CRUNCH Seminars at Brown, Division of Applied Mathematics

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Physics-informed neural networks for 1D sound field predictions with parameterized sources and impedance boundaries

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Realistic sound is essential in virtual environments, such as computer games and mixed reality. Efficient and accurate numerical methods for pre-calculating acoustics have been developed over the last decade; however, pre-calculating acoustics makes handling dynamic scenes with moving sources challenging, requiring intractable memory storage. A physics-informed neural network (PINN) method in 1D is presented, which learns a compact and efficient surrogate model with parameterized moving Gaussian sources and impedance boundaries, and satisfies a system of coupled equations. The model shows relative mean errors below 2/0.2 dB and proposes a first step in developing PINNs in realistic 3D scenes.