



Project Proposal On

"Risk Prediction in Pregnancy RPP using Vitals"

Submitted to

Division :NCSTC

Programme or Scheme : Call for Proposal Under NCSTC Division

Submitted by

Project Investigator:

Dr. Kothapally Venkata Rao

K S SCHOOL OF ENGINEERING AND MANAGEMENT-Bengaluru

General Information :		
1	Title of the Project	Risk Prediction in Pregnancy RPP using Vitals
2	Subject Area	Empowering STEM Students for Community Engagement and Career Exploration through Samvaad
	Other Subject Area	Scientific Career Progression
3	Duration of Project	1 Years 8 Months
4	Institute Type	Academic Institutions (Private)
5	Type of Proposal	Proposal Against Call
6	Proposal Submit Date	29/07/2024
7	Academic Area	Electronics, Computers and Communication Engineering,
8	Application Area	Health,
9	Government National Initiative	Make in India, Swasth Bhart, Innovate India,
10	Sustainable Development Goals (SDGs)	Goal 3: Good Health and Well-being,
11	Key words	Pregnancy, Maternal Health, Fetal Health, Vitals, Risk Prediction, Early Warning, Risk prediction model, NGOs.
12	Project Summary	
	<p>Pregnancy is associated with various risks. These risks can be influenced by a range of factors including healthcare infrastructure, socio-economic conditions, and cultural practices. Pregnancy risk in India remains a significant issue despite improvements in healthcare over the past few decades. Urban areas, while better equipped, still face challenges in providing timely and quality care to all segments of the population. This issue is worse in rural and underserved areas. The Maternal Mortality Rate MMR has decreased overtime, but it is still higher than in many other countries.</p> <p>Our proposal is to develop an efficient Risk Prediction model in Pregnancy RPP based on basic vitals. This makes the risk during pregnancy detection early to take the necessary clinical assistance. The solution proposed is easy to use for the doctors and effective to take the necessary actions. We will build a streamlined risk prediction model for pregnancy-related complications using basic vital signs such as blood pressure, heart rate, and temperature. Through the analysis of extensive datasets comprising pregnant women. The proposed solution will give early warning signs and forecast any adverse outcomes. The solution has immense benefits as proactive interventions can be made to enhance maternal and fetal health. The work has substantial potential to optimize prenatal care practices, consequently mitigating maternal morbidity and mortality rates.</p> <p>This work will make use of the vital data of pregnant women from the hospital. We have done some preliminary work with hospitals in getting the data. We are exploring various algorithms for the risk predictions. The proposed solutions can be built as a decision support system for the gynaecologists. The solutions will also provide information about the pregnant woman's condition. Data collection, data validation and risk model are some of the key parts of this project. Developing the project will involve close interactions with the medical practitioners mostly gynaecologists and technical experts on building a robust technical solution. The Indian Government and various Non-Governmental Organizations NGO are looking for improving the solution to the issue of risk in pregnancy. We address this issue in this proposal and contribute in supporting the Government and the NGOs in this endeavour.</p> <p>Index Terms – Pregnancy, Maternal Health, Fetal Health, Vitals, Risk Prediction, Early Warning, Risk prediction model, NGOs.</p>	

Principle Investigators :

1 Details of Principle Investigators (PI) :

1.	Name	Dr. Kothapally Venkata Rao
	Gender	Male
	Category	OBC
	Date of Birth	01/06/1977
	Designation	Professor and Head
	Department	Computer Science & Engineering

Institute Type	
Institute/University	K S SCHOOL OF ENGINEERING AND MANAGEMENT
State	Karnataka
District	Bengaluru Urban
City/Place	bangalore
Address	15, mallasandra, off kanakapura road, bangalore
Pin	560109
Communication Email	kothapallyvenkat@gmail.com
Alternate Email	venkatarao@kssem.edu.in
Mobile No	9900633688
Phone	
Fax	

2 Details of Co-Principle Investigators (Co-PI) :

1.	Name	Mrs. Meena G
	Gender	Female
	Category	OBC
	Date of Birth	24/07/1990
	Designation	Assistant Professor
	Department	Computer Science and Engineering
	Institute Type	Academic Institutions (Private)
	Institute/University	K S SCHOOL OF ENGINEERING AND MANAGEMENT
	State	Karnataka
	District	Bengaluru Urban
	City/Place	Bengaluru
	Address	#2, 1st main ,1st cross, Sri Sai Nagar , Arehalli, Near modern school,Bengaluru
	Pin	560071
	Communication Email	meenagkrish@gmail.com
	Alternate Email	meenag@kssem.edu.in
	Mobile No	9060850877
	Phone	
	Fax	

Proposer Agency/Organization/Institution Details :

1	Name	K S School of Engineering and Management
2	Agency Type	Private
3	Establishment Year	2010
4	Registration Number (if applicable)	
5	State	Karnataka
6	District	Bengaluru Urban
7	Website	https://kssem.edu.in/
8	Address	No. 15, Mallasandra, Off Kanakapura Road, Vajarahalli, Bengaluru-560109
9	If you have PFMS Code	Yes
	PFMS Unique Code	VAININ000058178
10	If you have NGO Darpan Unique Id	Yes
	NGO Darpan Unique Id	KA/2020/0257306

Head of the Proposer Organization Details :		
1	Name	Dr. Kothapally Venkata Rao
2	Designation	Professor and Head
3	Email Id	kothapallyvenkat@gmail.com
4	Phone Number	9343751362
5	Partner/Collaborating Agency/Institution (If any)	No
6	Proposed Area for Activity (If any)	No
7	Contribution towards project from any other sources (If any)	No

Technical Details :	
1	Appropriate stakeholder
	Researchers, Women,
2	Proposed Objectives (Outline the specific objectives of the project, including those related to specific areas mentioned, maximum five)
2.1	Proposed Objectives (I)
	Early prediction for risks in fetal health by using basic vitals for pregnant women. Collect and Process data from Hospital /Gynaecologist - Age, Blood Pressure (BP), Body Temperature, Heart Rate.
2.2	Proposed Objectives (II)
	Data pre-processing and validation for risk prediction Building various Risk Predictive models in pregnancy.
2.3	Proposed Objectives (III)
	Deploying the Risk Predictive Pregnancy solution:
3	Need Identification in the Proposed Area
	Risk Assessment for Pregnancy-induced Hypertension Utilizing Machine Learning – 2021 Utilizing Machine Learning for Predicting Pregnancy Complications: A Comprehensive Systematic Review – 2021 Machine Learning for Predicting Pregnancy Outcomes: A Systematic Review, Synthesized Framework, and Future Research Direction - 2022 Forecasting Maternal Health Risks using Traditional Machine Learning Techniques - 2023 Predicting Maternal Risk Levels through Ensemble Modelling – 2023
4	Description of the target area, target group (s) along with their beneficiaries (Gen/OBC/SC/ST)
	The target area was identified in discussion with the medical practitioners /gynaecologists. The audience identified for the solution was based on the background of – Family, Financial and Social. All of this was done in consultation with the doctors. The direct beneficiaries of this work are the pregnant women. Indirect beneficiaries are the hospitals /doctors and family members of the pregnant women, NGOs and the Government.
5	Deliverables, desired benefits to target groups/expected outcomes and its utilization

	<p>The work will have doctors /gynaecologists, technical experts and NGOs to form the team to work on this project.</p> <p>Our proposal bridges the gap of making the solution simpler and convenient to adopt and use. Currently pregnancy risks are determined by a combination of clinical evaluations, laboratory tests, and imaging studies. These methods are expensive and exhaustive. Our solution is quick and effective for managing risk in pregnancy early, as the risk can be predicted. Our method leads the way for continuous monitoring and assessment throughout the pregnancy to detect and manage any emerging risks promptly.</p> <p>Since the solution does not make use of expensive equipment and consumables, it is financially viable and sustainable. Post-funding this work the expectation is to find investors to take the solution to the market via medical solutions /device companies or form a startup with this and further go on to produce a family of solutions.</p>
6	Mechanism of impact assessment
	<p>We have utilized actual dataset collected from a hospital, ensuring the robustness and generalizability of our approach. Key features of our methodology include:</p> <p>Data Segregation: We partitioned the dataset into training and testing subsets. The training dataset was utilized for model development, while the testing dataset was employed to impartially evaluate model performance.</p> <p>Validation Dataset: Additionally, we set aside a separate validation dataset to further gauge the model's performance on unseen data, bolstering confidence in its predictive capabilities.</p> <p>Robustness Verification: Our study maintains reliability and generalizability by utilizing distinct datasets for different stages of model development.</p> <p>Methodological Stringency: We adhered to rigorous data handling practices, enhancing the credibility and reproducibility of our research findings.</p>
7	Infrastructure and resources already available with the organization to accomplish the project activities
	Computing Laboratory and technical support staff.
8	Account of self-generated resources BOTH IN CASH AND KIND, such as cash collected, use of equipment on the loan, manpower, free publicity etc. Mode of utilization and accounting of these resources for implementing this project
	Nil

Methodology & Work plan for Project Implementation Details :

1	Project Implementation Timelines (Provide a detailed timeline of project activities, including start and end dates for each phase)
	<p>Year 1(12 months)-Milestone1 (3 months): Resource allocation, Equipment Purchase. Activity: Equipment purchase, Setting up the hardware and software, Interacting with the hospital / Gynaecologists.</p> <p>Milestone2 (9 months):Data collection and developing the prediction models. Activity (3 : Data collection (n=100) and validation, Analyze the data (vitals), Identification of the risk prediction models, Development of the model.</p> <p>Year2 (8 months): Milestone1 (8 months): Interacting with Tertiary Health Centre /Urban Hospital gynecologist and deployment of the solution. Activity: Deployment of the solution in Tertiary Health Centre /Urban setting. Developing and evaluating various models, Testing, validation and optimization the solution with test subjects, Productizing the solution.</p> <p>Milestone2: Interacting with PHC and NGOs for deployment of the solution in rural setting, Report and Paper writing. Activity: Deployment of the solution in rural setting, Submission of report and paper submission.</p>
2	Key Performance Indicators (Define the criteria for measuring the success of the project and achieving its objectives)
	<p>Access and Affordability to end users</p> <p>The system will be made available to clinicians.</p> <p>The system will incorporate usability principles, ergonomics to assure ease of use.</p> <p>Deployment is targeted across the country with sufficient numbers of production. This will further bring down the cost of device.</p>

Roles and Responsibility of Partners (List potential partners and collaborators, including universities, research institutions, community organizations, and industry partners) :

S.N.	PI/Co-PI	Area of Expertise	Roles / Responsibilities
1 .	Kothapally Venkata Rao	•Theory of Computations, IoT ,Android Applications, Software Engineering	Dr K Venkata Rao Is the Head and Professor in Computer Science & Engineering at KS School of Engineering and Management, Bangalore. With around 24+ years of experience in teaching and 3+ years in research. Dr. K Venkata Rao expertise is in Discrete Mathematics, Data Structures, Design and Analysis of Algorithms, Automata Theory and Computation. Dr. Rao strives to deliver quality through a team of skilled people with utmost sincerity.

Prior experience along with activities in the area of public/community engagement, science communication, popularization and developing communication tools or modules :

Na

Mechanism of project monitoring, evaluation, lesson learning and beneficiary feedback from previous projects (recent five projects of similar nature) Details :

Details
nil

Financial Details :

Budget estimates (mapped on the proposed activities and must provide justification of each Budget Heads)

A. Non - Recurring

Equipment

S.	Equipments	Qty.	Justification	1 Year	2 Year	Total
1 .	Computer with hardware acceleration with software for running the Prediction model	1	Capable of running AI /ML models, processing and analysis	156416	142780	299196
Total				156416	142780	299196

Other NonRecurring

S.	Description	Justification	1 Year	2 Year	Total
1 .	Attending conferences, and paper submission	Reference materials, books, software, memberships, etc. Conference registration, paper submission in indexed journals	35000	35000	70000
Total			35000	35000	70000

B. Recurring

Project Staff

S.	Project Staff	No.	Justification	1 Year	2 Year	Total
1 .	Project Associate -II	1	Project Associate – Statistical and Data related implementation - Implementation of the data flow architectures, data cleaning and validation.	240000	240000	480000
2 .	Project Associate-I	1	Project Associate 1- ML- Implementation of the software Components of ML algorithms. Testing and validation of the solutions.	240000	240000	480000
Total				480000	480000	960000

Contingency

S.	Description	Justification	1 Year	2 Year	Total
1 .	Unplanned expenditures	Minor repairs, maintenance, etc.	25000	0	25000
Total			25000	0	25000

Travel

S.	Description	Justification	1 Year	2 Year	Total
1 .	Various travel expenses.	Identification of field trial locations and travel for field trials. Travel to or by Expert place and Hospitals /Clinicians. Travel costs for attending conferences.	35000	0	35000
Total			35000	0	35000

Any Other Recurring

S.	Description	Justification	1 Year	2 Year	Total
1 .	Field Trials	Honorarium cost is estimated to be INR 500 per person. We will test it on 40 subjects.	10000	10000	20000
2 .	Consultancy from External Agencies	Medical Practitioners - Consulting on pregnancy related issue. Data interpretation Experts- ML, Data and Analytics - Consulting on ML and Data processing. Building medical grade software. NGO staff - Understanding the issues of rural pregnant women. Connecting solution developers to interact and interpret the real issues.	125000	125000	250000
Total			135000	135000	270000

Budget Head Summary in (INR) :

Budget Head	Year-1	Year-2	Total
1- Non-Recurring			
Equipment	156416	142780	299196
Other NonRecurring	35000	35000	70000
Subtotal (Capital)	191416	177780	369196
2- Recurring			
Project Staff	480000	480000	960000
Contingency	25000	0	25000
Travel	35000	0	35000
Any Other Recurring	135000	135000	270000
Subtotal (General)	675000	615000	1290000
Total Project Cost (Capital + General)	866416	792780	1659196

PFMS Details :

PFMS Unique Code Available:	Yes
PFMS Unique Code :	VAININ000058178

List of Uploaded Documents:-

1. Complete Project proposal (PDF)
2. Biodata of PI/Co-PI
3. Conflict of interest
4. Certificate from PI/Co-PI
5. Endorsement from head of Institute
6. Quotation for Equipments

FORMAT FOR PROPOSAL

(Against the Call for Proposal)

1. Title of the Project: Risk Prediction in Pregnancy (RPP) using Vitals

2. Project Summary (max 300 words):

Pregnancy is associated with various risks. These risks can be influenced by a range of factors including healthcare infrastructure, socio-economic conditions, and cultural practices.

Pregnancy risk in India remains a significant issue despite improvements in healthcare over the past few decades. Urban areas, while better equipped, still face challenges in providing timely and quality care to all segments of the population. This issue is worse in rural and underserved areas. The Maternal Mortality Rate (MMR) has decreased overtime, but it is still higher than in many other countries.

Our proposal is to develop an efficient Risk Prediction model in Pregnancy (RPP) based on basic vitals. This makes the risk during pregnancy detection early to take the necessary clinical assistance. The solution proposed is easy to use for the doctors and effective to take the necessary actions. We will build a streamlined risk prediction model for pregnancy-related complications using basic vital signs such as blood pressure, heart rate, and temperature. Through the analysis of extensive datasets comprising pregnant women, the proposed solution will give early warning signs and forecast any adverse outcomes. The solution has immense benefits as proactive interventions can be made to enhance maternal and fetal health. The work has substantial potential to optimize prenatal care practices, consequently mitigating maternal morbidity and mortality rates. This work will make use of the vital data of pregnant women from the hospital. We have done some preliminary work with hospitals in getting the data. We are exploring various algorithms for the risk predictions. The proposed solutions can be built as a decision support system for the gynaecologists. The solutions will also provide information about the pregnant woman's condition. Data collection, data validation and risk model are some of the key parts of this project. Developing the project will involve close interactions with the medical practitioners mostly gynaecologists and technical experts on building a robust technical solution. The Indian Government and various Non-Governmental Organizations (NGO) are looking for improving the solution to the issue of risk in pregnancy. We address this issue in this proposal and contribute in supporting the Government and the NGOs in this endeavour.

Index Terms – Pregnancy, Maternal Health, Fetal Health, Vitals, Risk Prediction, Early Warning, Risk prediction model, NGOs.

3. Details of Principal Investigator/Principal Coordinator

Name: Dr. K Venkata Rao

Date of Birth (DD/MM/YYYY): 01/06/1977

Gender (Male/Female/Others): Male

Category (Gen/OBC/SC/ST): OBC

Designation: Professor and Head Dept. of CSE

Name & Address of Affiliated Organization with Pin Code: K S School of

Engineering and Management, 560109

Website: www.kssem.edu.in

Govt./Not for Profit/Autonomous (please specify): Not for Profit

Email ID: kothapallyvenkat@gmail.com

Telephone no.:

Mobile no.: 9343751362

4. Details of Co -Investigator/Co-Coordinator

Name: Mrs. Meena G

Date of Birth (DD/MM/YYYY): 24/7/1990

Gender (Male/Female/Others): Female

Category (Gen/OBC/SC/ST): OBC

Designation: Assistant Professor

Name & Address of Affiliated Organization with Pin Code: K S School of Engineering and Management, 560109

Website: www.kssem.edu.in

Govt./Not for Profit/Autonomous (please specify): Not for Profit

Email ID: meenag@kssem.edu.in

Telephone no.:

Mobile no.: 9060850877

5. Name & Address of the Proposer Agency/Organization/Institution

Website (mandatory): www.kssem.edu.in

Registration Number (if applicable):

Establishment Year:

NGO Darpan Unique Id (<http://ngo.india.gov.in/>): KA/2020/0257306

PFMS Unique ID: VAININ000058178

6. Name and Designation of the Head of the Proposer Organization:

Dr. K RamaNarasimha, Principal/Director

7. Partner/Collaborating Agency/Institution (If any):

Registration Number (if applicable):

Establishment Year:

NGO Darpan Unique Id (<http://ngo.india.gov.in/>):

PFMS Unique ID:

8. Proposed Area for Activity (if applicable)

Village:

Block:

District:

State:

9. Please select the appropriate stakeholder: Children, Students, Researchers, Elderly, Women, General, Other (please specify): Women, also Researchers.

10. Proposed Objectives (*Outline the specific objectives of the project, including those*

related to specific areas mentioned, maximum five)

1. Early prediction for risks in fetal health by using basic vitals for pregnant women.
2. Collect and Process data from Hospital /Gynaecologist - Age, Blood Pressure (BP), Body Temperature, Heart Rate.
3. Data pre-processing and validation for risk prediction
4. Building various Risk Predictive models in pregnancy.
5. Deploying the RPP solution.

11. Need Identification in the Proposed Area:

(Please furnish background information and rationalization for the proposed project. Clearly delineate the particular issue the project aims to tackle, including its identification process and the approach to its resolution. Additionally, expound on how the project aligns with the objectives, mandate, and goals of NCSTC. Elucidate on how the project will enhance capacity building among stakeholders. If applicable, present detailed data from any conducted surveys.)

- Risk Assessment for Pregnancy-induced Hypertension Utilizing Machine Learning – 2021
- Utilizing Machine Learning for Predicting Pregnancy Complications: A Comprehensive Systematic Review – 2021
- Machine Learning for Predicting Pregnancy Outcomes: A Systematic Review, Synthesized Framework, and Future Research Direction - 2022
- Forecasting Maternal Health Risks using Traditional Machine Learning Techniques - 2023
- Predicting Maternal Risk Levels through Ensemble Modelling – 2023

As NCSTC is involved in developing various formats of communication to disseminate Science, Technology and Innovation (STI) our problem statement fulfils the above objective with women and researchers as stakeholders.

12. Description of the target area, target group (s) along with their beneficiaries (Gen/OBC/SC/ST):

(Please indicate how was the target area, audience identified, and what criteria guided their selection? What factors motivated their choice? Additionally, specify the number of consultations conducted with the target group during the project's design phase and provide the source of this information. Please indicate no. of direct and indirect beneficiaries)

The target area was identified in discussion with the medical practitioners /gynaecologists.

The audience identified for the solution was based on the background of – Family, Financial and Social. All of this was done in consultation with the doctors.

The direct beneficiaries of this work are the pregnant women.

Indirect beneficiaries are the hospitals /doctors and family members of pregnant women, NGOs and the Government.

13. Methodology & Work plan for Project Implementation

- i) Project Implementation Timelines (Provide a detailed timeline of project activities, including start and end dates for each phase)
- ii) Key Performance Indicators (Define the criteria for measuring the success of the project and achieving its objectives)

Details given in annexure.

Access and Affordability to end users

The system will be made available to the medical practitioners /gynaecologists

The system will incorporate usability principles, to assure ease of use.

Deployment is targeted across the country with sufficient numbers of production.

- iii) Roles and Responsibility of Partners (List potential partners and collaborators, including universities, research institutions, community organizations, and industry partners)

We have a vibrant team comprising of members across multiple domains. The team comprises of Healthcare & Medical Professionals, Academicians, Industry Experts, Researchers and Engineers to execute the proposed project successfully.

Principal Investigator: Dr K Venkata Rao Is the Head and Professor in Computer Science & Engineering at KS School of Engineering and Management, Bangalore. With around 24+ years of experience in teaching and 3+ years in research. Dr. K Venkata Rao expertise is in Discrete Mathematics, Data Structures, Design and Analysis of Algorithms, Automata Theory and Computation. Dr. Rao strives to deliver quality through a team of skilled people with utmost sincerity.

Co-PI 1: Mrs. Meena G, is working as the Assistant Professor, Department of Computer Science & Engineering at K S School of Engineering and Management. With 3± years of experience in projects and teaching. Mrs Meena has a lot of insights in this work. She has expertise in Machine Learning, Computer Networks, Microcontrollers.

This project will also have people supporting the Industry and Doctors /Gynaecologists.

14. Project Duration: 1.8 years (20 months)

15. Total Cost Proposed: Rs 16.6 Lakhs

- i) **Recurring Budget: Rs 13.6 Lakhs**
- ii) **Non-recurring Budget: Rs 3 Lakhs**
- iii) **Details of Budget/Resources from other sources (if any)**

16. Detailed Budget Break-up: *(Provide justification for each budget item, detailing how the costs were determined, including unit costs and consolidated estimates. Additionally, furnish a concise summary of the budget outlay on a single sheet.)*

Detail budget attached as annexure

17. Prior experience along with activities in the area of public/community engagement, science communication, popularization and developing communication tools or modules.

i) list of on-going & completed projects

S. No	Title of the Project	Implementation Area (village/district & state)	Funding Agency	Duration of Support Ongoing/Completed
	Nil			

ii) Mechanism of project monitoring, evaluation, lesson learning and beneficiary feedback from previous projects (recent five projects of similar nature)

18. Deliverables, desired benefits to target groups/expected outcomes and its utilization *(Please specify other involved agencies, including government bodies, in the project's operational areas, and detail collaboration strategies. Describe how the project will bridge existing gaps, align with complementary initiatives, and prevent redundancy. Discuss the sustainability prospects post-funding and outline strategies for ensuring continued service provision beyond the project's duration. If applicable, delineate how the project's timeframe supports its objectives and fosters sustainability, emphasizing empowerment strategies and beneficiaries.)*

The work will have doctors /gynaecologists, technical experts and NGOs to form the team to work on this project.

Our proposal bridges the gap of making the solution simpler and convenient to adopt and use. Currently pregnancy risks are determined by a combination of clinical evaluations, laboratory tests, and imaging studies. These methods are expensive and exhaustive. Our solution is quick and effective for managing risk in pregnancy early, as the risk can be predicted. Our method leads the way for continuous monitoring and assessment throughout the pregnancy to detect and manage any emerging risks promptly.

Since the solution does not make use of expensive equipment and consumables, it is financially viable and sustainable. Post-funding this work the expectation is to find investors to take the solution to the market via medical solutions /device companies or form a startup with this and further go on to produce a family of solutions.

19. Mechanism of impact assessment: *(Please provide methodology of impact assessment in-line with defined objectives. Indicate measurable indicators, supported by baseline data and track changes over time. Provide a monitoring plan that guides the collection of data, evaluation framework outlines criteria for success, and Data*

analysis techniques to interpret findings.)

[See attachment](#)

We have utilized actual dataset collected from a hospital, ensuring the robustness and generalizability of our approach. Key features of our methodology include:

- **Data Segregation:** We partitioned the dataset into training and testing subsets. The training dataset was utilized for model development, while the testing dataset was employed to impartially evaluate model performance.
- **Validation Dataset:** Additionally, we set aside a separate validation dataset to further gauge the model's performance on unseen data, bolstering confidence in its predictive capabilities.
- **Robustness Verification:** Our study maintains reliability and generalizability by utilizing distinct datasets for different stages of model development.
- **Methodological Stringency:** We adhered to rigorous data handling practices, enhancing the credibility and reproducibility of our research findings.

METHODOLOGIES:

- **Data Collection:** This initial phase involves the acquisition of the dataset necessary for the study endeavour. Typically, this dataset contains information relevant to the research query or objective. For this study, the dataset encompasses demographic information and other pertinent features essential for risk prediction tasks.
- **Pre-processing Techniques:** Pre-processing methods are applied to the dataset to ready it for subsequent analysis and modelling. Common Pre-processing steps include managing missing data, standardizing or scaling features, encoding categorical variables, and eliminating outliers or irrelevant features. These techniques aim to ensure data is clean, consistent, and compatible with the machine learning algorithms.
- **Model Selection:** Model selection entails the judicious choice of appropriate machine learning algorithms and risk prediction features.
- **Training and Testing:** The dataset is partitioned into distinct training and testing subsets to facilitate model training and performance evaluation. The training subset is utilized to train the models, while the testing subset serves to assess their performance on unseen data. This partitioning ensures that the models demonstrate robust generalization to novel observations.
- **Model Training:** The chosen machine learning algorithms undergo training using the provided training data to discern patterns and relationships between input attributes and the target variable (risk level). Throughout the training process, the models iteratively adjust their parameters to reduce the disparity between the forecasted and observed outcomes.
- **Model Evaluation:** The efficacy of the trained models is assessed using suitable evaluation metrics, including accuracy, precision, recall, and F1-score. These metrics gauge the models' proficiency in predicting risk levels. Additionally, cross validation techniques may be employed to ascertain the models' robustness and generalizability.
- **Analysis and Comparison:** Subsequently, the outcomes of model evaluation are meticulously analysed and juxtaposed to discern the most effective algorithm for risk prediction tasks. Each algorithm's performance is evaluated based on metrics like accuracy and other pertinent measures. Visual aids, such as bar plots, may be employed to present comparison results succinctly and comprehensively.

20. Infrastructure and resources already available with the organization to accomplish the project activities:

Computing Laboratory and technical support staff.

21. Account of self-generated resources BOTH IN CASH AND KIND, such as cash collected, use of equipment on the loan, manpower, free publicity etc. Mode of utilization and accounting of these resources for implementing this project.

Nil

ANNEXURE

A. Project Duration (in months): 20 Months

B. Milestone of the Project:

Year	Milestone*	Milestone Duration (in Months)*	Activities to be performed
Year 1	Resource allocation, Equipment Purchase. Checking existing services & solutions (available apps in market).	3 Months	<ul style="list-style-type: none"> ● Equipment purchase ● Setting up the hardware and software. ● Interacting with the hospital /Gynaecologists
	Data collection and developing the prediction models	3 Months 6 Months	<ul style="list-style-type: none"> ● Data collection (n=100) and validation. ● Analyze the data (vitals) ● Identification of the risk prediction models ● Development of the model ● Developing and evaluating various models. ● Testing, validation and optimization the solution with test subjects ● Productizing the solution
Year 2	Interacting with Tertiary Health Centre /Urban Hospital gynecologist and deployment of the solution.	4 Months	<ul style="list-style-type: none"> ● Deployment of the solution in Tertiary Health Centre /Urban setting,
	Interacting with PHC and NGOs for deployment of the solution in rural setting. Report and Paper writing	4 Months	<ul style="list-style-type: none"> ● Deployment of the solution in rural setting ● Submission of report and paper submission.

C. Budget-Details:

• Table I: Budget Break-up for various Milestones (Funding Sought from DST):

Year	Milestone	Indian Partners (in INR)
Year 1	Resource allocation, Equipment Purchase. Checking existing services & solutions (available apps in market). Data collection and developing the prediction models	6,59,196
Year 2	Deployment of the solution at the Tertiary Health Centre /Urban Hospitals. Working closely with the practitioner-gynecologist for the deployment of the solution. Deployment of the solution at the Primary Health Centre (PHC). Working closely with the clinicians and NGOs for deployment of the solution in rural setting Report and Paper writing	10,00,000
Grand Total		16,59,196

D. Budget- Break-up:

S. No	Budget Heads	Year I			Year 2		Total Cost (in INR)
		Milestone 1 (in INR)	Milestone 2 (in INR)	Milestone 3 (in INR)	Milestone 4 (in INR)	Milestone 5 (in INR)	
Milestone Duration		3 Months	3 Months	6 Months	4 Months	4 Months	
NonRecurring Budget							
1.	Hardware and Software	2,99,196	0	0	0	0	2,99,196
Recurring Budget							
2.	Manpower	120,000	120,000	240,000	240,000	240,000	9,60,000
3.	Consultancy from External Agencies	50000	50,000	50,000	50,000	50,000	2,50,000
4.	Contingencies	5000	5000	5000	5000	5000	25,000
5.	Field Trials	0	0	0	10,000	10,000	20,000
6.	Domestic Travel	5000	5000	5000	10,000	10,000	35,000
7.	Other Cost	0	0	0	40,000	30,000	70,000
Grand Total		4,80,000	1,80,000	3,00,000	3,55,000	3,45,000	16,60,000

● **Justification for Equipment:**

S. No.	Particulars of Equipment(s)	Quantity	Cost per unit	Justification
1	Computer with hardware acceleration with software for running the Prediction model	1	1,56,416	Capable of running AI /ML models, processing and analysis
2		1	1,42,780	
Total Cost:			2,99,196	

● **Justification for Manpower:**

Name (s)	Designation/ Position	Annual Salary Package (in INR)	Time allocated for project (%)	Man-month(s) work in the project	Salary allocated in the project (in INR)	Role in the project and Justification
1	Project Associate - ML	20,000	100	20	400,000	Implementation of the software Components of ML algorithms. Testing and validation of the solutions.
2	Project Associate – Statistical and Data related implementation	20,000	100	20	400,000	Implementation of the data flow architectures, data cleaning and validation.

● **Justification for Consultancy:**

Name (s)	Designation / Position	Annual Salary Package	Time allocated for project (%)	Man-month(s) work in the project	Salary allocated in the project	Role in the project and Justification
1	Medical Practitioners	Hourly basis, estimated to be 3000 INR/hour	10	2	1,25,000	Consulting on pregnancy related issues. Data interpretation
2	Experts- ML, Data and Analytics.	Hourly basis, estimated to be 3000 INR/hour	10	2	1,25,000	Consulting on ML and Data processing. Building medical grade software.
3	NGO staff	Daily basis, estimated to be 1000 INR/day	2	1	25000	Understanding the issues of rural pregnant women. Connecting solution developers to interact and interpret the real issues.

• **Justification for Contingencies:**

S. No	Particulars	Amount (INR)	Justification
1	Unplanned expenditures	25,000	Minor repairs, maintenance, etc.

• **Justification for Field Trials, if any:**

S. No	Particulars	Amount (INR)	Justification
1	Deployment of Solution - Honorarium for participants in field trials.	20,000	Honorarium cost is estimated to be INR 500 per person. We will test it on 40 subjects.

• **Justification for Domestic Travel:**

S. No	Particulars	Amount (INR)	Justification
1	Various travel expenses.	35,000	Identification of field trial locations and travel for field trials. Travel to or by Expert place and Hospitals /Clinicians. Travel costs for attending conferences.

• **Justification for Other Cost, if any:**

S. No	Particulars	Amount (INR)	Justification
3	Attending conferences, and paper submission	70,000	Reference materials, books, software, memberships, etc. Conference registration, paper submission in indexed journals



Kammavari Sangham (R) 1952, K. S. Group of Institutions
K. S. SCHOOL OF ENGINEERING & MANAGEMENT

No.15, Mallasandra, off. Kanakapura Road, Bengaluru-560109
Affiliated to VTU, Belagavi & Approved by AICTE, New Delhi, **Accredited by NAAC**

Faculty Name	Dr. KOTHAPALLI VENKATA RAO
Designation	PROFESSOR & HEAD
DOB	01-06-1977
DOJ	01-02-2022
Educational Qualification	B.E (CSE), M.Tech (CSE), Ph.D in CSE



Experience in Years	Experience in KSSEM : 11 Months Experience in Teaching : 22 Yrs Experience in Industry : NIL Total Experience : 22 Yrs
Subject Handled	Programming in C, DMS, DSc, LD, DAA, FAFL, CG, ATC, SS, OR, SAN, AA, CD
Subject Handling	Automata Theory and Computability
Areas of Interest	<ul style="list-style-type: none">• Theory of Computations, IoT• Android Applications• Software Engineering

EDUCATIONAL DETAILS: -

Examination / Degree	College/University	Year of Passing
Ph.D	JAIN UNIVERSITY BANGALORE	2022
M.TECH IN CSE	BMS COLLEGE OF ENGINEERING / VTU UNIVERSITY	2001
BE IN CSE	VTU UNIVERSITY	1999

PUBLICATIONS:-

Journal Publications: International Journals – 08

Conference Papers: National Conference – 02

International Conference – 05

AWARDS: -

PROFESSIONAL MEMBERSHIP: -

Life Member ISTE No: LM40482

CONTACT DETAILS: -

Name: Dr. Venkata Rao K

Official address: KSSEM, No.15, Mallasandra, Holiday Village Road, off. Kanakapura Road, Bengaluru-560109

Personal Mail id: kothapallyvenkat@gmail.com

List of Publications:

1. IoT based Animal Detection System, Dr. K Venkata Rao, Pallavi, Anjali, Dakshayini, Bindupriya, TIJER, Volume 11 January 2024.
2. Indian Currency Recognition system for visual impaired people using ML, Dr. K Venkata Rao, Bharani, Chandana, DivyaLakshmi, Kalpana C, TIJER, Volume 11, January 2024
3. A study on ML approaches for enhanced quality of service and security in CN, Dr. K Venkata Rao, Sushmitha Suresh, IJERCT, Volume 12, Oct 2023
4. Real time assistive communicative system for deaf, dumb and blind, Dr. K Venkata Rao, Sanjana AN, Shraddha MK, Shreya G, Shwetha K, International Journal of Research publication and reviews, Volume 4, May 2023.
5. Smart Shoe for Blind, Dr. K Venkata Rao, Mohammed Ameenulla, Damini K, Deepa, Gauthami, IJRMETS, Volume 5, May 2023.
6. Real time sign language recognition using CV, Dr. K Venkata Rao, Sanjana AN, Shraddha MK, Shreya G, Shwetha K, IJRMETS, Volume 5, Jan 2023
7. Smart Shoe for Blind, Dr. K Venkata Rao, Mohammed Ameenulla, Damini K, Deepa, Gauthami, IJRMETS, Volume 4 Dec 2022.
8. Anti- Poaching detection for forest, Dr. K Venkata Rao, Mr Rupesh Kumar, Vijay NS, Pavan Kumar, Nithish Kumar, Sandeep Kumar, IARJSET, Volume 9, March 2022.

DEPARTMENT OF SCIENCE AND TECHNOLOGY
POLICY ON CONFLICT OF INTEREST

**FOR REVIEWER & COMMITTEE MEMBER or APPLICANT or DST OFFICER ASSOCIATED/ DEALING WITH
THE SCHEME/ PROGRAM OF DST**

Issues of Conflicts of Interest and ethics in scientific research and research management have assumed greater prominence, given the larger share of Government funding in the country's R & D scenario. The following policy pertaining to general aspects of Conflicts of Interest and code of ethics, are objective measures that is intended to protect the integrity of the decision making processes and minimize biasness. The policy aims to sustain transparency, increase accountability in funding mechanisms and provide assurance to the general public that processes followed in award of grants are fair and non-discriminatory. The Policy aims to avoid all forms of bias by following a system that is fair, transparent and free from all influence/ unprejudiced dealings, prior to, during and subsequent to the currency of the programme to be entered into with a view to enable public to abstain from bribing or any corrupt practice in order to secure the award by providing assurance to them that their competitors will also refrain from bribing and other corrupt practice and the decision makers will commit to prevent corruption, in any form, by their officials by following transparent procedures. This will also ensure a global acceptance of the decision making process adopted by DST.

Definition of Conflict of Interest:

Conflict of Interest means "any interest which could significantly prejudice an individual's objectivity in the decision making process, thereby creating an unfair competitive advantage for the individual or to the organization which he/she represents". The Conflict of Interest also encompasses situations where an individual, in contravention to the accepted norms and ethics, could exploit his/her obligatory duties for personal benefits.

1. Coverage of the Policy:

- a) The provisions of the policy shall be followed by persons applying for and receiving funding from DST, Reviewers of the proposal and Members of Expert Committees and Programme Advisory Committees. The provisions of the policy will also be applicable on all individuals including Officers of DST connected directly or indirectly or through intermediaries and Committees involved in evaluation of proposals and subsequent decision making process.
- b) This policy aims to minimize aspects that may constitute actual Conflict of Interests, apparent Conflict of Interests and potential Conflict of Interests in the funding mechanisms that are presently being operated by DST. The policy also aims to cover, although not limited to, Conflict of interests that are Financial (gains from the outcomes of the proposal or award), Personal (association of relative / Family members) and Institutional (Colleagues, Collaborators, Employer, persons associated in a professional career of an individual such as Ph.D. supervisor etc.)

2. Specifications as to what constitutes Conflict of Interest.

Any of the following specifications (non-exhaustive list) imply Conflict of Interest if,

- (i) Due to any reason by which the Reviewer/Committee Member cannot deliver fair and objective assessment of the proposal.
- (ii) The applicant is a directly relative# or family member (including but not limited to spouse, child, sibling, parent) or personal friend of the individual involved in the decision making process or alternatively, if any relative of an Officer directly involved in any decision making process / has influenced interest/ stake in the applicant's form etc..
- (iii) The applicant for the grant/award is an employee or employer of an individual involved in the process as a Reviewer or Committee Member; or if the applicant to the grant/award has had an employer-employee relationship in the past three years with that individual.
- (iv) The applicant to the grant/award belongs to the same Department as that of the Reviewer/Committee Member.
- (v) The Reviewer/Committee Member is a Head of an Organization from where the applicant is employed.
- (vi) The Reviewer /Committee Member is or was, associated in the professional career of the applicant (such as Ph.D. supervisor, Mentor, present Collaborator etc.)
- (vii) The Reviewer/Committee Member is involved in the preparation of the research proposal submitted by the applicant.
- (viii) The applicant has joint research publications with the Reviewer/Committee Member in the last three years.
- (ix) The applicant/Reviewer/Committee Member, in contravention to the accepted norms and ethics followed in scientific research has a direct/indirect financial interest in the outcomes of the proposal.
- (x) The Reviewer/Committee Member stands to gain personally should the submitted proposal be accepted or rejected.

The Term "Relative" for this purpose would be referred in section 6 of Companies Act , 1956.

3. Regulation:

The DST shall strive to avoid conflict of interest in its funding mechanisms to the maximum extent possible. Self-regulatory mode is however recommended for stake holders involved in scientific research and research management, on issues

pertaining to Conflict of Interest and scientific ethics. Any disclosure pertaining to the same must be made voluntarily by the applicant/Reviewer/Committee Member.

4. Confidentiality:

The Reviewers and the Members of the Committee shall safeguard the confidentiality of all discussions and decisions taken during the process and shall refrain from discussing the same with any applicant or a third party, unless the Committee recommends otherwise and records for doing so.

5. Code of Conduct

5.1 To be followed by Reviewers/Committee Members:

- (a) All reviewers shall submit a conflict of interest statement, declaring the presence or absence of any form of conflict of interest.
- (b) The reviewers shall refrain from evaluating the proposals if the conflict of interest is established or if it is apparent.
- (c) All discussions and decisions pertaining to conflict of interest shall be recorded in the minutes of the meeting.
- (d) The Chairman of the Committee shall decide on all aspects pertaining to conflict of interests.
- (e) The Chairman of the Committee shall request that all members disclose if they have any conflict of interest in the items of the agenda scheduled for discussion.
- (f) The Committee Members shall refrain from participating in the decision making process and leave the room with respect to the specific item where the conflict of interest is established or is apparent.
- (g) If the Chairman himself/herself has conflict of interest, the Committee may choose a Chairman from among the remaining members, and the decision shall be made in consultation with Member Secretary of the Committee.
- (h) It is expected that a Committee member including the Chair-person will not seek funding from a Committee in which he/she is a member. If any member applies for grant, such proposals will be evaluated separately outside the Committee in which he/she is a member.

5.2 To be followed by the Applicant to the Grant/Award:

- (a) The applicant must refrain from suggesting referees with potential Conflict of Interest that may arise due to the factors mentioned in the specifications described above in Point No. 2.
- (b) The applicant may mention the names of individuals to whom the submitted proposal should not be sent for refereeing, clearly indicating the reasons for the same.

5.3 To be followed by the Officers dealing with Programs in DST:

While it is mandatory for the program officers to maintain confidentiality as detailed in point no. 6 above, they should declare, in advance, if they are dealing with grant applications of a relative or family member (including but not limited to spouse, child, sibling, parent) or thesis/ post-doctoral mentor or stands to benefit financially if the applicant proposal is funded. In such cases, DST will allot the grant applications to the other program officer.

6. Sanction for violation

3.1 For a) Reviewers / Committee Members and b) Applicant

Any breach of the code of conduct will invite action as decided by the Committee.

3.2 For Officers dealing with Program in DST

Any breach of the code of conduct will invite action under present provision of CCS (conduct Rules), 1964.

7. Final Appellate authority:

Secretary, DST shall be the appellate authority in issues pertaining to conflict of interest and issues concerning the decision making process. The decision of Secretary, DST in these issues shall be final and binding.

8. Declaration

I have read the above "Policy on Conflict of Interest" of the DST applicable to the Reviewer/ Committee Member/ Applicant/ DST Scheme or Program Officer # and agree to abide by provisions thereof.

I hereby declare that I have no conflict of interest of any form pertaining to the proposed grant *
I hereby declare that I have conflict of interest of any form pertaining to the proposed grant *

* & # (Tick whichever is applicable)

Name of the Reviewer/ Committee Member or Applicant or DST Officer
(Strike out whichever is not applicable)

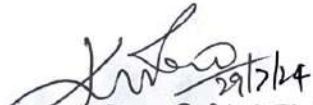

(Signature with date)
22/7/24

CERTIFICATE FROM THE INVESTIGATOR

PROJECT TITLE: **Risk Prediction in Pregnancy (RPP) using Vitals**

1. We agree to abide by the terms and conditions of the DST grant.
2. We did not submit this or a similar project proposal elsewhere for financial support.
3. We have explored and ensured that equipment and basic facilities will actually be available as and when required for the purpose of the project. We shall not request financial support under this project, for procurement of these items.
4. We undertake that spare time on permanent equipment will be made available to other users.
5. We have enclosed the following materials:

ITEMS	NUMBER OF COPIES
(a) Endorsement from the Head of the Institution (on letter head)	One
(b) Certificate from Investigator	One
(c) Certificate from Investigator regarding conflict of interest	One
(d) Name and address of experts/institution interested in the subject/ outcome of the project	One
(e) Copies of the proposals	One hard Copy


KOTHAPALLI VENKATA RAO

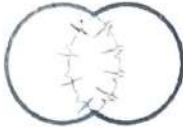
Name & Signature of
Principal Investigator


Meena G

Name & Signature Of
Co-Investigator(s)

Date: 29th July 2024

Place: Bengaluru



THALESAT

Thalesat Innovations Private Limited
Entrepreneurship Centre,
Indian Institute of Science (IISc) Campus,
Bangalore - 560012, Karnataka, INDIA
www.thalesat.com
CIN: U74999KA2017PTC107068

ENDORSEMENT FROM THALESAT INNOVATIONS PRIVATE LIMITED

PROJECT TITLE: **Risk Prediction in Pregnancy (RPP) using Vitals**

Thalesat Innovations Private Limited works in the area of providing personalized cures by applying digital innovations on individual biological insights. We are very interested in this project as we find the proposed solution to be very useful, efficient and affordable to detect risks in pregnancy. The company intends to take to the solution to the market once the project is successfully completed.

Regards,

Dr. Pradeep V Desai
CEO, Thalesat Innovations Private Limited,
Bengaluru,



Vision

To be the global leader in developing socially impactful digital healthcare solutions enriched with individualized biological insights

Mission

*To develop widely-applicable healthcare & wellness solutions using digital innovations to individualize biological insights
Personalized Cures Through Digital Innovations*



K.S. School of Engineering & Management

Approved by AICTE-1-5279601, Affiliated to VTU, Belagavi, **ACCREDITED BY NAAC**

#15, Near Vajarahalli, Mallasandra, off Kanakapura Road, Bengaluru - 560 109

Ph : +91 80 2842 5163, Mob : 88844 44408 / 96060 55906, Website : www.kssem.edu.in

ENDORSEMENT FROM THE HEAD OF INSTITUTION

PROJECT TITLE: Risk Prediction in Pregnancy (RPP) using Vitals

1. Certified that the Institute welcomes participation of Dr. K Venkata Rao as the Principal Investigator and Smt. Meena G as the Co-Investigator for the project and that in the unforeseen event of discontinuance by the Principal Investigator, the Co-Investigator will assume the responsibility for the fruitful completion of the project (after obtaining consent in advance from DST).
2. Certified that the equipment, other basic facilities and such other administrative facilities as per terms and conditions of the grant, will be extended to investigator (s) throughout the duration of the project.
3. Institute assures financial and other managerial responsibilities of the project.
4. Certified that the organization has never been blacklisted by any department of the State Government or Central Government.

K. Rama 27/7/24

Name and Signature of Head of Institution

Dr. K. RAMA NARASIMHA

Principal/Director

K S School of Engineering and Management

Bengaluru - 560 109

Date: 27th July 2024

Place: Bengaluru

SALES QUOTATION

Quotation No:BWITPL/KSIT/JULY '24/A1

Date:30/07/2024

To,
KSSEM

Kind Atten: Mr Venugopal

Sub: Proposal for the HP ZBOOK

Dear Sir,

We thank you for giving us the opportunity to submit the proposal of Laptop.

Bluewave IT Solutions Pvt. Ltd is an ISO Certified Company established in 2011. We are into IT Product Solutions, Sales and Services.

We have the expertise and resources required to design, develop and manage the highly available and highly secure technology platform that you need, giving you the time and confidence to focus on running your Business. The reasons why you should choose us to build your infrastructure, support your people and Systems, as well as advise you on projects that will reduce your risk, enhance your productivity and give you a real competitive edge.

We are keen to look at a long lasting and fruitful partnership between our companies enabling us to provide more to your organization.

S.No	Description	Qty	Unit Price	Total Amount	Tax	Total Including Tax	Delivery
1	HP Zbook Firefly 16 G11 Mobile Workstation - Intel U7-155H/16GB DDR5 RAM /1TB SSD/Nvidia RTX A500 4GB Graphics /Win11 Pro/16" FHD/ 3 Years Onsite Warranty/ Backpack	1	1,22,200	1,22,200	28%	1,56,416	Within 1 Week
2	HP Zbook Firefly 14 G11 Mobile Workstation - Intel U7-155H/16GB DDR5 RAM /1TB SSD/Nvidia RTX A500 4GB Graphics /Win11 Pro/14" FHD/ 3 Years Onsite Warranty/ Backpack	1	1,21,000	1,21,000	18%	1,42,780	Within 1 Week
Terms & conditions							
1	Tax: GST as mentioned in the commercial offer, If any change in the GST at the time of billing will be applicable.						
2	Payments Terms : 30 Days Net from Date of Invoice						
3	Delivery: As mentioned above						
4	Offer Validity : 7 Days						
5	Order to be placed on: Blue Wave IT Solutions India Pvt Ltd #379,2nd Floor,5th Main, Sector 6, HSR Layout Bengaluru-560102, Karnataka						
6	Warranty: As mentioned Above						

We look forward for your valuable order at the earliest.
Assuring you of our best services and attention at all times.

Thanking You,

For Blue Wave IT Solutions India Private Limited

Pradeep Kumar

Regional Head- Bengaluru, KA

Mob- 8147443498

pradeep@bluewaveits.com