**Phase 3 Report: IT6423**

**Project Domain:** Healthcare Informatics

**Project Name:** Symptom-Based Disease Prediction System Using Machine Learning

**Problem Statement**

The existing healthcare system heavily relies on manual diagnosis that is time-consuming, error-prone and can result in delayed treatment. This manual procedure also places a considerable load on medical professionals. There is a critical requirement for a more efficient and reliable technique for illness prediction based on symptoms that uses machine learning and healthcare informatics. The aim of this research is to create a machine learning-based system that can reliably forecast illnesses using symptoms supplied by patients. This method intends to increase the efficiency and accuracy of illness diagnosis.

**Objectives:**

* Develop a machine learning model that can accurately predict diseases based on symptoms provided by patients.
* Integrate the prediction system into existing healthcare systems to assist healthcare providers in making faster and more accurate diagnoses.
* Improve patient outcomes using early detection and treatment of diseases.

***MODULE 5: WORKBOOK***

**1. Measuring Outcome Goals:**

| **Outcome Goals** | **Planned Activities** | **Effects of Planned Activities** | **Inputs** | **Activities** | **Outputs** | **Changes in Program Participants** |
| --- | --- | --- | --- | --- | --- | --- |
| Increase in accuracy of disease predictions | Develop a machine learning model for disease prediction | Accuracy of predictions measured quarterly | Government and vendor resources including staff, funding, and IT infrastructure | Model development | Functional prediction system | Improved health outcomes |
| Successful integration of prediction system into healthcare systems | Integrate prediction system into existing healthcare systems | Integration success rate measured monthly |  | System integration |  | Potentially reduced healthcare costs |
| Improvement in patient outcomes | Improve patient outcomes | Patient outcome improvement rate measured annually |  | Patient care improvement | Improved patient health records |  |

**2. Contract Performance Discussions:**

| **Frequency** | **Topics & Data** | **Participant Roles** |
| --- | --- | --- |
| Monthly | Review accuracy of predictions, discuss any issues encountered, identify areas for improvement. Data Review: Model evaluation metrics. | The Data Science Team leads, plans, and brings information to the meeting. |
| Quarterly | Assess integration success rate, evaluate integration process, make adjustments if needed. Data Review: Integration logs. | The IT Team leads, plans, and brings information to the meeting. |
| Annual | Evaluate patient outcome improvement rate, discuss strategies for further improvement. Data Review: Patient health records. | Healthcare Providers lead, plan, and bring information to the meeting. |
| As Needed | Address any urgent issues or changes to the project plan, involving relevant stakeholders. | Project Manager coordinates with stakeholders. |

**3. Information Systems or Tools:**

* Use specialized healthcare software for patient records (Hospital Management System).
* Use data analysis tools like matplotlib and seaborn for model evaluation and integration logs. Use Excel also for opening the dataset.
* Use Smartsheet project management and Microsoft Team tools for tracking progress and scheduling meetings.

***Module 5: DRAFTING PROMPTS***

**Drafting Performance Metrics:**

| **Goal** | **Performance Metric** | **Data Source** | **Data Frequency** | **Responsibility** |
| --- | --- | --- | --- | --- |
| Develop a machine learning model for disease prediction | 1. Accuracy of predictions | Model evaluation metrics | Quarterly | Data Science Team |
| 2. Model training time | Training logs | Monthly | Data Science Team |
| Integrate prediction system into existing healthcare systems | 1. Integration success rate | Integration logs | Monthly | IT Team |
| 2. System downtime | System logs | Monthly | IT Team |
| Improve patient outcomes | 1. Patient outcome improvement rate | Patient health records | Annually | Healthcare Providers |
| 2. Patient satisfaction rate | Patient surveys | Quarterly | Healthcare Providers |

**2. Active Contract Management Strategy:**

Regular meetings will be held with the vendor to review performance metrics and discuss contract performance. These meetings will provide an opportunity to discuss progress, address challenges and make adjustments as necessary. The schedule and topics for these meetings are as follows:

* Monthly Meetings:
  + Frequency: Monthly
  + Topics: Review accuracy of predictions, discuss any issues encountered, identify areas for improvement.
  + Data Review: Model evaluation metrics
  + Responsibility: Data Science Team will lead, plan, and bring information to the meeting.
* Quarterly Meetings:
  + Frequency: Quarterly
  + Topics: Assess integration success rate, evaluate integration process, make adjustments if needed.
  + Data Review: Integration logs
  + Responsibility: The IT Team will lead, plan and bring information to the meeting.
* Annual Meetings:
  + Frequency: Annually
  + Topics: Evaluate patient outcome improvement rate, discuss strategies for further improvement.
  + Data Review: Patient health records
  + Responsibility: Healthcare Providers will lead, plan, and bring information to the meeting.
* As Needed Meetings:
  + Address any urgent issues or changes to the project plan, involving relevant stakeholders.

***MODULE 6: WORKBOOK***

**Dream Vendor Description:**

* Experience and Qualifications: The dream vendor would have extensive experience in healthcare informatics and machine learning, specifically in developing and integrating predictive models into healthcare systems. They would have a track record of successful projects with measurable outcomes and satisfied clients.
* Working Relationship: The vendor would be collaborative, communicative, and responsive, actively engaging with our team to understand our needs and provide innovative solutions. They would adhere to timelines and deliver high-quality work.
* Project Staff: The project team would include experienced data scientists, IT professionals, and healthcare experts, all dedicated to the success of the project. They would have a project manager who is proactive in managing the project and ensuring smooth communication.
* Pricing: The vendor would offer competitive pricing that aligns with the budget constraints of our project while providing excellent value for their services.

**Vendor Evaluation Criteria for Goals and Scope of Work:**

* Machine Learning Model Development: We would need to know the vendor's experience in developing machine learning models for disease prediction, including the algorithms they have expertise in and the accuracy rates they have achieved in previous projects.
* Integration into Healthcare Systems: Understanding the vendor's experience in integrating prediction systems into existing healthcare systems is crucial. We would look for details on the integration process, compatibility with different systems, and success rates of past integrations.
* Improving Patient Outcomes: To assess the vendor's ability to improve patient outcomes, we would need information on their approach to patient care improvements, any evidence-based practices they follow, and the results they have achieved in similar projects.

**Collecting Information for Awarding Multiple Contracts:**

* We would collect information on the vendor's areas of expertise and interest, including the types of work they are most interested in being considered for and their capacity to take on additional projects.
* We may also collect information on unique evaluation criteria for different service types if applicable, to ensure that we select the most suitable vendors for each aspect of the project.

***Module 6: DRAFTING PROMPTS***

**Evaluation Criteria:**

| **Evaluation Criterion** | **% of total points** | **What would a top score look like?** |
| --- | --- | --- |
| Past Experience | 20% | Proposer has a proven track record of providing similar services to government entities, with references reporting excellent quality work and no major performance problems. |
| Technical Expertise | 25% | Proposer demonstrates deep understanding and expertise in healthcare informatics and machine learning, with a team of experienced data scientists, IT professionals, and healthcare experts. |
| Integration Success Rate | 15% | Proposer has a high success rate in integrating predictive models into existing healthcare systems, with minimal downtime and effective system compatibility. |
| Project Management | 15% | Proposer has a dedicated project manager who is proactive, communicative, and ensures smooth project execution, meeting all timelines and milestones. |
| Cost Proposal | 25% | Proposer offers competitive pricing that aligns with the project budget, providing excellent value for the services offered. |

**Proposal Submission Components:**

| **Evaluation Criterion** | **Proposal Submission Component** |
| --- | --- |
| Past Experience | Short Answer Question: "Please provide an overview of your experience providing similar services to government entities, including references." |
| Technical Expertise | Detailed Description: Provide a detailed description of your team's expertise in healthcare informatics and machine learning, including relevant qualifications and project examples. |
| Integration Success Rate | Case Study: Submit a case study showcasing a successful integration of predictive models into existing healthcare systems, highlighting system compatibility and minimal downtime. |
| Project Management | Project Plan: Provide a detailed project plan outlining how you will manage the project, including timelines, milestones, and communication strategies. |
| Cost Proposal | Cost Breakdown: Provide a detailed breakdown of your pricing, including all costs associated with the project and any discounts or incentives offered. |

***MODULE 7: WORKBOOK***

**1. Return to the RFP Components:**

* Understanding of the Problem or Goals: As we have drafted other sections of the RFP, our understanding of the problem and goals has evolved. We now have a clearer picture of the technical requirements and the desired outcomes of the project. We have also identified specific performance metrics and evaluation criteria that will help us assess the success of the project.
* Additional Research Needed: To ensure that our requests are reasonable and align with industry standards, we need to conduct additional research on pricing models and procurement best practices. This research will help us refine our RFP components and make them more effective in attracting qualified vendors.

**2. Additional Questions and Action Plan:**

**Remaining Questions:**

* How will we handle vendor inquiries and clarifications during the proposal submission period?
* What criteria will we use to evaluate proposals and select the winning vendor?
* How will we handle contract negotiations and finalization?

**Action Plan:**

* Schedule a meeting to discuss and finalize the process for handling vendor inquiries and clarifications.
* Develop an evaluation rubric based on the defined evaluation criteria.
* Assign responsibilities for contract negotiations and finalize the negotiation strategy.

**3. Outreach Strategy for RFP:**

* Websites: We will post the RFP on government procurement portals, industry-specific websites, and social media platforms. We will also explore state vendor portals and advertising platforms to maximize the reach of our RFP.
* Vendor List: We will compile a list of vendors from previous projects, industry directories, and minority, small, and women-owned business databases. We will specifically target these groups to ensure that they are aware of the opportunity and encourage them to submit proposals.
* Industry and Trade Groups: We will notify relevant associations and groups about the RFP to reach a wider audience of potential vendors. These groups often have members who are qualified to do the work but may not have traditionally obtained their fair share of contracting opportunities.
* Press Release: If this RFP is a high-priority project for our government and we want to draw major attention to it, we will issue a press release to major media outlets and industry publications. This will help us reach a broader audience and attract a diverse pool of qualified vendors.

***Module 7: DRAFTING PROMPTS***

**Request for Proposals (RFP)**

**Symptom-Based Disease Prediction System Using Machine Learning**

**Introduction**

The Nursing Organization is seeking proposals from qualified vendors to develop a Symptom-Based Disease Prediction System Using Machine Learning. This system aims to revolutionize the healthcare industry by providing a more efficient and reliable technique for illness prediction based on symptoms supplied by patients.

**Background**

The existing healthcare system heavily relies on manual diagnosis, which is time-consuming, error-prone, and can result in delayed treatment. This manual procedure also places a considerable load on medical professionals. There is a critical requirement for a more efficient and reliable technique for illness prediction based on symptoms that uses machine learning and healthcare informatics.

**Project Goals**

The primary goal of this project is to create a machine learning-based system that can reliably forecast illnesses using symptoms supplied by patients. This method intends to increase the efficiency and accuracy of illness diagnosis, leading to better patient outcomes and reduced healthcare costs.

**Scope of Work**

The scope of work includes:

* Developing a machine learning model for disease prediction based on symptoms.
* Integrating the prediction system into existing healthcare systems.
* Conducting data collection and analysis to train and validate the model.
* Providing project documentation and training for healthcare professionals on using the system.

**Deliverables**

The selected vendor will be expected to deliver:

* A fully functional machine learning model for disease prediction.
* Integration reports and documentation for integrating the system into existing healthcare systems.
* Project documentation, including user manuals and technical specifications.
* Training for healthcare professionals on using the system.

**Timeline**

The project is expected to be completed within 6 Months. Specific milestones and deadlines will be provided to the selected vendor upon contract execution.

**Evaluation Criteria**

Proposals will be evaluated based on the following criteria:

* Past experience in developing machine learning models for healthcare applications.
* Technical expertise in machine learning, healthcare informatics, and system integration.
* Integration success rate in previous projects.
* Project management capabilities.
* Cost proposal and value for money.

**Submission Requirements**

Interested vendors are required to submit a proposal that includes:

* Company profile and relevant experience.
* Technical approach and methodology for developing the prediction system.
* Proposed timeline and milestones for the project.
* Cost proposal, including all costs associated with the project.
* References from previous clients.

**Selection Process**

The selection process will involve evaluating proposals based on the evaluation criteria mentioned above. Shortlisted vendors may be invited for interviews or product demos to further assess their qualifications.

**Outreach Strategy**

The RFP will be posted on [Organization Name]'s website and other relevant platforms to ensure that all interested parties are aware of the opportunity. Targeted outreach will be conducted to minority, small, and women-owned businesses to encourage their participation.

**Budget**

The estimated budget for this project is 10,000$. Proposals should align with this budget and provide value for money.

**References:**  
**[1]** Maniruzzaman, M., Rahman, M. J., Ahammed, B., & Abedin, M. M. (2020). Classification and prediction of diabetes disease using machine learning paradigm. Health information science and systems, 8, 1-14.

**[2]** Ali, M. M., Paul, B. K., Ahmed, K., Bui, F. M., Quinn, J. M., & Moni, M. A. (2021). Heart disease prediction using supervised machine learning algorithms: Performance analysis and comparison. Computers in Biology and Medicine, 136, 104672.

**[3]** Ali, F., El-Sappagh, S., Islam, S. R., Kwak, D., Ali, A., Imran, M., & Kwak, K. S. (2020). A smart healthcare monitoring system for heart disease prediction based on ensemble deep learning and feature fusion. Information Fusion, 63, 208-222.