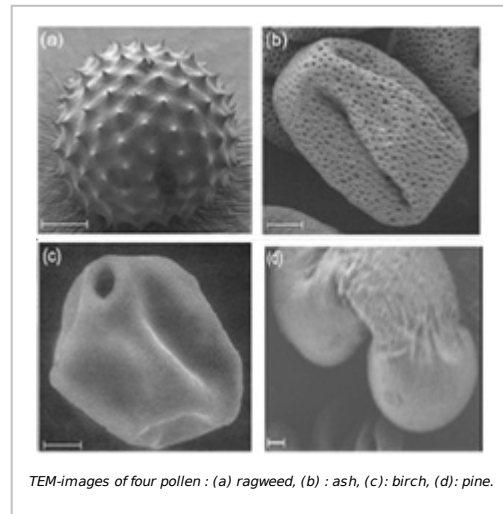


## USING ARTIFICIAL INTELLIGENCE TO REMOTELY IDENTIFY POLLEN

**LABORATORY :** Institut Lumière Matière  
**LEVEL :** M2  
**TEAM(S) :** ATMOS  
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**KEYWORD(S) :** artificial intelligence / Polarimetry / Spectroscopy / pollen

### SCIENTIFIC CONTEXT :

Monitoring pollen is crucial to ensure a successful ecological transition, by preserving biodiversity, assessing ecosystem health, promoting sustainable agriculture, aiding allergy diagnosis, and providing cost-effective early warnings. Allergy symptoms induce an impressive economic cost on public health estimated to reach up to 151 billion € in Europe in 2014 [1]. This cost is predicted to rise in the coming decades due to global warming with warmer temperatures and pollen seasons starting earlier and lasting longer. In this context where there is a need for remotely identifying pollen, an optical radar (lidar), based on light polarimetry and light backscattering, has been developed at iLM [2], to identify pollen. It is a polarimetric radar identifying pollen through their polarimetric fingerprint during light backscattering. Indeed, as shown by microscopic TEM images, pollen exhibits a nonspherical but clear nonspherical shape, which induces specific light depolarization [3].



### MISSIONS :

The goal of the internship is then to develop a numerical program to identify pollen from given lidar vertical profiles of atmospheric particles backscattering.

As first step, the intern will understand the optical laboratory experiment [2, 3] and expand it. Then, and as a second part, over the last three or four months, the intern will build a numerical program allowing to identify pollen from given (lidar) vertical profiles of particles backscattering. This second part will be based on using artificial intelligence

#### Required skills:

Skills in polarimetry, spectroscopy, and numerical programming are required.

Complementary skills in artificial intelligence, lidar remote sensing or pollen will be appreciated, though not necessary.

#### Funding :

The internship is funded by ANR (scientific coordinator: A. Miffre).

#### Supervisors :

The internship is supervised by A. Miffre (Mdc HDR) and by A. Genoud (post-doctorate on this activity for 2 years).

#### More information :

Feel free to ask questions and contact me (A. Miffre), to come and visit the experiments and the planned work.

### OUTLOOKS :

This work can obviously be pursued with a PhD.

### BIBLIOGRAPHY :

- [1] Lake, I. R. et al., *Environmental Health Perspectives* 125: 385-391, <https://pubmed.ncbi.nlm.nih.gov/27557093/>, (2017).
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- [3] Cholleton, D., E. Bialic, A. Dumas, P. Kaluzny, P. Rairoux and A. Miffre, *Atmos. Meas. Tech.*, 15, 1021-1032, 10.5194/amt-15-1021-2022, (2022).