CRUNCH Seminars at Brown, Division of Applied Mathematics

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Physics-Informed Neural Network Framework for PDEs on 3D Surfaces

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Partial differential equations (PDEs) on surfaces are ubiquitous in natural science. Many traditional mathematical methods have been developed to solve surface PDEs. However, almost all of these methods have obvious drawbacks and complicate general problems. With the fast growth of the machine learning area, we show an algorithm by using the physics-informed neural networks (PINNs) to solve surface PDEs. Our algorithm only needs a set of points and their corresponding normal to deal with the surfaces, while the traditional methods need a partition or a grid on the surface. This is a big advantage for real computation. A variety of numerical experiments have been shown to verify our algorithm.