

A Topological Theory of Tangent Distributions

Final Report

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Description and aims

The idea behind the workshop was to bring together four different mathematical communities, to foster new insights across discipline boundaries, and to act as an incubator for new ideas and collaborations. Specifically, organizers and participants included experts from contact and symplectic topology, sub-Riemannian geometry, index theory and spectral theory. All these fields have many common interests and the overarching commonality, in our opinion, was the centrality of tangent distributions.

Being in the same room was a key part of our initial concept. However, due to the size of the venue (and taking into account that many researchers had already displayed interest in attending), we reworked it immediately into a hybrid event. Unfortunately, the outbreak of the COVID-19 pandemic proved particularly challenging and it was ultimately necessary to revisit the whole idea and go for an online-only workshop.

The final implementation of the programme contemplated roughly two hours of talks per day (mini-courses to level the background of the participants) and the rest of the time was allotted for discussions and social breaks (an additional two hours). Furthermore, to make it easier for people from the United States to attend, the workshop took place during the European afternoon.

Overall, there were consistely 40 participants attending the talks, of which 30+ stayed for the discussions. On Monday and Tuesday these had the form of a conference-wide open discussion. From Wednesday to Friday participants gathered in smaller working groups

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(8-10 people in each). On Friday we held a closing discussion in which the spokepeople for each group provided a summary of the ideas brought forward in the groups.

Out of the registered participants about 40 actively joined the conference (including the 4 organizers):

- 6 participants were female (15%), 34 male.
- Around 40% (15-18) were in the early part of their careers, but many of them attended solely the minicourses, 15% (5-7) were in their middle career stage, and the remaining were senior researchers.
- A large majority of the participants attending the workshop was based in Europe.

Experience with online-only workshop during the Covid-19 pandemic

We worked out the online-only programme in collaboration with the Lorentz Center. The redesign was meant to accommodate the time zones of the participants and maximise their opportunities to interact. The organizers would like to thank the Lorentz Center for their input and support, which was crucial to react on the fly to changing circumstances.

In hindsight, the redesigned program worked remarkably well when compared with many other online-only programs and received extremely positive feedback from the participants.

The minicourses were very informative and provided a fantastic selection of material from which to start understanding the different research interests and perspectives. In the end, all the lectures were recorded and have been published (with the permission of the speakers and the participants) on a [YouTube channel](#).

The time freed from talks allowed us to dedicate a large amount of time to questions, discussions and social breaks, including one specifically aimed at helping young researchers to share their experiences and do some networking.

The discussion sessions and working groups took place in a very informal and friendly atmosphere: they proved exceptionally popular and saw a large participation (3/4 of the participants eventually joined these interactive sessions). We had decided not to record them on purpose, so people would feel completely free to make suggestions and ask questions. Some ideas had been collected and edited by the organizers in the weeks before the workshop in order to have an initial core of material to generate discussions. During the workshop itself, this material kept growing thanks to the common discussions; notes were taken collaboratively by the participants summarising the work carried out in the working groups.

Participants have been extremely positive about the experience, comparing it favorably to other online workshops. We believe that some of the lessons learned will also be incorporated in “traditional” conferences in the future, in particular the importance of allocating sufficient time to discussions at the expense of talks.

Overall, the streamlined program, the space left for discussions, and the generous breaks were very positively received by the participants. The main complaint we received has been, not surprisingly, that participants would have greatly preferred an in-person event. A few participants also had difficulties with Microsoft Teams, despite the good support from the Lorentz Center.

Scientific outcomes

Overall, the workshop proved very successful from a scientific vantage point. It definitely succeeded in getting people to meet (virtually) and allowing them to see connections between their own research area and other fields they were previously not familiar with. The minicourses have been extremely beneficial from this point of view and we are very grateful to the lecturers for their efforts to point out connections between their talks.

There were also few concrete outcomes:

- The courses are available on [YouTube](#).
- The [notes of the discussions](#), which will be polished and extended in the upcoming weeks, and will converge into a booklet which we will share with the participants.
- We are aware of various groups of people that want to keep discussing in order to further explore some of the ideas brought up during the workshop.
- There is significant enthusiasm for a renewal of the workshop, possibly in a physical form, in 2-3 years time. This will be particularly relevant if the working groups lead to new ideas and publications.

All in all, the material gathered during the workshop will provide a good resource for (young) researchers to get an overview of the subjects and their connections, as well as a curated list of open problems that can keep them busy for years to come.