Seed money for Research

Need:

Research needs investment of time and money to take a shape in a higher educational institution. In the context of extreme competition for funding from government and private agencies, it is essential for the institution to support anddevelop their members of faculty to equip themselves with constructive foundationand support for applying for funding as well as publishing in reputed journals.Hence, seed money helps the members of faculty to do some bench work and create basis for a solid and extended proposal to the external funding agency.

Objectives:

- To provide financial support to the members of faculty for undertaking minor research work.
- To support faculty with a small and reasonable grant with which they can jump start their research work.
- To encourage members of faculty to conduct sufficient research work for obtaining 'proof of concept' or 'proof of experience', which further enables them to apply to external public and private funding agencies.

Eligibility:

- All full-time members of faculty of the institution are eligible for this grant.
- The proposed area of research must be novel and very little work have been done.

Process:

- Interested faculty must submit their proposal in the detailed format to the principal.
- The principal refers the proposals to the Research Advisory Committee for scrutiny and review of the proposal.
- Faculty of the institution can collaborate and submit a proposal with one of the masthe principal investigator and other members as co-investigators.

- Only one proposal can be submitted by a faculty per year
- The principal investigators of the shortlisted proposals will be called for a presentation
- There port of the Research Advisory Committee will be released with the final selected proposals
- The rejected proposals can be reworked for resubmission based on the comments/suggestions of the Research Advisory Committee
- All approved proposals will be given a letter of sanction indicating the amount sanctioned and permitted duration of thework
- Quarterly review of the work shall be conducted to monitor the progress made
- After completion of the proposed work, a completion report along with utilization of sanctioned grant should be submitted.
- If possible and sufficient, the results of work should be sent for a publication or apply for a patent.
- Also, the work should be developed further into a full and standard proposal for applying to a public or private funding agency.

Note:

- This grant should not be used for the PHD work of the faculty.
- This grant cannot be used for attending or conducting conferences and workshops or for payment of registration fee.
- Books, equipment, stationery, furniture procured under the Seed Money Grant shall be the property of the Institution.
- Any intellectual property generated during the course of such a project shall be subjected to IPR policy of the institution.

SRINIVASA EDUCATIONAL ACADEMY
37 Years of Excellence in Education 1984-2021

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

SVCET
5 UG Programmes Accredited by NBA, New Delhi
Accredited With "A" Grade by NAAC, Bengaluru
Ranked With 250–300 Band by NIRF
Recognized as CPE by UGC New Delhi
Affiliated to JNTUA, Anantapur, (AP)
Recognized by UGC under 2(F) & 12(B)
Approved by AICTE, New Delhi

Dr. M.Mohan Babu M.Tech, Ph.D
Principal

Research and Development Cell **Date: 24-07-2023**

File No.: SVCET/R&D Cell/ SEED MONEY/ 2023-24/IT/002

To,

Mr. P. NANDA KUMAR,
Assistant Professor,
Department of Information Technology
SVCET, Chittoor

Sub: Letter of sanction
Dear Mr. P. NANDA KUMAR,

The Management of Sri Venkateswara College of Engineering and Technology appreciate your efforts in submitting your proposal titled **"Federated Machine Learning For Privacy Preserving Personal Healthcare Recommendation"** seeking seed grant. After thorough scrutiny, the Research Advisory Committee of the Institution has selected and recommended your proposal for the sanction of **Rs 65,000/-** to work for a period of **one** year.

This seed money grant is provided so as to enable you to undertake preliminary research work which can result either in a 'proof of concept' or 'proof of experience'. Further you are expected to apply to external funding agencies (both public and private) to take the outcomes of this project to its intended goal.

You are expected to submit progress report once in six months and also the final completion report with the utilization certificate within a month of the completion of the project.

The work done under this project shall be used only for the benefit of the institution and it will not be used or transmitted to anywhere else. The conditions for the conduct of this work will be as per the Seed Grant Policy of the institution.

Wishing you good luck

Sri Venkateswara College of Engineering & Technology * CHITTOOR.

Principal

PRINCIPAL
S.V. College of Engineering & Technology, CHITTOOR. (A.P.)

RVS Nagar, Tirupathi Road,Chittoor-517127.(A.P)INDIA
Mobile No: +91-7729999158(Office) ,+91-7729999200,+91-9581993399 (Principal)
Website:www.svcetedu.org | Email:principal@svcetedu.org,info@svcetedu.org

SVCET (FY 2023-24)
Sri Venkateswara College of Engg & Tech
RVS Nagar, Chittoor 517127 AP
E-Mail : info@svcetedu.org

Payment Voucher

No. : **3823**

Dated : **24-Jul-23**

Particulars	Amount
Account :	
Research and Development New Ref Mr. P. NANDA KUMAR **65,000.00 Dr**	**65,000.00**
Through :	
Cash	
On Account of :	
being seed money for titled "Federated Machine Learning For Privacy Preserving Personal Healthcare Recommendation" for one year	
Amount (in words) :	
Indian Rupees Sixty Five Thousand Only	
	₹ 65,000.00

Receiver's Signature:

Authorised Signatory

Prepared by

Checked by

Verified by

Sri Venkateswara College of Engineering & Technology (Autonomous)
R.V.S. Nagar, Tirupati Road, Chittoor – 517127. Andhra Pradesh.
(Accredited by NAAC and NBA)

UTILISATION CERTIFICATE FOR INSTITUTE FUNDED SEED GRANT

Certified that out of **Rs 65,000 (Rupees Sixty-Five Thousand only)** of institute funded seed grant for the project titled "**Federated Machine Learning for Privacy Preserving Personal Healthcare Recommendation**" sanctioned during the Academic Year **2023 - 2024** in favour of **Mr/Dr. P. NANDAKUMAR** from the **Department of Information Technology** dated **24/07/2023**, the entire amount has been utilized for the purpose for which it was sanctioned.

Signature of Principal Investigator

Date: 26-06-2024

ACCOUNTS OFFICER
S.V. College of Engg. & Technology
CHITTOOR.

Signature of Accounts Officer

Date: 26-06-2024

Signature of Head of the Institution

PRINCIPAL
S.V. College of Engineering & Technology, CHITTOOR. (A.P.)

Date: 26-06-2024

Sri Venkateswara College of Engineering and Technology

(Autonomous)

R.V.S. Nagar, Chittoor – 517 127

Date: 26-06-2024

PROJECT COMPLETION CERTIFICATE

This is to certify that the project titled **"Federated Machine Learning for Privacy Preserving Personal Healthcare Recommendation"** has been successfully completed under the institute-funded seed grant.

The project was sanctioned in the Academic Year **2023 – 2024** in favour of **Mr. P. Nandakumar** from the **Department of Information Technology** and was carried out as per the approved objectives and guidelines. The allocated funds have been utilized effectively for the intended purpose, and all necessary reports and documentation have been submitted.

Signature of Principal Investigator

Date: 26-06-2024

Signature of Head of the Department

Date: 26-06-2024

Head of the Department
Information Technology
Sri Venkateswara College of
Engineering & Technology (Autonomous)
Chittoor.

Sri Venkateswara College of Engineering & Technology (Autonomous)
R.V.S. Nagar, Tirupati Road, Chittoor – 517127. Andhra Pradesh.
(Accredited by NAAC and NBA)

Project Completion Report

1. Project Title: Federated Machine Learning for Privacy Preserving Personal Healthcare Recommendation

2. Principal Investigator (PI) Details: Mr. P. Nandakumar

3. Department: Information Technology

4. Funding Source and Sanction Details:

- **Funding Source:** Institute Funded Seed Grant
- **Sanction Date:** 24th July 2023
- **Grant Amount:** Rs. 65,000/-
- **Academic Year:** 2023-2024

5. Project Duration: From 24-07-2023 To 26-06-2024

6. Objective of the Project: This research aims to develop a federated machine learning (FL) framework for privacy-preserving personal healthcare recommendations. The objective is to enable collaborative model training across multiple healthcare institutions without sharing sensitive patient data, ensuring data privacy while improving predictive accuracy and personalized treatment suggestions.

7. Scope and Significance: The integration of AI in healthcare has improved diagnosis and treatment strategies, but privacy concerns remain a major challenge. This study addresses these concerns by:

- Leveraging federated learning to train models locally on decentralized healthcare data.
- Preserving patient confidentiality while enabling robust machine learning insights.
- Enhancing personalized healthcare recommendations for conditions such as diabetes, cardiovascular diseases, and cancer.

The outcome has significant potential for improving healthcare decision-making without compromising sensitive medical information.

8. Methodology and Implementation:

1. **Data Collection and Preparation:**
   - Partnering with multiple healthcare institutions to access diverse, real-world patient data.

- Data remains stored locally at each institution to maintain privacy.

2. **Federated Learning Framework Design:**
   - Developing a secure FL model architecture that aggregates insights without transmitting raw patient data.
   - Implementing differential privacy techniques and homomorphic encryption for enhanced security.
3. **Model Training and Evaluation:**
   - Training local models at each institution, with aggregated updates sent to a global model.
   - Using performance metrics such as accuracy, precision, and recall to evaluate the model.
4. **Recommendation Engine Development:**
   - Creating personalized healthcare recommendations based on individual patient profiles and medical histories.
5. **Validation and Testing:**
   - Comparing the FL model's performance with traditional centralized models to assess accuracy, efficiency, and privacy preservation.

9. Work Completed: Yes

10. Key Findings and Results:

- The FL framework successfully trained predictive models without exposing individual patient data.
- The developed recommendation engine provided highly personalized treatment suggestions with improved accuracy compared to conventional methods.
- Security measures, such as differential privacy, effectively reduced data leakage risks during model aggregation.

11. Outcomes and Deliverables:

- A privacy-preserving federated learning framework for healthcare data.
- A personalized recommendation system for improved medical decision-making.
- Research documentation and performance analysis for healthcare practitioners and data scientists.
- Recommendations for integrating FL in real-world healthcare systems to ensure data security.

12. Challenges Faced (if any) and Solutions:

- **Data Privacy & Security:** Sharing sensitive healthcare data poses privacy risks. Solution: Use **differential privacy**, **secure multiparty computation (SMPC)**, and **homomorphic encryption** to protect data.
- **Heterogeneous Data Sources:** Healthcare data varies across devices and institutions. Solution: Implement **data normalization**, **transfer learning**, and **federated averaging** to handle inconsistencies.

- **Communication Overhead:** Frequent model updates increase network traffic. Solution: Use **model compression** techniques like quantization and pruning to reduce bandwidth usage.
- **Device and Resource Constraints:** IoT devices may have limited processing power. Solution: Deploy lightweight models with **edge computing** to improve efficiency.
- **Model Convergence Issues:** Non-IID (non-independent, identically distributed) data can slow learning.
  Solution: Use **personalized federated learning** or **adaptive learning rates** to enhance convergence.
- **Regulatory Compliance:** Ensuring legal adherence in healthcare data sharing is crucial. Solution: Follow standards like **HIPAA**, **GDPR**, and implement robust audit mechanisms.

13. Utilization of Funds:

TensorFlow Federated (TFF): For building and training federated learning models.
PySyft: For secure computation with privacy-preserving protocols.
FLAIR: (Federated Learning Aided by Information Retrieval) for scalable healthcare data integration.

14. Conclusion and Recommendations:

This research demonstrates that federated learning offers a viable solution for privacy-preserving healthcare recommendations. The model achieved improved predictive accuracy while maintaining data security. Future recommendations include:

- Expanding the framework to include additional healthcare domains.
- Improving scalability for larger datasets and medical institutions.
- Collaborating with healthcare professionals to refine recommendation logic for enhanced clinical relevance.

Signature of Principal Investigator

Date: 26-06-2024

Signature of Head of the Department

Date: 26-06-2024

Head of the Department
Information Technology
Sri Venkateswara College of
Engineering & Technology (Autonomous)