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Large Language Models as Tools for Searching and Explaining Tokamak Shot Logs

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While the quantitative data generated by tokamaks is invaluable, tokamak operations also generate another, often underutilized data stream: text logs written by experimental operators. In this work, we leverage these extensive text logs by employing Retrieval-Augmented Generation (RAG) with state-of-the-art large language models (LLMs) to create chat-bot instances that can answer questions using knowledge recorded in these historical text logs. Instances of this chat-bot were created using text logs from the fusion experiments DIII-D and Alcator C-Mod and deployed for researchers to use. In this talk, we report on the datasets and methodology used to create these chat-bots, along with their performance in three use cases: 1) semantic search of experiments, 2) assisting with device-specific operations, and 3) answering general tokamak questions. As LLMs improve over the coming years, we hope that future iterations of this work will provide increasingly useful assistance for both fusion research and experimental operations.

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