



Data-Driven Vegetation Modeling and Tackling Representation Shift

with Few-Shot
Meta-Learning
Methods

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1. Data-Driven Vegetation Modeling and

- why is it meaningful
- data-driven verus model-driven approaches

EPFL Structure

1. Data-Driven Vegetation Modeling and
 - why is it meaningful
 - data-driven verus model-driven approaches
2. Tackling Representation Shift
 - when does it arise?
 - regional representations

1. Data-Driven Vegetation Modeling and
 - why is it meaningful
 - data-driven versus model-driven approaches
2. Tackling Representation Shift
 - when does it arise?
 - regional representations
3. with Few-Shot Meta-Learning Methods
 - seeing our remote sensing data as a dataset-of-datasets
 - Model-agnostic meta-learning as one algorithm to tackle it.

EPFL Vegetation Modeling

Vegetation Modeling

EPFL Why do we want to classify vegetation?

Food security Estimate the expected yield (from cultivated area) to predict food prices, shortages in countries that collect few agronomic statistics.



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Precision Agriculture Identifying vegetation is a first step to provide personalized recommendations to farmers on machining practices and location-based fertilizer use.



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Subsidy control In Europe: monitor and control crop subsidy payments for European farmers.



EPFL Remote Sensing Data in Abundance

MODIS
Temporal
characteristics



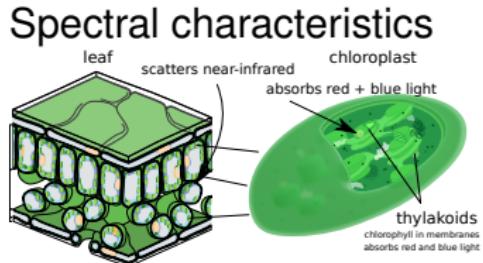
visualization Aaron Penne

Github

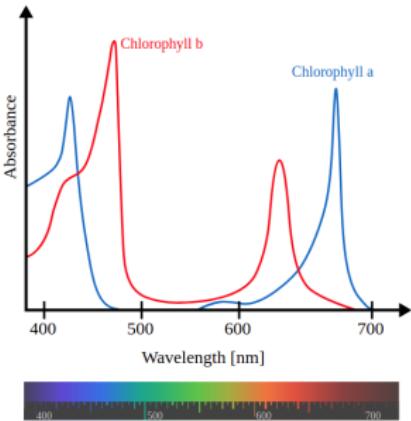
Sentinel 2

PlanetScope

EPFL Photosynthesis: Light → Life



common remote sensing feature: $NDVI = \frac{NIR - RED}{NIR + RED}$
images modified from wikipedia cc



Vegetation follows **seasonal life cycles** (phenology) which can be used to **distinguish categories**.

Feature Extraction

EPFL Data-Driven Methods

DNNs

EPFL Label Data in Abundance!

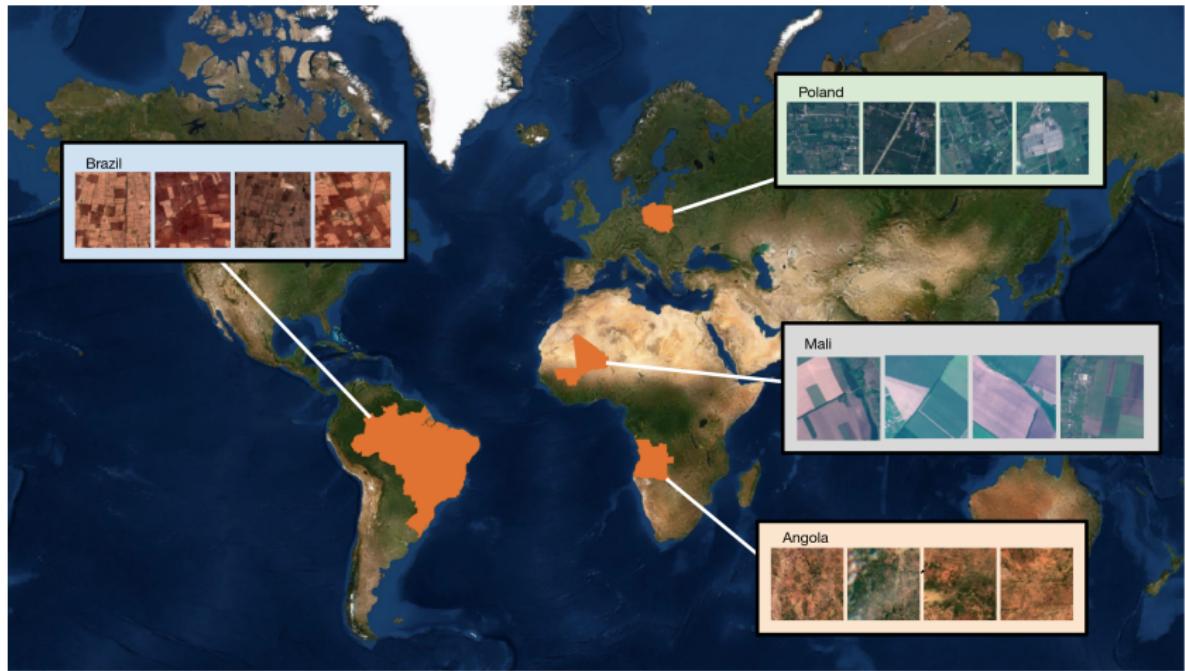
DNNs

EPFL Problem solved?

content...

EPFL Representation Shift

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EPFL Domain and Task

domain

$$\mathcal{D} = \{\mathcal{X}, P(\mathcal{X})\}$$

task

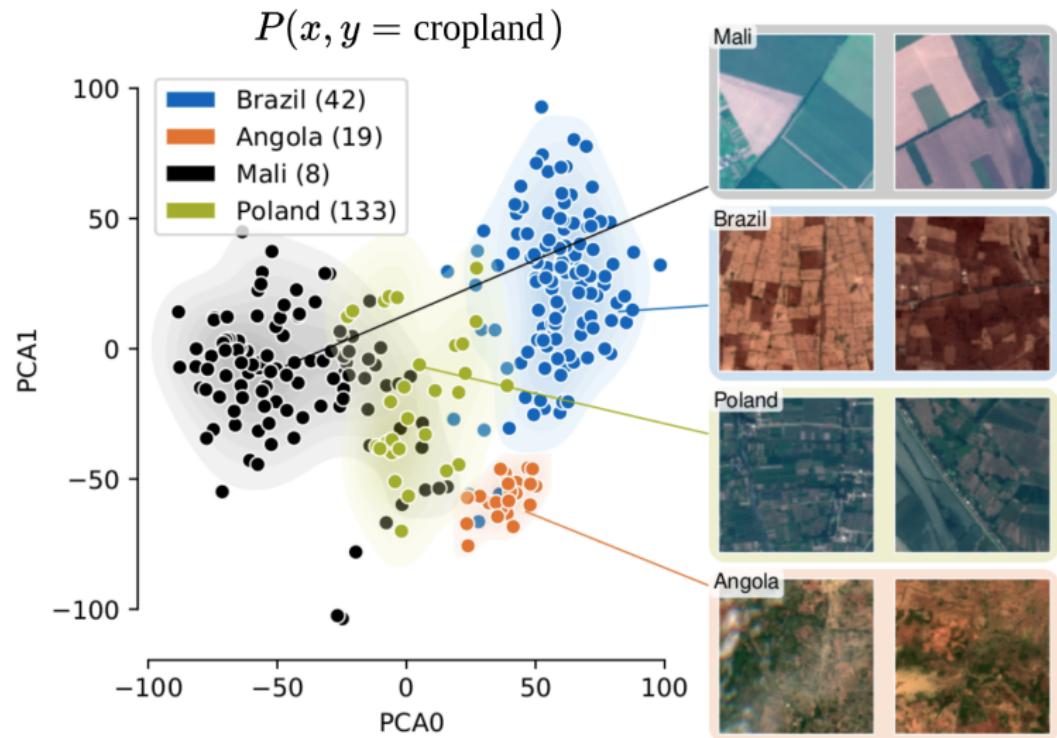
$$\mathcal{T} = \{\mathcal{Y}, f(\cdot)\}$$

Pan, S. J., & Yang, Q. (2009). A survey on transfer learning. *IEEE Transactions on knowledge and data engineering*, 22(10), 1345-1359.

EPFL Shift in Remote Sensing Data

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MARC RUßWURM



Rußwurm, M., Wang, S., Korner, M., & Lobell, D. (2020). Meta-learning for few-shot land cover classification. In Proceedings of the ieee/cvpr conference on computer vision and pattern recognition workshops (pp. 200-201).

This is the frame content

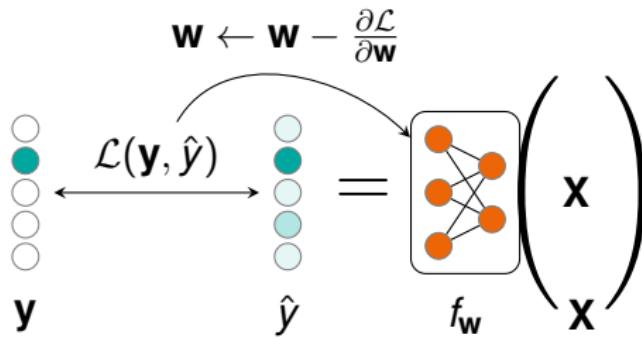
- with some itemize objects
- and another one

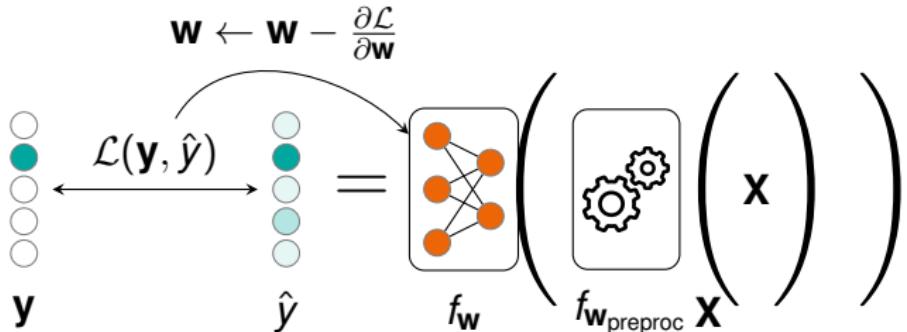
Enumerates should work too

1. one
2. two

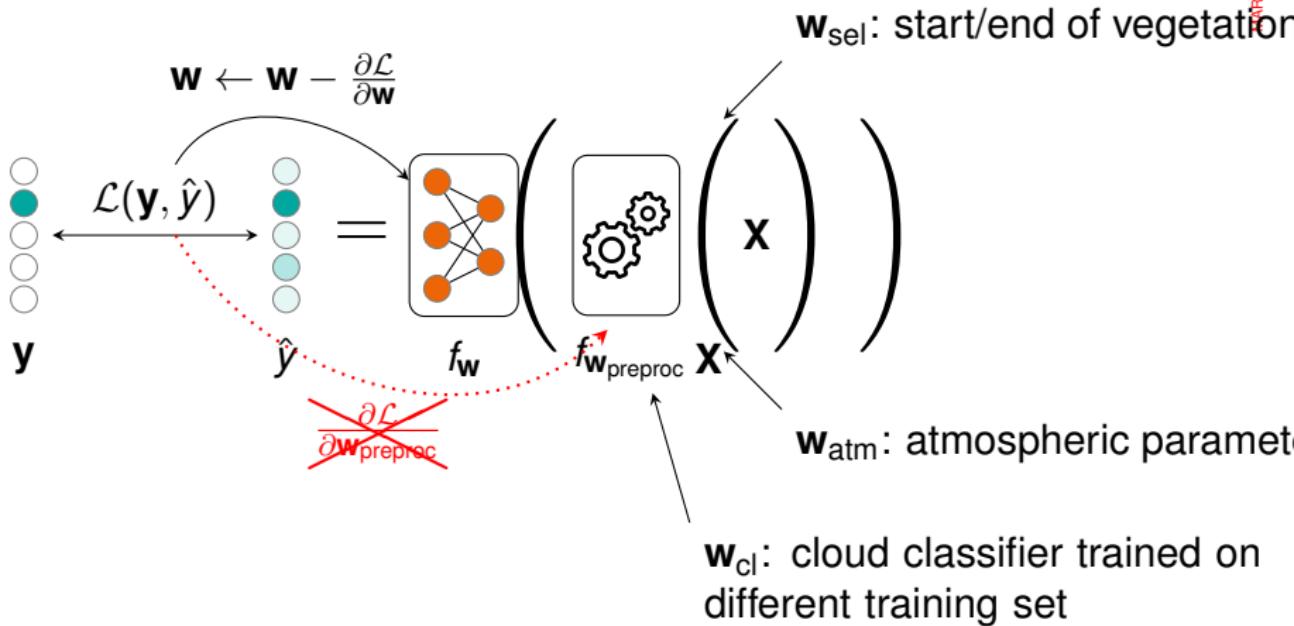
A second column with other content, maybe more text, or something **emphasized**. For more, highlight in **red** or **blue**.

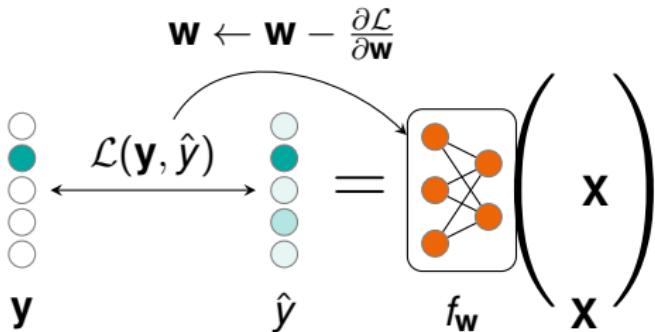
End → End





EPFL Deep Neural Networks

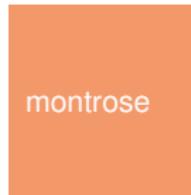




EPFL Colors



rouge



montrose



acier



chartreuse



leman



perle



soufre



marron



grosseille



vertedeau



carotte



ardoise



canard



rose



zinzolin



taupe