WOOSTER

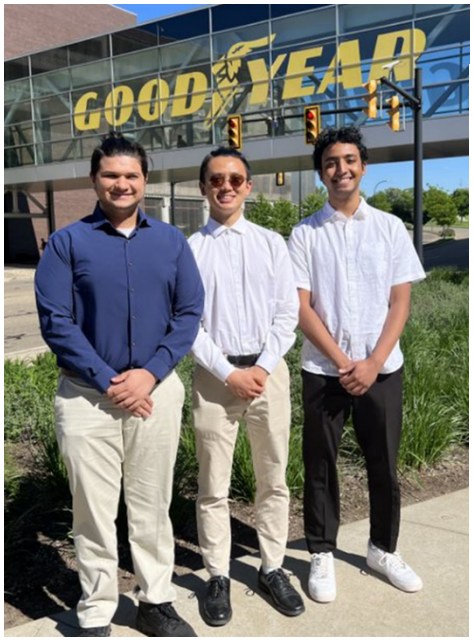
Applied Methods & Research Experience

Annual Report 2022

AMRE

The Applied Methods and Research Experience (AMRE) Program provides consulting services to corporate, public sector, and nonprofit organizations. Consulting teams, comprised of two to four skilled students and an experienced faculty or staff advisor, provide full-time consulting services for eight weeks during the summer. The fields of expertise include mathematical/data analysis, computer science, assessment, research, and business consulting.

During the summer of 2022, 45 students (including eight from Ashesi University in Ghana) and 23 faculty or staff advisors completed 14 different AMRE projects. Speaking to the diversity of our projects, the work ranged from website analysis for Aetna, to research about the ways Ohio landowners can participate in the carbon credit market, to energy use forecasting for Schneider Electric, to quantifying the employee benefits plan for The Wooster Brush Company.



*Members of the Goodyear Tire & Rubber Company Airless Tires Team: **Praneel Panchigar** '23, Math and Statistical & Data Sciences, **Kevin Yuan** '23, Computer Science, **Ussama Mustafa** '23, Mathematics and Computer Science*

CELEBRATING LONG-TERM PARTNERSHIPS

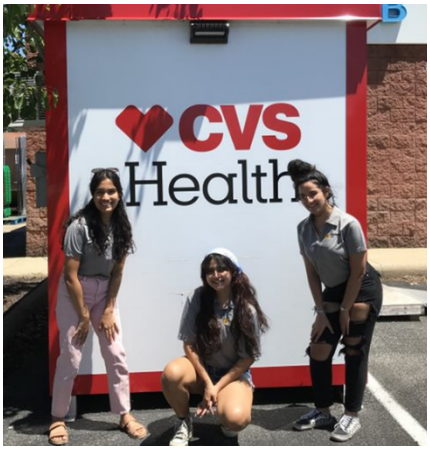
In the program's 29-year history, AMRE teams have completed 216 projects for 72 unique clients. As an indication of the quality of the work and the value provided by the program, many of our clients have worked with AMRE several times. Progressive Insurance has participated in 15 AMRE projects and PRC-Saltillo has engaged AMRE 13 times. The list goes on, but no company has worked with AMRE more than the Goodyear Tire & Rubber Company with 30 projects, including four this past summer.

Goodyear projects tend to be very technical in nature and challenge our students to complete work beyond their expectations. As one student reflects, "If you had asked me a few months ago if I could implement some of the features in the project, I would have responded, 'no way'. But working on the project has helped me overcome my phobia of perceiving certain activities as out of my ability. And I believe what I have learned is that I should be confident in confronting large or complex jobs."

As AMRE enters its 30th year, the program looks forward to continuing its partnership with Goodyear.

2022 AMRE projects

WOOSTER
Applied Methods & Research Experience



Members of the Aetna Team: ***Shiropa Shahreen*** *'23, Biochemistry and Molecular Biology,* ***Sobika Thapa*** *'23 Computer Science, and* ***Yasmine Fazazi*** *'24, Computer Science and Psychology*

Members of the Carbon Credit Team: ***Emma Staggs*** *'24, Studio Art, Economics minor,* ***Carolyn Klein*** *'24, Environmental Studies,* ***Ron Holtman,*** *local landowner and client*

AETNA

WEBSITE PERFORMANCE ANALYIS

Aetna is currently in the process of transforming its digital experience and this project was designed to help them understand the full scope of the Aetna Medicare's Direct to Consumer enrollment experience. The team built tables to summarize website data and created an interactive data visualization tool which showed the detailed enrollment process with filters according to year, channels, and different products.

ASHESI UNIVERISITY COLLABORATION

FUTURE – ME

The AMRE team developed a web-based career guidance system that enables Ashesi University students to identify their ideal career path. The system also provides students with the ideal academic courses or track necessary to prepare them for their desired career field. The career planning system utilizes a recommender algorithm which takes courses or careers as parameters and generates outputs based on the user's choices. To create more value, the system also includes an interactive blog and discussion section, a staff booking page, and an information resource repository.

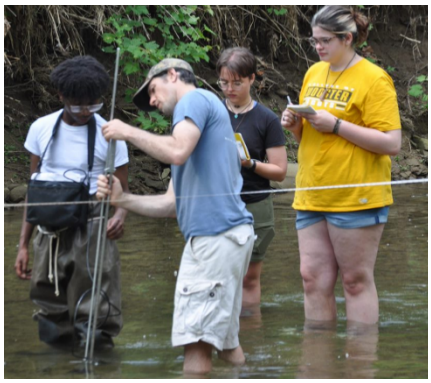
MAIN STREET WOOSTER AND WAYNE ECONOMIC DEVELOPMENT COUNCIL

LEAKAGE STUDY

The clients, Main Street Wooster and the Wayne Economic Development Council, sought to better understand the retail market in Downtown Wooster and Downtown Orrville by assessing the retail leakage. The team, therefore, conducted a retail gap analysis to determine which major business groups and subsectors registered leakage using data provided by the Buxton Company. An inventory of commercial building spaces in Downtown Wooster was also created by sourcing data from real estate websites, Wayne County auditor's website, and the City of Wooster's data files. The team also reached out to downtown building owners to obtain information about vacancies and potential uses.

CARBON CREDITS FOR OHIO LANDOWNERS

The team worked with a local landowner to research how the carbon market works and evaluated the plausibility for small Ohio landowners to sell carbon credits from their forest land. Research included a comprehensive analysis of the carbon market and current credit programs. The team created an economic model that allows local landowners to understand the monetary benefits of carbon credits, and a drafted proposed changes to Ohio legislation that would incentivize landowners to enroll their land in carbon credit projects.



*Members of the Community Climate Change Team: **Tyrell Cooper** '25, Environmental Studies, **Nick Wiesenberg**, Geology Technician, **Skylar Barnett** '25, undecided, **Desiree Smith** '25, Geoscience*

COMMUNITY CLIMATE CHANGE

IMPACT ON WHITE OAK TREES

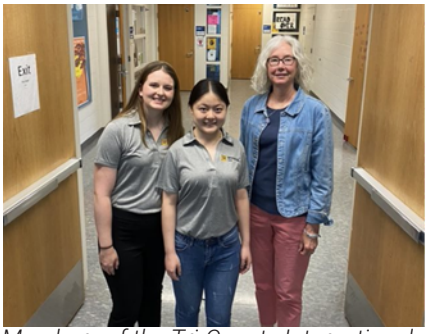
Climate change is causing increased precipitation and more frequent and intense storms in Wooster, OH. White oak (Quercus alba) tree rings can serve as a record of past climatic conditions, and they can be analyzed to determine tree response to a changing climate. Our team analyzed white oak tree rings to see how the species is responding to a wetter climate and to learn how white oaks are responding to climate change.

ASHESI UNIVERSITY COLLABORATION

MY SAFE CAMPUS

In support of Ashesi University's work at creating a safe campus for all, the AMRE team developed technology to:

- Expand and improve current avenues for reporting instances sexual abuse
- Automate campus sexual misconduct training



*Members of the Tri-County International Academy Team: **Delaney Tubbs** '24, History and French, **Tina Lam** '22 Global & International Studies, with **Victoria Birk,** IB Program Coordinator, Tri-County ESC*

TRI-COUNTY INTERNATIONAL ACADEMY

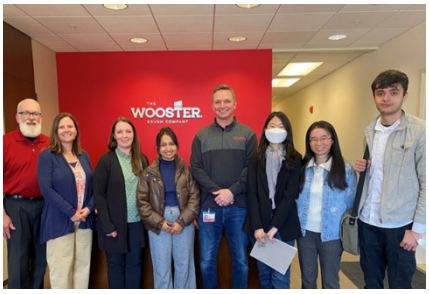
PROGRAM REVIEW

The team conducted research to deliver a program evaluation, a marketing plan, and a funding plan to the client. Research methods included. The team analyzed data that was collected through a survey, interviews, and focus groups. The team also updated the program's website, created marketing materials and social media posts, and drafted foundation grant applications.

SCHNEIDER ELECTRIC

FORECASTING ENERGY DEMAND

The team was tasked with finding the most important variables for forecasting energy demand in three specific Independent System Operators (ISO). ISOs are organizations that coordinate, control, and monitor the electric grid in a given region. The team tackled this problem by extensively evaluating calendar and weather-related variables in conjunction with various feature selection techniques and machine learning models to make predictions.



*Members of the Wooster Brush team: **Keith Hancock**, The Wooster Brush Company, **Vikki Briggs**, AMRE Co-Director, **Dr. Brooke Krause**, Professor of Economics, **Ruisha Prasai** '23, Psychology, **Yeeun Koh** '24, Economics and Mathematics, **Dr. Huiting Tian**, Professor of Economics, **David Sokurov** '24, Statistical & Data Sciences and Business Economics, with **Ben Maibach** '00, President, The Wooster Brush*

THE WOOSTER BRUSH COMPANY

QUANTIFYING THEIR BENEFIT PLAN

Wooster Brush prides itself on offering its employees an exceptional benefits package. The AMRE team developed a formula for quantifying the rich offerings. and collected data from multiple Northeast Ohio manufacturing companies to enable Wooster Brush to benchmark their benefits. Additionally, the team researched current labor market to tailor recommendations.

THE FUND FOR OUR ECONIMIC FUTURE

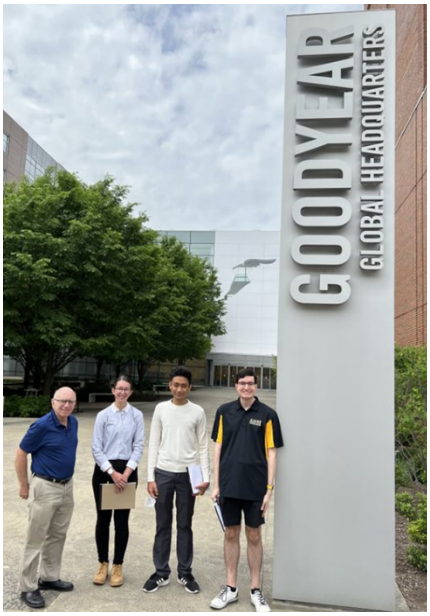
THE IMPACT OF CASH BENEFITS ON EMPLOYMENT OUTCOMES

The team explored the effects of cash transfer programs on employment outcomes by researching the results of previous projects and the reviewing the goals of ongoing projects. The team also interviewed multiple organizations working on this or related issues in Wayne County.

THE GOODYEAR TIRE & RUBBER COMPANY

AIRCRAFT

The stiffness of a tire is its ability to resist deformation under various conditions. The team worked with data from tire experiments to develop simple models for three types of stiffness of radial airplane tires using key variables. This would allow Goodyear to estimate the stiffness of new tires even before production begins.



*Members of the Goodyear Tire & Rubber Company iPhone/MacBook team: **Dr. Tom Montelione**, Professor of Computer Science, **Kaiya Magnuson** '24, Computer Science, French minor, **Moe Ko** '23, Computer Science, and **Kyle Rossi** '23, Computer Science*

THE GOODYEAR TIRE & RUBBER COMPANY

AIRLESS TIRES

The project goal was to translate and package a multi-software analytical design calculator program for nonpneumatic tires into a single comprehensive python program. The result was a combination of innovative scientific programming, creative organization of complex data structures and class objects, and rigorous application of cutting-edge Python libraries to create a product that was faster and more accurate than the client's original program.

THE GOODYEAR TIRE & RUBBER COMPANY

IPHONE/MACBOOK

The AMRE team was tasked with developing an iOS application and a MacOS application using the Swift programming language. A key priority of this project was to create user-friendly designs for the apps.

THE GOODYEAR TIRE & RUBBER COMPANY

OTR (PART 2)

WAVE is a software that visualizes frictional wear across a segment of a tire. The first iteration of the software, created by one of last summer's AMRE teams, included the core visualization capabilities and the filtering functionality. This year's focus was to develop additional functionalities to the software to enable the extraction of more quantitative information from the visualizations. Some of the features included a GUI, probing of specific points, and saving and loading specific views.

MISSION STATEMENT

The AMRE program provides a quality immersive experiential opportunity for students at the College of Wooster. Students solve authentic problems in business, industry, government agencies and social service agencies as well as in academic research areas. In the process, students reflect on their contributions and develop an understanding of how the experience can be translated into future opportunities.

The College of Wooster offers its students a unique educational experience while further establishing collaborations with our local and regional corporate, public sector, and nonprofit partners.

- **Our clients** get help solving problems or completing projects that have lingered on "to-do" lists.
- **The students** apply what they have learned in the classroom to solve real-world problems. Often the experience helps them develop their career aspirations, and sometimes they learn what they don't want to do for a career. Always, they have an experience that can't be found inside the classroom.

The AMRE program is made possible by generous support from the Laura B. Frick Charitable Trust, the GLCA Global Crossroads Internationalization Initiative, the Harbage Endowed Fund, the Ralph R. and Grace B. Jones Foundation, the National Science Foundation, the Donald and Alice Noble Foundation, the Wayne County Community Foundation and The College of Wooster.

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