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FROM LIDAR DATA TO VEGETATION BIOPHYSICAL VARIABLES

Pau Ventura Rodríguez

2024





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- Introducció
- Metodologia
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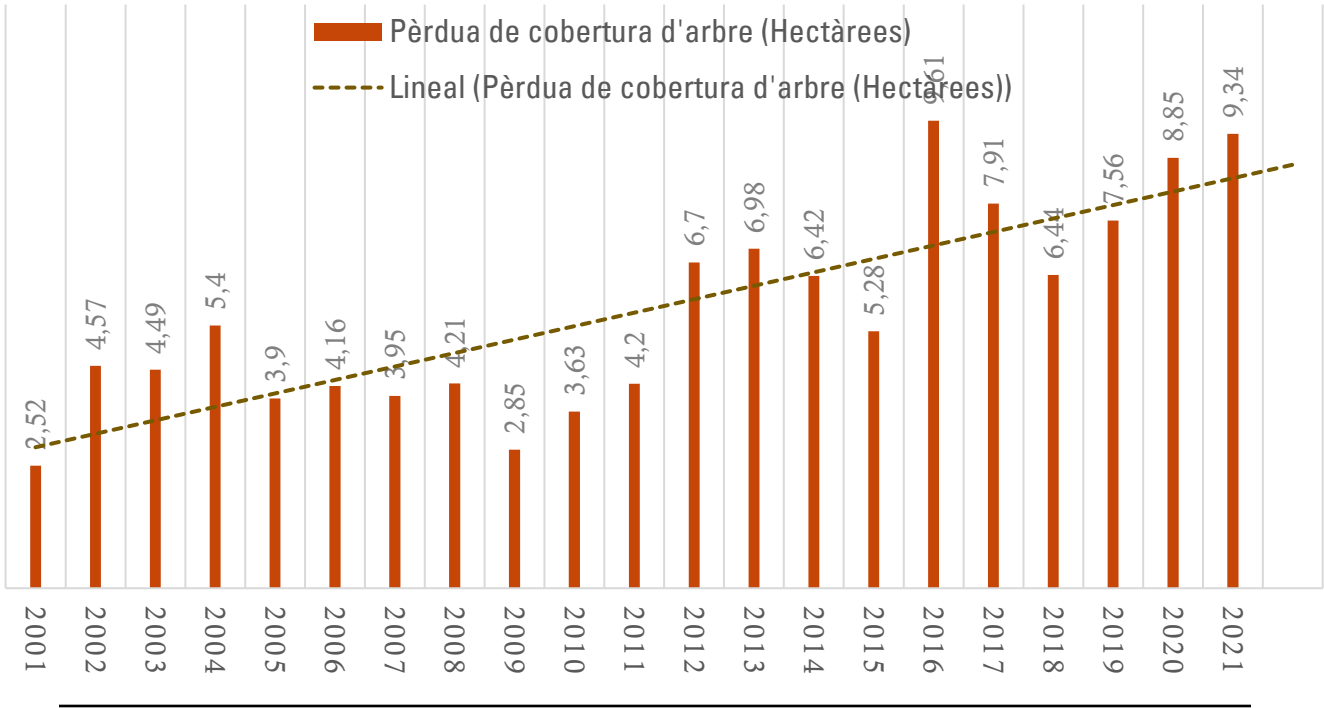
The background of the slide is a close-up photograph of a tree trunk's cross-section, showing concentric growth rings in various shades of brown and tan. A small, dark, irregular hole is visible in the wood, slightly to the left of the center. Two thin white horizontal lines are positioned near the top and bottom of the slide, framing the central text.

Introducció

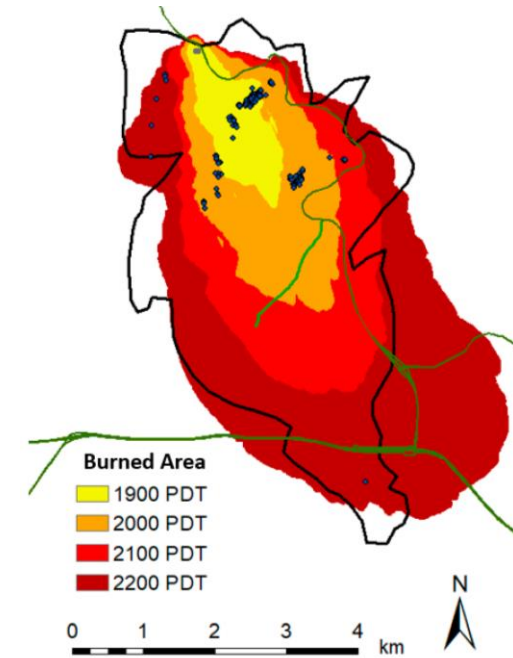


EL PROBLEMA – INCENDIS FORESTALS

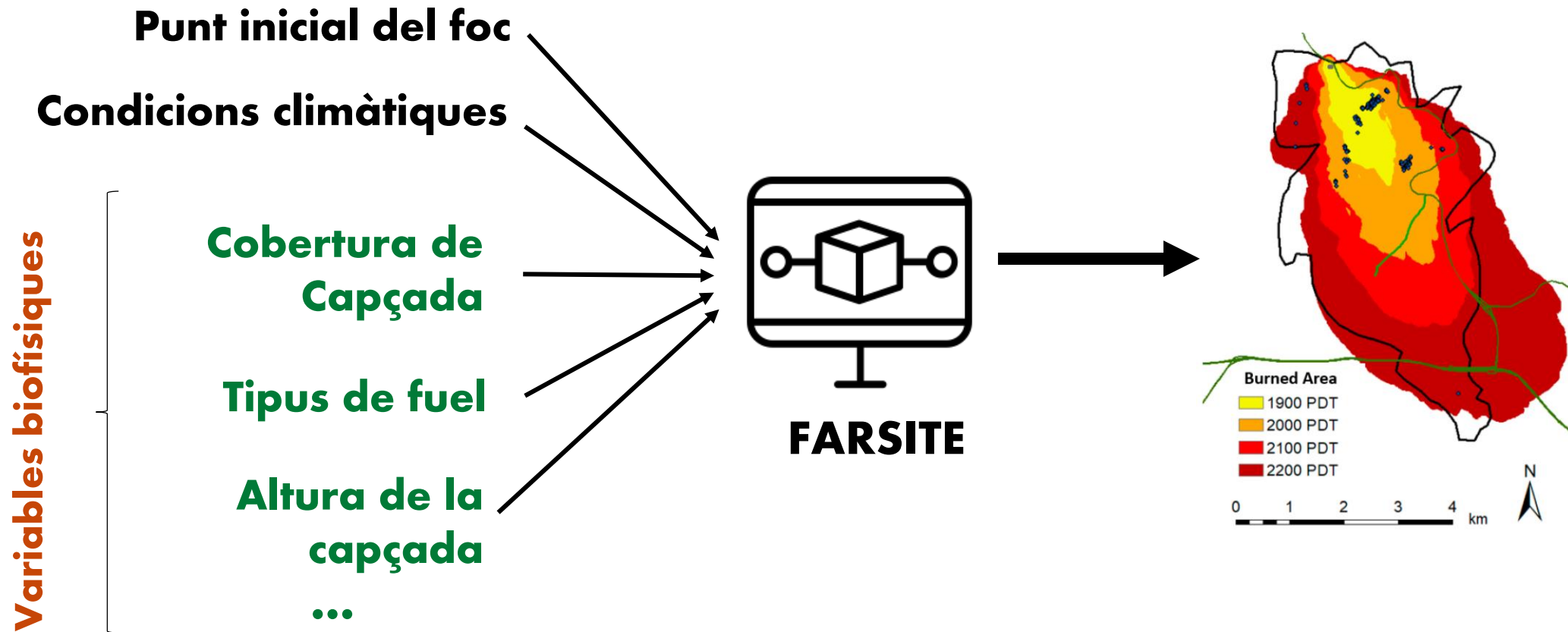
9.3 Milions d'hectàrees



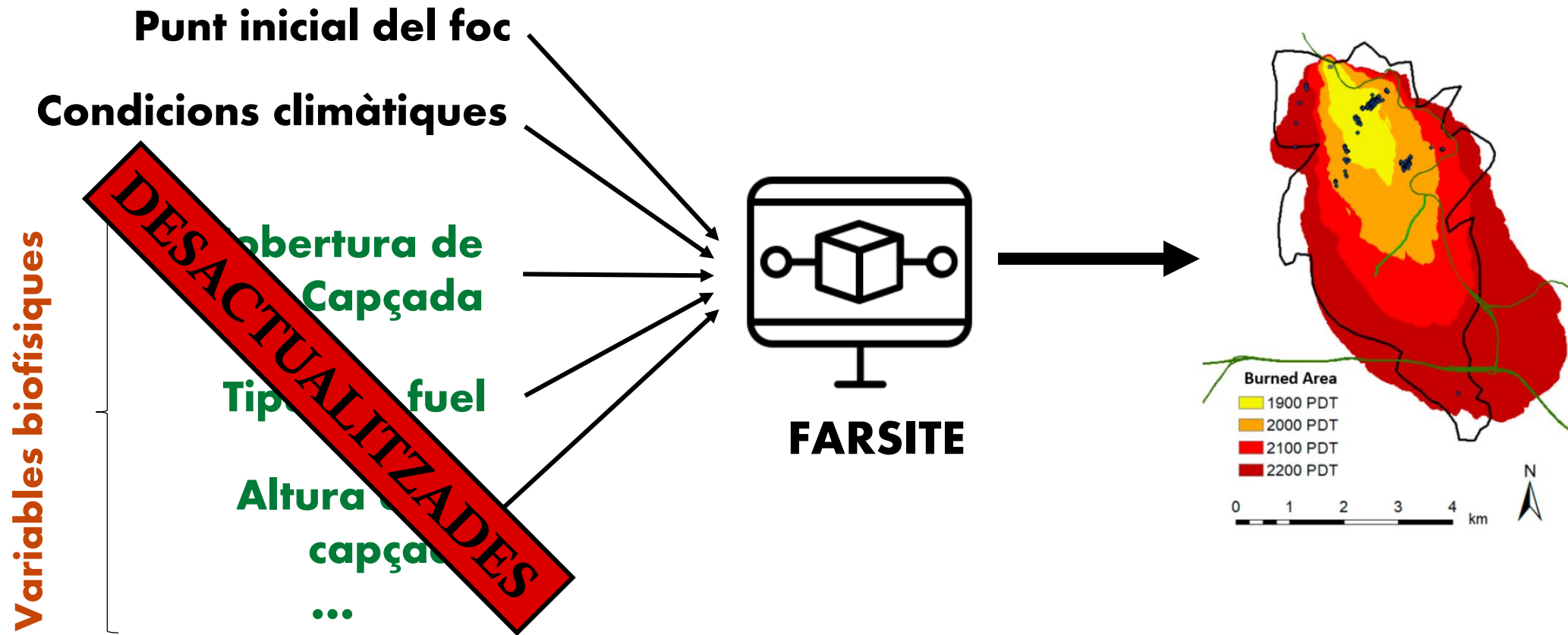
LA SOLUCIÓN - FARSITE



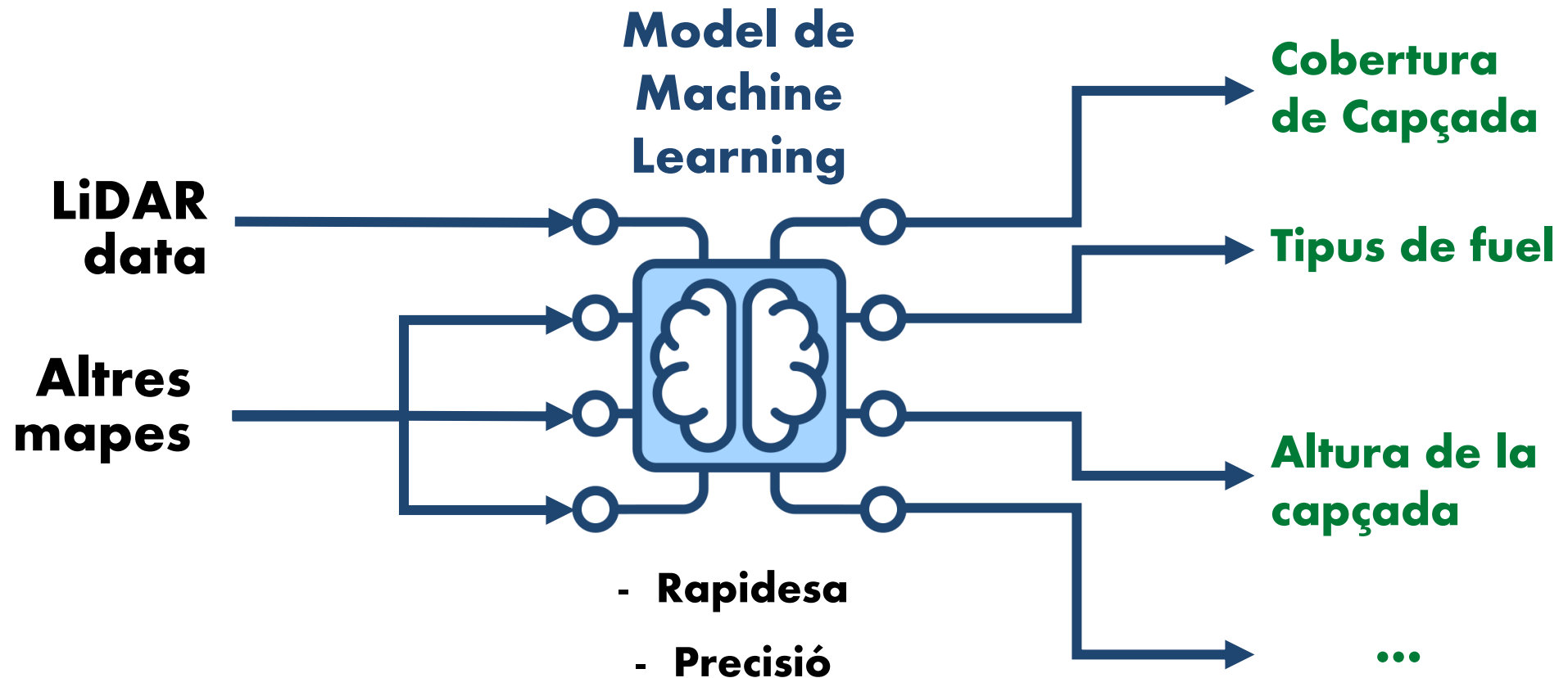
LA SOLUCIÓ - FARSITE



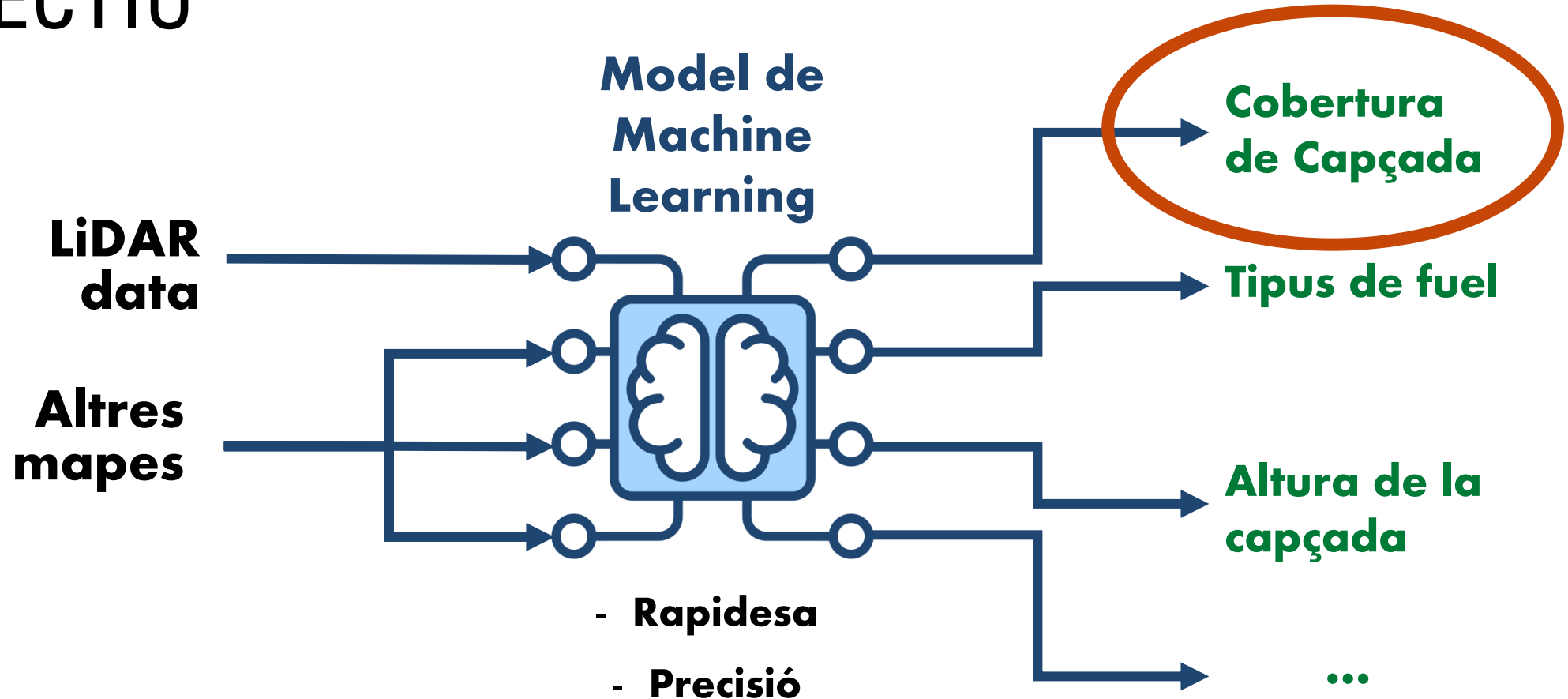
LA SOLUCIÓ - FARSITE



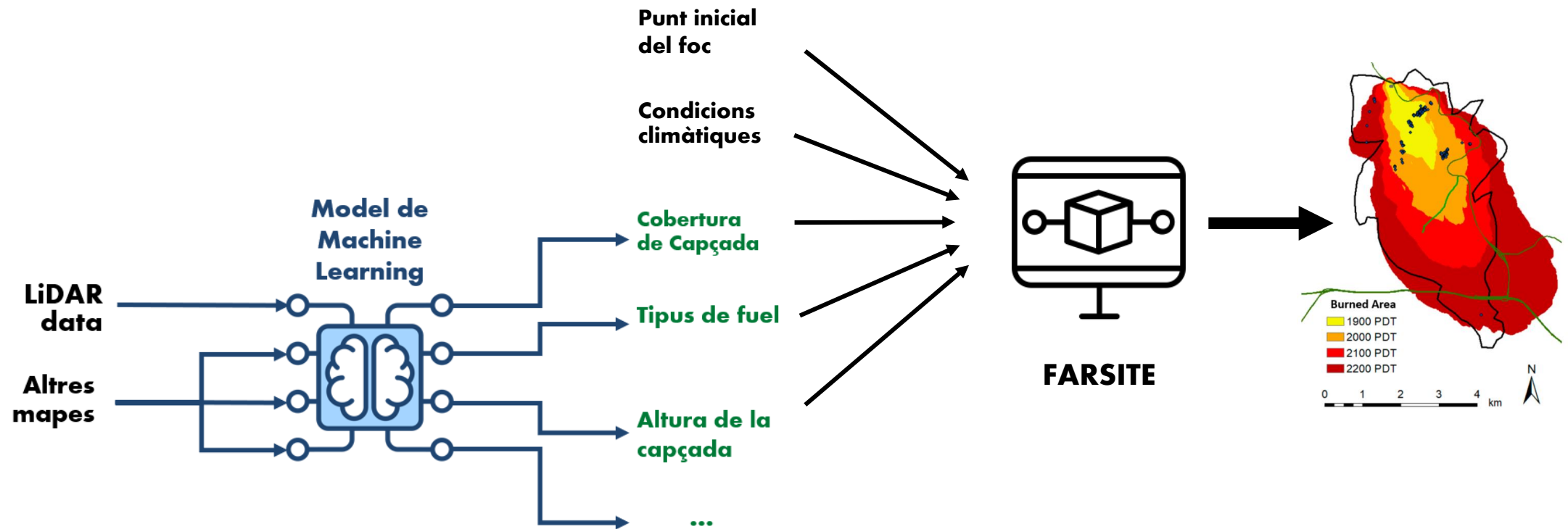
OBJECTIU



OBJECTIU

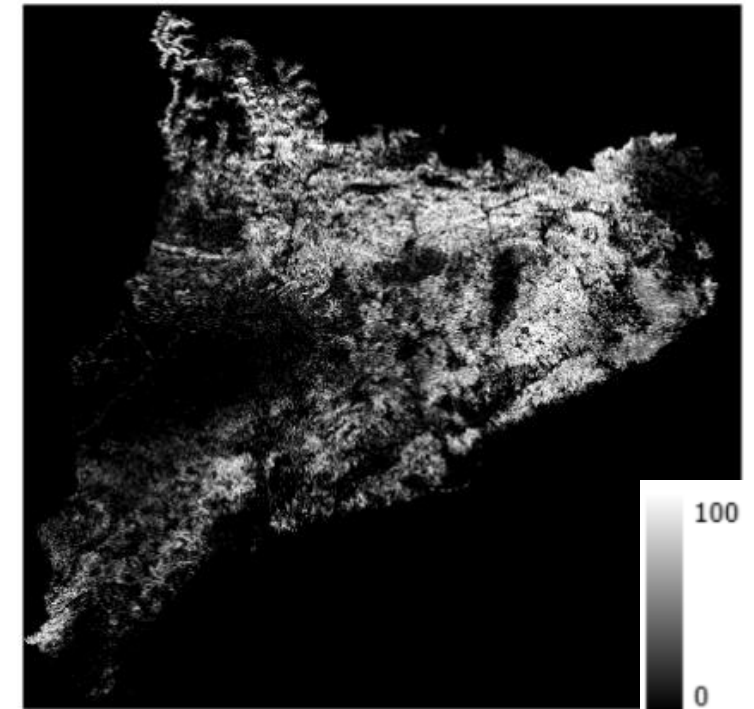
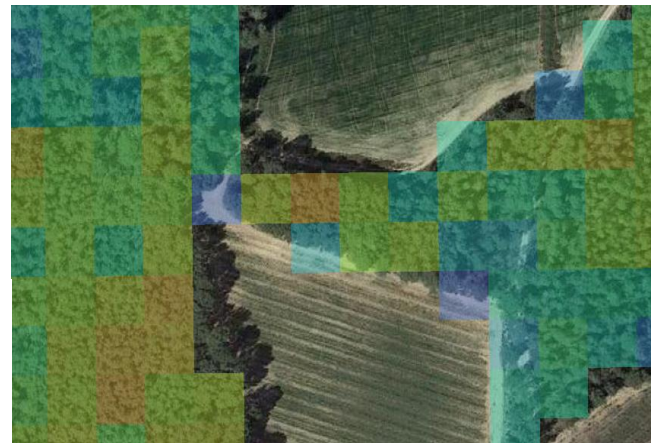


OBJECTIU



COBERTURA DE CAPÇADA

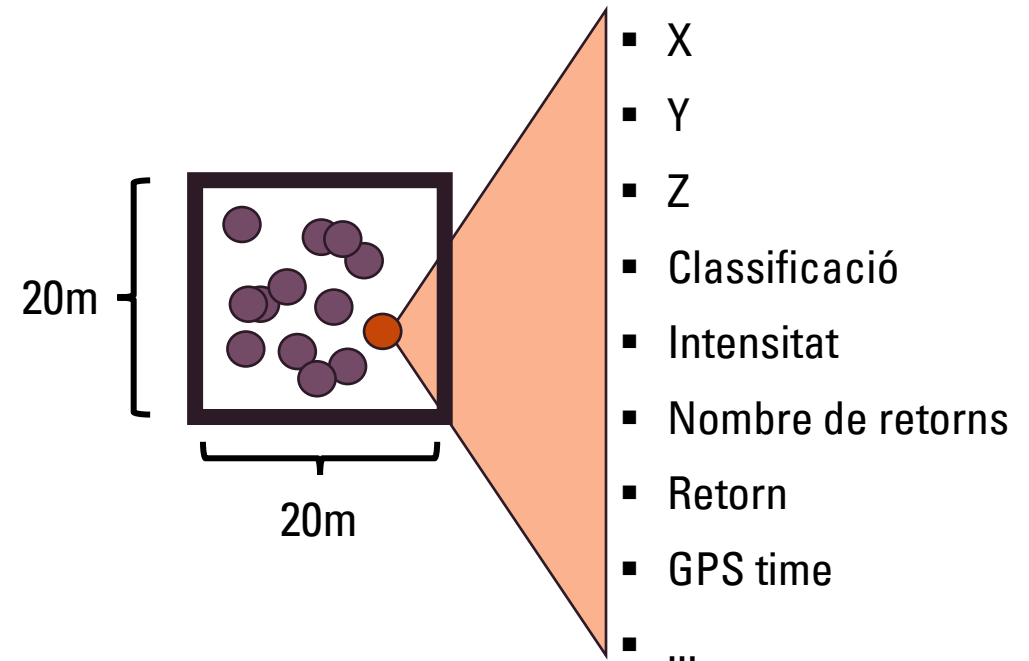
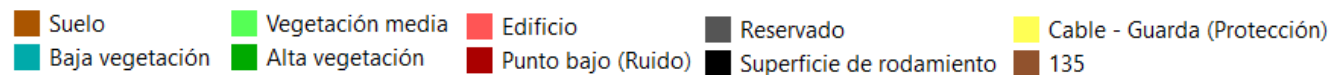
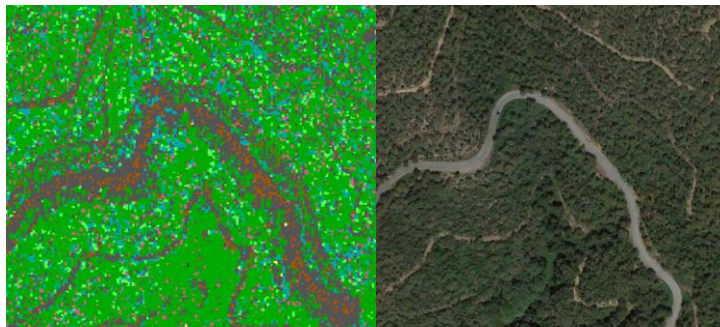
- **Definició:** Percentatge de l'àrea que la capçada dels arbres ocupen.
- **Resolució:** 20x20m
- **Proveïdor:** Institut Cartogràfic i Geològic de Catalunya



LIDAR

Light Detection and Ranging

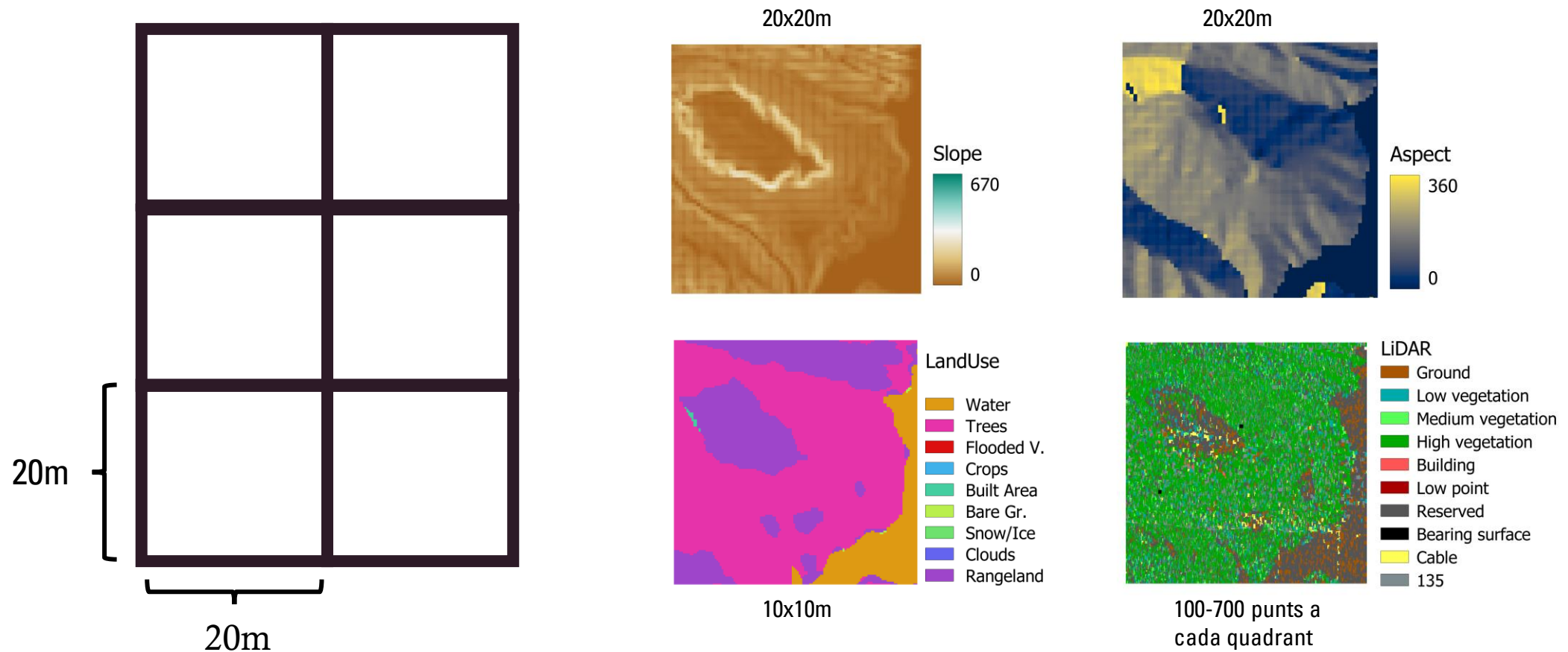
- Mètode de detecció que permet generar núvols de punts d'un àrea que la caracteritzen a partir d'un làser.
- Atribueix a cada punt múltiples característiques.



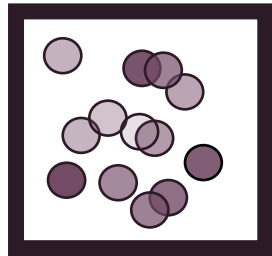
The background of the slide is a close-up photograph of a tree trunk's cross-section, showing concentric growth rings in various shades of brown and tan. A small, dark, irregular hole is visible in the wood, slightly to the left of the center. Two thin white horizontal lines are positioned near the top and bottom of the slide, framing the central text.

Metodologia

MODELATGE DE LES DADES



MODELATGE DE LES DADES



Intensitat

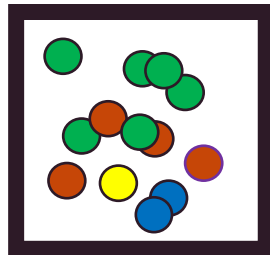
Mediana: ●
Mitjana: ●
Desviació: 2.4

Percentil 10: ●
Percentil 20: ●
...

Percentatge de punts per damunt del valor ● : 60%

...

Atributs continus:
Intensitat, altura, angle

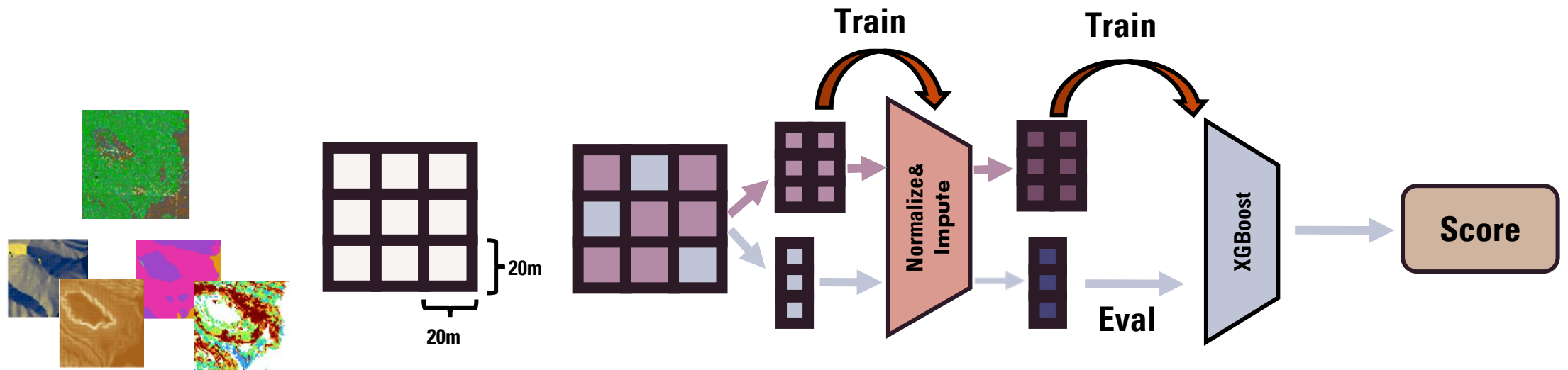


Classe

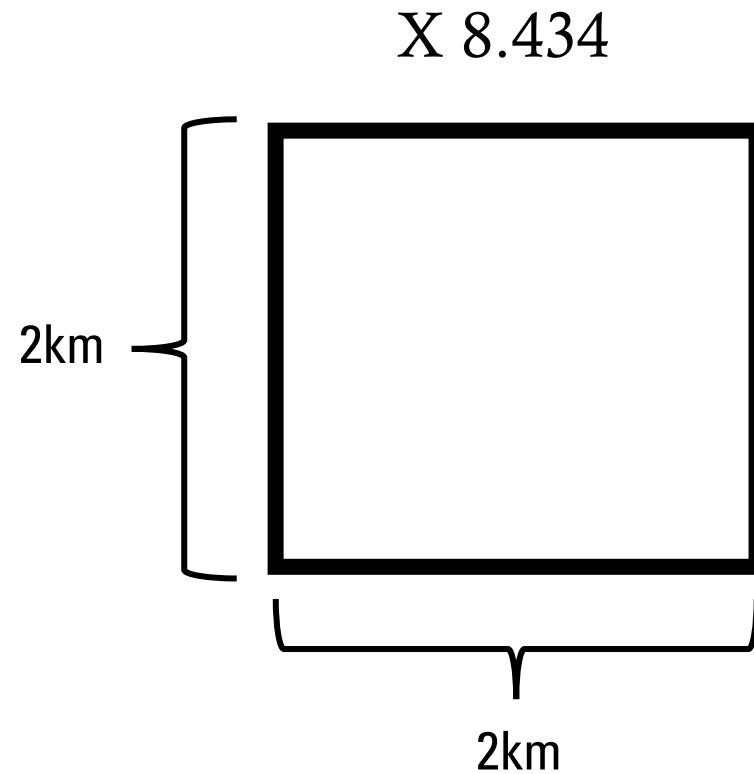
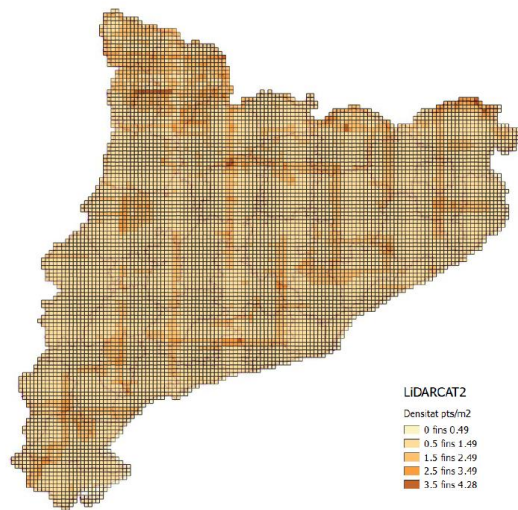
● - 46.15%
● - 7.69%
● - 30.76%
● - 15.38%

Atributs discrets: Classe,
nombre de retorns, retorn

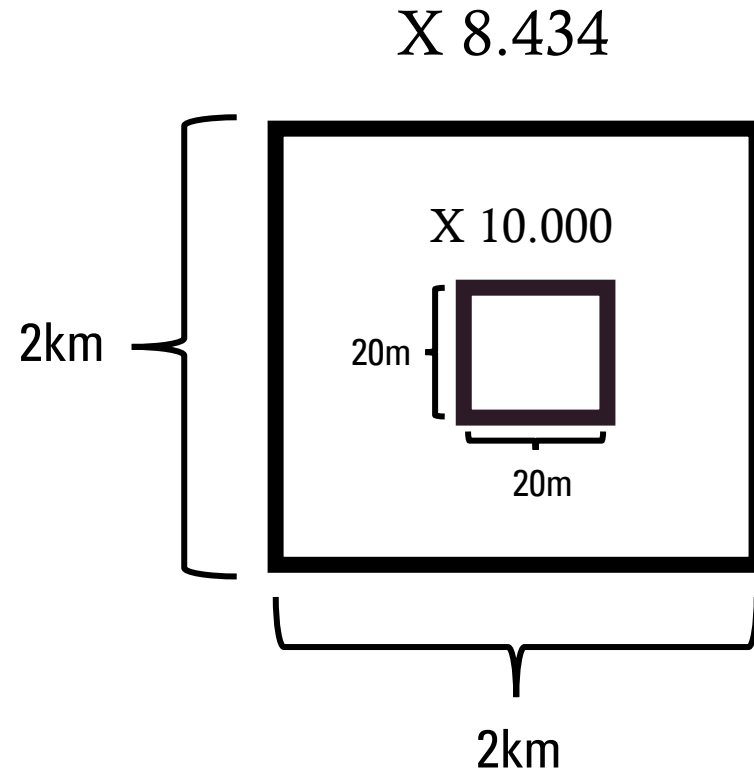
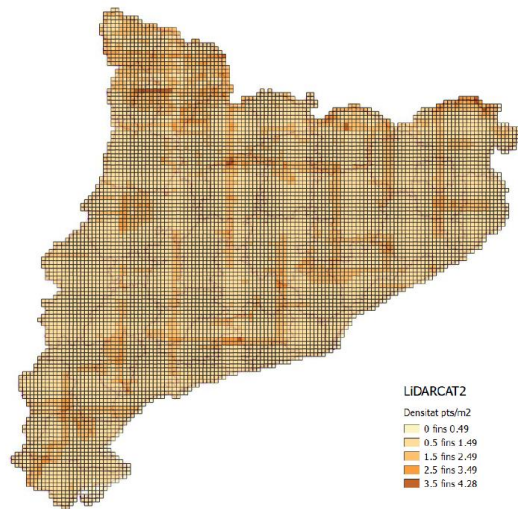
MACHINE LEARNING WORKFLOW



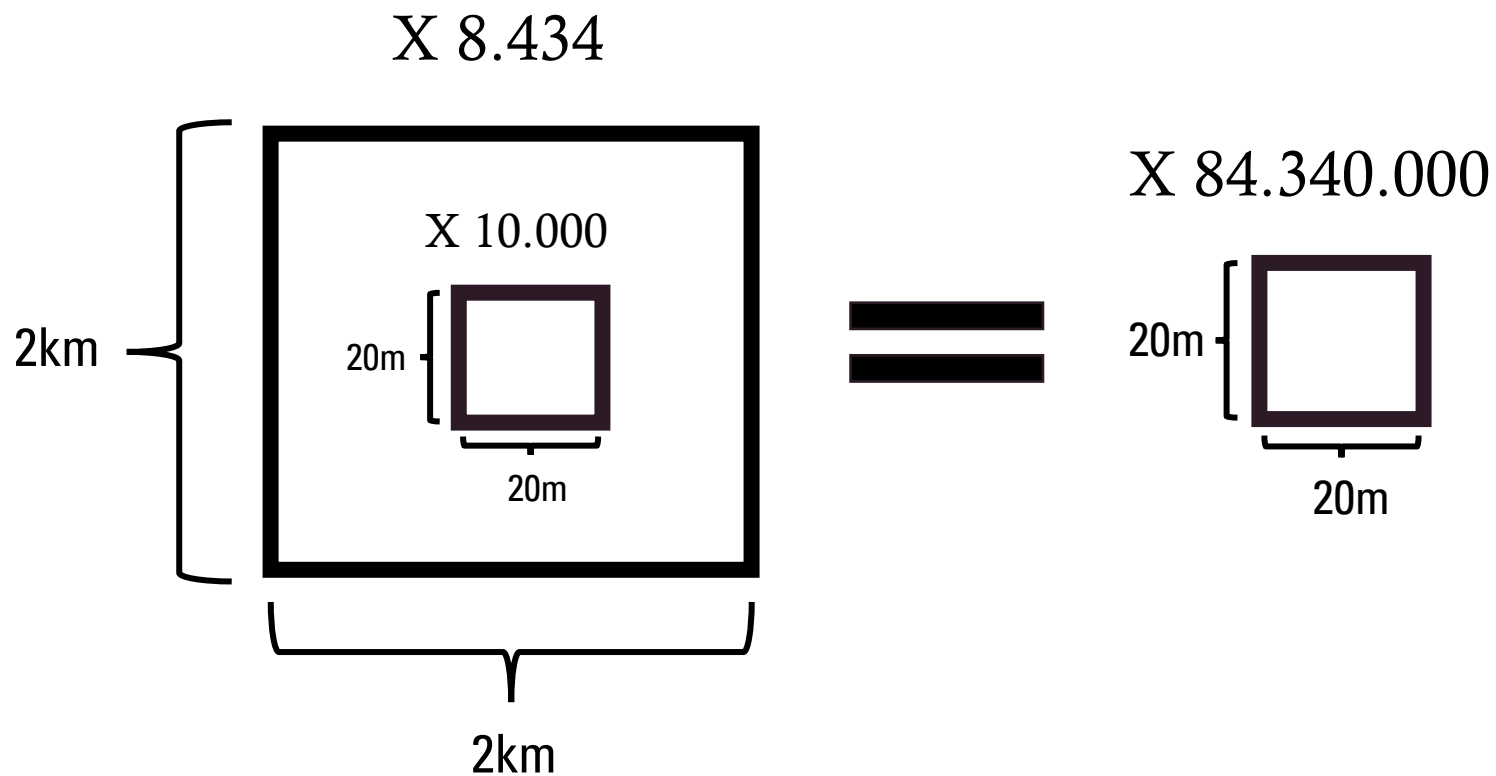
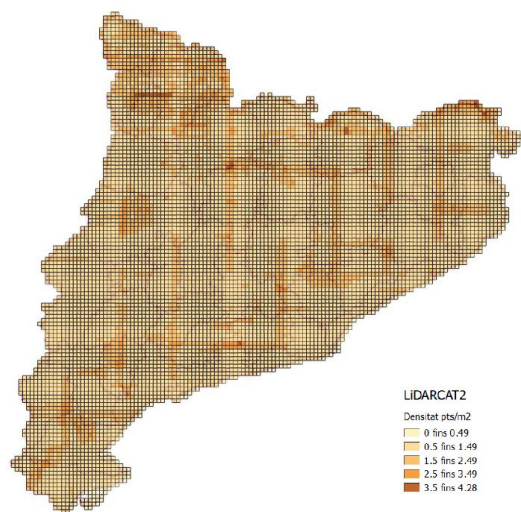
STUDY AREA



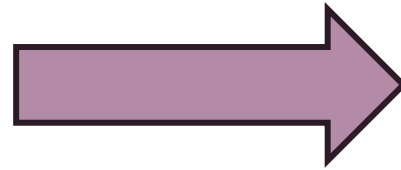
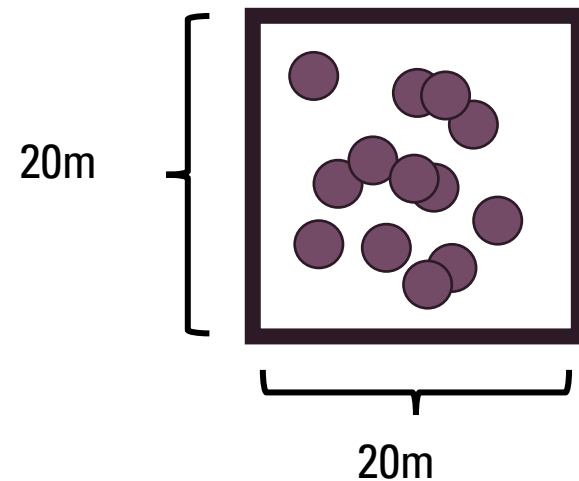
STUDY AREA



STUDY AREA



FEATURE SELECTION

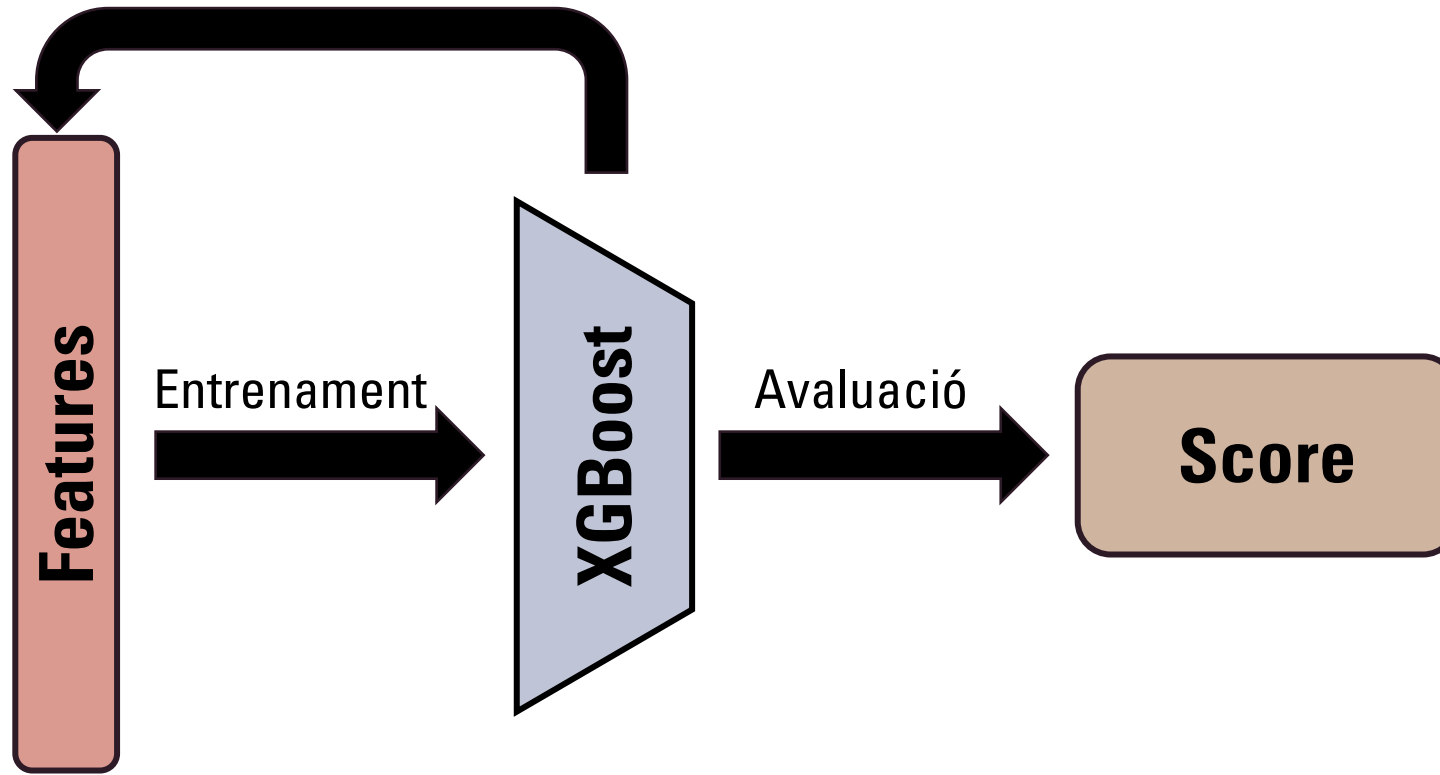


152 Atributs

- **Alt temps d'execució (24 blocs ~ 1h)**
- **Alt ús de memòria**
- **Redundància**
- **Overfitting del model**
- **No explicabilitat**

FEATURE SELECTION PROCESS - EMBEDDED

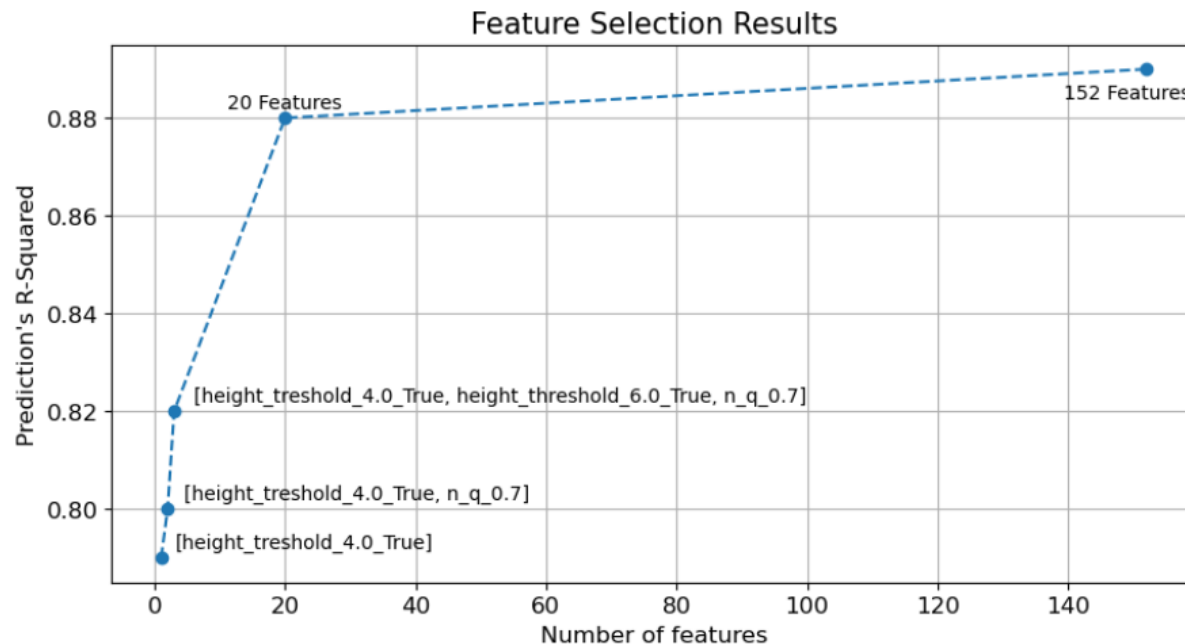
Eliminar els atributs menys importants



The background of the slide is a close-up photograph of a tree trunk's cross-section, showing concentric growth rings in various shades of brown and tan. A small, dark, irregular hole is visible in the wood, slightly to the left of the center. Two thin white horizontal lines are positioned near the top and bottom of the slide, framing the central text.

Resultats

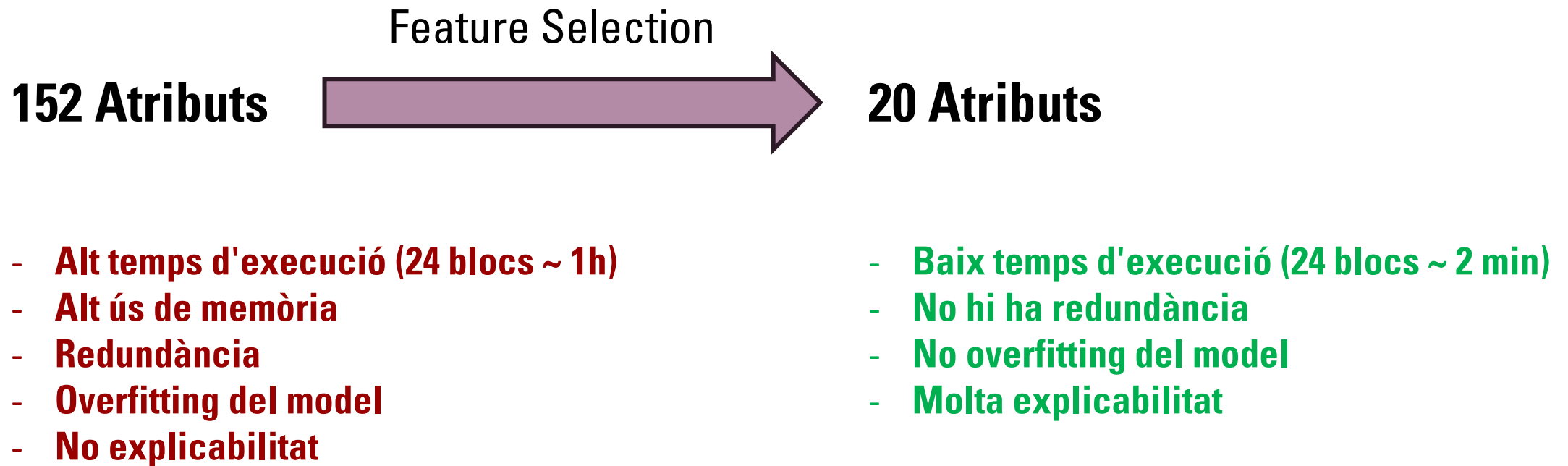
FEATURE SELECTION



20 Atributs:

'height_q_0.2', 'height_q_0.3',
height_treshold_3.0_True',
'height_treshold_4.0_True',
'height_treshold_5.0_True', 'height_tre
shold_6.0_True',
'height_treshold_7.0_True',
'n_q_0.3', 'n_q_0.4', 'n_q_0.5',
'n_q_0.6', 'n_q_0.7', 'n_sd',
'i_treshold_10_True',
'i_treshold_130_False',
'i_treshold_70_False',
'num_points_5', 'num_points_2',
'r_treshold_1_False',
'slope'

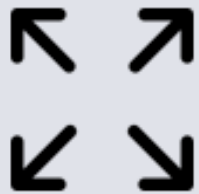
FEATURE SELECTION



RESULTATS DE L'ENTRENAMENT

Mida de l'entrenament

- 8424 blocs (**tota Catalunya**).
- 80% train – 20% test.



Temps de processament

- Blocs: **4h 30 min.**
- Model: **46 min.**

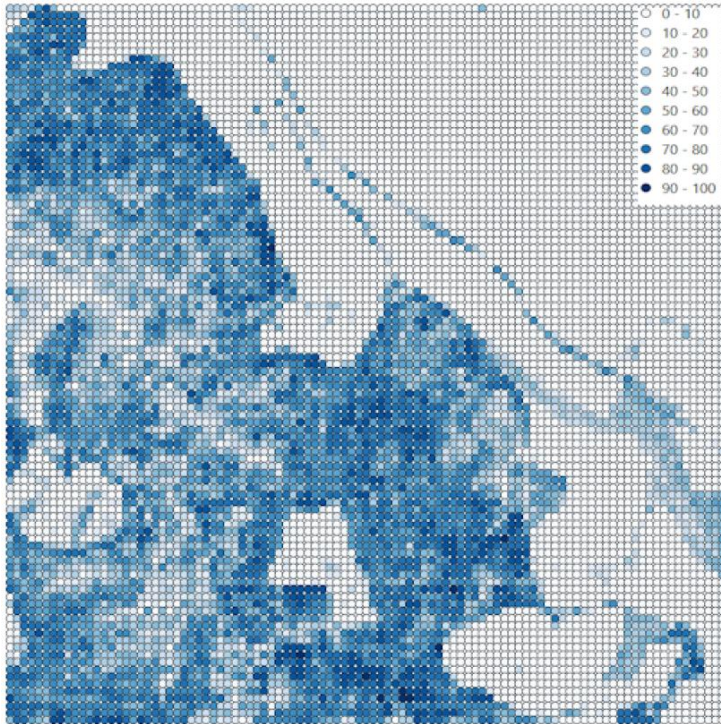


Mètriques

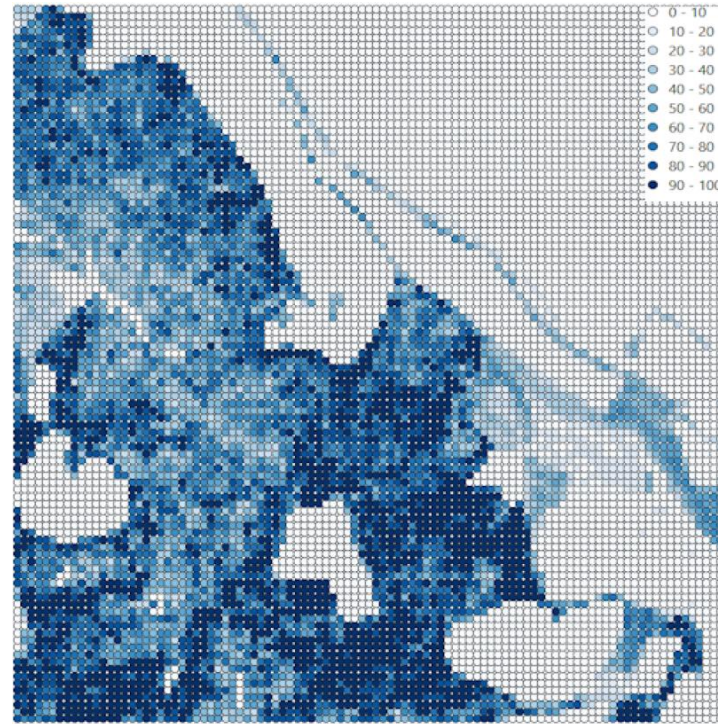
- R-sq: **0.89** (train), **0.88** (test)
- MAE: **6.30** (train) **6.47** (test)



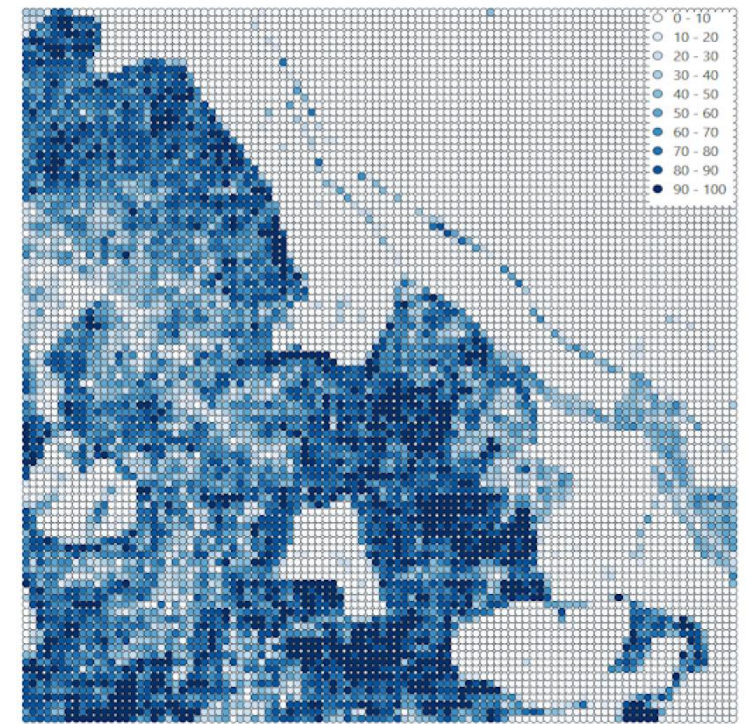
VISUALITZACIÓ DELS RESULTATS



Prediccions del model
parcial (15 MAE)

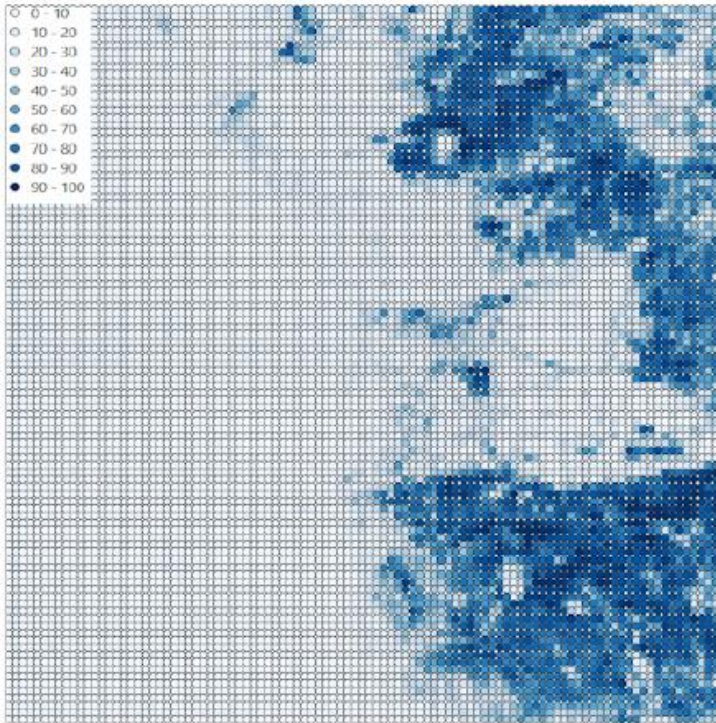


Cobertura de
Capçada Real

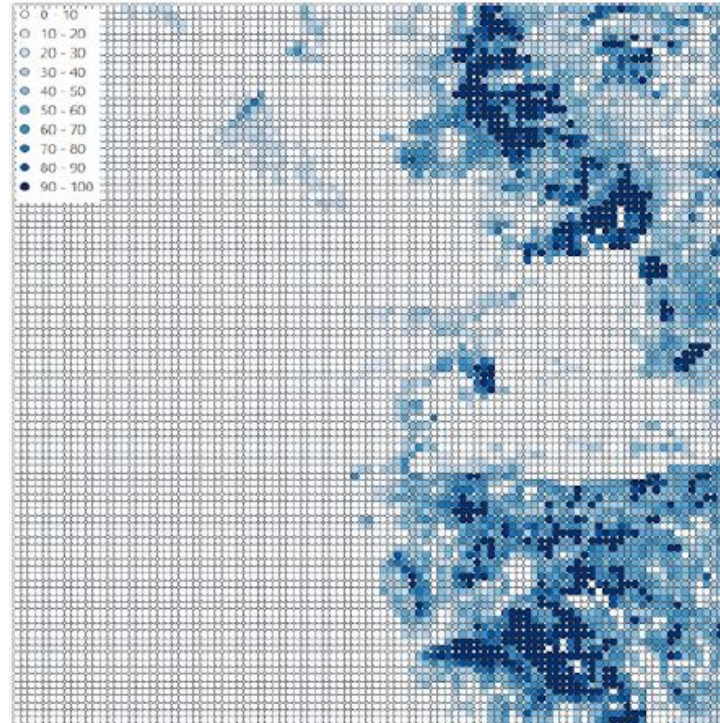


Prediccions del model
complet (6 MAE)

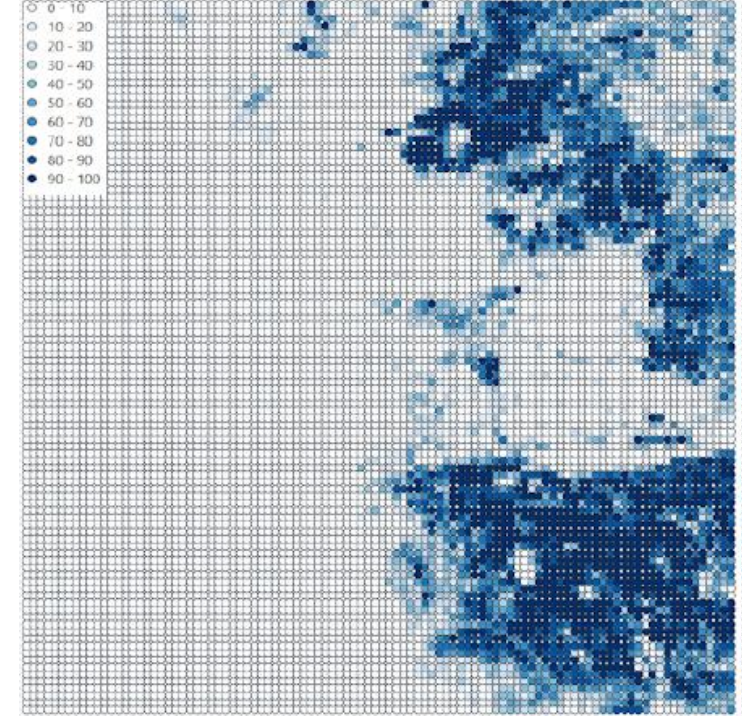
VISUALITZACIÓ DELS RESULTATS



Prediccions del model
parcial (12.5 MAE)

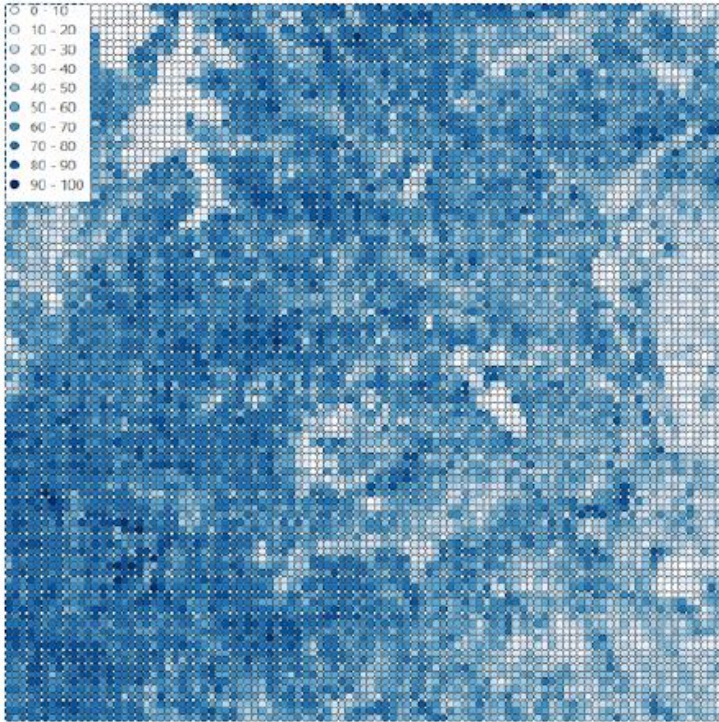


Cobertura de
Capçada Real

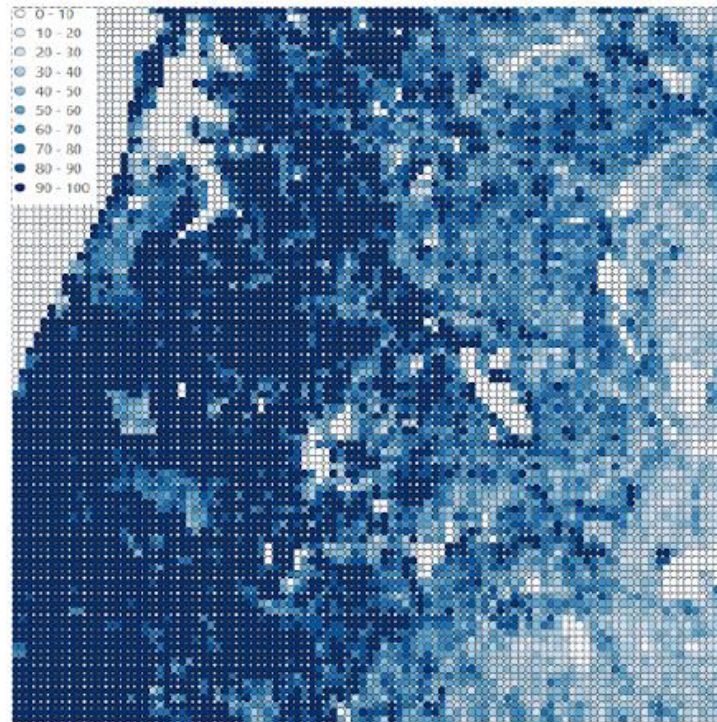


Prediccions del model
complet (8.8 MAE)

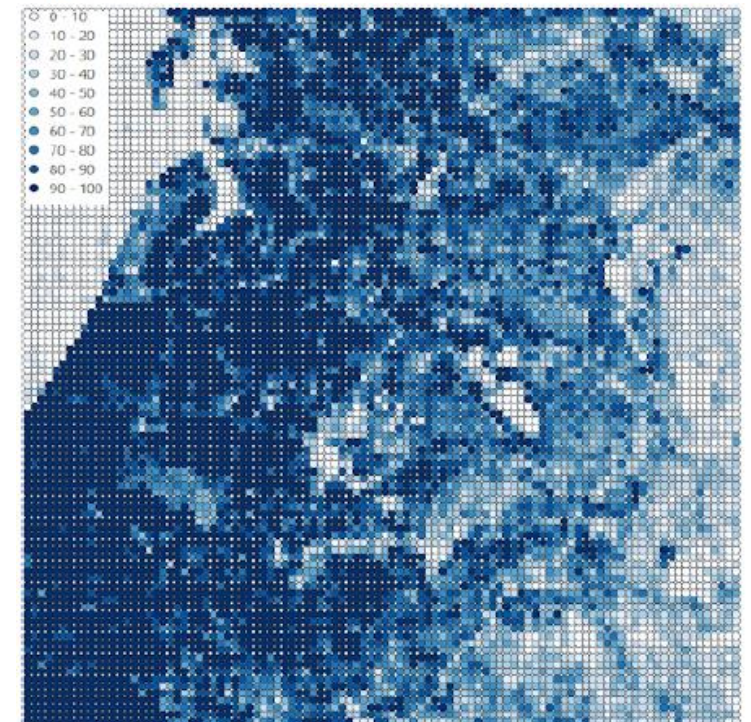
VISUALITZACIÓ DELS RESULTATS



Prediccions del model
parcial (10.5 MAE)

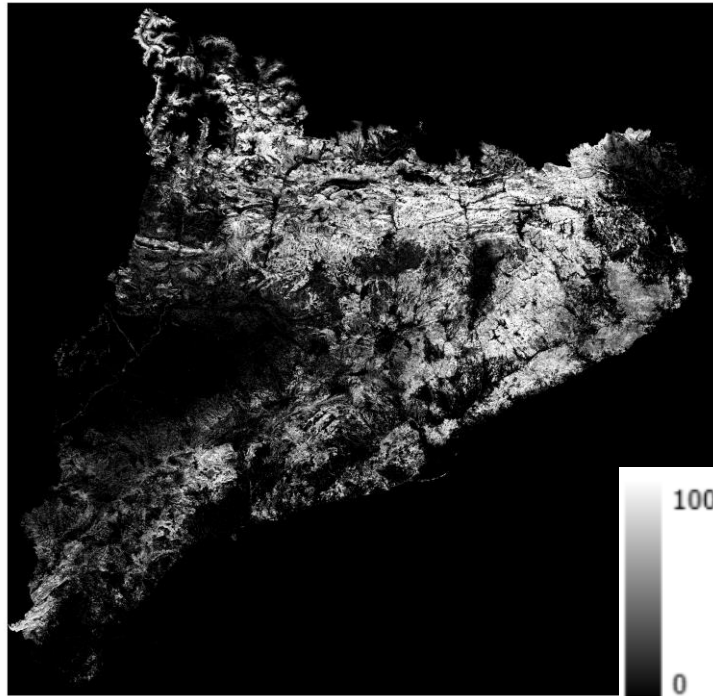


Cobertura de
Capçada Real

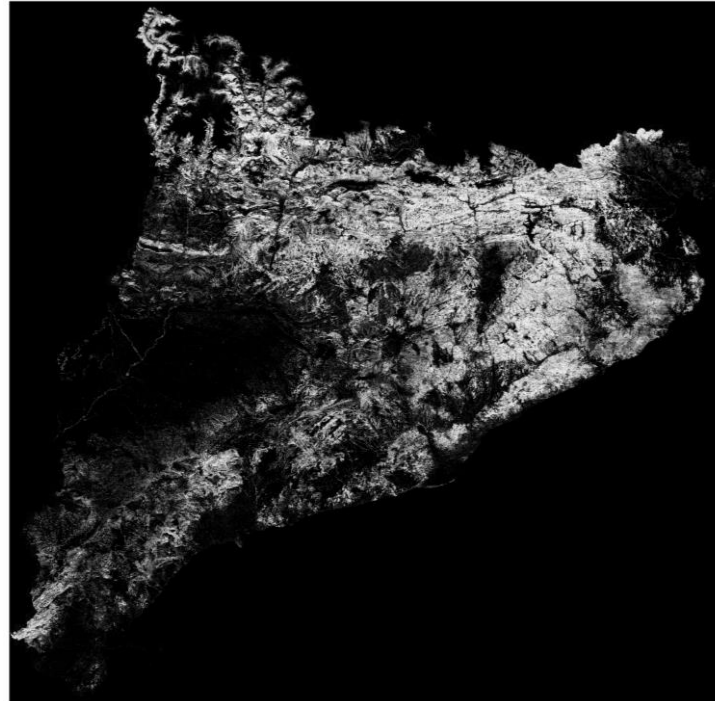


Prediccions del model
complet (7 MAE)

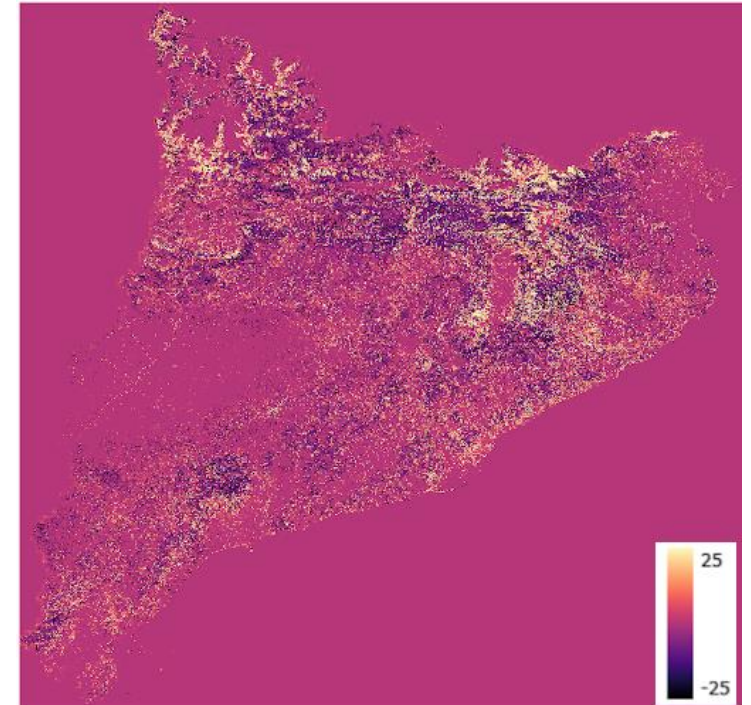
VISUALITZACIÓ DELS RESULTATS



Cobertura de Capçada
Real



Cobertura de Capçada
Predicció



Diferencia
Predicció - Real

The background of the slide is a close-up photograph of a tree trunk's cross-section, showing concentric growth rings in various shades of brown and tan. A horizontal white line is positioned near the top of the image.

Conclusions

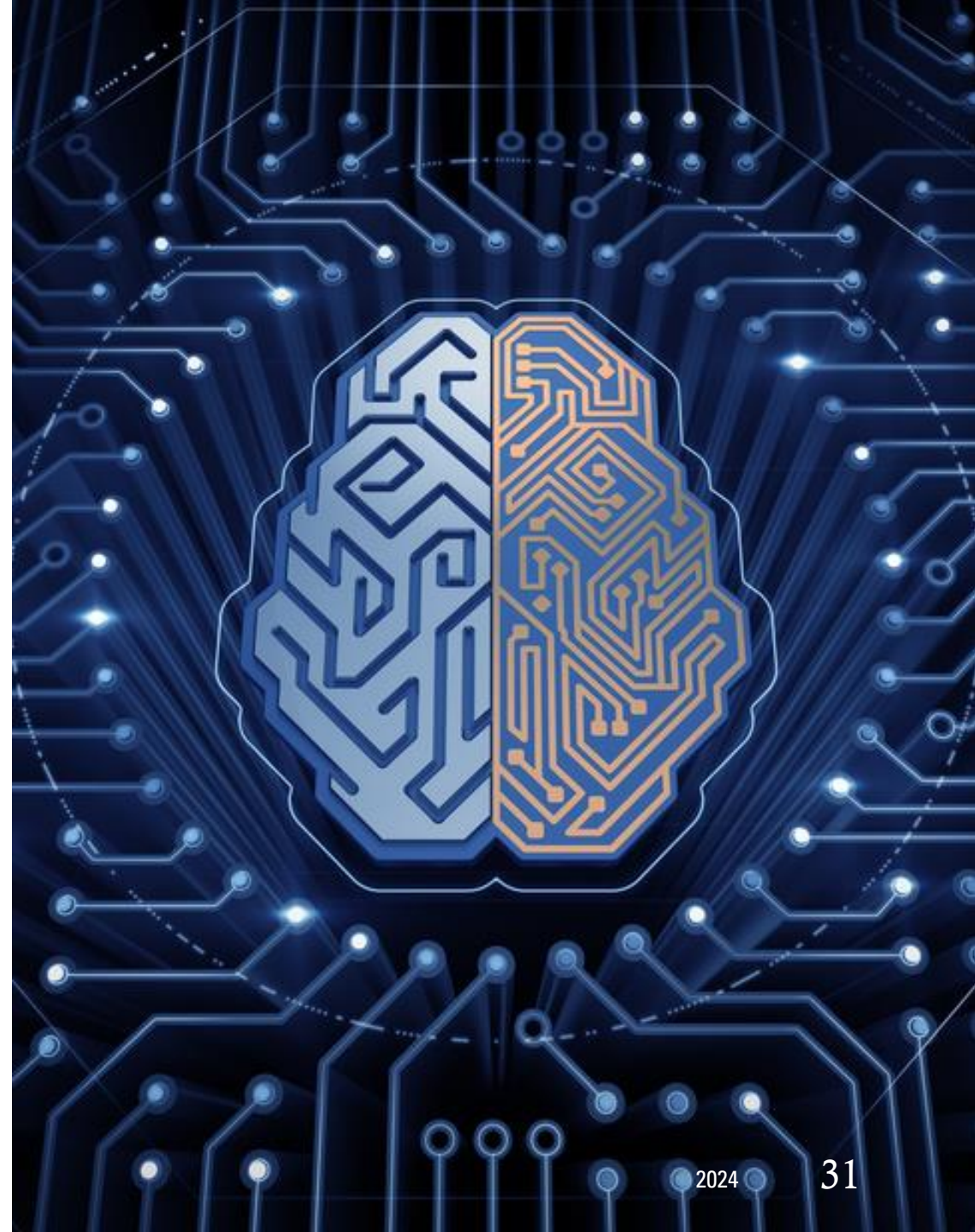
CONCLUSIONS

Model:

- **Ràpid** (24 blocks ~ 2 min).
- **Precís** (6.47 MAE).

Script **automatitzat** de predicció.

Framework **extensible** a altres **variables biofísiques**.





MOLTES GRÀCIES

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biophysical variables