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Europlanet Machine Learning Working Group: a year of progress

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The rapid advances in machine learning (ML) present unprecedented opportunities for planetary science. We have established a dedicated working group (WG) focused on the application of ML in this field to harness these technological advancements, address complex scientific questions, and enhance our understanding of planetary systems.

The Europlanet Machine Learning Working Group held its kick-off meeting during the EPSC 2024 in Berlin, September 2024. The discussion focused on launching the group for exchanging ideas and opportunities with people within and outside of Europlanet's membership for the first year of its launch. Some of the main goals established were to create a knowledge-sharing platform for members to share their research and invite collaboration, form sub-groups within the WG to expand on current research focus, and foster new collaborative research opportunities within or outside of Europlanet with new funding.

As of May 2025, the Europlanet Machine Learning Working Group has 30 members. Better still, the group has so far been able to attract both senior and early career members.

The WG will build upon the achievements of the Europlanet RI project, which has addressed a broad range of ML applications across planetary research. The new group will delve deeper into specialized areas and foster collaboration and knowledge exchange. This targeted approach will enable the development of tailored ML solutions, drive innovation, and accelerate scientific discoveries.

Bridging the gap between ML and planetary science, the WG will position academic institutions and industry stakeholders at the forefront of cutting-edge research. The WG will develop

- ML methods and tools for planetary surface and subsurface mapping, mineralogy, geomorphology, and geology;
- apply ML techniques to planetary atmospheres, climates, and weather systems;
- study the formation and evolution of planetary systems, exoplanets, and astrobiology;
- create ML frameworks and platforms for data integration, fusion, visualization, and dissemination.
- Large Language Models (e.g., ChatGPT) will be utilized as tools for ML in planetary science.

Figure 1. Europlanet Machine Learning Working Group web page (https://www.europlanet.org/services/europlanet-machine-learning-working-group/)

The Machine Learning WG initiated regular monthly meetings on the third Wednesday of each month from January 2025 onwards, where members of the WG got an opportunity to present their current or published work followed by a Q/A session. On the Europlanet website(Fig. 1), you can see the scheduled meetings and speakers. We will highlight some of the talks given by our members. Membership in the WG requires being a member of Europlanet. Benefits include participating in high-impact, state-of-the-art ML science, sharing ML tools and facilities on the Europlanet ML Portal, developing collaborations, participating in future Europlanet EC-funded ML proposals, and accessing Europlanet ML training, career development, and professional services.

Europlanet Machine Learning Working Group: the full list of members can be seen at the Europlanet website.