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## Fully virtual learning groups - pilot project on Machine Learning for early career researchers

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For early career researchers (ECRs), it is of utmost importance to acquire various skills including the application of different methods under the umbrella of data science. However, curricula of scientific degrees do not necessarily always include all relevant methods in the field, and there are also new methodologies emerging. Besides organized training schools, self-organized learning groups are common in universities for collaboratively acquiring new skills. Here, we present a concept that goes beyond in-person meetings and a prescribed curriculum to learn collaboratively, implemented for learning Machine Learning (ML) methods.

There is growing interest in ML methods applied to Earth system science. These tools are being incorporated rapidly in the curricula of many scientific degrees, however, there is a generation of ECRs who did not learn to apply or work with ML while obtaining their masters or doctorate degrees and are now interested in filling this hiatus. The Young Earth System Scientists (YESS) Community, a network of ECRs working in Earth system sciences, has organized a learning activity to bring together members of our community who want to apply these methods to their own data and scientific problems and have little or no knowledge on ML.

The main goal of this activity was to **provide ECRs of our community the opportunity and platform to engage in a guided and collaborative learning process** via the participation in small learning groups. The activity was implemented fully virtual. Additionally, the purpose of working in groups was to allow group **discussions on how to interpret the results in combination with traditional physics-based methods/knowledge**.

Each group had a group leader which was in turn exchanging closely with other group leaders

about the progress made and challenges encountered while keeping track of their group. The main challenges were working across time-zones, collaborative coding while learning, task distribution that ensured everyone learned from the activity. The activity not only proved to be useful for learning ML concepts, it was also a seedbed for projects which participants wish to continue working on. The skills and lessons learned from the organization included managing different time commitments among group members, working across time zones, learning-tasks distribution, ways to divide people into groups according to their research interests, advancing in knowledge coming from different backgrounds, writing a short proposal, literature review, providing a research project and reading material to stimulate an active learning mindset for students. Here, we show what tools and learning strategies were most successful, results from the research projects and lessons learned that can be useful for other groups, networks or even teachers when designing such learning activities.