



The National Institute for Innovation in Manufacturing Biopharmaceuticals

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# Hybrid Model Federated Learning Request for Information (BD RFI 2024.002)

RFI Release Date: July 23, 2024

Submission Due Date: September 23, 2024

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## 1. Overview

The National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) is dedicated to advancing biopharmaceutical manufacturing innovation, developing standards to enhance manufacturing efficiencies and speed, and cultivating a leading biopharmaceutical manufacturing workforce. This RFI is related to applications of Hybrid Model Federated Learning. This RFI seeks innovative approaches that combine Federated Learning with hybrid models (combining Physics-Based and AI/ML data-driven methodologies) specifically tailored for biopharmaceutical manufacturing processes. This request aims to gather insights and concepts for achieving integration and operationalization of these models in a practical, industry-relevant context. This RFI aims to collect information only and is not a solicitation for funding proposals.

## 2. Background

NIIMBL seeks input on potential approaches to apply Federated Learning with Hybrid Models combining Physics-Based and AI/ML data-driven methodologies. By fostering collaboration among a wide range of stakeholders, we aim to enhance prediction accuracy of Hybrid Models for biopharmaceutical process predictions using Federated Learning and other Privacy Preserving Computing approaches. This initiative seeks to train a centralized model using community data while maintaining data privacy.

This RFI is a preliminary step to gauge interest and gather insights which may shape future studies or funding opportunities in Hybrid Model Federated Learning. We encourage contributions from all interested parties to become integral parts of this innovative endeavor.

## 3. Detailed Request

**System Purpose:** This RFI seeks input from the scientific community to provide comments and advice on the opportunities on developing a federated learning system capable of integrating diverse biopharmaceutical manufacturing data to enhance predictive analytics without compromising data privacy.

### **Goals:**

1. **Enhanced Predictive Analytics:** Develop methods to enhance the accuracy of predictive models through federated learning, integrating physics-based and machine learning approaches.
2. **Data Privacy and Security:** Implement advanced privacy-preserving methods to ensure data across collaborating entities is protected during the analytics process.

### **Objectives:**

1. **Integration of Technologies:** Evaluate and propose technologies that facilitate the integration of federated learning into existing biopharmaceutical processes.
2. **Standardization and Interoperability:** Develop standards and protocols for data sharing among diverse systems while ensuring compatibility and data integrity.
3. **Scalable Implementation:** Outline approaches for scaling the solutions to handle data from multiple sources with varying data volume and complexity.



### **Application Areas:**

- A. Protein Glycosylation Profiles Prediction in bioprocessing environments.
- B. Elution Profile Prediction for chromatography processes.

## 4. Submission Details

A. Technical Approach: A brief description of the following:

- 1) What technologies and methodologies will be used in your project?
- 2) How will each goal and objective be addressed in your approach?
- 3) How does your project apply to the specified areas, and what theoretical or empirical backing supports this application?
- 4) Can you clearly differentiate the technical aspects, practical applications, and benefits of your approach?
- 5) Are you aware of any other relevant initiatives that could support this request? If so, please describe them.

B. Organizational Capabilities: An overview of organization's capabilities, instrumentation, and facilities, that could support the development of such a system.

C. Cost Estimation: Rough order magnitude (ROM) budget for the development of the proposed system or component(s). This estimate will help us understand the potential financial implications and is not binding. This RFI is not a solicitation for proposals for funding.

## 5. Submission Process

Submissions must be sent via the NIIMBL submission hub by the due date. Late submissions will not be considered.

## 6. Use of Information

The insights and information gathered from this RFI will be used to inform NIIMBL's strategic planning for future solicitations. It may also contribute to broader discussions with government stakeholders about the needs and opportunities in biomanufacturing.

## 7. Encouragement for Broad Participation

We encourage submissions from a wide range of stakeholders, including academic institutions, industry, technology providers, and consortia. Whether you can offer comprehensive solutions or insights into specific aspects of the universal connectivity challenge, your input is valuable. Feedback on this RFI's scope,



requirements, and objectives is also welcome, as it will help refine our approach to addressing the needs of the biomanufacturing sector.

## 8. Conclusion

This RFI is a preliminary step towards identifying innovative solutions and collaborations that can advance the field of biomanufacturing. We look forward to engaging with the community to gather valuable information that will shape future initiatives.

For more information, please contact [projectcalls@NIIMBL.org](mailto:projectcalls@NIIMBL.org).

## Abbreviated List of Acronyms

1. NIIMBL - National Institute for Innovation in Manufacturing Biopharmaceuticals
2. RFI - Request for Information
3. AI - Artificial Intelligence
4. ML - Machine Learning