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M. D’Elia and **Cynthia Flores*** (cynthia.flores@csuci.edu), One University Drive, Bell Tower East, Camarillo, CA 93012, and **Xingjie Li**, **Petronela Radu** and **Yue Yu**. *On Theoretical Aspects of Nonlocal Helmholtz Decomposition of a Vector Field.*

Nonlocal theories have been introduced in the mechanics of solids where the propagation of cracks and other discontinuities hinder the use of classical differential operators. The study of integral operators has been central to the formulation of nonlocal systems and the analysis of their corresponding solutions. By replacing classical differential operators with integral operators, nonlocal frameworks allow the consideration of solutions with little to no regularity (L^2 -level). Moreover, a collection of nonlocal tools can be identified that is useful for analyzing the Helmholtz-Hodge Decompositions (HHD) of a vector field into its divergence-free, curl-free, and harmonic components. In this talk, we will discuss preliminary well-posedness results for nonlocal material science models where the interaction kernel of the integral operator is weakly singular and we will motivate the development of theory for HHD in the nonlocal setting. The work presented is part of the recent Women in Mathematics of Materials (WIMM) Workshop at University of Michigan. (Received September 17, 2019)