

Quarterly Progress and Performance Indicators Report:

Project Number and Title: 4-12 Proactive and Intelligent Risk Management in Complex Civil Infrastructure Project Systems

Research Area: Thrust 4 Connectivity for enhanced asset and performance management

PI: Jin Zhu, Ph.D. Assistant Professor, University of Connecticut

Reporting Period: October 2021-December 2021

Submission Date: December 31, 2021

*****IMPORTANT:** Please fill out each section fully and reply with N/A for questions/sections with nothing to report. For ease of reporting to the USDOT, please do not remove, or change the order of, any sections/text. You may remove/add each rows in tables as needed. Thank you! ***
The report is due on the last day of the reporting period in .doc format to tidc@maine.edu.

Overview:

Provide **BRIEF** highlights of activities performed during the reporting period. This summary should be written in lay terms for a general audience to understand. This should not be an extensive write up of findings (those are to be included in the final report), but a **high-level overview of the activities conducted during the last three months no more than 3 bullet points at no more than 1 sentence each**

During the past three months, we focused on the following activities:

- Literature review
- Meeting with CTDOT technical champion to discuss data source
- Designing database structure

Meeting the Overarching Goals of the Project:

How did the previous items help you achieve the project goals and objects? Please give one bullet point for each bullet point listed above.

- Activity 1 helps to understand the problem and prepare for data collection;
- Activity 2 helps to obtain the data from DOT and future research collaboration;
- Activity 3 helps to complete the data collection task.

Accomplishments:

List any accomplishments achieved under the project goals in bullet point form...

1. A list of construction project factors that will be used as input indicators in the machine learning module

Task, Milestone, and Budget Progress:

Complete the following tables to document the work toward each task and budget (add rows/remove rows as needed, make sure you complete the Overall Project progress row and include all tasks even if they have ended or have not been started)...

Table 1: Task Progress			
Task Number: Title	Start Date	End Date	% Complete
Task 1: Data collection and database development	October 1, 2021	Feb 28, 2022	40%

Task 2: Machine learning model development and training	Feb 28, 2022	June 30, 2022	0%
Task 3: Simulation model development	July 1, 2022	Jan 31, 2023	0%
Task 4: Strategy evaluation	Jan 31, 2023	July 31, 2023	0%
Task 5: Reporting	July 15, 2023	Sep, 2023	0%
Overall Project: 4-12 Proactive and Intelligent Risk Management in Complex Civil Infrastructure Project Systems	October 1, 2021	Sep, 2023	10%

Table 2: Milestone Progress

Milestone #: Description	Corresponding Deliverable	Start Date	End Date
1.1 Completion of designing database template	Database template in Excel	10/1/2021	1/1/2022
1.2 Completion of data collection and database development	A project database	11/1/2021	2/28/2022
2.1 Completion of machine learning model development	A preliminary machine learning model in MATLAB	1/1/2022	5/30/2022
2.2 Completion of machine learning model validation	A validated machine learning model	5/30/2022	6/30/2022
3.1 Completion of developing the conceptual framework for simulation model	A conceptual framework for simulation model	7/1/2022	8/15/2022
3.2 Completion of computational model based on selected case study	Computational simulation model in MATLAB	8/15/2022	1/31/2023
4.1 Completion of collecting information on risk mitigation strategies	A report including a list of risk mitigation strategies	2/1/2023	3/31/2023
4.2 Completion of running simulation experiments implementing risk mitigation strategies	A summary of simulation results and analysis	4/1/2023	7/31/2024
5.1 Completion of final report	Final report	7/15/2023	9/30/2023

Table 3: Budget Progress

Project Budget	Spend – Project to Date	% Project to Date (include the date)
\$149,127.97	the information will be provided by the Institutional Lead	the information will be provided by the Institutional Lead

Is your Research Project Applied or Advanced?

- Applied** (*The systematic study to gain knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.*)
- Advanced** (*An intermediate research effort between basic research and applied research. This study bridges basic (study to understand fundamental aspects of phenomena without specific applications in mind) and applied research and includes transformative change rather than incremental advances. The investigation into the use of basic research results to an area of application without a specific problem to resolve.*)

Education and Workforce Development:

Answer the following questions (N/A if there is nothing to report):

1. Did you provide any workforce development or training opportunities to transportation professionals (already in the field)? If so, what was the training? When was it offered? How many people attended? (i.e. The research team provided an in the field training for the SAR technology for 3 maintenance crew members of the MassDOT on 3/31/2021. The members learned how to use the technology and interrupt the data.)
n/a
2. Did you hold meetings with any transportation industry organizations or DOTs? If so, what was the meeting’s purpose? When was it offered? How many people attended? (i.e. The research team held a meeting with MaineDOT to update them on the progress of the research findings and how the findings can be implemented on 3/31/2021. 15 DOT maintenance members were present at the meeting.)
The PI held a meeting with CTDOT to brief the project and coordinate with data collection.
3. Did you host/participant in any K-12 education outreach activities? If so, what was the activity? What was the target age/grade level of the participants? How many students/teachers attended? When was the activity held? (i.e. 25 8th graders and 2 teachers visited the concrete lab and created small concrete trinkets like Legos on 3/31/2021. They learned about the different types of fibers that can be used in the concrete.)
n/a

Technology Transfer:

Complete all of the tables below and provide additional information where requested. Please provide ALL requested information as this is one of the most important sections for reporting to the USDOT. **ONLY provide information relevant to this reporting period.**

Use the table below to complete information about conference sessions, workshops, webinars, seminars, or other events you led/attended where you shared findings as a result of the work you conducted on this project:

Table 4: Presentations at Conferences, Workshops, Seminars, and Other Events					
Type	Title	Citation	Event & Intended Audience	Location	Date(s)

Use the table below to report any publications, technical reports, peer-reviewed articles, newspaper articles referencing your work, graduate papers, dissertations, etc. written as a result of the work you conducted on this project. Please list only completed items and exclude work in progress.

Table 5: Submitted/Accepted Publications, Technical Reports, Theses, Dissertations, Papers, and Reports				
Type	Title	Citation	Date	Status

Answer the following questions (N/A if there is nothing to report):

1. Did you deploy any technology during the reporting period through pilot or demonstration studies as a result of this work? If so, what was the technology? When was it deployed?
n/a
2. Was any technology adopted by industry or transportation agencies as a result of this work? If so, what was the technology? When was it adopted? Who adopted the technology?
n/a
3. Did findings from this research project result in changing industry or transportation agency practices, decision making, or policies? If so, what was the change? When was the change implemented? Who adopted the change?
n/a
4. Were any licenses granted to industry as a result of findings from this work? If so, when? To whom was the license granted?
n/a
5. Were any patent applications submitted as a result of findings from this research? If so, please provide a copy of the patent application with your report.
n/a
6. Did industry organizations or DOTs provide cost-share (cash or in-kind) to your research during the reporting period? Who was the organization? Please provide an in-kind support invoice from the organization with your report (this is kept confidential and used for record keeping purposes only).
n/a

Please add figures/images that can be included on the website and/or in marketing/social media materials to further clarify your research to the general public. This is very important to our Technology Transfer initiatives.

Insert figures here

Describe any additional activities involving the dissemination of research results not listed above under the following headings:

Outputs:

Definition: Any new or improved process, practice, technology, software, training aid, or other tangible product resulting from research and development activities. They are used to improve the efficiency, effectiveness, and safety of transportation systems. List any outputs accomplished during this reporting period:

n/a

Outcomes:

Definition: The application of outputs; any changes made to the transportation system, or its regulatory, legislative, or policy framework resulting from research and development activities. List any outcomes accomplished during this reporting period:

n/a

Impacts:

Definition: The effects of the outcomes on the transportation system such as reduced fatalities, decreased capital or operating costs, community impacts, or environmental benefits. The reported impacts from UTCs are used for the assessment of each UTC and to make a case for Federal funding of research and education by demonstrating the impacts that UTC funding has had on technology and education. NOTE: The U.S. DOT uses this information to assess how the research and education programs (a) improve the operation and safety of the transportation system; (b) increase the body of knowledge and technologies; (c) enlarge the pool of people trained to develop knowledge and utilize technologies; and (d) improves the physical, institutional, and information resources that enable people to have access to training and new technologies. List any outcomes accomplished during this reporting period:

This proposed research has the potential to help mitigate risks and enhance performance in transportation projects construction. By doing so, the investment on transportation infrastructure could be more efficiently used to improve the durability and quality of the nation's transportation network.

Participants and Collaborators:

Use the table below to list individuals (compensated or not) who have worked on the project other than students.

Table 6: Active Principal Investigators, faculty, administrators, and Management Team Members				
Individual Name & Title	Dates involved	Email Address	Department	Role in Research
Jin Zhu, Assistant Professor	October 1, 2021	jzhu@uconn.edu	Civil and Environmental Engineering	PI

Use the table below to list **all** students who have participated in the project during the reporting period. (This includes all paid, unpaid, intern, independent study, or any other student that participated in this project.) **ALL FIELDS ARE REQUIRED.**

Table 7: Student Participants during the reporting period								
Student Name	Start Date	End Date	Advisor	Email Address	Level	Major	Funding Source	Role in research
Sudipta Chowdhury	Oct 1, 2021	-	Jin Zhu		PhD	Transportation Engineering	TIDC	Conducting literature review

Use the table below to list any students who worked on this project and graduated or received a certificate during this reporting period. Include information about the student's accepted employment during the reporting period (i.e. the student is now working at MaineDOT) or if they are continuing their students through an advanced degree (list the degree and where they are attending).

Table 8: Students who Graduated During the Reporting Period			
Student Name	Degree/Certificate Earned	Graduation/Certification Date	Did the student enter the transportation field or continue another degree at your university?
			Please list the organization or degree

Use the table below to list any students that participated in Industrial Internships during the reporting period:

Table 9: Industrial Internships			
Student Name	Degree/Certificate Earned	Graduation/Certification Date	Did the student enter the transportation field or continue another degree at your university?
			Please list the organization or degree

Use the table below to list **organizations** that have been involved as partners on this project and their contribution to the project during the reporting period.

Table 10: Research Project Collaborators during the reporting period		
Organization	Location	Contribution to the Project

		Financial Support	In-Kind Support	Facilities	Collaborative Research	Personnel Exchanges
		List the amount	List the amount	Mark with an “x” where appropriate		

Use the table below to list **individuals** that have been involved as partners on this project and their contribution to the project during the reporting period. (**List your technical champion(s) in this table.** This also includes collaborations within the lead or partner universities who are not already listed as PIs; especially interdepartmental or interdisciplinary collaborations.)

Table 11: Other Collaborators				
Collaborator Name and Title	Contact Information	Organization and Department	Date(s) Involved	Contribution to Research
William S. Pratt, Principal Engineer	william.pratt@ct.gov	CTDOT	Oct 1, 2021	Technical champion

Use the following table to list any transportation related course that were taught or led by researchers associated with this research project during the reporting period:

Table 12: Course List						
Course Code	Course Title	Level	University	Professor	Semester	# of Students
CE 5030	Sem in Transportation and Urban Engineering	Grad	University of Connecticut	Jin Zhu	Fall 2021	15
CE 4999	Independent Study Civil Engineering	Undergrad	University of Connecticut	Jin Zhu	Fall 2021	1

Changes:

List any actual or anticipated problems or delays and actions or plans to resolve them (list no-cost extension requests here)...

List any changes in approach and the reasons for the change...

Planned Activities:



List the activities planned during the next quarter.

1. Continue data collection
2. Start machine learning model development