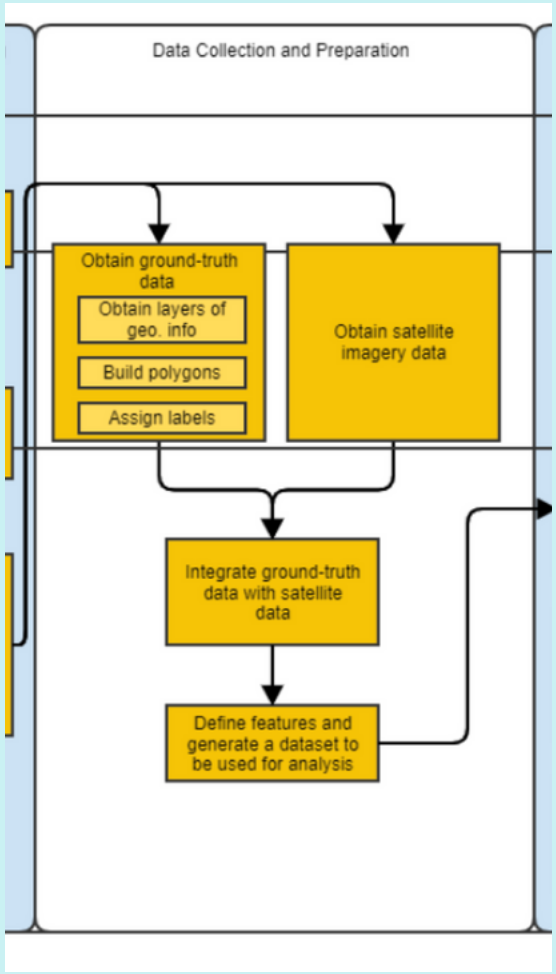
EXAMPLE



Business understanding

- Predict crop yield for province/country level
- Satellite data (NOAA), history crop yield data, agroclimatic data
- Regression problem with Census Agricultural Region (CAR) as unit of analysis

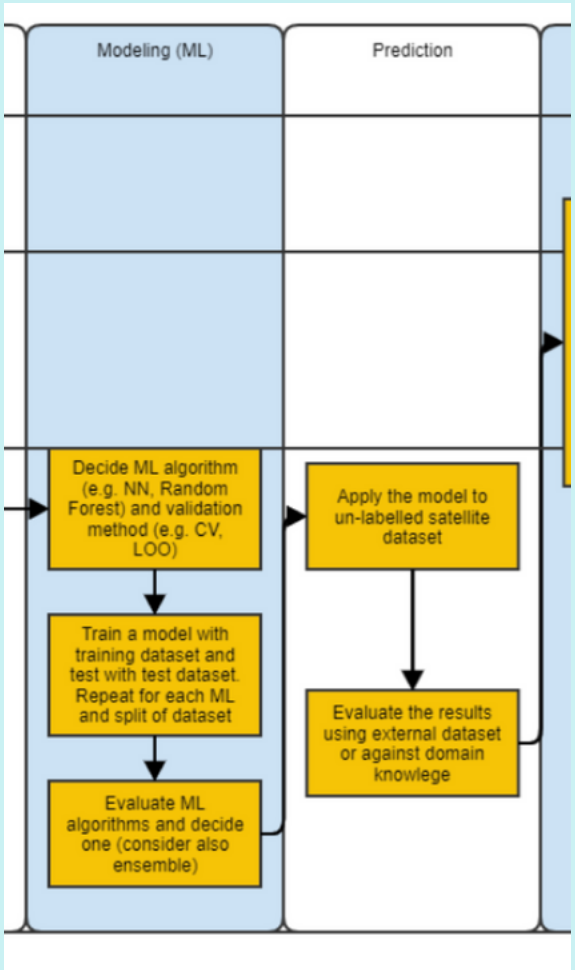
EXAMPLE



Data collection and processing

- Crop yield/weather data (EC)
- Normalized Difference Vegetation Index (NDVI)
- Integrate all at CAR level
- Each CAR has 28 years of data and 80 explanatory variables.

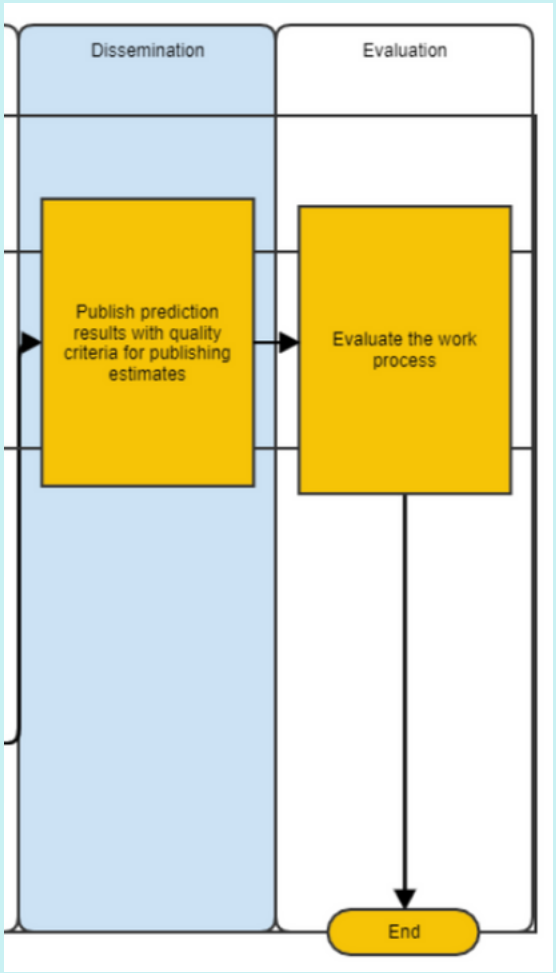
EXAMPLE



Modeling and prediction

- Linear regression/LASSO model
- Relative difference
- LASSO selected
- Subject-matter experts also review the results to identify any questionable estimates.

EXAMPLE



Dissemination and evaluation

- Acceptable level of quality to publish, e.g. minimum of 12 years of historical survey data

THANK YOU!

(MORE DETAILS IN PILOT STUDY REPORT)