



Michigan Tech
Transportation Institute
Pasi Lautala, Director

Annual Report 2024



MISSION

The Michigan Tech Transportation Institute will provide the operating structure, resources, recognition, and leadership, in a collaborative environment, that supports research, education and outreach leading to sustainable solutions for transportation.

VISION

Partnering for the future of transportation.

FOCUS

The Michigan Tech Transportation Institute (MTTI) is a multidisciplinary affiliation of faculty and professional staff actively engaged in a wide range of transportation-related activities. MTTI has a singular charge; to leverage University resources for the purpose of increasing external funding of transportation-related activities including research, education, training, product development, outreach, and technology transfer to assist in development of transportation systems. To achieve this goal, MTTI provides an administrative structure and resources for programs, individuals, and initiatives. MTTI resources are necessarily distributed to support activities of the Institute.

SUMMARY OF FY24 HIGHLIGHTS

MTTI received positive feedback on the submission of the five-year annual renewal report by the Vice President of Research (VPR) Office and was awarded an extension of the Institute for an additional five years through December 2028.

MTTI continued outreach to the campus community by providing multiple informational sessions on research opportunities available through in person meetings and via Zoom.

Two general membership meetings, open to all researchers on campus, were held over the past fiscal year in September 2023 and April 2024. The meetings provide an overview of MTTI and encourage members outside the typical transportation area to join as well.

At the invitation of Director Pasi Lautala, MDOT research leadership team flew to the MTU campus for meetings with the MTTI Executive Committee, faculty conversations and lab and facility tours.

MTTI continued to update members, campus faculty, and outside subscribers on research projects, faculty and student awards, and upcoming events through the newsletter. We also started a regular “Director’s message” that provided members with monthly information and encouragement to grow transportation research and other activities on campus.

While the research expenditures of MTTI were still somewhat subdued, research awards to the institute increased from \$1.6 million to \$5.5 million over the past year, demonstrating significant growth. We expect this growth to continue and to translate to increased expenditures during FY25.

GOVERNANCE STRUCTURE

MTTI is governed by a member elected Director and five-member Executive Committee. The Director is approved by the VPR Office and is responsible for the overall operation of the organization.

The Director is the main representative internally to the university and externally to other universities, state and federal agencies and private organizations. The Director is installed, renewed, or removed in accordance with procedures outlined in the MTTI By-Laws. The Director reports to the Vice President of Research.

The Executive Committee consists of five members elected by and from the Institute's Principal and Affiliate Members. An elected term for an Executive Committee member is three (3) years and terms are staggered such that at least one (1) member is elected yearly. The Executive Committee also includes the MTTI Director serving as an ex officio (non-voting) member.

The Director and Executive Committee establish policies/procedures and recommend strategic financial decisions, including but not limited to an annual MTTI operating budget, project cost share commitments, staffing decisions to support the activities of the Institute, capital investments, and other strategic initiatives.

The MTTI fiscal year 2024 Executive Committee included Colin Brooks (MTRI) and Beth Veinott (CLS) as affiliate members. Principal members were Kuilin Zhang (CEGE), Zhanping You (CEGE), Barbara Dai (CEGE). Pasi Lautala (CEGE) served as Director.

Elections for rotating members are held annually during the spring semester.

MEMBERSHIP

MTTI membership is open to all campus researchers. Members are divided into two groups: principal members and affiliate members. All others are invited to be friends of the institute.

Principal Members - Those eligible for membership who in the last three years have served as the Principal Investigator (PI) or Co-Principal Investigator (Co-PI) on one or more MTTI Activities that result in combined average IDC recovery greater than or equal to \$5000/year over the three previous fiscal years.

Affiliate Members – Eligible PI or Co-PI (as defined previously) with successfully awarded project(s) that qualify as a MTTI Activity(-ies) but does not meet the combined minimum \$5,000/year IDC rule over the three previous fiscal years. Additionally, one may qualify as an Affiliate Member if he/she has submitted at least three proposals in the last three fiscal years through MTTI.

Friends of the Institute - All others who request to join MTTI as a friend.

New members to the institute in fiscal year 2024 include Yui Zhu and Sadeep Chitta (both CEGE). A list of current members is included in Appendix A.

MEMBERSHIP INVOLVEMENT AND CAPACITY BUILDING

MTTI continues to host informational sessions on current and upcoming funding opportunities for our members and other campus researchers. The meetings are available via Zoom and in person, allowing us to reach the maximum number of interested individuals. While the main audience is current and prospective MTTI members, we consider MTTI as an umbrella organization that concentrates on transportation and mobility research and activities across campus. Hence, all events, visits, and activities integrate and encourage participation of all relevant stakeholders across the campus, regardless their primary department, institute or center.

During fiscal year 24:

- MTTI hosted a public seminar for investigators interested in research, featuring keynote speaker, Robert Ledoux, program director for the U.S. Department of Energy's Advanced Research Projects Agency–Energy (ARPA-E).

The goal of ARPA-E is to advance high-potential, high-impact energy technologies that are too early for private-sector investment. ARPA-E awardees are developing entirely new ways to generate, store and use energy. MTTI has had multiple research projects awarded by ARPA.

- In addition to the ARPA-e seminar, MTTI also held an informational session recapping the Advanced Research Projects Agency - Infrastructure (ARPA-I) workshop held by the USDOT. ARPA-I is a new program that will fund high-risk, high-reward next-generation transportation technologies. In addition to MTTI members, we also had presenters from Center for Technology and Training (CTT) and Michigan Tech Research Institute (MTRI).
- MTTI also held informational sessions on two rail transportation related opportunities. The Federal Railroad Administration (FRA) Broad Agency Announcement for Research Initiatives in Support of Rail Safety session reviewed the research topics available plus provided instructions on the application process and examples of current MTTI projects funded by the FRA.

The second session provided information on the MxV Rail solicitation addressing the Grand Challenge research topics in railway technology. The purpose of this request for proposals (RFP) is to solicit a variety of innovative applied technologies for railway research projects and provide seed money to demonstrate the feasibility of the project and the effectiveness of the project team.

- At the spring 2024 MTTI general meeting, Director Pasi Lautala was joined by Tim Colling (CTT) and Colin Brooks (MTRI) to provide information on the Transportation Research Board annual conference and advised members on how to join the TRB committees.
- MTTI hosted a luncheon titled “Learn About Transportation/Mobility Research Opportunities” which focused on MDOT’s request for research ideas towards future funding cycles. An overview was also given of Michigan Tech's participation in the

development of the largest surface transportation center by ENSCO and Federal Transportation Administrations in Pueblo, Colorado.

- In addition to MTTI events, the Rail Transportation Program (RTP) hosts regular events specific toward growth of rail transportation education and research on campus. In FY24, RTP hosted its traditional Railroad Night, including Maryam Allahyar, Director of Research and Development for the Federal Railroad Administration (FRA) as keynote. RTP also supports the and the Railroad Engineering and Activities Club (REAC) and their monthly meetings with industry speakers. RTP also hosted Rail Alumni night with more than 20 students and alumni at the Railway Interchange (Indianapolis, IN).

In addition to the informational sessions, MTTI also hosts visitors on campus. In response to an invitation by MTTI Director Pasi Lautala, members of the Michigan Department of Transportation (MDOT) research staff enjoyed a visit to MTU’s campus in early June. Michael Townley, engineer of research at MDOT, was joined by Dean Kartiz, MDOT project program manager, and Heidi Spangler, MDOT innovation engineer, for site visits and meetings. The day’s agenda included center and lab tours, a luncheon with the MTTI Executive Committee and presentations of research by the newer faculty on campus.

BUDGET OVERVIEW

FY24 BUDGET SUMMARY

The MTTI Director and Executive Board set an annual budget for the use of IRAD expenditures earned in support of our members. The proposed and actual budgets for FY24 are included below. As can be seen, the actual budget ended up being only 50% of the proposed. The main reason was significant overestimation of IRAD returns from ASPIRE. Several large contracts were taking months (sometimes of six months) to complete, so our expenditures were well below expected. Hence, we had to cut back most discretionary funding to support our lone staff member. We expect this situation to improve during FY25.

Budget FY24	Proposed	Actual
Faculty Summer (Director)	\$10,000	
Other - Pam Hannon	\$45,000	\$41,361
Other Technical Staff	\$10,000	\$511
Fringe Benefits	\$24,000	\$16,330
Equipment		
Travel/Meals	\$6,000	\$323
Supplies/Events	\$4,000	\$2,020
Services (Fees) - MnDOT	\$2,000	\$2,372
Other - Education	\$2,000	
Other - Cost Share	\$7,000	\$6,744
	\$110,000	\$69,660

IRAD

The Institutional Research and Development (IRAD) funds allocated to MTTI by the Vice President of Research Office have been primarily used for staff wages in support of proposal development over the past several years, which continues to be a strength of the institute. Most of the home departments for our research faculty do not have dedicated personnel for proposal development. Over the past fiscal year, we have submitted 52 proposals by fifteen PIs to various research entities in the amount of \$20,094,259.

Other types of support have been limited since the pandemic, mainly due to reduction in research expenditures, and hence IRAD returns. MTTI currently supports our researcher members financially by funding the cost of the \$2,000 annual fee for research with the Minnesota Department of Transportation which allows MTTI members to submit proposals to the Local Road Research Board (LRRB) program.

Cost share funding was awarded to two projects during this fiscal year in the form of staff support and for PI or student travel. We anticipate additional cost share funding in the future as IRAD returns increase.

MTTI also funds multiple informational sessions with refreshments each year, for all researchers of the campus community plus the annual general membership meetings and supports visitors to campus. According to its bylaws, MTTI also offers portion of its IRAD returns as cost share, as necessary, although we have recently taken steps to restrict such cost share to staff time.

An overall graph depicting MTTI membership funding is provided in Figure 1.

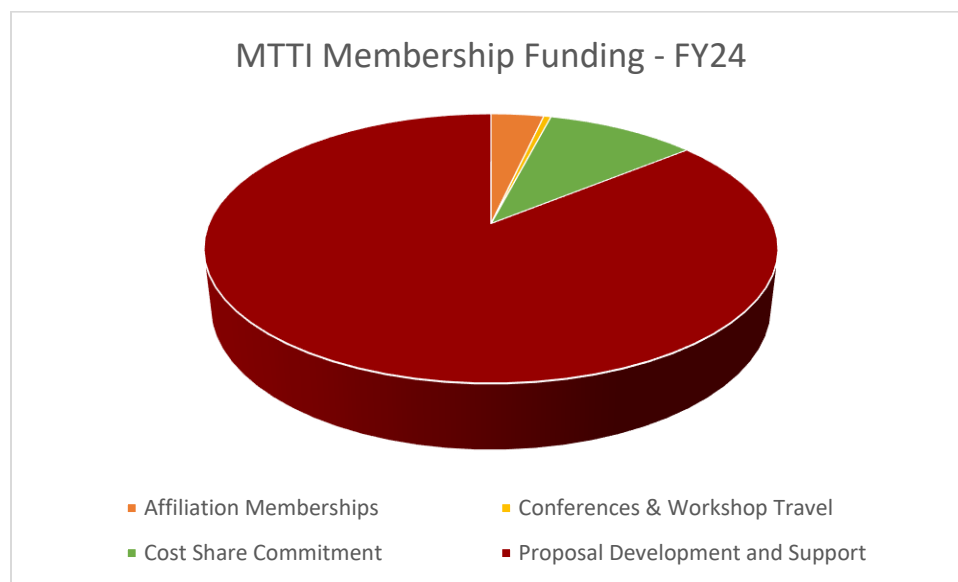


Figure 1: Membership Funding 2024

With more than 200% increase in awards during FY24, we expect to see an increase in research expenditures and IRAD revenue in FY25. Once finances are stabilized, the Executive Committee is planning to reinstate other types of investments, starting with member travel stipends that mainly

support conference presentations by graduate students. Other types of investments will be considered based on actual quarterly returns.

The MTTI director is also the Principal Investigator on the Michigan Department of Transportation five-year master contract with the university. At the invitation of MTTI, the MDOT research team has visited campus labs and facilities plus met with researchers this past year. The MDOT current director is scheduled for a return visit to MTU in November 2024. The Executive Committee will explore relationships with other state agencies within and outside Michigan, such as the Wisconsin DOT in the near future.

PROPOSAL LIST

A list of proposals submitted in FY24 is found in Appendix B.

PROPOSALS, PROJECTS, AWARDS

In fiscal year 24, MTTI researchers submitted **53** proposals to **40** different sources requesting **\$20,094,259** in funding. **19** projects were awarded with an award value of **\$5,449,840**. Overall, MTTI currently has **38** projects in progress valued at **\$14,744,031**.

Figure 2 below provides a summary of proposals, awards, and on-going projects over the previous five fiscal years. Figure 3 provides the awards for the past five fiscal years.

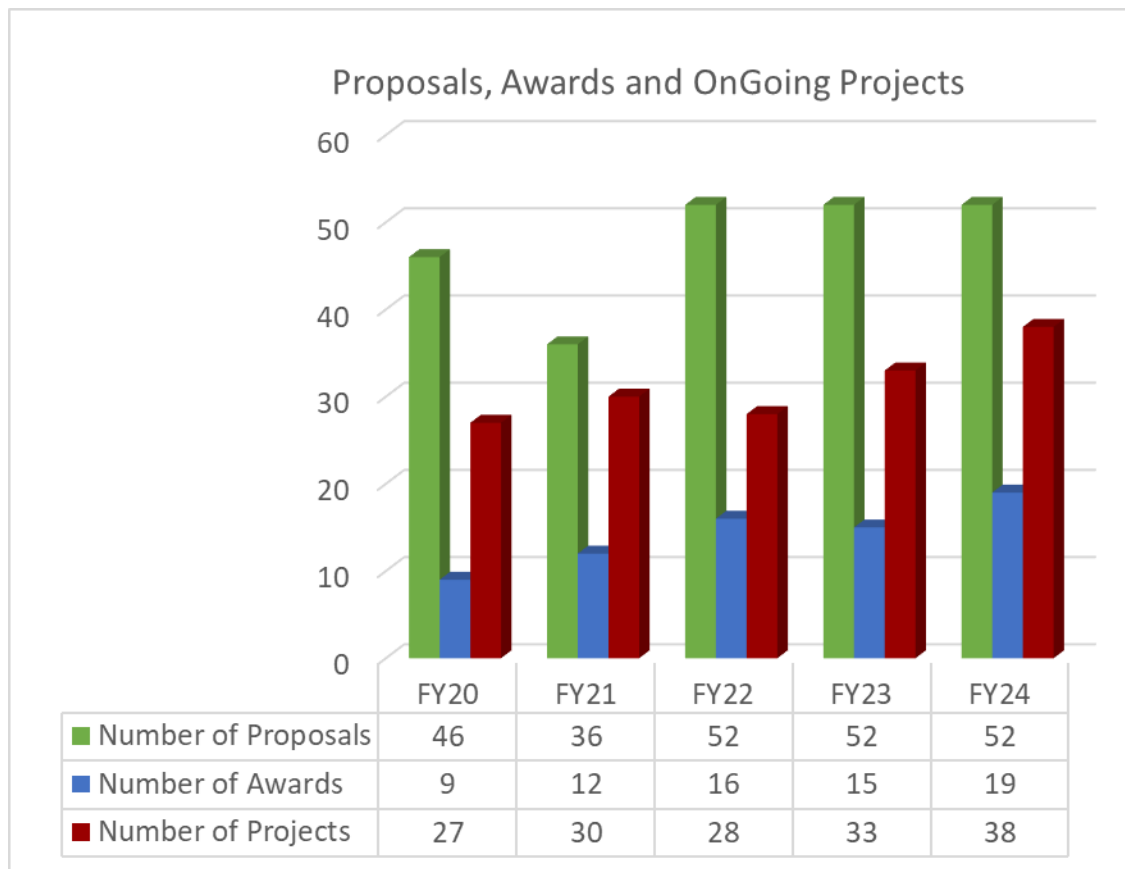


Figure 2: Proposals, Awards, and Projects (FY20-FY24)

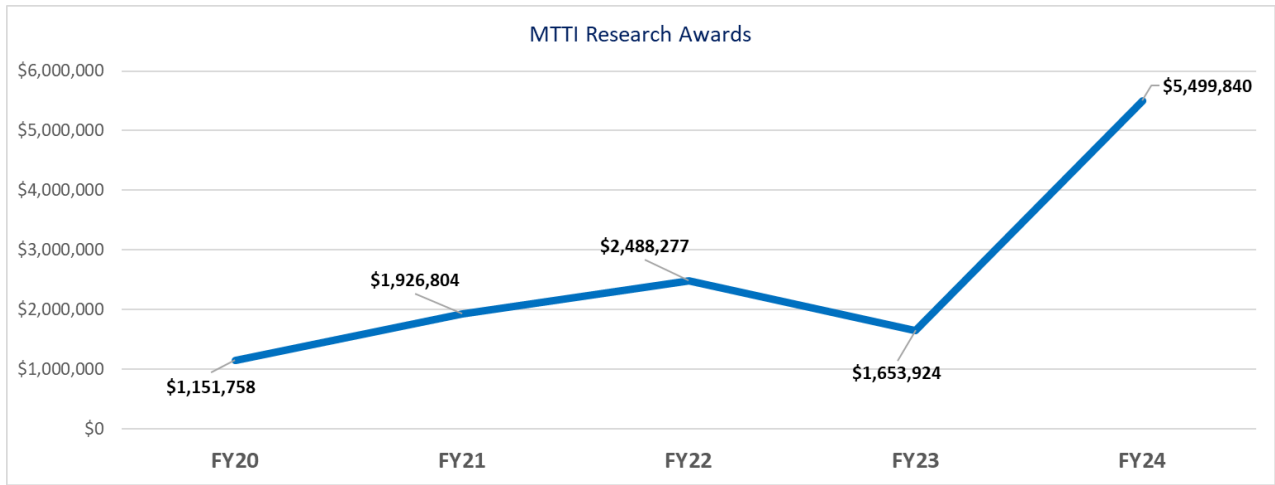
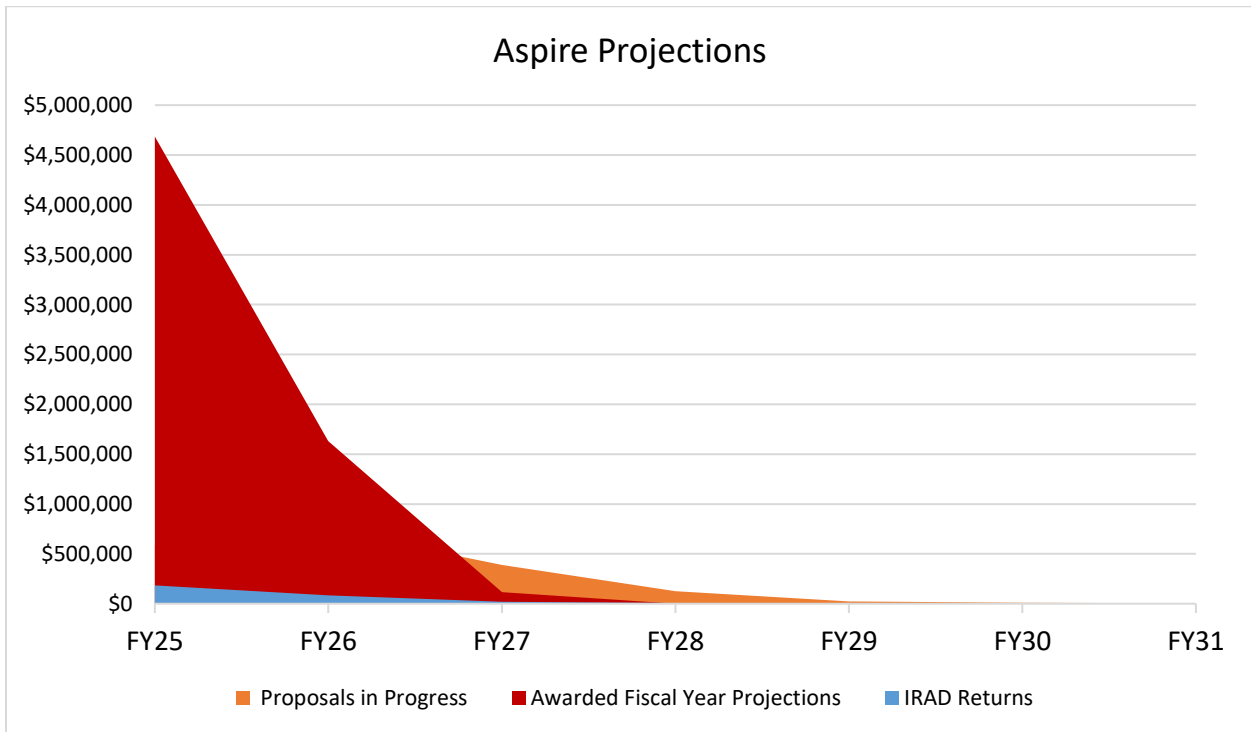


Figure 3: MTTI Research Awards Past 5 Years

ASPIRE PROJECTIONS

Figure 4 (ASPIRE Projections) and the related table show proposal value, award value, and IRAD return projections for MTTI from FY25 through FY31. Per projections, MTTI IRAD revenues are expected to grow by 200% in FY25. However, based on past fiscal years, we expect the actual increase to be between 75-100%



ASPIRE	FY25	FY26	FY27	FY28	FY29	FY30	FY31
Proposals in Progress	\$588,396	\$742,084	\$390,044	\$127,261	\$22,501	\$11,812	\$2,383
Awarded Fiscal Year Projections	\$4,684,819	\$1,630,824	\$116,245	\$0	\$0	\$0	\$0
IRAD Returns	\$183,713	\$85,489	\$19,503	\$5,705	\$973	\$493	\$101

Figure 4: ASPIRE Projects (FY25 – FY31)

FUTURE PLANS AND GOALS

STRATEGIC PLANS AND GOALS

As stated earlier, MTTI went through a renewal process in fall 2024. Our strategic plans and goals were established in the renewal request but have been adjusted based on the feedback provided by the administration as part of the renewal decision. The following section highlights the specific actions and plans by MTTI to date and beyond as a response to the administration feedback:

- **Grow membership in numbers and span of departments**
This continues to be a priority of the Executive Committee. We've increased our communication with our members and Michigan Tech research community through regular newsletter, Director's message, MTTI membership meetings and information sessions (both open to everyone), We will continue this for the FY25.
- **Engage with state and national agencies to build relationships**
To date, our efforts have concentrated on State of Michigan agencies (especially MDOT), but we're also expanding to national agencies, such as Federal Railroad Administration (FRA) and Environmental Protection Agency (EPA)
- **Participate in strategic hiring of transportation faculty**
MTTI will be active participant in discussing the needs for transportation and mobility faculty. We also see ourselves in investing the faculty (start-up packages), but only after the fiscal situation has improved.
- **Collaborate with other centers/institutes for IRAD sharing**
MTTI currently has collaborative projects with the Great Lakes Research Center, the Michigan Tech Research Institute and the Cognitive and Learning Sciences. MTTI faculty has also facilitated funded projects that are now led by Institute of Materials Processing (IMP) and Advanced Power Systems Laboratory (APS Labs). We will continue to explore collaborations with aligning institutes and will work toward a shift from facilitating the projects to become IRAD sharing partners.
- **Build new hire participation with incentives**
To provide funding for new hire roles, increased revenues to the Institute would be required. At this time, with one of the lower institutes IRAD return rates of 15.5%, the funding will have to come from other entities on campus. We expect to be able to re-start our incentive programs in FY25 due to increased IRAD returns. The first program will be support for graduate student conference presentations for MTTI members.
- **Identify associate chair members from Executive Committee for continuation in leadership**
Currently, Zhanping You (CEGE) is the Chair of the Executive Committee, elected in 2023. In the event that Pasi Lautala is not able to continue to serve as director, the Chair would assume the leadership role of MTTI and a new Chairperson would be elected.

FINANCIAL AND MEMBERSHIP GOALS TO ENHANCE MEMBERSHIP

As a condition of the five-year renewal awarded to MTTI in 2023, the Executive Committee is tasked with growing membership in numbers and across departments. Expansion of MTTI researchers in numbers and diversity has been a continual goal of the Institute over the years. To increase awareness of the institute and to attract new members, MTTI holds general meetings twice annually, open to all members of the research community. In addition, our informational sessions on research opportunities available are open and marketed to all at MTU. We will continue to recruit throughout FY25.

With IRAD returns increasing again, MTTI will also provide travel incentives to members and students. As our revenue increases, we are expecting to start supporting visits by funding agency representatives, or to the funding agencies by our members. The strategy beyond these initiatives will be discussed with our membership during FY25.

SPACE AND FACILITY NEEDS

MTTI continues to have access to the spaces listed below. In addition, MTTI members share research and lab space with other departments.

- 301J Dillman Hall (Conference room)
- 315 Dillman Hall (CN RTEC Media Room/CTT Webinar studio)
- 316 Dillman Hall (CN Rail Transportation Education Center),
- 318A and 318B offices,
- 318 cubicle and
- 301B Dillman Hall.

There are no immediate additional space requirements for the Institute.

FINANCIAL DEFICIT IN ACHIEVING GOALS

Although research awards have greatly increased over the past year, IRAD earned is down from the previous year. Many of our proposals do not collect the full 56.5% facilities and administrative costs available in their research budgets, lowering the overall return to the institute.

Additionally, research expenditures have been flat which also delays revenue returns to the Institute. We do expect the expenditures to grow significantly for FY25 and beyond which will enhance our operating capabilities.

STRATEGIES TO FILL DEFICIT

We have begun charting proposal development hours with the goal of reducing proposal support to those proposals with lower F&A rates. If the data reveals negative financial return for MTTI from certain projects, we will limit the MTTI-funded development hours. We have also shifted MTTI

policy for cost share. For any new proposals, it is limited to staff time provided by the Institute, instead of direct transfer to the PIS.

We are communicating to PIs the importance of timely expenditures and invoicing for the projects. Many of our projects are now “fixed fee” per milestones/deliverables, but there is no clear communication path between PIs and SPA to make sure invoices are submitted on a timely basis.

Finally, we are continuously looking for opportunities with other Tier-2 institutes for sharing staff when available, so we can maximize the productivity of our limited human resources.

CHALLENGES AND BARRIERS

MTTI’s primary research focus continues to be transportation and mobility related research, but we are not the only institute addressing those topics. Hence, several projects relevant for MTTI are using other Centers/Institutes, reducing MTTI growth and awards. MTTI tries to maintain its status as umbrella organization for all transportation and mobility related research, but we also realize that sometimes initiatives/events organized by MTTI end up with direct benefits to other institutes/centers. We still consider this a “win”, but it creates a challenging fiscal environment, if the investment by MTTI doesn’t lead to MTTI-specific returns.

Although MTTI has collaborated with a few centers and institutes on campus, there remains a competitive nature to process of collecting new members and providing incentives to them. We would prefer a more collaborative approach and will try to shift toward shared reward model whenever possible.

APPENDIX A: FY24 MEMBERS

Brooks, Colin
Buller, William
Chatterjee, Snehamoy
Chitta, Sandeep
Colling, Timothy
Dai, Qingli
Darestani, Yousef
Eiris, Ricardo
Erfani, Abdolmajid
Ge, Dongdong
Handler, Rober
Kim, Jae Sung
Jin, Dongzhao
Lautala, Pasi
Malladi, Sriram
Minkata, Daisuke
Morse, Audra
Mueller, Shane
Nelson, Dave
Nguyen, Vinh
Oliver, Tom
Perrine, Kathryn
Sadeghi, Mohammad
Sanders, Paul
Swartz, Andrew
Ten, Chee-Wooi
Tran, Quang
Veinott, Elizabth
Watkins, Dave
Xiao, Bo
Yang, Y
You, Zhanping
Zhang, Kuilin
Zhu, Yui

APPENDIX B: PROPOSALS SUBMITTED FY24

PI	Sponsor	Full Project Title	Total Sponsor Costs	Total Project Cost
Zhanping You	Michigan Soybean Committee	Using soybean oil to improve the infrastructure construction and maintenance	\$ 250,000.00	\$ 374,106.00
Pasi Lautala	US Dept of Transportation/Federal Railroad Administration	Expanding Summer Youth Programs in Rail through Virtual Learning and National Campus Network	\$ 297,520.00	\$ 297,520.00
Pasi Lautala	University of Texas/Austin	"Guidebook for Railway-themed K-12 STEM Distance Learning Activities	\$ 36,500.00	\$ 36,500.00
Kuilin Zhang	ENSCO Inc	C-V2X Train Arrival and Departure Information Provision at Active and Passive Grade Crossings - Performance Assessment	\$ 896,508.00	\$ 896,508.00
Abdolmajid Erfani	University of Maryland/College Park	Guide to Supporting and Sustaining Transportation Grant Programs for Local Governments and Tribes	\$ 200,000.00	\$ 200,000.00
Laura Bourgeau-Chavez	National Aeronautics and Space Administration(NASA)	Improving Fire Danger and Fire Emissions Models with SMAP Data in Arctic and Boreal Regions	\$ 524,964.00	\$ 524,964.00
Kuilin Zhang	Texas State University	Research on Covid and Traffic Crashes/Impact on Safety Targets	\$ 149,758.00	\$ 149,758.00
Mohammadhossein Sadeghiamirshahi	Deep Foundation Institute	Quantifying carbon footprint reduction from foundation reuse	\$ 28,000.00	\$ 65,149.00
Vinh Nguyen	NEx	Investigating the durability performance of FRP rebar with polyolefin resins to advance integration with standards and manufacturability	\$ 79,822.00	\$ 108,628.00
Zhanping You	Minnesota Department of Transportation	Identify the benefits of using geotextiles and geogrids to improve the performance of unbound pavement layers (708)	\$ 218,825.00	\$ 218,825.00
Abdolmajid Erfani	Minnesota Department of Transportation	Best Practices for Electric Vehicles: Charging Stations	\$ 126,837.00	\$ 126,837.00
Zhanping You	Minnesota Department of Transportation	Amount of Bituminous Surface Lost Each Year	\$ 189,856.00	\$ 189,856.00
Bo Xiao	National Science Foundation(NSF)	ERI: Development of Embedded Generative AI for Worker-Centric Safety Monitoring in Construction Workplace	\$ 199,625.00	\$ 199,625.00
Quang Tran	National Science Foundation(NSF)	ERI: RELATIONSHIP OF LEAKY RAYLEIGH WAVE AND IN-SITU EARLY AGE CONCRETE PROPERTIES FOR MATERIAL-GUIDED DECISION-MAKING	\$ 199,870.00	\$ 199,870.00
Shane Mueller	US Dept of Transportation/Federal Railroad Administration	Lightweight evaluation, training, and user collaboration for Human-AI Work Systems in Rail Operations	\$ 326,237.00	\$ 326,238.00
Zhanping You	Washtenaw County Road Commission	Rubber Asphalt Overlay in Washtenaw County	\$ 120,372.00	\$ 278,861.00
Zhanping You	Dickinson County Road Commission	Rubber High Fiber and Rubber Asphalt Construction in Dickinson County	\$ 110,292.00	\$ 255,435.00
Colin Brooks	Montana Department of Transportation	Improved work zone traffic performance from advanced unmanned aerial systems (UAS) - enabled technologies in Montana	\$ 870,706.00	\$ 870,706.00
Zhanping You	Michigan Dept of Environment Great Lakes and Energy(EGLE)	Rubber Asphalt with Fibers/Plastics on Road Parallel to I-94	\$ 499,656.00	\$ 1,091,029.00
Qingli Dai	Michigan Dept of Environment Great Lakes and Energy(EGLE)	Durable rubber-modified epoxy concrete overlay for bridge deck protection and rehabilitation	\$ 210,070.00	\$ 472,826.00
Zhanping You	Michigan Dept of Environment Great Lakes and Energy(EGLE)	Design and Construction of rubber asphalt layers on rubber stabilized base in Saginaw	\$ 491,998.00	\$ 1,114,850.00
Abdolmajid Erfani	Michigan Technological University/VPR	"Navigating Success: Building Career Role Models for Civil Engineers with Artificial Intelligence and LinkedIn Data	\$ 30,000.00	\$ 40,000.00
Snehamooy Chatterjee	Iowa State University/Institute for Transportation	Large language models and deep-learning for risk factors identification from work zones accident reports	\$ 116,539.00	\$ 159,394.00
Zhanping You	National Road Research Alliance	Hot rubber seal coating to survive wet and frozen environments	\$ 181,912.00	\$ 181,912.00
Thomas Oliver	BHK Child Development Board	BHK Great Explorations After School STEM Clubs	\$ 15,564.00	\$ 15,564.00
Zhanping You	Michigan Dept of Transportation(MDOT)	AS NEEDED ASPHALT, CONCRETE, AND UNBOUND MATERIAL LABORATORY TESTING	\$ 74,994.00	\$ 74,994.00
Yousef Mohammadi Darestani	Rowan University	National Center for Equitable, Transformative, and Zero-Emissive Transportation Systems through Research Opportunity (NETZERO)	\$ 300,000.00	\$ 450,000.00
Abdolmajid Erfani	University of Maryland/College Park	Thriving Communities National Capacity Builder Program (TCP-N)	\$ 350,000.00	\$ 350,000.00
Qingli Dai	Missouri University of Science and Technology	Using Rubber Powder to Improve Freeze/Thaw Resistance of Concrete.	\$ 45,000.00	\$ 45,000.00
Vijaya Malladi	MxV Rail	Novel data-driven approach for rail neural temperature and in-situ stress measurement using steady-state traveling waves	\$ 100,000.00	\$ 100,000.00
Quang Tran	MxV Rail	Non-contact data fusion technology for fully in-motion rail section inspection	\$ 100,000.00	\$ 110,317.00
Qingli Dai	ACI Foundation	Wet-Carbonation of RCAs to increase mechanical properties and reduce alkali leachate	\$ 57,500.00	\$ 66,149.00
Bo Xiao	MxV Rail	In-motion Nondestructive Evaluation of Fastener Health Status in a Railway Line by Time-lapse Cameras and Deep Learning Enhancement	\$ 100,000.00	\$ 100,000.00
Mohammadhossein Sadeghiamirshahi	G2 Consulting Group	Design of lightly loaded piles based on realistic tangential heave forces	\$ 256,405.00	\$ 256,405.00
Kuilin Zhang	Texas State University	Balancing Freight and Goods Delivery Needs in Designing Complete Streets	\$ 90,000.00	\$ 90,000.00
Zhanping You	Scrap Tire Research and Education Foundation	Develop robust EPDs for the recycled tire rubber industry and develop datasets for the advancement of a cradle-to-repave asphalt pavement PCR.	\$ 1,057,329.00	\$ 1,057,329.00
Zhanping You	Molten Materials	Project PROSPR: Upcycling Waste Plastic into Thermoplastic Elastomer	\$ 33,000.00	\$ 33,000.00
Abdolmajid Erfani	University of Maryland/College Park	Accelerating the use of advanced digital management systems in the transit industry to improve the delivery of transit infrastructure projects	\$ 400,000.00	\$ 480,000.00
Qingli Dai	WISDOT	Hydraulic Conductivity of Base Course Materials and Relation to Pavement Buckling	\$ 225,000.00	\$ 225,000.00
Abdolmajid Erfani	NCHRP	Right-of-Way and Utility Risk Identification and Management	\$ 700,000.00	\$ 700,000.00
Zhanping You	Minnesota Department of Transportation	Continuous Bituminous Pavement Stripping Assessment through Non-Destructive Testing	\$ 150,000.00	\$ 150,000.00
Bo Xiao	NCHRP	Smart Helmet for Analyzing Highway Worker Fatigue	\$ 150,000.00	\$ 159,317.00
Abdolmajid Erfani	NCHRP	A Guide for implementing Price Adjustment Clauses to Balance Risk Sharing in Construction Projects	\$ 450,000.00	\$ 450,000.00
Zhanping You	Columbia University	SAI: Enzymatic Depolymerization of Plastic Wastes for Improving Performance of Asphalt Pavements	\$ 155,000.00	\$ 155,000.00
Kuilin Zhang	Texas A&M University System	Multi-dimension Autonomous Vehicles for Integrated Freight and Logistics Services to Rural and Tribal Areas	\$ 550,000.00	\$ 1,100,000.00
Qingli Dai	US Dept of Energy (EERE)	Low-Carbon and Cost-Competitive alternative Supplementary Cementitious Materials from Waste Mine Tailings	\$ 1,660,187.00	\$ 2,252,576.00
Zhanping You	Consortium for Asphalt Pavement Research and Implementation	Consortium for Asphalt Pavement Research and Implementation on Expanded Lag and Dwell Time Experiment	\$ 100,000.00	\$ 100,000.00
Vinh Nguyen	US Dept of Commerce (NIST)	Standards Development Center for Automated Driving Systems in Inclement Winter Weather	\$ 2,000,000.00	\$ 2,000,000.00
Zhanping You	Pennsylvania State University	Supplement Performance Testing and BMD Threshold Validation Using Well Documented Field Projects	\$ 217,000.00	\$ 210,000.00
Zhanping You	University of Maine	Effective upgrading of municipal solid waste to wax, glycolic acid, and asphalt binders	\$ 347,527.00	\$ 434,410.00
Pasi Lautala	California State University/Fresno	Fast Track to a Railroad Career	\$ 250,000.00	\$ 300,000.00
Zhanping You	University of Wisconsin/Madison	Incorporating Tribology Principle into Asphalt Mix Design for Low Carbon Asphalt Pavement	\$ 200,001.00	\$ 250,001.00
			\$ 16,483,374.00	\$ 20,094,259.00

APPENDIX C: PROJECTS AWARDED

PI	Sponsor	Total Sponsor Cost	Total Project Value	Full Project Title
Pasi Lautala	University of Texas/Austin	\$ 36,500.00	\$ 36,500.00	"Guidebook for Railway-themed K-12 STEM Distance Learning Activities
Zhanping You	Michigan Dept of Transportation(MDOT)	\$ 27,000.00	\$ 27,000.00	AS NEEDED ASPHALT, CONCRETE, AND UNBOUND MATERIAL LABORATORY TESTING
Pasi Lautala	US Dept of Transportation/Federal Railroad Administration	\$ 297,526.00	\$ 297,526.00	Expanding Summer Youth Programs in Rail through Virtual Learning and National Campus Network
Qingli Dai	Minnesota Department of Transportation	\$ 250,000.00	\$ 270,792.00	Evaluation of Conditions that Cause Negative Environmental Impacts when Using Recycled Concrete Aggregate
Zhanping You	Michigan Dept of Environment Great Lakes and Energy(EGLE)	\$ 418,814.00	\$ 919,453.00	Construction of Rubber Asphalt Concrete Pavement on Portland Cement Pavement on Dixie Highway
Zhanping You	Minnesota Department of Transportation	\$ 390,000.00	\$ 390,000.00	Development of Process to Lower GWP of Construction Materials
Yousef Mohammadi Darestani	US Dept of Transportation/Federal Railroad Administration	\$ 144,938.00	\$ 155,193.00	A Risk Informed Decision-Making Framework for Coastal Railroad System Subjected to Storm Hazards and Sea Level Rise
Yousef Mohammadi Darestani	US Dept of Transportation/Federal Railroad Administration	\$ 139,581.00	\$ 150,349.00	A Risk Informed Decision-Making Framework for Coastal Railroad System Subjected to Storm Hazards and Sea Level Rise
Pasi Lautala	US Dept of Transportation/Federal Railroad Administration	\$ 208,788.00	\$ 219,263.00	Railroad Track Maintenance Life-Cycle Assessment (LCA) Development; Framework Data Tools and Implications for Multi-
Zhanping You	Dickinson County Road Commission	\$ 100,000.00	\$ 223,219.00	Tire Rubber Asphalt and Recycled Glass for County Road Paving
Zhanping You	Michigan Dept of Environment Great Lakes and Energy(EGLE)	\$ 482,549.00	\$ 1,063,466.00	Multi Agency Reconstruction of Asphalt Pavement with Rubber in Bay County to prepare US 10 Detour
Thomas Oommen	US Dept of Transportation/Federal Railroad Administration	\$ 203,599.00	\$ 227,599.00	An Integrated and Automated Decision Support System for Ground Hazard Risk Mitigation for Railway using Remote Sensing and Traditional Condition Monitoring Data
Mohammadossein Sadeghiamirshahidi	Minnesota Department of Transportation	\$ 216,845.00	\$ 216,845.00	Instrumentation and Data Management/Analyses for Measurement While Drilling Technology
Mohammadossein Sadeghiamirshahidi	Michigan Technological University/AVPRD	\$ 30,000.00	\$ 39,961.00	REF-RS: Measurement While drilling in geotechnical engineering: Laboratory experiments and Machine Learning models
Kuilin Zhang	US Dept of Energy (ARPA-E)	\$ 1,050,000.00	\$ 1,144,540.00	A Decarbonized and Resilient Intermodal Freight Transportation (DRIFT) Modeling Platform for Intermodal Logistical
Zhanping You	Minnesota Department of Transportation	\$ 181,912.00	\$ 181,912.00	Hot rubber seal coating to survive wet and frozen environments
Zhanping You	ENSCO Inc	\$ 896,508.00	\$ 896,508.00	C-V2X Train Arrival and Departure Information Provision at Active and Passive Grade Crossings - Performance Assessment
Zhanping You	Minnesota Department of Transportation	\$ 220,000.00	\$ 220,000.00	Cost-benefit of applying a higher asphalt film thickness (AFT) vs. doing chip seal at Year 1
Elizabeth Veinott	Virginia Tech/Virginia Bioinformatics Inst	\$ 155,280.00	\$ 155,280.00	Multi-Site Simulation to Examine Driver Behavior Impact of Integrated Rail Crossing Violation Warning (RCVW) and In-Vehicle Auditory/Visual Alert (IVAA) System
		\$ 5,449,840.00	\$ 6,835,406.00	

PI	Sponsor	Total Sponsor Cost	Total Project Value	Full Project Title
Pasi Lautala	University of Texas/Austin	\$ 36,500.00	\$ 36,500.00	"Guidebook for Railway-themed K-12 STEM Distance Learning Activities
Zhanping You	Michigan Dept of Transportation(MDOT)	\$ 27,000.00	\$ 27,000.00	AS NEEDED ASPHALT, CONCRETE, AND UNBOUND MATERIAL LABORATORY TESTING
Pasi Lautala	US Dept of Transportation/Federal Railroad Administration	\$ 297,526.00	\$ 297,526.00	Expanding Summer Youth Programs in Rail through Virtual Learning and National Campus Network
Qingli Dai	Minnesota Department of Transportation/Research Services Section(MN-DOT)	\$ 250,000.00	\$ 270,792.00	Evaluation of Conditions that Cause Negative Environmental Impacts when Using Recycled Concrete Aggregate
Zhanping You	Michigan Dept of Environment Great Lakes and Energy(EGLE)	\$ 418,814.00	\$ 919,453.00	Construction of Rubber Asphalt Concrete Pavement on Portland Cement Pavement on Dixie Highway
Zhanping You	Minnesota Department of Transportation/Research Services Section(MN-DOT)	\$ 390,000.00	\$ 390,000.00	Development of Process to Lower GWP of Construction Materials
Yousef Mohammadi Darestani	US Dept of Transportation/Federal Railroad Administration	\$ 144,938.00	\$ 155,193.00	A Risk Informed Decision-Making Framework for Coastal Railroad System Subjected to Storm Hazards and Sea Level Rise
Yousef Mohammadi Darestani	US Dept of Transportation/Federal Railroad Administration	\$ 139,581.00	\$ 150,349.00	A Risk Informed Decision-Making Framework for Coastal Railroad System Subjected to Storm Hazards and Sea Level Rise
Pasi Lautala	US Dept of Transportation/Federal Railroad Administration	\$ 208,788.00	\$ 219,263.00	Railroad Track Maintenance Life-Cycle Assessment (LCA) Development; Framework Data Tools and Implications for Multi-
Zhanping You	Dickinson County Road Commission	\$ 100,000.00	\$ 223,219.00	Tire Rubber Asphalt and Recycled Glass for County Road Paving
Zhanping You	Michigan Dept of Environment Great Lakes and Energy(EGLE)	\$ 482,549.00	\$ 1,063,466.00	Multi Agency Reconstruction of Asphalt Pavement with Rubber in Bay County to prepare US 10 Detour
Thomas Oommen	US Dept of Transportation/Federal Railroad Administration	\$ 203,599.00	\$ 227,599.00	An Integrated and Automated Decision Support System for Ground Hazard Risk Mitigation for Railway using Remote Sensing and Traditional Condition Monitoring Data
Mohammadhossein Sadeghiamirshahidi	Minnesota Department of Transportation/Research Services Section(MN-DOT)	\$ 216,845.00	\$ 216,845.00	Instrumentation and Data Management/Analyses for Measurement While Drilling Technology
Mohammadhossein Sadeghiamirshahidi	Michigan Technological University/AVPRD	\$ 30,000.00	\$ 39,961.00	REF-RS: Measurement While drilling in geotechnical engineering: Laboratory experiments and Machine Learning models
Kuilin Zhang	US Dept of Energy/Advanced Research Projects Agency - Energy(ARPA-E)	\$ 1,050,000.00	\$ 1,144,540.00	A Decarbonized and Resilient Intermodal Freight Transportation (DRIFT) Modeling Platform for Intermodal Logistical
Zhanping You	Minnesota Department of Transportation/Research Services Section(MN-DOT)	\$ 181,912.00	\$ 181,912.00	Hot rubber seal coating to survive wet and frozen environments
Kuilin Zhang	ENSOC Inc	\$ 896,508.00	\$ 896,508.00	C-V2X Train Arrival and Departure Information Provision at Active and Passive Grade Crossings - Performance Assessment
Zhanping You	Minnesota Department of Transportation/Research Services Section(MN-DOT)	\$ 220,000.00	\$ 220,000.00	Cost-benefit of applying a higher asphalt film thickness (AFT) vs. doing chip seal at Year 1
Elizabeth Veinott	Virginia Tech/Virginia Bioinformation Inst	\$ 155,280.00	\$ 155,280.00	Multi-Site Simulation to Examine Driver Behavior Impact of Integrated Rail Crossing Violation Warning (RCVW) and In-Vehicle Auditory/Visual Alert (IVAA) System
		\$ 5,449,840.00	\$ 6,835,406.00	

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Report 2024