# An iso-geometric radial basis function partition of unity method for PDEs in thin structures

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The application that motivates this work is numerical simulation of the biomechanics of the respiratory system. The main respiratory muscle is the diaphragm, which is a thin structure. There are several challenges associated with the geometry, including its representation. Here, we first use a radial basis function partition of unity method (RBF-PUM) to make a smooth reconstruction of the geometry from noisy medical image data. Then we use RBF-PUM to approximate the solution of a PDE problem posed in this geometry. In a PUM, the global approximation is expressed as a weighted combination of local approximations over patches that form a cover of the domain. A particular benefit of RBF-PUM is that we can adapt each local approximation to the local properties of the problem. For this thin, curved, non-trivial geometry, we can scale the local problems to ensure sufficient local resolution of the thickness dimension. We show results for a simple Poisson test problem and show that we can achieve high-order convergence with an appropriate choice of method parameters.