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Understanding mathematical proofs from a planning perspective

What does it mean to understand a mathematical proof? Poincaré has suggested that, in understanding a mathematical proof, one wants to know "not only whether all the syllogisms of a demonstration are correct, but why they are linked together in one order rather than in another" (Poincaré, 1908, p.118). In this talk, I will present an account of the understanding of mathematical proofs which aims to be faithful to Poincaré's perspective. The main idea to be developed is that a mathematical agent understands a mathematical proof P whenever she can rationally reconstruct the plan underlying P. This characterization will be fleshed out using the notion of proof plan proposed in Hamami and Morris (2021) which adopts an action-perspective on mathematical proofs and which builds on Bratman's theory of planning agency (Bratman, 1987). I will illustrate the resulting account on concrete examples and I will argue that it can explain some of the key features that have been associated to proof understanding.

Michael E. Bratman. *Intention, Plans, and Practical Reason*. Harvard University Press, Cambridge, MA, 1987.

Yacin Hamami and Rebecca Morris. Plans and planning in mathematical proofs. *The Review of Symbolic Logic*, 14(4), 1030–1065, 2021.

Henri Poincaré. *Science et Méthode*. Flammarion, Paris, 1908