

# ON THE NUMERICS OF NON-NEWTONIAN FLUIDS: VIRTUAL ELEMENTS AND NEURAL NETWORKS

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ABSTRACT. In the first part of the talk, we will present recent results on the numerical approximation of non-newtonian fluids on polygonal meshes obtained in collaboration with Paola F. Antonietti, Michele Botti (Politecnico di Milano), Lourenco Beirão da Veiga (Università di Milano Bicocca), Giuseppe Vacca (Università di Bari). In particular, we will introduce the discrete virtual formulation, show a priori error estimates and discuss numerical results assessing the validity of the theoretical findings. In the second part of the talk, we will discuss results obtained in collaboration with Nicola Parolini, Andrea Poiatti and Julian Vene' (Politecnico di Milano) addressing the possibility of employing data-driven structure preserving neural networks to define the viscosity of non-newtonian fluids. In particular, the well posedness of the resulting PDE will be discussed together with the impact of the use of structure preserving neural networks for the viscosity on the numerical approximation of velocity and pressure.

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