

# Bringing geometric methods to robot learning, optimization and control

## IROS 2020 Workshop

**Talk title:**

Lie theory for the roboticist

**Speaker:**

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**Abstract:**

A Lie group is an old mathematical abstract object dating back to the XIX century, when mathematician Sophus Lie laid the foundations of the theory of continuous transformation groups. Its influence has spread over diverse areas of science and technology many years later. In robotics, we are recently experiencing an important trend in its usage, at least in the fields of estimation, and particularly in motion estimation for navigation. Yet for a vast majority of roboticists, Lie groups are highly abstract constructions and therefore difficult to understand and to use. In many fields in robotics it is often not necessary to exploit the full capacity of the theory, and therefore an effort of selection of materials is required. In this presentation, we will walk through the most basic principles of the Lie theory, with the aim of conveying clear and useful ideas, and leave a significant corpus of the Lie theory behind. Even with this mutilation, the material included here has proven to be extremely useful in modern estimation and control algorithms for robotics, especially in the fields of SLAM, visual odometry, nMPC, and the like.