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Deep Learning of Single-Point PDF Closure for Turbulent Scalar Mixing PEYMAN GIVI, HESSAM BABAEE, University of Pittsburgh, MAZIAR RAISSI, Nvidia Corp., and Brown University — Honoring Ted O'Brien. O'Brien and Jiang [1] have shown that a useful means of characterizing the single-point PDF of a scalar field, is to consider its corresponding rate of the conditional expected dissipation. They demonstrate it by implementing the amplitude mapping closure (AMC) as applied to the classical problem of the binary scalar mixing. Based on recent developments in physics-informed deep learning and deep hidden physics models, we put forth a framework for discovering turbulent scalar mixing models from scattered and potentially noisy spatio-temporal measurements of the PDF. Our discovered model is appraised via comparison with the exact solution obtained by O'Brien and Jiang [1]. [1] O'Brien, E. E. and Jiang, T.-L., "The Conditional Dissipation Rate of an Initially Binary Scalar in Homogeneous Turbulence," Phys. Fluids A, vol. 3(12), pp. 3121-3123 (1991).

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