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IN-CORE POWER MAPPING FOR AN HPR1000 USING AN INDIGENOUS PROGRAM FOR DEPLETION CALCULATION AND MACHINE LEARNING

The application of **AI** is in vogue in almost all fields, including **nuclear power engineering**. A nuclear reactor can be safely and optimally operated when various **safety metrics** are reliably obtained from the **core power distribution**. The **failure** of in-core instrumentation poses a challenge for continued safe and reliable operation, and risks in **forced shut down** to ensure core integrity. This project sought suitable Machine Learning techniques for In-Core Power Mapping of an HPR1000, based upon reactor core simulations of the **first fuel cycle** of an HPR1000; using a locally developed **depletion calculation program** and available operational data. Using available detector data for charge and relative power distribution, **LSTMNs** and **TLFFNs**, used in conjunction, have been found suitable to potentially allow extending plant operation for a few hours in the event of more than 25% of detector failures. Prediction of **temperatures** based on power predictions is also proposed and demonstrated to validate against measured temperatures for practical implementation. **GUIs**, implementing the best of explored techniques, have also been developed.

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