

Reading Group on Stacks and Moduli Spaces at IMAR Spring 2025

This reading group is aimed at collaboratively learning the technicalities of stacks which lie behind the theory of moduli spaces. We will be following the notes of Jared Alper [1] and Olsson's book [2], supplemented with the other resources listed below. We plan to meet each week for 1.5 to 2 hours, starting with a summary presentation on a section of the notes, then after a short break, working together on problems and exercises. Eager attendees are encouraged to volunteer to present a section from the notes.

We will meet on Mondays in the Foiaş lecture room (8th floor) at 2 PM.

March 31, (Margot Bruneaux): *Descent theory and examples. Review of sites and sheaves.*

April 7, (Cameron Ruether): *Introduction to fibered categories and stacks. Stackification.*

April 14, (Margot Bruneaux): *Definition of algebraic spaces and algebraic stacks. Deligne-Mumford stacks. Representability and properties of morphisms.*

April 21: *Easter Break.*

April 28, (Mihai Pavel): *Algebraicity of quotient stacks U/G . Representability of the diagonal. Algebraicity of \mathcal{M}_g .*

May 5, (TBA): *Topological space of a stack. Tangent spaces and dimension. Definition of quasi-finite, étale, and unramified morphisms.*

May 12, (TBA): *Equivalence relations by groupoids. Residual gerbes.*

Further topics will be determined as the reading group progresses.

References

- [1] J. Alper, *Stacks and Moduli*, <https://sites.math.washington.edu/~jarod/moduli.pdf>.
- [2] M. Olsson, *Algebraic Spaces and Stacks*, Providence, RI: American Mathematical Society (AMS) (2016).

- [3] Stacks project, <https://stacks.math.columbia.edu> Cambridge University Press,
- [4] A. Vistoli, *Notes on Grothendieck topologies, fibered categories and descent theory*, Mathematical Surveys and Monographs **123** (2005), American Mathematical Society, 1-104.