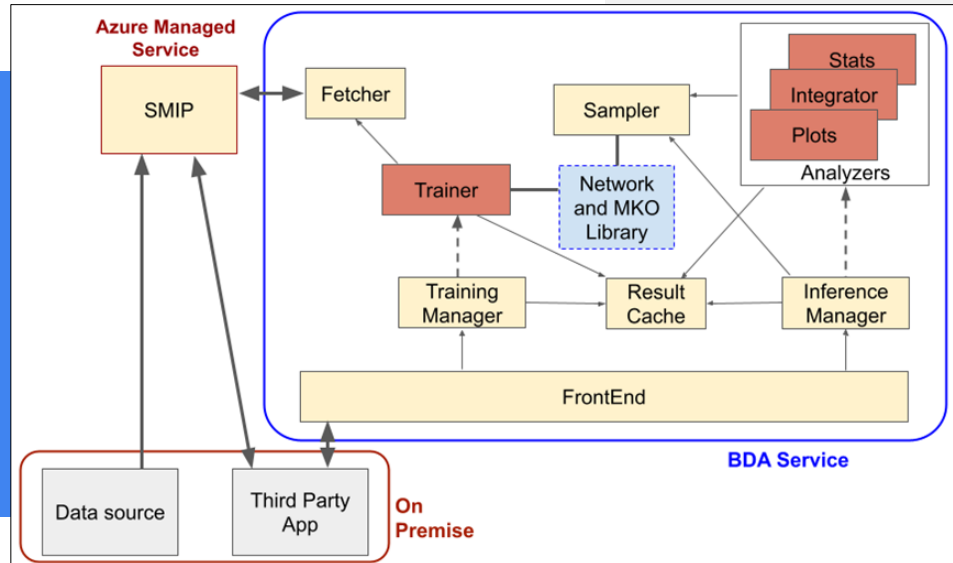


PROJECT CASE STUDY
Bayesian Dropout
Approximation for
Process Outcomes



Analytics Engine Enhances Machine Learning Applications in Manufacturing

PROJECT LEAD

RPI

PROJECT TEAM

N/A

PROJECT OBJECTIVE

Provide the CESMII Platform with a modeling engine with sophisticated predictive capabilities that can be invoked by Smart Manufacturing Innovation Platform apps to model a variety of manufacturing processes.

BENEFITS TO OUR NATION

Adopting smart manufacturing technologies in manufacturing processes will allow manufacturers to reduce energy consumption and improve manufacturing productivity, leading to cost savings and environmental sustainability. Improved manufacturing productivity would bolster economic growth by increasing output, creating job opportunities, and driving innovation. By embracing energy efficiency and productivity improvements, the United States can position itself as a leader in sustainable manufacturing, fostering economic resilience and a greener future.

BENEFITS TO INDUSTRY

Implementation of the Bayesian Dropout Approximation (BDA) Service Application will enable manufacturers to improve the accuracy of their production models and process controls. The BDA Service Application will enable the analysis of dark data sources that will increase the confidence in predictions of production outcomes, which will improve production yields and resource utilization while decreasing waste. Additionally, implementation of the app will contribute to CESMII’s overall goals of improving American manufacturing productivity and energy utilization.

[MORE ON CESMII.ORG](https://www.cesmii.org)

PROJECT DESCRIPTION

TECHNICAL APPROACH

- This project will create an application, containerized and deployable on Azure, and primarily used by Platform apps as a modeling engine. It will interoperate with the Smart Manufacturing Innovation Platform to manage raw and processed data.
- The app implements a stochastic neural network approach to capture complex relationships between data features in the form of output distributions.
- The app implements a basic suite of tools to postprocess distributions, to extract useful information and visualizations from model outputs.

ACCOMPLISHMENTS

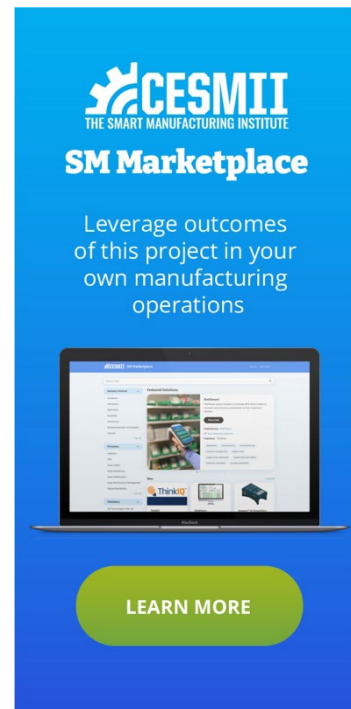
- Implemented a sophisticated machine-learning-based modeling engine that interfaces with CESMII's Smart Manufacturing Innovation Platform (SMIP).
- Analyzed multiple datasets using the Bayesian Dropout Approximation (BDA) Service.
- Implemented a graphical interface desktop app for interfacing with both the SMIP and the BDA Service.

DELIVERABLES

- Application Programmer Interface Documentation
- Bayesian Dropout Approximation Service Code,

REUSABLE OUTCOMES / SM MARKETPLACE

- Bayesian Dropout Approximation Smart Manufacturing Profile
- Predictive Modules
- Bayesian Dropout Approximation Service
- Bayesian Dropout Approximation Service GUI



PROJECT DETAIL

Budget Period: BP3 - BP4
Submission Date: 1/21/2023
Sub-Award (contract) Number:
4550 G YA101
SOPO: 2316

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