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Bayesian Neural Networks for Assimilation of Experimental Data into a G-equation Flame Model MAXIMILIAN CROCI, USHNISH SENGUPTA, MATTHEW JUNIPER, Univ of Cambridge — In the G-equation flame model, a thin laminar flame propagates at a fixed speed into a premixed gas moving at a prescribed velocity. This model can simulate cusp formation and flame pinch-off, while remaining computationally cheap, making it attractive for design optimization. The G-equation model is sufficiently accurate to provide a qualitative description of a flame. In order to be quantitatively accurate, however, the model parameters need to be fitted to experimental or numerical data. In this study we use Bayesian neural networks (BNNs) to fit the model parameters and their uncertainties for a conical premixed Bunsen flame. The BNNs are trained on a library of reference flames created with G-equation simulation data and are then applied to experimental data. This is an extremely fast way to assimilate experimental data into a model. The assimilation is orders of magnitude faster than the current state of the art. The method itself is general and can assimilate data from any flame that can be modelled by the G-equation.

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