



ANNUAL REPORT

FISCAL YEAR 2022-23

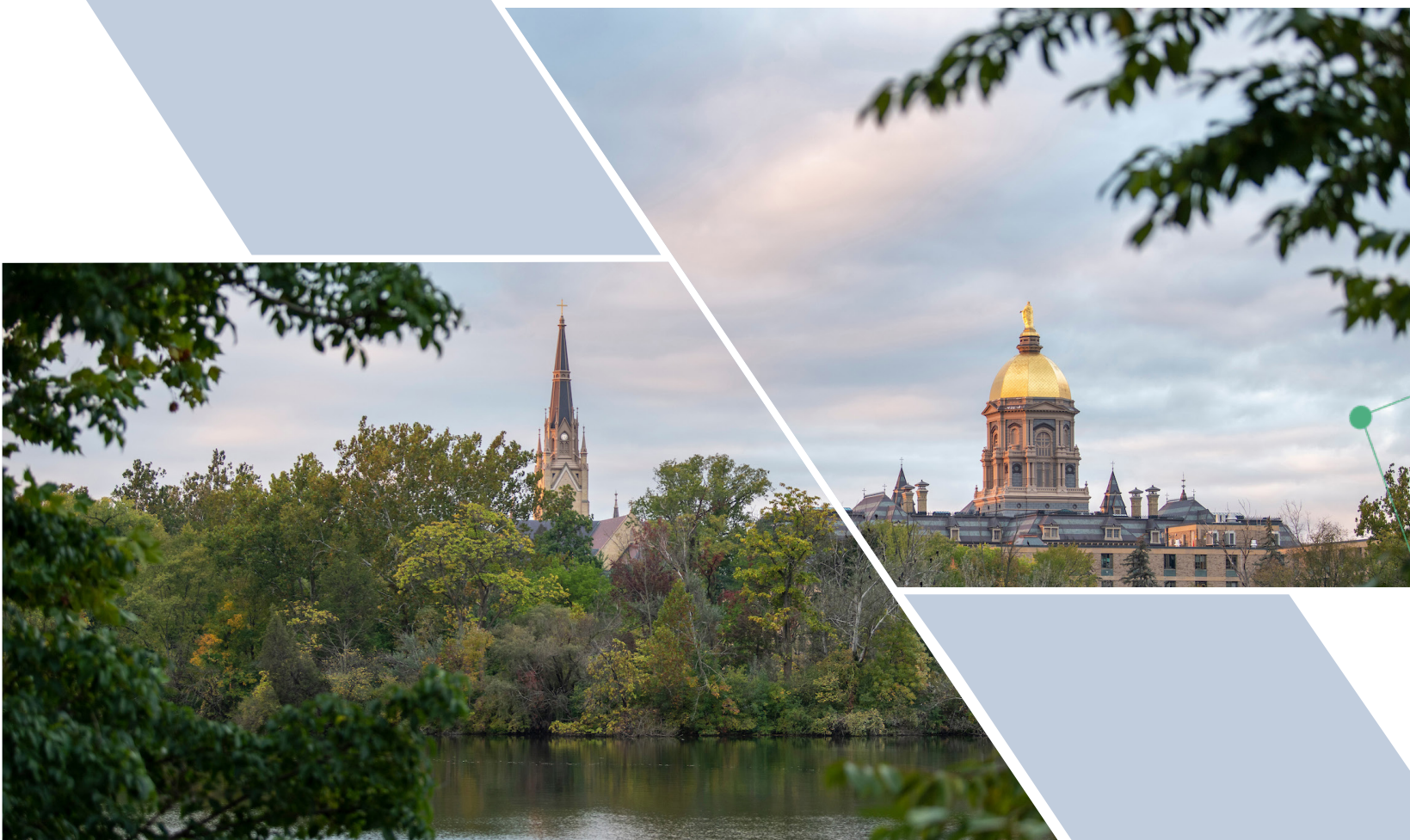


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Adventurously collaborative, Lucy Family Institute for Data & Society is forging connections between intellectual capital, industry domain knowledge, and the leading edge of data science, defining intelligence that goes far beyond 1s and 0s.

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LETTER FROM THE INSTITUTE DIRECTOR



Nitesh V. Chawla, PhD is the Frank M. Freimann Professor of Computer Science and Engineering and the Founding Director of the Lucy Family Institute for Data & Society



The 2021-22 fiscal year expansive growth was followed by a year of doubling down on identified priorities. As we reflected on our activities over the past two years, we recognized that a thoughtful and comprehensive strategy was essential to sustain our momentum, drive growth, and amplify our impact. With the guidance from the Office of Institutional Research, Innovation, & Strategy, and with involvement of collective insights and expertise of our team, stakeholders, and partners, we have crafted a visionary and ambitious roadmap that aligns with our mission and values. This new strategic plan outlines Lucy Family Institute's mission and vision, goals and key priorities, and actionable steps to chart our course for the coming years.

One of our major accomplishments this year was establishing the new Health Equity Data Lab, which also received a generous gift from Accenture. Beyond that, the Institute delivered on its aims to produce impactful and equitable data-driven solutions with its many achievements in research, education, and service. The Institute was involved in 98 proposals in the current FY, a 14% increase over the prior FY (85), for a total funding request of \$120.5M. Institute-affiliated faculty and staff published over 1,000 papers. The Institute held over 100 events, and substantially increased its industry engagement with 52 projects and placement of almost 90 interns. In addition to its own projects, the Institute supported 29 Notre Dame faculty and staff projects, and facilitated 33 technical skills workshops (with over 200 participants). Through its flagship iTREDS program, the Institute enabled socially responsible and engaged data science experiential learning activities for an interdisciplinary group of undergraduate students.

This report presents our many other achievements in research, education, and service, aimed at producing impactful and equitable data-driven solutions as a global force for good. None of these achievements would have been possible without the dedication, passion, and unwavering support of our incredible team, partners, and stakeholders. As we continue on this remarkable journey, we remain resolute in our commitment to fundamentally advancing data-driven knowledge, recruiting top talent to Notre Dame, promoting equity, expanding educational opportunities, and tackling the wicked problems that challenge our society through convergence and translational research. We aspire to play like a champion every day!



Sincerely,

Nitesh Chawla

LUCY FAMILY INSTITUTE IS...

A GREAT PLACE TO WORK



27
FACULTY
AND STAFF

6 NEW
HIRES

5 PROMO-
TIONS

154
FACULTY
AFFILIATES

23
GRADUATE
SCHOLARS

ADVANCING RESEARCH

2023 LUCY FAMILY INSTITUTE **ANNUAL THEME:**
ADVANCES IN DATA FOR HEALTH EQUITY RESEARCH AND
EDUCATION



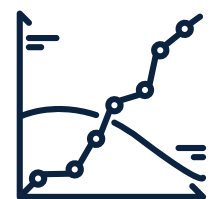
IN THE FALL OF 2022, THE INSTITUTE LAUNCHED A MAJOR RESEARCH PLATFORM AIMED AT
REDUCING HEALTH INEQUITY - THE **HEALTH EQUITY DATA LAB** (HEDL).



SUBMITTED
98
PROPOSALS
IN FY 2022-23

VALUE OF
\$120.5M
PROPOSALS SUBMITTED
IN FY 2022-23

PROPOSAL SUCCESS RATE
43.7%
IN FIRST FULLY EVALUATED
FISCAL YEAR (2021-22)



COMPOUND ANNUAL GROWTH RATE
31.1%
IN PROPOSAL SUBMISSIONS
OVER TWO YEARS

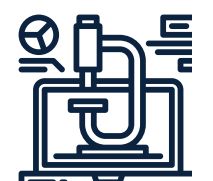
COMPOUND ANNUAL GROWTH RATE
28.7%
IN SUBMITTED PROPOSAL VALUE
OVER TWO YEARS



PUBLICATIONS
1028
IN 2022

JOURNAL IF>10
15%
OF PUBLICATIONS

TOTAL CITATIONS
936K
OF INSTITUTE-AFFILIATED
AUTHORS



RECEIVED THE **LARGEST NEW AWARD** TO A RESEARCH INSTITUTE AT NOTRE
DAME IN 2023: **\$5M** GRANT FROM BILL & MELINDA GATES FOUNDATION

ADVENTUROUSLY COLLABORATIVE



101
EVENTS
HELD

2.7K
PEOPLE BROUGHT
TOGETHER

7
UNIVERSITY-WIDE
INITIATIVES SPON-
SORED / SUPPORTED

2X
INCREASE IN NUM-
BER OF EVENTS
FROM FY 2022-23



11
INTERNATIONAL
PARTNERS

ALGERIA
INDIA
MEXICO
PORTUGAL

CHILE
ISRAEL
POLAND
UKRAINE

COLOMBIA
ITALY
VIETNAM

TRANSFORMING EDUCATION



FLAGSHIP
ITREDS
PROGRAM

6
EDUCATIONAL
INITIATIVES

SPECIAL
GRADUATE
STUDENT SUPPORT

OVER
200
PARTICIPATING
STUDENTS



2
STUDENT-RUN
INITIATIVES

GRADUATE STUDENT
COLLABORATION
HOUR SERIES

GRADUATE STUDENT
CONNECT
SERIES



3
INTERNSHIP
PROGRAMS

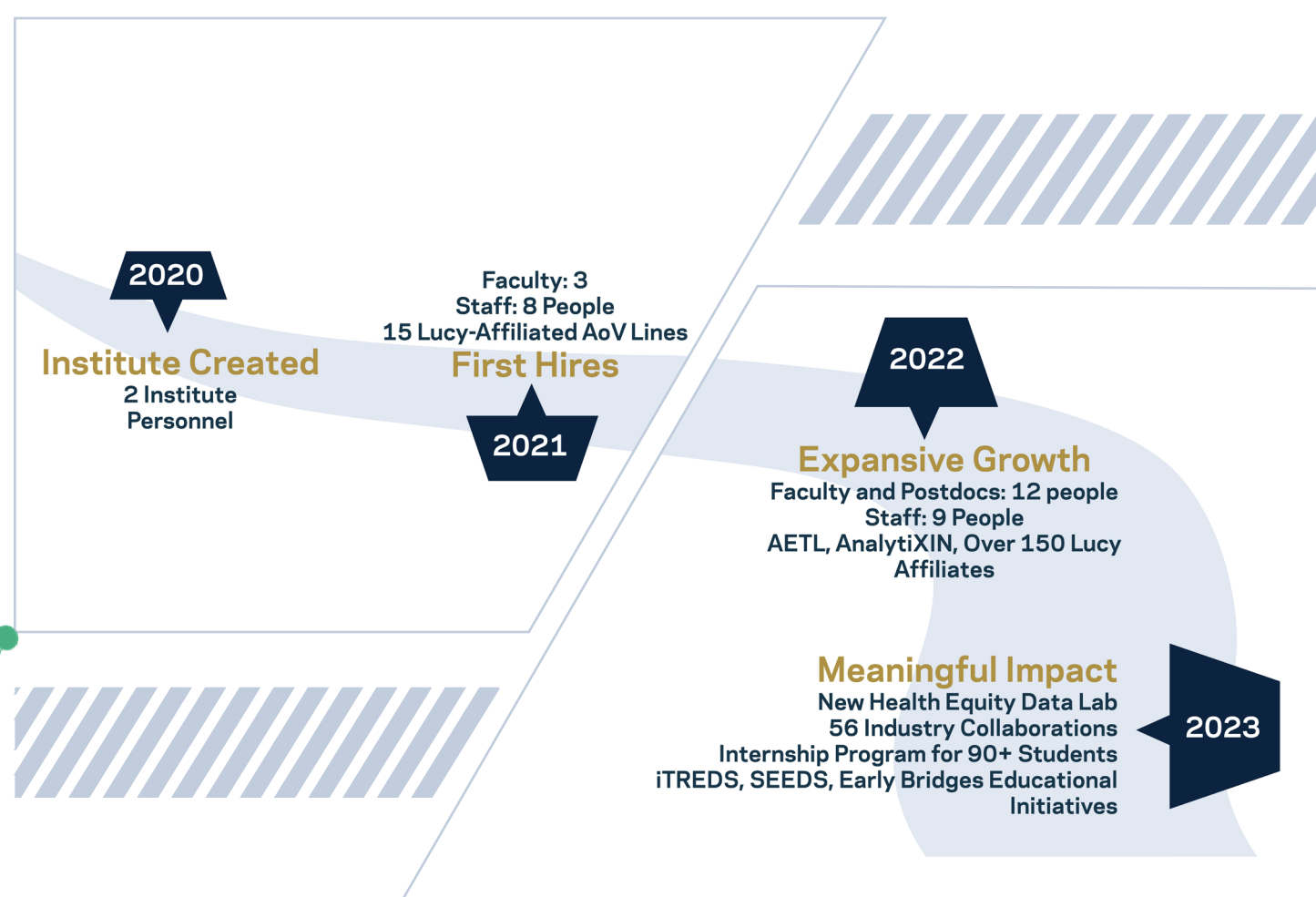
CLOSE TO
90
CO-OP AND
SUMMER INTERNS

OVER
TEN-FOLD
INTERNSHIP PROGRAM
GROWTH IN A YEAR

32
PARTICIPATING
COMPANIES

PLANNING STRATEGICALLY

THE LUCY FAMILY INSTITUTE STORY



Launched in Fall of 2020 with a \$25 million gift from Robert and Sara Lumpkins, the Lucy Family Institute for Data & Society is an interdisciplinary research Institute that focuses on creating innovative data-driven solutions to address grand societal challenges.

OUR MISSION

Guided by Notre Dame's Mission, the Lucy Family Institute adventurously collaborates on advancing data-driven convergence research, translational solutions, and education to ethically address society's wicked problems. As an innovative nexus of academia, industry, and the public, the Institute also fosters data science access to strengthen diverse and inclusive capacity building within communities.

OUR VISION

To become the preeminent intellectual beacon, inspiring collaborative, equitable, and impactful data innovations as a global force for good.

OUR GOALS

- Become the epicenter where disciplines and expertise collide to inspire and perform socially responsible, ethical, and impactful data science research, education, and interdisciplinary applications.
- Pursue emergent research questions and translational challenges to accelerate data-driven solutions for society's wicked problems.
- Design and implement ethical and inclusive data science education programs to build access, capacity and leadership.
- Cultivate a driven, agile, and inclusive environment that enables all team members to thrive and collectively deliver on the institute's goals.
- Establish the Lucy Family Institute as a collaborative, mission-driven, global thought leader.

PLANNING FOR SUCCESS: GOAL 1

Become the epicenter where disciplines and expertise collide to inspire and perform socially responsible, ethical, and impactful data science research, education, and interdisciplinary applications.

We aim to create a dynamic and collaborative environment where diverse disciplines and areas of expertise intersect, where people meet and collaborate, and where ideas come to life. This convergence will serve as a catalyst for fostering innovative, equitable, and meaningful approaches to data science.

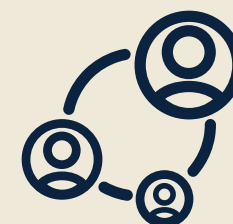
By bringing together experts and community partners from various fields, we seek to promote cross-disciplinary collaboration and exchange of ideas. This interdisciplinary approach encourages researchers to explore novel perspectives and methodologies, leading to cutting-edge data science research that addresses complex societal challenges.

We understand the importance of social responsibility and ethical considerations in all our research, education, and service activities. We will prioritize conducting research that not only advances new fundamental research and discoveries but also has a positive impact on society.



Data science education is a key component of our mission. By offering ethical, equitable experiential educational programs and resources, we aim to equip the next generation of data scientists with the necessary skills and knowledge to engage in ethical and socially responsible practices. We are committed to addressing wicked problems in communities where we work and live. By actively engaging with communities and stakeholders, we seek to use our expertise and resources to address real-world challenges and contribute to advancing the common good.

GOAL 1 OBJECTIVES



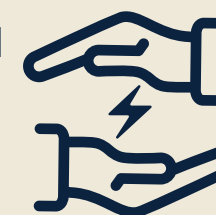
1. Collaborate with departments, colleges, and schools at Notre Dame to amplify collective data science and Artificial Intelligence (AI) capabilities.

We plan to establish a welcoming physical space that will serve as a hub for people and organizations to come together, encourage spontaneous interactions, and foster a creative environment. By promoting openness and accessibility, we aim to inspire the cross-pollination of ideas and the emergence of transformative data-driven solutions.



2. Create an approachable physical space for serendipitous connections among diverse thinkers and doers.

3. Foster and implement initiatives that bring local and global communities together to define problem statements and pursue scalable solutions.



By facilitating a platform for diverse partnerships, we aim to collectively identify and articulate pressing society-facing problem statements. Through collaborative efforts, we will seek innovative, ethical data-driven solutions to these challenges, emphasizing the power of collective thinking and action to address complex issues and promote positive change.

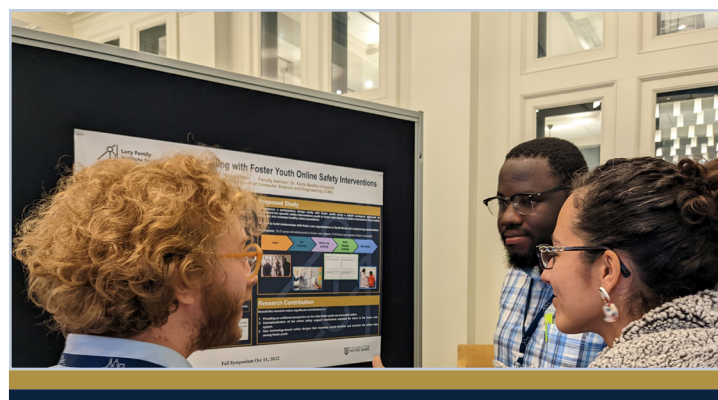
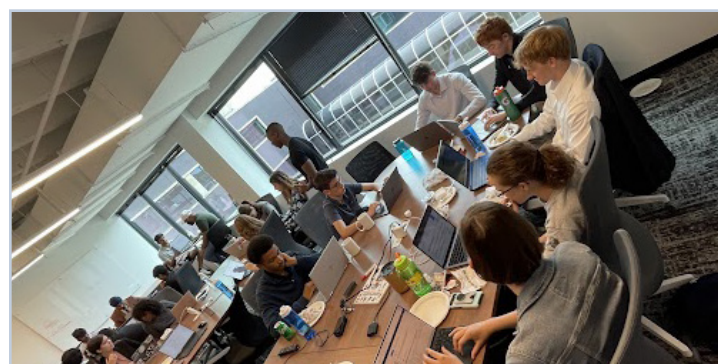
By forging strong connections with the private sector, we can co-innovate solutions to their challenges. Industry collaboration will provide valuable insights and expertise, helping to bridge the gap between academic research and practical applications. This symbiotic relationship will foster a dynamic ecosystem for student trainees and workforce development.

4. Strengthen engagement with industry to facilitate co-innovation of solutions to use-inspired challenges and cultivate pathways for workforce development.



PLANNING FOR SUCCESS: GOAL 2

Pursue emergent research questions and translational challenges to accelerate data-driven solutions for society's wicked problems.



In the pursuit of knowledge and progress, we recognize that some problems are incredibly complex and interconnected—so complex that they are referred to as “wicked problems.” These challenges, such as world hunger, poverty, and health and well-being, require comprehensive and thoughtful approaches to find effective solutions. We embrace wicked problems as opportunities for growth and transformation. Our goal is to stay at the forefront of cutting-edge research in data science and AI and address emerging questions, pushing the boundaries of traditional thinking to discover innovative ways to approach these issues.

Central to our approach is harnessing the power of data. Data empowers us to develop efficient and effective solutions, ensuring that our efforts are grounded in the most reliable and informed methodologies. In pursuit of this goal, we will initiate collaborations with diverse stakeholders, engaging with local and global communities to co-create solutions that resonate with real-world needs. These partnerships will amplify our collective capabilities, enabling us to tackle these challenges from multiple perspectives.

GOAL 2 OBJECTIVES



1. Design a framework for the Institute that enables fundamental to convergent advances in research and scholarship that are responsive to the Strategic Priorities of the University.

We are committed to taking the lead in solving new and intricate wicked problems. Our approach involves leveraging expertise and insights from various disciplines, and employing advanced data-driven research techniques as a force for good.

By thinking strategically about research, we will find synergies in our capabilities, facilitating collaboration across diverse disciplines, and encouraging convergent thinking and innovative approaches. Our framework will serve as a roadmap, guiding us towards fundamental breakthroughs and transformative data-driven solutions to complex challenges while ensuring sustainable funding of our efforts.

2. Spearhead solution discovery to emergent wicked problems using domain-informed, multidisciplinary, and data-driven research.



Committed to data-driven excellence, we strive to lead in developing a cutting-edge data platform. This hub will unite diverse data from various sources, aiding researchers, educators, and the community. By spearheading this effort, we aim to improve data access, encourage knowledge sharing, and nurture collaboration.

3. Lead the development of a data platform that integrates several data assets and becomes a campus and community resource.



We recognize that research has the potential to drive real-world impact and transformative change. To achieve this, we prioritize translational research, or transforming research findings into practical applications. We aim to fast-track the journey of research breakthroughs to the market and society to ensure that our discoveries make a positive difference in people's lives.



4. Accelerate translational research through agile advancement of innovations to market and society.

PLANNING FOR SUCCESS: GOAL 3

Design and implement ethical and inclusive data science education programs to build access, capacity, and leadership.



With the power of data also comes great responsibility. Addressing the educational skills gap in the rapidly changing technological landscape is at the heart of the Institute's goal to provide diverse and inclusive data science access for all. Our mission to advance the common good is rooted in Catholic Social Teaching and in alignment with the mission of the University of Notre Dame.

Through a specialized curriculum grounded

in ethics, our design thinking principles, experiential capstone projects, and immersive internships, programs equip students and professionals with the vital skills needed to thrive in a rapidly changing world.

As we envision an exceptional education at a Catholic University in our rapidly changing data and AI era, our goal is to train individuals to creatively solve challenges from various perspectives, as well as emphasize critical thinking, ethical reasoning, and moral wisdom. We aim to offer an experiential learning program for undergraduates that promotes interdisciplinary teamwork, communication, and knowledge sharing, to equip them to ethically and responsibly lead in the evolving data and technology landscape.

We're planning a transformative workforce upskilling program, which will prioritize socially responsible handling of data, data science, and AI. In line with Notre Dame's mission, education about responsible data and AI use demands both a data-driven culture and accountability. Our initiative supports the community by providing upskilling in data science and AI for future jobs, which is especially vital in the South Bend-Elkhart region due to AI and automation impacts on manufacturing.

GOAL 3 OBJECTIVES

1. Identify gaps in data science capacity and experience in communities and industry and co-create training programs that are responsive to such stakeholder needs and latest developments in data science and AI.

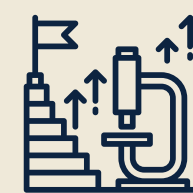


By grasping our community's distinct needs, we will jointly design training and upskilling programs that remain up-to-date, practical, and aligned with the latest data science advancements. Our method equips communities with the necessary tools to excel in a data-focused industry.

We believe that a university education should not only develop students that can create and impact the future through their work, but also help them to see the implications to society of the future they will contribute to. We are dedicated to expanding educational opportunities with a focus on social responsibility through practical training and student leadership.



2. Scale experiential learning and educational programs for students to lead on socially responsible data science and AI.



3. Develop a flagship postdoctoral scholar program at the interface of data and domain(s), supporting research of faculty affiliates across colleges and schools.

Our goal is to nurture outstanding postdoctoral scholars with expertise in data-driven methods and specific domains. By connecting these areas, we'll encourage innovative research and interdisciplinary teamwork, pushing the limits of knowledge to tackle intricate challenges.

We're dedicated to Notre Dame's community. We aim to bring in thought leaders as seminar speakers and also organize training workshops to enable data science capabilities across diverse groups of students.



4. Develop and deliver responsive learning opportunities for campus constituents through workshops and seminar series.

PLANNING FOR SUCCESS: GOAL 4

Cultivate a driven, agile, and inclusive environment that enables all team members to thrive and collectively deliver on the institute's goals.



We strive for a culture that encourages everyone to pursue purpose-driven excellence in their work while responding swiftly and effectively to the ever-changing technological landscape of research and education. By embracing diversity, equity, and inclusion, we value and respect the unique perspectives and backgrounds of every team member. We want to create a safe space for collaboration and foster a sense of belonging.

We will harness the power of teamwork and cooperation, where each individual's dedication to our mission will ripple through the Institute and beyond, resulting in heightened creativity, increased productivity, and a sense of camaraderie that inspires collective enthusiasm. In line with Notre Dame's mission, we will foster a holistic approach to team building, leadership, and organizational development, encompassing individual growth, collective collaboration, and a shared commitment to making a meaningful impact.

GOAL 4 OBJECTIVES



1. Recruit and retain mission-motivated and collaborative team members whose strengths and interests align with key objectives.

By maintaining clear and open channels of communication, we seek to provide our team members with timely and comprehensive information. We aim to enhance transparency, build trust, foster a sense of inclusion, and empower our team members to contribute more effectively to our common goals.

3. Nurture a vibrant team spirit, Diversity, Equity, and Inclusion (DEI) culture, and supportive climate.



We aim to create a united, high-performing team dedicated to our mission, purpose, and positive impact. Our goal is a collaborative environment where members cohere to achieve common and leverage their strengths synergistically for a powerful force for good.

2. Enhance communication across the Institute to increase transparency, effectiveness, and openness.



We embrace a DEI culture that values and celebrates the diverse backgrounds, experiences, and perspectives of all our team members, and where everyone feels respected, included, and empowered to contribute their unique talents and ideas. We will build a place where we will feel comfortable seeking help, sharing challenges, and expressing opinions.



PLANNING FOR SUCCESS: GOAL 5

Establish the Lucy Family Institute as a collaborative, mission-driven, global thought leader.



The Lucy Family Institute embodies Notre Dame's mission, guiding us with purpose. Our approach is fueled by innovation, collaboration, and a data-driven passion to impact society. We'll carefully align research with critical issues, echoing Notre Dame's vision as a transformative force for societal challenges. This resonance is underscored by a commitment to ethical and unbiased information, establishing the Institute as a beacon of trust, offering insights that guide decisions and catalyze change.

As thought leaders, we will aspire to contribute innovative ideas and cutting-edge research, aligning with Notre Dame's aspiration to be a global leader in addressing complex problems. We firmly believe that our insights can influence public discourse and inspire actions that lead to social progress and lasting change.

We strive to become an influential voice in data-driven research, known for its expertise, innovative ideas, influential publications, impactful solutions, thoughtful communication, and a culture of continuous learning and collaboration. By harnessing the power of data and leveraging our collaborative approach, we will contribute to transformative change and help build a more just, sustainable, and compassionate world – a vision that aligns seamlessly with Notre Dame's mission and values. Together, we can make a lasting impact and fulfill our collective aspiration to be a force for good in the world.



GOAL 5 OBJECTIVES

1. Spark and popularize the journey from innovation to translation for societal impact.



We aim to be a catalyst for not only advancing fundamental research but also translating the advances into solutions for societal benefit. We want to tackle the last-mile challenge that goes beyond publications to deployment of research innovations for market and/or society.

Our goal is to build an inclusive platform for open, constructive discussions on responsible data and AI use. We aim to raise awareness about their benefits, risks, and societal impacts, fostering collaboration among academics, experts, organizations, and the public. This will enable stakeholders to collectively leverage data and AI for the greater good.



2. Foster dialogues among varied stakeholders on data and AI as a global force for good.

As emerging thought leaders, we value sharing our innovative research and impactful initiatives widely. This will promote internal knowledge-sharing, collaboration, and engagement. Externally, it will raise awareness of our pioneering work and establish the Institute as a go-to source for data expertise and thought-provoking insights.



3. Create a comprehensive internal and external communication strategy to increase outreach and promote Institute endeavors.

We strive to establish the Institute as a credible and reliable source of information and guidance, fostering a reputation for offering impartial insights and trustworthy perspectives on the ethical considerations that underpin the domain research. Through rigorous analysis and transparent discourse, we aim to become a respected beacon in promoting ethical understanding and informed decision-making.



4. Become an impartial and trusted public source on ethics governing.

LUCY ADHERE: ADVANCES IN DATA FOR HEALTH EQUITY RESEARCH AND EDUCATION

2023 LUCY ANNUAL THEME



Selection of the Lucy Annual Theme for 2022-2023 was the culmination of several years of work addressing healthcare disparities, tackling health and healthcare inequities, and establishing state and national health research collaborations.

ANNUAL THEME HISTORY

The Lucy Family Institute 2023 Annual Theme is “Advances in Data for Health Equity Research and Education (ADHERE).” As health disparities threaten our communities’ well-being, our passionate faculty and staff refused to keep aside. A short stroll down memory lane highlights groundbreaking convergence research projects, inspiring conferences, and local, state, and international collaborations focusing on data-driven insights in health equity.



MOMENT TO SEE, COURAGE TO ACT

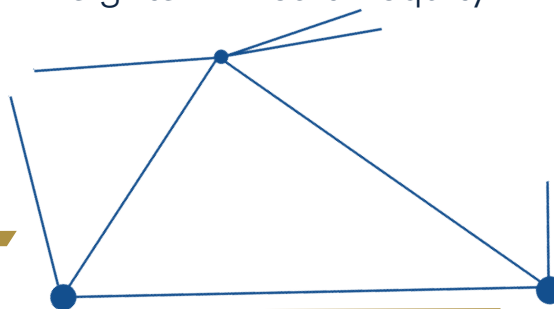
Led by the Lucy Family Institute Director, Nitesh Chawla, a diverse team of nearly 30 Notre Dame faculty and staff, along with six centers and institutes, proposed “A Call to Action: An Initiative to Solve Health and Healthcare Inequities” at the *2021 Moment to See, Courage to Act* Notre Dame Initiative in the fall of 2021. They proposed strategic investment to address health and healthcare inequities, form partnerships with community organizations and health systems, mobilize campus expertise, recruit experts, develop data infrastructure, train students and scholars, and enhance community data and health literacy.

ADDRESSING HEALTHCARE DISPARITIES IN MEXICO

In partnership with Hospital Infantil de México Federico Gómez in Mexico City, Mexico, this project is focused on understanding the clinical, social, and structural challenges associated with inequity in health and healthcare access in low- to middle-income countries. The Lucy Family Institute team, lead by Angélica García Martínez, PhD, developed a data-driven mobile application deployed within the public health care system in Mexico.

STATE & NATIONAL HEALTH COLLABORATIONS

Nitesh Chawla chairs the Structural and Social Determinants of Health Project Development Team (PDT) for Indiana Clinical and Translational Sciences Institute (CTSI). This PDT supports research that enables a deeper understanding of multiple contexts that shape patterns of health and wellness, and promotes equitable opportunities for good health and well-being.



CONTINUED WORK

Our dedication to data-driven health equity research shows in multiple new projects developed by Lucy Family Institute and affiliates. Throughout this report, projects falling within the annual theme are marked with the annual theme logo.



NEW HEALTH EQUITY DATA LAB

Driven by our mission and the identified needs of the community, we launched a major research platform aimed at reducing health inequity - the **Health Equity Data Lab (HEDL)** - in Fall of 2022. This Lab received an initial funding from Accenture of \$1.5M, with the potential of another \$750K by over 450 Notre Dame Accenture alumni.

The goal of HEDL is to advance interdisciplinary research and translation at the intersection of health equity and data science and AI. HEDL will develop a comprehensive framework for tackling health and health-care equity challenges, specifically at the intersection of medical and social care.

The Lab will take a data-driven approach, which will work to identify measurable and actionable health inequities to prioritize resource allocation.



"The Accenture Health Equity Data gift will allow us to build a comprehensive framework to identify where gaps exist for underserved communities when trying to improve health and well-being."

Nitesh V. Chawla,
Director of the Lucy Family Institute for
Data & Society

COLLABORATION FOR IMPACT

We invited faculty and staff from the broader Notre Dame community to partner with the HEDL on the following topics:

1. Health Literacy 2.0: Responsible use of AI and Empowering the Workforce of the Future
2. Beyond HR: Benefits to Community Organizations
3. Precision Social Determinants of Health
4. Health Equity Index

HEALTH EQUITY RESEARCH INCUBATION

We funded four projects proposed by interdisciplinary teams of Notre Dame faculty and staff affiliated with the Institute. We anticipate that these awardees will share their initial project results at the September Health Equity Data Forum, in the fall of 2023.

Indigenous Cancer Disparities: Multi-Modal Data Integration of Social and Biological Determinants of Health

Meenal Datta

Assistant Professor
Department of Aerospace and Mechanical Engineering

Margaret Traeger

Assistant Professor
Department of IT, Analytics, and Operations

Bridging the Data Gap Between Parental Adversity and Infant Health Outcomes

Theodore Beauchaine

William K. Warren Foundation Professor
Department of Psychology

Mark Fox

Associate Dean
Indiana University School of Medicine, South Bend

Kimberly Green Reeves

Executive Director of Community Impact.
Beacon Health System

Cassy White

Lead Project Specialist, Community Impact
Beacon Health System

Emergency Room Usage and Hospitalization Study of Motels4Now Low-barrier Shelter Program Participants

Margaret Pfeil

Teaching Professor
Department of Theology and the Center for Social Concerns

Donald Zimmer

Memorial Hospital Emergency Department

Katharine Callaghan

Associate Director
Family Medicine Residency Program
Memorial Hospital

Sheila McCarthy

Director, Motels4Now at Our Lady of the Road

Housing - Health Equity Nexus: Better Housing as Health Risk Mediator (HOUSE4HEALTH)

Ming Hu

Associate Professor in the School of Architecture
Associate Dean for Research, Scholarship, and Creative Work

Chaoli Wang

Professor
Department of Computer Science and Engineering



HEALTH EQUITY DATA FORUM



Within the six months of its launch, HEDL held a Health Equity Data Forum that brought together over 60 leaders from industry, government, and community organizations, along with Notre Dame leadership, faculty, and staff to develop a charter of collaborative work towards addressing health equity gaps. The cross-disciplinary, cross-industry group included health payers, providers, health technology retailers, pharmacies, pharmaceutical, government, and community health organizations, and universities. Participants have committed to

active involvement and data sharing in exchange for project transformation and the ability to leverage its outcomes to generate greater health equity in their organizations and communities.



FORUM PROVOCATIONS

Precision Social Determinants of Health

- Black maternal health
- Food as medicine
- Mental health support

Workforce of the Future

- Analysis of current gaps in the current workforce
- Improving community health literacy
- Future of healthcare worker
- Responsible AI

Health Equity Index

- Definition of health equity
- Metrics that drive the index

Beyond HR

- Analysis of current community interventions for employers in the business forum

MATERNAL HEALTH WORKING SESSION

In June of 2023, the Institute organized a working session on maternal health, with a special focus on Black maternal health. The session had several important objectives, designed to inform ground-breaking research in this area for the near future:

- Identify the problem domain / topic focus for the upcoming work
- Understand what data is required and available to address these areas of opportunity
- Decide how to measure the effectiveness of interventions ("start with the end in mind")
- Determine strategies to encourage participation from providers / community resources and mothers / pregnant individuals
- Establish ideas for intervention deployment and plans for data collection
- Discuss how to tackle issues surrounding racial / ethnic concordance and bias



The session generated a concise set of objectives, establishing the foundation for data-driven research led by the Institute and its partners. Key goals included addressing the well-being of Black mothers in Indiana, including physical and mental health issues leading to maternal stress, and monitoring relevant data throughout pregnancy, with a target of postpartum (the "4th trimester") outcomes. Each objective was precisely defined to ensure actionable research results.

HEALTH EQUITY DATA LAB PROGRAM DIRECTOR



in national and community programs.

Mary Mumbi Wachira, MS combines seasoned project management skills, community engagement, evaluation, research, and strategy development experience to explore existing organizational and community frameworks and identify opportunities for social change and impact. While at the St. Joseph County Department of Health, she defined the county burden of disease, created the inaugural health equity report, developed and completed the Community Health Workers (CHW)-led health equity data analysis (HEDA). Mary has international experience in integrating research in health and education practices

LUCY FAMILY INSTITUTE TEAM

PEOPLE ARE THE HEART

WE VALUE TEAMWORK, DIVERSITY, AND GROWTH MINDSET



We increase our impact through our people: the Lucy Family Institute faculty and staff, affiliates, graduate scholars, and undergraduate students. People are the heart of everything we do at the Institute.

Nitesh Chawla, PhD

Frank M. Freimann Professor of Computer Science and Engineering and the Founding Institute Director

Anne Beasley, MS

Senior Administrative Coordinator

Jasmine Botello, MA

Executive Assistant to the Institute Director

Sugana Chawla, MA

Data Science Education Program Manager

Ying (Alison) Cheng, PhD

Associate Professor, Psychology and Associate Director of Education at the Lucy Family Institute

Brian Fogarty, PhD

Associate Professor of the Practice and Associate Director, Center for Social Science Research (CSSR)

Angelica Garcia Martinez, PhD

International Scholar

Christine Grashorn, MA

Research Communications Specialist

Matthew Hauenstein, PhD

Assistant Research Professor

Richard Johnson, MLIS

Associate Professor of the Practice and Managing Director, Applied Analytics and Emerging Technologies Lab (AETL)

Michael Kennel

AETL Lead Software Architect

Valentina Kuskova, PhD

Professor of the Practice and Managing Director, Notre Dame AnalytiXIN site in Indianapolis

Cheng Liu, PhD

Lead Data Scientist and Assistant Research Professor, CSSR

Katie Liu, PhD

Assistant Director, Research Programs

Donovan Leiva, MS

Research Program Coordinator

Ramandeep Makhija, MS

Lead Data Scientist, AETL

Natalie Meyers, MA, MLIS

Professor of the Practice

Nuno Moniz, PhD

Associate Research Professor and Associate Director, DIAL Lab within Lucy Family Institute

Margaret Nichols, PhD

Data Scientist, AETL

William 'Russ' Morris

Software Engineer, AETL

Jaron Porciello, MLIS

Associate Professor of the Practice

Matthew Sisk, PhD

Associate Professor of the Practice

Mary Mumbi Wachira, MS

Health Equity Data Lab Program Director

Yang Xu, MS

Data Science Consultant, CSSR

Fanny Ye, PhD

Collegiate Associate Professor of Computer Science and Engineering and Associate Director of Analytics

Jessica Young, MS

Data Science Consultant, CSSR

Dmitry Zaytsev, PhD

Associate Professor of the Practice



LUCY INSTITUTE STEERING COMMITTEE

Corey Angst

Department of IT, Analytics, and Operations
Mendoza School of Business

Michael Ferdig

Department of Biological Sciences
College of Science

Vijay Gupta

Electrical and Computer Engineering
College of Engineering

David Hachen

Department of Sociology
College of Arts and Letters

Robert Landers

Department of Mechanical Engineering
College of Engineering

Lizhen Lin

Department of Applied and Computational Mathematics and Statistics
College of Science

Fang Liu

Department of Applied and Computational Mathematics and Statistics
College of Science

Ron Metoyer

Department of Computer Science and Engineering
College of Engineering

Tijana Milenkovic

Department of Computer Science and Engineering
College of Engineering

Tom Mustillo

Keough School of Global Affairs
Faculty of Political Science
College of Arts and Letters

Rahul Oka

Department of Anthropology
College of Arts and Letters

Meghan Sullivan

Department of Philosophy
College of Arts and Letters

Tim Weninger

Department of computer Science and Engineering
College of Engineering

Olaf Wiest

Department of Chemistry and Biochemistry
College of Science

Fanny Ye

Department of Computer Science and Engineering
College of Engineering

Xiangliang Zhang

Department of Computer Science and Engineering
College of Engineering

ADVANCING OUR VISION / INSTITUTE-SUPPORTED FACULTY

Karla Badillo-Urquiola

Department of Computer Science and Engineering
College of Engineering

Yuefeng Han

Department of Applied and Computational Mathematics and Statistics
College of Science

Matthew Kilbane

Department of English
College of Arts and Letters

Fanxin Kong

Department of Computer Science and Engineering
College of Engineering

Robert Landers

Department of Mechanical Engineering
College of Engineering

Toby Jia-Jun Li

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College of Engineering

Spyridaon (Spyros) Mastorakis

Department of Computer Science and Engineering
College of Engineering

Frederick Nwanganga

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Mendoza School of Business

Rachel Porter

Department of Political Science
College of Arts & Letters

Ranjodh Singh Dhaliwal

Department of English
College of Arts and Letters

Daniel Tadmon

Department of Sociology
College of Arts & Letters

Margaret Traeger

Department of IT, Analytics, and Operations
Mendoza School of Business

Yang Yang

Department of IT, Analytics, and Operations
Mendoza School of Business

Yanfang (Fanny) Ye

Department of Computer Science and Engineering
College of Engineering

Dmitry Zaytsev

Lucy Family Institute for Data & Society

Xiangliang Zhang

Department of Computer Science and Engineering
College of Engineering

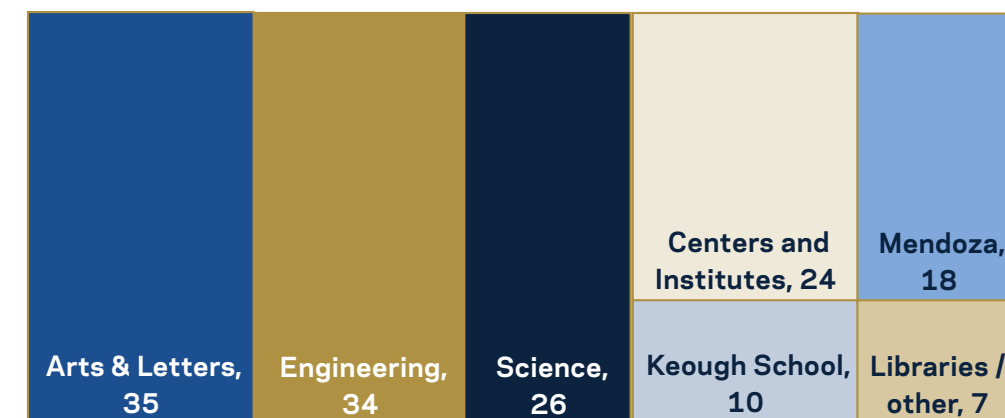
Changbo Zhu

Department of Applied and Computational Mathematics and Statistics
College of Science



LUCY FAMILY INSTITUTE AFFILIATES

Lucy Family Institute's impact is amplified through the work of its 154 faculty and staff affiliates from Notre Dame and community.



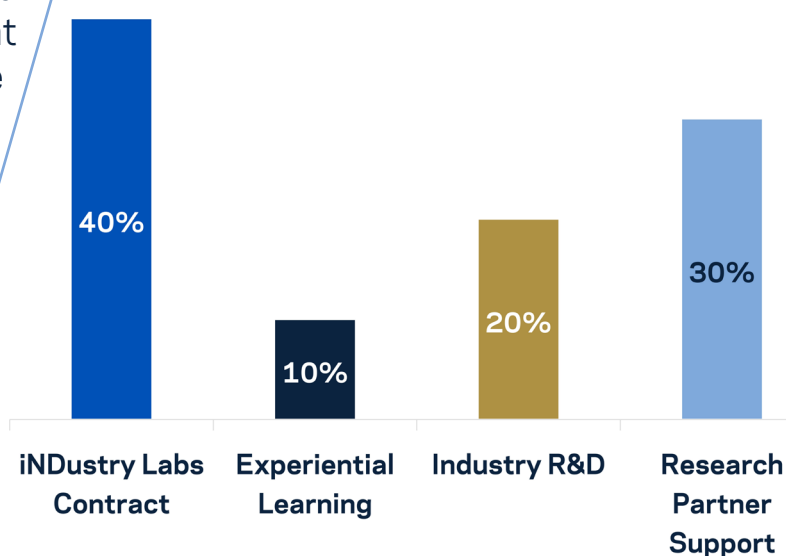
INSTITUTE'S LABS AND INITIATIVES

APPLIED ANALYTICS AND EMERGING TECHNOLOGIES LAB

Applied Analytics and Emerging Technologies Lab (AETL) is an integral part of the Institute and serves as the application arm, working in collaboration with iNDustry Labs to deliver on short- and long-term opportunities for the local region, while inspiring use-oriented research in academia.

The mission of AETL is to propel adoption of analytics and emerging technologies to advance organizational capability to foster a thriving industry community.

In FY 2022/23, AETL engaged with industry partners on **15** different projects. **40%** of the projects were with local companies in the South Bend - Elkhart region, and **47%** also involved partners at Notre Dame. The number of active projects increased more than three-fold, from **3** in FY 2021/22 to **ten** active projects currently. Other accomplishments for the year included several new programs.



In 2023, AETL launched the South Bend-Elkhart Regional Internship Program with five interns working directly with AETL on industry facing projects, as well as other interns placed with 1st Source Bank, Tire Rack, Aunalytics, Trek10, Inc., and ITAMCO.

"1st Source Bank is excited to partner with the College of Engineering and AETL to give students applied experience on a real problem to analyze and learn from data. We look forward to the insights they discover and future opportunities to learn from each other. This type of project experience is important for those entering the local workforce, since it's indicative of the problem-solving, communication and results-oriented skills we look for in our colleagues."

Jeff Williams, Vice President Head of IT Delivery at 1st Source Bank

AETL PROJECTS

RAISEuP FELLOWSHIP PROGRAM

RAISEuP fellowship program (Research & Industry Scholarly Exchange Program) brings industry professionals to co-locate with AETL for a year, to work on an impactful problem for their industry that aligns with the work and mission of AETL.



In the past year, AETL has worked closely with Matt Harrison (CHaSE Manufacturing) to develop ML-driven systems combined with visual data to measure and manage quality of products in real-time. With the success of these efforts with CHaSE Manufacturing, AETL will fully launch the RAISEuP fellowship for future participants in the upcoming year with research topics, including applied data and analytics within the industry, smart device or other emerging technology integration, data applied operation optimization, or applied AI/ML.

PARTNERS AND TESTIMONIALS



aunalytics

TeacherRead

AM General

INCOG
BIOPHARMA SERVICES

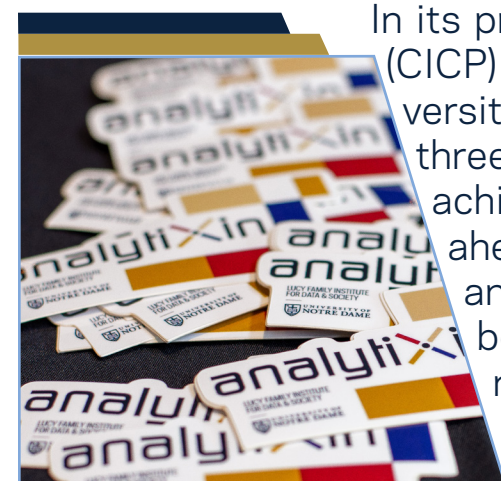
"iNDustry Labs [and AETL's] help with developing the AM General Smart Factory App has been a key enabler at transforming the AM General production workstation with the implementation of the Smart Factory user interface screens located in the production workstations integrating product traceability (RFID), work instructions, error proofing and statistical process control."

"What you did contributed to 8 billion dollars flowing into the community."

AM General

ANALYTIXIN

The Institute houses Notre Dame's AnalytiXIN initiative, financed by the Lilly Endowment, Inc., and managed by Valentina Kuskova, PhD, to establish a digital community, including a place-focused collaboration hub in Indianapolis that will strengthen connections and encourage academic data science R&D talent to engage with their industry peers to drive sustained innovation within Indiana.



In its proposal to the Central Indiana Corporate Partnership (CICP) for AnalytiXIN University Talent Recruitment, the University of Notre Dame set ambitious goals for itself for the three-year duration of the project; all project goals were achieved or surpassed by the end of the second year, well ahead of time. In total, over 140 faculty, staff, students, and administrative personnel from the University have been involved in the initiative; many held more than one role in the project. In AnalytiXIN's focus on talent recruitment and engagement, we have not only met but exceeded expectations.

INITIATIVE RESULTS

9 Faculty Fellows

14 Summer Fellows

16 Graduate Students

79 Summer and Co-Op Interns

42 Indiana Company Partners

PROJECT HIGHLIGHTS: HUNGERTECH CHALLENGE

HungerTech is a month-long technology challenge by AgriNovus Indiana, a Central Indiana Corporate Partnership (CICP) company. The challenge tasks innovators with ideating and implementing tech-enabled business solutions that connect targeted populations experiencing food insecurity to for-profit and not-for-profit food networks, with an aim to reduce inequity in food access, improving quality of life of target populations. Participants received access to AgriNovus research data, connections to subject matter experts and mentors, as well as one-on-one coaching to develop their idea. The Institute's AnalytiXIN team, including two co-op interns, worked with Geoff Gentz and AgriNovus for over six months on research leading up to the challenge and developing ideas for the competition. At the conclusion of the challenge, Notre Dame's AnalytiXIN team was one of the judges who selected the winner. More information about the challenge is available: <https://agrinovusindiana.com/hungertech/>.



PROJECT HIGHLIGHTS: ENERGY INSIGHTS

Energy Insights is a flagship AnalytiXIN project, developed in close co-operation with Energy Systems Network (ESN), Emerging Manufacturing Collaboration Center (EMC2) and Amazon Web Services (AWS) on the Energy Insights Research Platform (EIRP). The AnalytiXIN partner universities (Notre Dame, Purdue and Indiana University) are developing advanced energy/manufacturing models and analytics applications towards monitoring and reducing energy use within Indiana manufacturing companies. By demonstrating the effectiveness of analytics for energy attribution, prediction, and optimization, as well as carbon footprint quantification and reduction, this project positions Indiana as a world leader in advanced manufacturing, and as a blueprint for successful engagement of AI providers and industry.



Utilizing the analytics infrastructure provided by Energy Insights and Opto22, the AETL and AnalytiXIN team completed the installation of the minimum valuable product (MVP) kits on three assets in the Engineering Innovations Hub (EIH) at Notre Dame to collect energy data and then deployed a solution for collecting machine data off these assets. The AETL team created an AWS database for the EIH data, annotated datasets for the EIH and EMC2 data, created prototype dashboards for displaying energy data, and trained and validated machine learning models to predict energy consumption. The AnalytiXIN team also facilitated monthly seminars presenting results among partner AnalytiXIN universities, which are archived on YouTube.

DIAL LAB



Data,
Inference,
Analysis
and Learning
Lab @ ND



The Data, Inference, Analytics, and Learning (DIAL) Lab at the University of Notre Dame focuses on a diverse set of problems in data science, machine learning (AI), and network science, and driven by the question of how technology can advance the common good. The DIAL Lab is internationally renowned and highly cited, having made several fundamental contributions and inspiring new areas of research in topics such as learning from imbalanced data, learning on graphs, learning on complex, multimodal, and big data, and interdisciplinary applications in health & wellbeing, environmental and climate sciences, chemistry, learning analytics, and computational social sciences. DIAL Lab is led by Nitesh Chawla, with Nuno Moniz as associate director. Since 2007, DIAL has mentored 39 PhD students (graduated 28), 11 postdoctoral scholars, and 52 undergraduate researchers.

CENTER FOR SOCIAL SCIENCE RESEARCH

As part of the Institute, the Center for Social Science Research (CSSR) is dedicated to improving the quality and efficiency of social research at the University of Notre Dame by working with faculty, students, and staff across all academic disciplines.



The CSSR has three primary functions:

- Supporting Notre Dame faculty and researchers conducting social science research (as a core facility);
- Conducting original research as principal investigators and in partnership with faculty and researchers at Notre Dame and across the world;
- Providing quantitative and computational social science training and support to Notre Dame students, faculty, and staff.

Fiscal Year 2022-23 Results



In FY2023, the CSSR experienced its most successful year since its establishment. The center substantially increased performance in nearly all areas including the number of research projects, student consultations and support hours, number of training workshops, and grant activity.

Of particular note, the CSSR achieved its highest levels of grantsmanship and student support in the history of the center. Our grant activity for the year includes **\$3.6 million** in total PI allocation of submitted research grants by CSSR faculty and staff, as well as a total value of **\$14.4 million** for submitted grants and **\$8.5 million** for awarded research grants with the CSSR in non-PI roles. Our student support saw a **153% increase** in consultations and a **79% increase** in support hours compared to the previous year. These increases were primarily driven by our support of graduate students in the College of Arts & Letters and the Keough School of Global Affairs.

CSSR faculty and staff have also increased research publications in the areas of social science, applied statistics, and data science. Over the past 18 months, CSSR personnel have co-authored **11** journal articles, **2** articles in conference proceedings, **1** book chapter, and a **solo-authored book**.

During FY2023, the CSSR collaborated on research projects with Notre Dame faculty and researchers in

Berthiaume Institute for Precision Health
 Biological Sciences Department
 Center for Research Computing
 Division of Student Affairs
 Eck Institute for Global Health
 Environmental Change Initiative
 Institute for Educational Initiatives

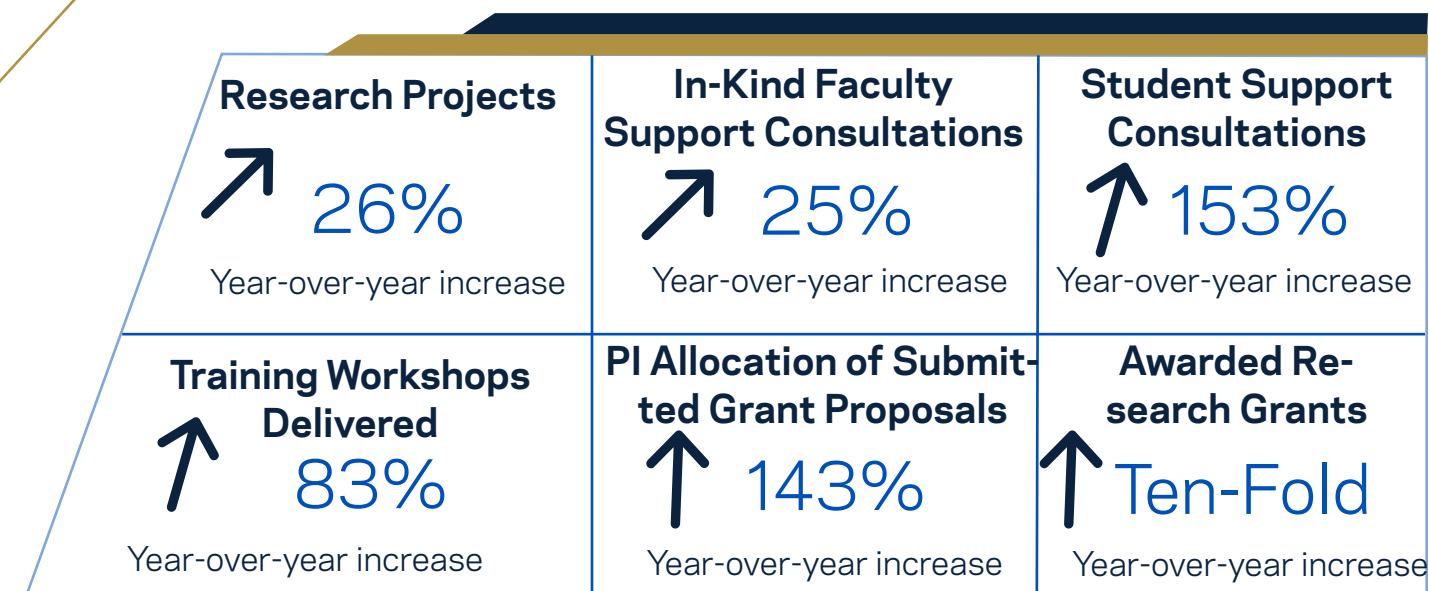
Keough School of Global Affairs
 Lucy Family Institute for Data & Society
 Neuroscience Department
 Political Science Department
 Psychology Department
 Pulte Institute for Global Development
 Sociology Department

The CSSR also worked on research projects with local and community organizations including Beacon Health System and St. Joseph County Department of Health.

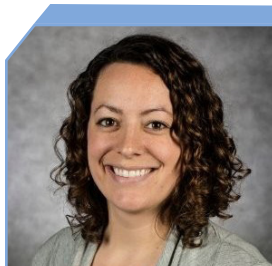
Over the past year, the CSSR provided extensive in-kind research support and training to faculty, researchers, and students from the College of Arts & Letters, College of Engineering, College of Science, Keough School of Global Affairs, and Mendoza College of Business.



CSSR GROWTH STATISTICS



GROWING WITH LUCY: NEW HIRES



Anne (Beerhorst) Beasley, MS is our new Senior Administrative Coordinator. Prior to Notre Dame, she worked as an accounts manager at Sterling Integrators, an events coordinator and administrative assistant at DePaul University, and an office administrator at Worthy Insurance Group. She has a bachelor's degree in biology from Calvin University and a Master's in nonprofit management from DePaul University.

Christine Grashorn, MA joined Notre Dame Research in 2023, and provides communications support for the Institute. Christine holds Bachelor of Arts degrees in anthropology and religious studies from East Carolina University. She also holds a Master of Arts degree from Andrews University. In the past, she facilitated internal and external communications for an ophthalmology practice.



Donovan Leiva, MS joined the Lucy Family Institute as a Research Project Coordinator. He holds a Master's degree in global affairs with a specialization in global health. He was the field station manager at the Belize Vector and Ecology Center, where he worked to support the Ministry of Health in strengthening the country's capacity for malaria elimination, disease prevention and research.

Margaret Nichols, PhD joined the Institute as a Postdoctoral Research Associate with the AETL. She holds a Ph.D. in Mathematics from the University of Chicago. Prior to joining Notre Dame, she held appointments as a Simons Postdoctoral Fellow at the Fields Institute in Toronto and as a Visiting Assistant Professor in the mathematics department at the University at Buffalo.



Mary Mumbi Wachira, MS joined Lucy Family Institute as the Program Director for its new Health Equity Data Lab. She holds a Master's in Global Affairs degree from the University of Notre Dame, where she was the recipient of a Kroc Institute Fellowship. In the past, she was a Global Health Research Associate/Public Health Fellow with St. Joseph Department of Health.

Dmitry Zaytsev, PhD joined the Institute as an Associate Professor of the Practice. He holds a PhD in political science and two master's degrees - in public policy and applied mathematics and informatics. He previously held positions of associate professor of social sciences, deputy director of a research laboratory, academic supervisor of a master's program, and director of an undergraduate minor.



GROWING WITH LUCY: PROMOTIONS



Michael Kennel was promoted to the position of **Lead Software Solutions Architect**. He will lead the design and incubation of solutions (products, tools, and platforms) that target market needs identified with industry and research partners. Michael will also supervise the day-to-day activities of AETL interns and other software engineers, and lead strategic pieces of technology or projects for AETL.

Katie Liu, PhD was promoted to the position of **Assistant Institute Director, Research Programs**. Katie will design, direct, and manage the sustainable research agenda of the Institute, oversee the development and evaluation of initiatives, grants, and other funding opportunities; build relationships within Notre Dame, partner universities, grant agencies, consulting and advocacy groups focused on societal initiatives. She will develop the overall Institute research strategy and translate it into action.



Ramandeep Makhija, MS was promoted to the position of **Lead Data Scientist**. Ramandeep will mentor and supervise other AETL Data Scientists and fellows in their activities and professional development. He will be positioned within an Industry Engagement focus area, serving industry and campus research projects as assigned. He will continue to apply his skills to strategic industry engagements and research partnerships while guiding other AETL data scientists, interns, and fellows in their efforts.

Nuno Moniz, PhD was promoted to the position of **Associate Director** of the Data, Inference, Analysis, and Learning (DIAL) Lab, a research unit that, through innovations and fundamental advances in data science and artificial intelligence (AI), is dedicated to creating and developing solutions for the social good. His main objective is to help students unleash their full potential and ensure that we are shaping the next generation of academia and industry.



Margaret Nichols, PhD was promoted to the position of Data Scientist with the AETL. In her current position, she will work with other AETL faculty and staff on data science and analytics projects in collaboration with a wide range of businesses in manufacturing, healthcare, and more. She will also supervise and mentor student interns, work with RAISEuP fellows on their projects, and help develop strategic engagements with industry stakeholders.

EMERGENT RESEARCH QUESTIONS AND TRANSLATIONAL CHALLENGES

INTERDISCIPLINARY AND CONVERGENCE RESEARCH







The Institute faculty aims to inspire innovations in fundamental research that generate translational societal impact through three overarching research foci that are domain-informed and data-driven: health and wellbeing of communities; future of work, life & physical sciences; and socio-technical systems for sustainable societies.

SCHOLARLY IMPACT AND METRICS

Scholars affiliated with Lucy Family Institute make noticeable scholarly impact.

FUNDING AND ENGAGEMENT

98 Research Proposals Submitted	\$121M Funding Requested	31M Funding Received
 Proposal Submissions	43.7% Proposal Value	Proposal Success Rate in first fully evaluated fiscal year (2021-22)
 31.1% compound annual growth rate over two years	 28.7% compound annual growth rate over two years	 166% year over year increase to FY 2021/22 in number of companies engaged, from 21 to 56

SCHOLARLY IMPACT

Lucy Family Institute’s publication dashboard contains detailed information about each scholar’s impact, including numbers of publications, citations, H-Indexes overall and in the last five years, as well as the list of each author’s publications. All metrics are available by calendar year.

Metric		2021	2022	2023 (First 6 months)
Publications	Institute-affiliated authors	42	130	136
	Number of publications	1,050	1,028	495
	% high-impact journals (10+)	7.6%	15%	13.7%
Citations	Total citations	171,557	936,092	1,030,004
	Citations since 2018	71,811	426,474	491,221

Dashboard is available here: <https://lucyapps.shinyapps.io/Lucy-publications-dashboard/>

RESEARCH PROJECT HIGHLIGHTS

We highlight a handful of projects, led by Institute faculty, that have walked the innovation to translation journey.

GLOBAL AFFAIRS CANADA

In 2020, **Ceres2030: Sustainable Solutions to End Hunger**, a landmark study led by **Jaron Porciello** and colleagues, provided policymakers with evidence-based policy recommendations to achieve the goal of zero hunger by 2030 by investing in agricultural development and food security. These recommendations are based on rigorous cost modeling and evidence synthesis techniques and have informed policy decisions at the national and global levels.

Canada's international development assistance supports agriculture and food systems programming that helps reduce poverty for vulnerable populations in developing countries, especially women and girls. Canada's assistance helps to address the root causes of hunger by reducing reliance on costly humanitarian food and nutrition assistance and strengthening the resilience of global agriculture and food systems.

Jaron Porciello, along with Lucy Family Institute's data science consultant **Yang Xu** and assistant research professor **Matthew Haustein**, PhD, collaborated with a team of experts at Global Affairs Canada to conduct a retrospective review of existing, non-classified Global Affairs Canada data. Using data science and artificial intelligence models, they generated a series of new, transferable data pipelines that will enable robust analysis of project data, supporting Global Affairs Canada's commitment to results-based management and evidence-based decision-making.

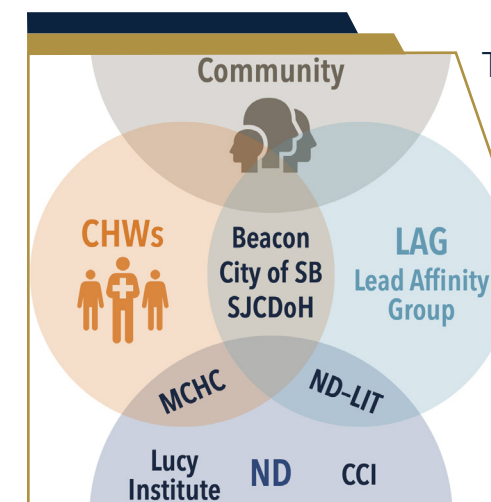


COMBATING ONLINE OPIOID TRAFFICKING WITH ADVANCED AI TECHNIQUES

Led by the Lucy Family Institute Associate Director of Applied Analytics, Professor **Yanfang (Fanny) Ye**, the NSF-sponsored project aims to help federal and state governments, public health agencies, law enforcement, and local communities detect, disrupt, and dismantle opioid trafficking networks. The project will use novel AI-based technology to investigate complex trafficking activities not detected by traditional methods. Massive amounts of data will be generated from online illicit drug markets and analyzed automatically. As part of the effort, Ye and her team will integrate this research with new curricula and student mentoring to train students in interdisciplinary research methods for combatting opioid trafficking and preventing abuse. The effort also will extend to work with K-12 students.



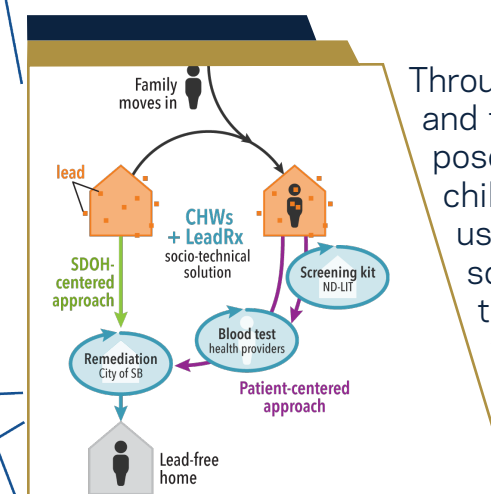
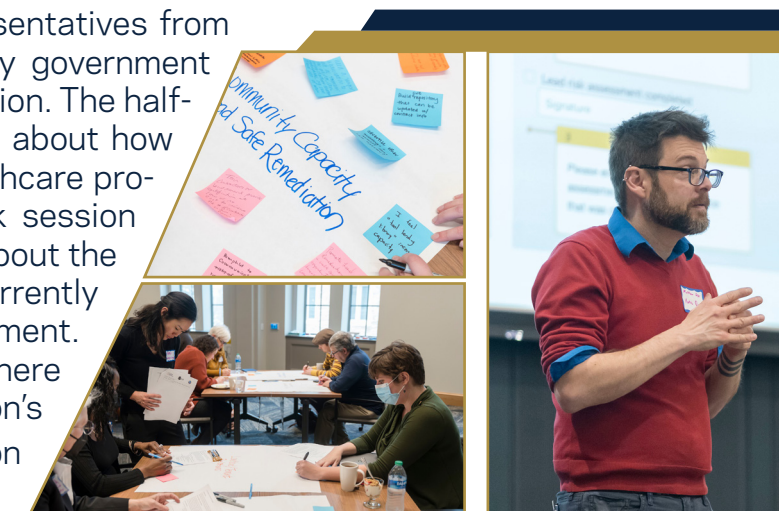
NSF CIVIC: CLOSING THE LOOP ON CHILD LEAD POISONING



To address child lead poisoning in St. Joseph County, IN, the Lucy Family Institute faculty led a team of researchers from the Notre Dame Lead Innovation Team (ND-LIT), the Center for Civic Innovation, healthcare providers at Beacon Health System, the St. Joseph County Department of Health, community health workers, local governmental officials at the City of South Bend, and the Lead Affinity Group, to identify gaps in care coordination and design a technological intervention for community health workers to effectively guide a household through lead exposure diagnosis and remediation.



In February 2023, our team hosted representatives from over 20 community organizations and city government departments in the South Bend-Elkhart region. The half-day workshop featured a panel discussion about how recent policy changes have impacted healthcare provider practices, in addition to a feedback session where participants provided suggestions about the application user interface that we are currently developing for lead poisoning case management. The ND-LIT team also facilitated sessions where participants collectively identified the region's top priorities for lead poisoning prevention over the next year.



Through discussions at monthly Lead Affinity Group (LAG) meetings and the CIVIC Lead & Healthy Housing Conference (above), we proposed developing an application called LeadRx to "close the loop" on child lead poisoning (schematic on the left). Coordinated by CHWs using LeadRx, a child (family) may enter the loop from an ND-LIT screening and/or a blood test at the healthcare provider, which then activates eligibility for remediation services (e.g. grants) provided by the City of South Bend. We also anticipate that LeadRx will enable proactive detection of houses with lead hazards, and remediate homes that could expose a child to lead.

HESAT2030: A ROADMAP TO END HUNGER SUSTAINABLY AND NUTRITIOUSLY

Led by **Jaron Porciello**, Associate Professor of the Practice at the Lucy Family Institute, Hesat2030 was established in November 2022 with an initial award of \$4.6M from the Bill & Melinda Gates Foundation. Additional funders, including the Foreign Commonwealth and Development Office (UK) and Federal Ministry for Economic Cooperation and Development (BMZ Germany), have contributed towards Hesat2030 through specific activities. This was the **largest new award to a research institute** at Notre Dame in 2023. Hesat2030 endeavors to integrate outcomes focused on climate change, nutrition-sensitive agriculture, women's empowerment, and social inclusion into donor and international agency policies, programs, and strategic plans. This integration is done through costing, evidence, and advocacy to scale-up on effective innovations.



"When people think about big data, they think about satellite imagery, weather reports and traffic data, but the data I work with is nowhere near as clean and collected. I work with small and distributed data sets and bring scientific studies together with technical documents, news reports, and blog posts, and apply a framework to understand what is really going on and what could be done more effectively."

Jaron Porciello

Key Message

Scaled-up action and increased investment is necessary to deliver progress toward ending hunger. Additional evidence, cost modeling, and coordinated action plans are needed to better integrate diet, gender and climate into sustainable food systems.

Key Outputs and Outcomes

- The Juno Evidence Alliance, comprised of team members from CABI-UK and Notre Dame is creating normative guidance and training for evidence synthesis. It is also conducting additional research and cost modeling for gender and climate mitigation, and creating an online platform for ODA analysis.
- The Zero Hunger Private Sector Pledge enables governments, donors, companies and civil society to implement recommendations in policies, programs, and projects. In its first year, it has received commitments of \$506M from 44 companies. These pledges funded projects in 48 of the 90 countries identified for priority funding for Ceres2030, precursor to Hesat2030 project.
- An independent "Commission on Food Security, Climate Change and Innovation" convened researchers and a high-level group that included former heads of state and finance ministers, senior policymakers, and private sector leaders.
- Several policy documents, white papers, reports and other publications will be prepared.



HEALTH EQUITY RESEARCH IN COLLABORATION WITH LATIN AMERICA

Over several years, Lucy Family Institute developed collaborative relationships with researchers in Latin America. In addition to the health equity research project with Hospital Infantil de México Federico Gómez in Mexico City, the Institute supports health-related projects in Mexico, Columbia, and the Dominican Republic.



MEXICO: INDIGENOUS WOMEN COOPERATIVE



In May 2022-July 2023, **the Institute's team**, in collaboration with **Vania Smith**, PhD, Notre Dame's professor of anthropology, and the Iberoamerican University in Puebla (UIA) conducted a qualitative study in the northeastern mountain regions of the State of Puebla, examining interaction between ecological stoves and health benefits. Previous evidence demonstrated that ecological stoves reduced respiratory complications, such as asthma and COPD in women and children in Mexican communities. This project takes examines gender and health equity in indigenous communities though various interventions by NGOs acting to reduce violence and empower women.

MEXICO: NATIONAL LONGITUDINAL STUDY ON MALNUTRITION

Led by **Angélica García Martínez**, PhD, the Institute team is working on building predictive models that explore the risks of extreme poverty that can result from severe illnesses in children under five years of age in Mexico. The longitudinal data were collected in four waves between 2006-2020 by the Mexican National Institute of Public Health, and contain information on socio-economic status, health, national health, nutrition, etc. The ultimate goal of the study is to create a marginalization index - a comprehensive approach to malnutrition in children under five years old - that assesses social health and nutrition security programs available through time.



COLOMBIA: EVALUATION OF HEALTHCARE SYSTEM EFFICIENCY USING ML



Multimorbid patients often receive care from multiple care providers, resulting in fragmentation of care, increase in the treatment burden, and reduction of patients' satisfaction with care and health outcomes. The Institute team collaborates with the National University of Colombia and the Ministry of Health to perform a comprehensive evaluation of healthcare systems related to the medical care of multimorbid patients. Machine learning algorithms will integrate multiple historical databases to generate insights on the healthcare system's efficiency and potential for improvement.

LUCY GRADUATE SCHOLARS

C-CAS

The NSF Center for Computer Assisted Synthesis (C-CAS) was named a Phase II Center for Chemical Innovation in August 2022, receiving a \$20M award over five years. C-CAS aims to transform the way that chemists discover, optimize, interrogate, and apply new reactions to the synthesis of functional molecules by developing, validating, and popularizing open-science data science tools and computational chemistry workflows. These tools will use AI and machine learning to help both academic labs and industry scientists streamline the process of creating complex molecules, which will reduce trial-and-error and unnecessary waste. C-CAS is led by Lucy Faculty Affiliate and Steering Committee member **Olaf Wiest** (Chemistry and Biochemistry), with Co-PIs **Nitesh Chawla** and **Xiangliang Zhang** (Computer Science and Engineering), in addition to faculty at CalTech, Carnegie Mellon University, Colorado State University, MIT, UC Berkeley, UCLA, and the University of Utah.



The Institute's AETL collaborated closely with C-CAS to help develop the Open Reaction Database (ORD), an interactive and free tool for chemists to share and utilize reaction data for reaction prediction and experimental design. In addition to providing an accessible interface for easily downloading and browsing chemical data, the ORD encourages sharing of pre-competitive proprietary data, which is a major shift from typical practices in the field.

FLIP THE SCRIPT

Lucy Family Institute faculty received several Notre Dame internal grant awards, helping further propel groundbreaking research ideas.

Trustworthy AI Lab for Education (TALE)

PI: **Alison Cheng**, Co-PI: **Nitesh Chawla**, **John Behrens**, **Daniel Lapsley**

Co-I: **Alex Ambrose**, **Cheng Liu**, **Fang Liu**, **Nuno Moniz**, **Meng Jiang**, **Xiangliang Zhang**

The objective of TALE is to bring the power of new forms of data, computing, and AI to the educational community, by researching how best to build trustworthy, fair, and effective educational computing systems.

Overcoming the Evaluation and Monitoring Gap

PI: **Nitesh Chawla**, Co-PI: **Nuno Moniz**, **Jaron Porciello**

The objective of this project is to assess and evaluate the social impact of AI research scholarship by developing the ND Index on AI for Humanity and an AI for Development, which will position the University of Notre Dame as the leading convening space on this the AI dialogue.

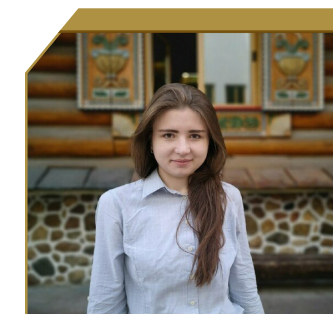
In Spring 2023, ten PhD students were selected to join the second cohort of Lucy Graduate Scholars. These students will collaborate with the first cohort of Graduate Scholars to design and develop programming that centers cutting-edge advances in data science and facilitates opportunities for graduate students from different disciplines to engage with the Institute.



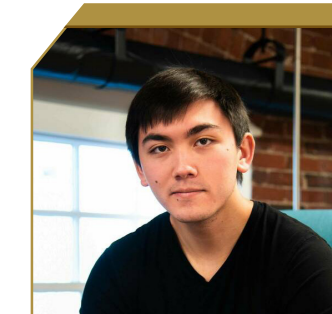
Adriana Pilar Ferreira Albanus
Political Science
Advisor: Aníbal Pérez-Liñán



Ali Altiok
Peace Studies and Political Science
Advisor: Caroline Hughes



Anna Sokol,
Computer Science and Engineering
Advisor: Nitesh Chawla



Aydin Wells
Computer Science and Engineering
Advisor: Tijana Milenkovic



Barnabas Agbodekhe
Chemical and Biomolecular Engineering
Advisor: Edward Maginn



Isabella Gimón
Integrated BioMedical Sciences (IBMS)
Advisor: Santiago Schnell



Kyla Jones
Chemical and Biomolecular Engineering,
Advisor: Alexander Dowling



Ruyuan Wan
Computer Science and Engineering
Advisor: Karla Badillo-Urquiola



Seham Kafafi
Psychology
Advisor: Jessica Payne



Simon Weaver
Integrated BioMedical Sciences, Chemistry, Biochemistry, Advisor: Matthew Champion

Upcoming events for 2023-2024 include:



Tutorial on applying for industry internships



Workshop on advances in Generative AI



CONNECT panel featuring experts that work at the intersection of Data and Humanities

ADVENTUROUSLY COLLABORATIVE

INCUBATION HUB FOR UNIVERSITY, COMMUNITY, GOVERNMENT, INDUSTRY, AND GLOBAL PARTNERS

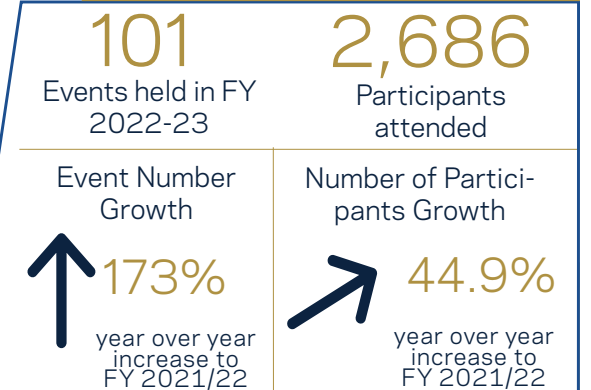


As collaborative, mission-driven thought leader, Lucy Family Institute continued many of its collaboration initiatives this year as well as created new.

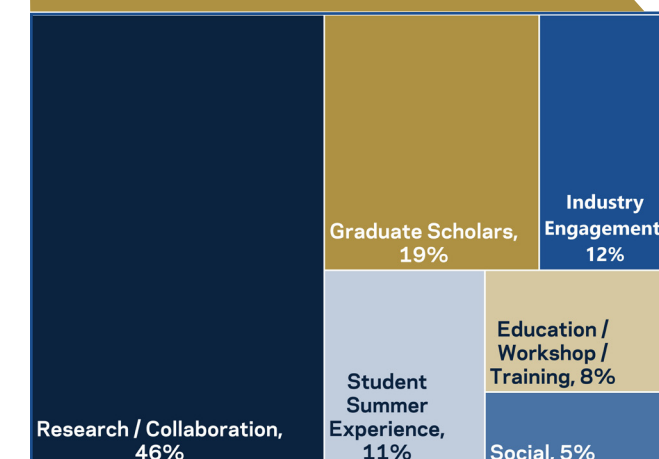
CONVENING FOR IMPACT

INSTITUTE-SPONSORED EVENTS

By hosting 101 events (not counting CSSR workshops) in FY 2022-23, the Institute more than doubled its number of events relative to the previous year, bringing together over 2,600 people for research, collaboration, education, and celebration. The Institute provided financial support to all of these events, in addition to employing a full-time role of Events & Communications coordinator, and many hours invested into event preparation and participation by the Institute faculty and staff. We believe that convening leads to co-creation, co-inspiration, and collaboration, significantly amplifying the Institute's impact.



Research-related events, happening on average four times per month, brought together audiences from 10-15 people for research presentations and group discussions, to over 150 people for the Symposium. The Institute invited nine external guests for seminars and fireside chats, and featured Notre Dame faculty and staff at an additional 11 events.



Events for graduate and undergraduate students take a close second place, with a total of 38 for the year. They include all graduate student seminar series, iTREDS events, and summer internship engagement events.

Engagements with industry partners, both in Indianapolis and South Bend, are also important to the institute, and take place about once a month on average. And occasionally we just have fun!

LUCY FALL SYMPOSIUM 2022

The Second Lucy Fall Symposium, which took place on October 11, 2022, was a celebration of collaboration, scholarship, and camaraderie. It brought together **over 150** students, faculty, staff from Notre Dame, industry partners from the region and Indianapolis, and university leadership.

Amplifying Research and Education

In Spring 2022, we funded **13** interdisciplinary research proposals that were submitted by faculty and staff across campus. To introduce these projects to the ND community, each team presented an overview of their project in a five-minute, three-slide lightning format. The audience had a chance to see the **diversity of research sponsored by the Institute**, the magnitude of talent, and the relentless spirit in pursuit of solutions to wicked problems affecting our society.



Panel on Convergence Research

We convened Institute-affiliated faculty and staff to discuss recently-funded, multidisciplinary research projects. The panelists included:

- Olaf Wiest** (Chemistry and Biochemistry)
- Jocelyn Keranen** (Notre Dame Lead Innovation Team)
- Yong Suk Lee** (Keough School of Global Affairs)
- Josefina Echavarria Alvarez** (Keough School of Global Affairs)
- Angélica García Martínez** (Lucy Family Institute)
- Luis Felipe R. Murillo** (Anthropology)



Following the presentations and panel discussions, small groups convened to discuss existing wicked problems and collaborative opportunities on the following topics:

- Advancement in Health Equity Research
- Industry Partnerships and Engagement
- Omics, Imaging, and Data Analytics for Personalized Health
- Tech Governance & Digital Ethology
- Human Factors in Data Science
- Data-Driven and Evidence-Based Education Research

Breakout Sessions



Awards Reception

The day concluded with an awards reception to honor the awardees of research funding and the student poster competition winners.

Featured iTREDS Capstone Projects:

- Unlocking Social Determinants of Health & Wellbeing for Equitable Health & Healthcare Access in LMIC. Wagner M, Calderon A, Robles J.
- A Sustainability and Food Security Analysis of International Agricultural Efforts. McKenna J, Sabumukama E, Cha T, Nordan E.

Featured Research Collaborations:

- A Novel Method for Efficient Uncertainty Reduction in Estimates of Air Pollution Mortality. Alifa M, Castruccio S, Bolster D, Bravo M, Crippa P.
- Active learning evaluation, criteria analyses, and application recommendation on metal-organic frameworks. Osaro E, Colón Y.



ADVENTUROUSLY COLLABORATIVE

MICHIANA COMMUNITY HEALTH COALITION

Since January 2022, the Institute has funded the Michiana Community Health Coalition (MCHC), which comprises health workers, community navigators, and certified addiction peer recovery coaches. Its goals include advancing research, offering student education, and enhancing public health in the South Bend-Elkhart community. MCHC is convened by Institute affiliates **Jessica Brookshire, Jen Burke Lefever, and Jill Pentimonti**.



The coalition meets monthly to pursue solutions to issues that commonly contribute to disparate health outcomes in the U.S. Over the last year, MCHC has grown to include 18 organizations within the region of St. Joseph, Elkhart and Marshall Counties. Key partners of MCHC include Beacon Health System, City of South Bend, Elkhart County Health Department, Franciscan Health, Goshen Hospital, HealthLinc, Heart City Health, Lacasa, Inc., Naxos Neighbors, Oaklawn, Office of Minority Health, Primary Care Partners of South Bend, Purdue Extension, Saint Joseph Health System, South Bend Fire Department, St. Joseph County Department of Health, St. Joseph County Public Library, and United Way of St. Joseph County.



"These individuals are working on the front line of health, listening and building trust within our community to improve our system of care. Their work is critical in understanding the needs that exist and in helping develop solutions."

Jessica Brookshire

Senior Director of the Office of Clinical Partnerships



Key Initiatives

MCHC hosted workshops and panels on the following topics:

Health & Wellbeing

- Advanced Care Planning: Honoring Choices
- Mental Health Resources
- Medicaid Eligibility Review Actions
- Diabetes Prevention Program

Other Workshops

- Self Healing Communities
- Motivational Interviewing

Safe and Healthy Housing

- Detecting and Mitigating Environmental Lead
- Panel on Michiana Housing Resources

Essential Services

- Panel on addressing Food Insecurity
- Community Resources (FindHelp, Bendable)
- Bridging the gaps in early childhood services

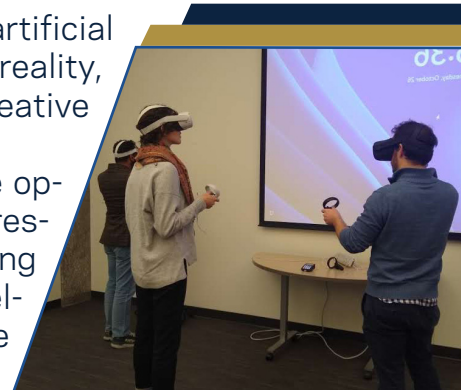
ADVENTUROUSLY COLLABORATIVE

DATA POETICS

Over the last year, the Institute funded “Data Poetics” - a series of events that brought Notre Dame faculty, staff, and students alongside artists and researchers from beyond campus for regular, interdisciplinary conversations at the intersection of data science and the humanities. In particular, the series featured opportunities for undergraduate students to speak with leaders in the Digital Humanities. This initiative was led by **Matthew Kilbane** and an interdisciplinary team of Institute-affiliated faculty.



Data Poetics featured topics such as the cultural meaning of artificial intelligence, the narrative possibilities of augmented and virtual reality, the relationship between natural and machine languages in creative expression, and the urgent challenges of platform capitalism. These conversations have led to a number of new collaborative opportunities, including a collection of essays inspired by the Expressive Networks symposium that will be published in an upcoming peer-reviewed volume and an ND undergraduate course in-development for Fall 2023 titled “Coding Poetry” that aims to guide students through literary studies and the process of building a “poetry robot.”



Event Highlights

October 25, 2022 - Writing, Directing, & Experience Design for VR / AR / XR: An Undergraduate Workshop with Artist Graham Sack
 October 26, 2022 - Storytelling for Immersive Media: Case Studies in Virtual and Augmented Reality: Lecture by Artist Graham Sack
 November 11, 2022 - An Undergraduate Workshop with Poet-Programmer Allison Parrish
 November 11, 2022 - A Reading and Artist's Talk with Poet-Programmer Allison Parrish
 April 24, 2023 - Expressive Networks: A Virtual Symposium on Poetry and Platform Cultures (Samuel Caleb Wee, Andrew Campana, Susanna Sacks, Anna Preus, Melanie Walsh, Micah Bate-man, Scott Challener, and Carly Schnitzler)



ADVENTUROUSLY COLLABORATIVE

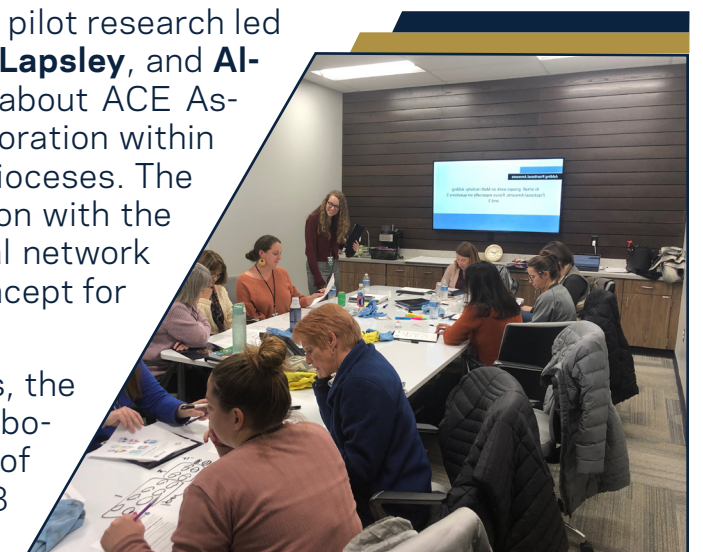
FORTIFYING AND EXPANDING CATHOLIC SCHOOL COLLABORATION THROUGH SOCIAL NETWORK ANALYSIS

National education data have suggested that Catholic schools are closing their doors at a deleterious rate (NCEA, 2022). Although the explanation is unknown, it is hypothesized that effective schools prioritize school ethos, communal organization, a sense of community, and relational trust. There is a notable lack of research on communal organization within schools, which is one of the motivations behind the Alliance for Catholic Education (ACE) Ascent Program.



The Lucy Family Institute supported one year of pilot research led by Institute affiliates **Christine Trinter**, **Daniel Lapsley**, and **Allison Olshefke**, supported by **Jessica Young**, about ACE Ascent Program's influence on professional collaboration within and between 10 schools across two Catholic dioceses. The funding enabled the project team in collaboration with the Institute's CSSR to pilot the efficacy of a social network survey instrument and establish the proof of concept for a scaled-up study.

As a result of the initial project period's findings, the CSSR and the project team will continue to collaborate throughout the launch of the next phase of the research study, which will begin in Fall 2023 with 46 schools across two Catholic dioceses.



ADVENTUROUSLY COLLABORATIVE

RESEARCH ACCELERATORS

Through a variety of programs, Lucy Family Institute sponsors research projects that address wicked problems, promise to become groundbreaking, or help graduate scholars progress faster towards their dissertations. Here are some highlights of such projects.

How can Artificial Intelligence Inform Air Quality and Incentives for Environmental Justice?



Led by **Paola Crippa** (CEEES), **Diogo Bolster** (CEEES and ECI), **Stefano Castruccio** (ACMS), **Richard Marcantonio** (Mendoza), and **Danielle Wood** (ECI). Graduate student Mariana Alifa (CEEES) created a framework for measuring the mortality uncertainty associated with various amounts of air pollution and health outcomes data. These models aim to help inform the creation and implementation of effective policies to protect human health. To understand the governance of air policies at state boundaries, MS student Alixandra Underwood (Keough) created six interactive maps and policy briefs detailing the air quality governance in the Chicago-Gary region (Illinois and Indiana). The team plans to continue working with air pollution governance organizations to identify additional modeling needs.

Rapid Personalized Image-Based Cardiovascular Flow Modeling using Bayesian Deep Learning

Led by **Jian-Xun Wang** (Aerospace and Mechanical Engineering) and **Chaoli Wang** (Computer Science and Engineering). Cardiovascular diseases are a leading global cause of death, but detailed, patient-specific hemodynamics information is often unavailable through routine clinical imaging. To address this challenge, graduate students Pan Du (AME) and Delin An (CSE) worked towards developing a deep learning framework that combines image segmentation and 3D mesh reconstruction of aortic vessel images. The team plans to continue these preliminary studies over the next year to refine their models and provide accurate and exhaustive evidence for clinical diagnosis and treatment planning.



Machine Learning Methods for Handling Nonlinear Relationships in Psychometric Models



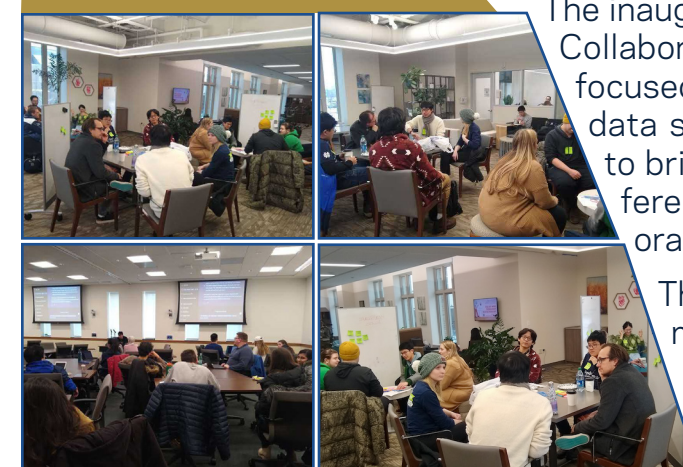
Led by **Johnny Zhang** (Psychology), **Meng Jiang** (CSE), and **Jun Li** (ACMS). Graduate student **Lingbo Tong** (Psychology & CSE) worked to integrate machine learning methods with structural equation modeling (SEM) to increase the accuracy and interpretability of SEM models, especially when they are applied to systems that have nonlinear relationships between latent factors and observed indicators.

ADVENTUROUSLY COLLABORATIVE

INITIATIVES FOR CROSS-CAMPUS STUDENT RESEARCH COLLABORATIONS

The Lucy Graduate Scholars are Notre Dame PhD students who are selected through a competitive application process to serve a two-year term as leaders and ambassadors for the Institute. They are tasked with designing data science-informed events and initiatives that are responsive to the interests of graduate students across campus. The program was launched in FY 2022-2023, providing students with financial and program support. As part of their commitment to the program, the first cohort of Lucy Graduate Scholars established several new initiatives over the last year including discussions, panels, and workshops that collectively engaged hundreds of students.

Collaboration Hour Series



The inaugural cohort of Lucy Graduate Scholars created the Collaboration Hour Series, or afternoon discussion events focused on topical research questions at the interface of data science and society. Scholars recognized the need to bring undergraduate and graduate students from different disciplines across campus together for collaborative discussions.

Through this event series, students had the ability to meet others outside of their own disciplines, share ideas, find collaborators, start new research projects, and get feedback on their ongoing research projects from peers.

Scholars also led workshops for Notre Dame to demonstrate the capabilities of emerging technologies such as generative AI, followed by a discussion about the ethics and use of platforms like ChatGPT and DALL·E 2.

CONNECT Series

The Lucy Graduate Scholars also designed and hosted a series of panels that focused on connecting Notre Dame graduate students across all disciplines with academics and industry leaders in various data-driven fields. Scholars recruited panelists to speak on a variety of topics and moderated panels where speakers highlighted the importance of industry-academia collaborations and explored the field-specific similarities and differences between academia and industry. Topics covered by the series included Data Science & Industry, Data & Education, and Data & Health. Lucy Graduate Scholars and other students were also given the opportunity to network with visiting speakers, meeting with them in small groups.



INTERNATIONAL COLLABORATIONS

Lucy Family Institute faculty and staff are actively engaged in collaborations that allow us to tackle national and global challenges in data and society. In FY 2022-23 our faculty and staff worked with teams from eleven countries, preserving data, building capacity, and attempting to find solutions to wicked problems.

COLOMBIAN TRUTH COMMISSION



The Lucy Family Institute, in collaboration with the Kroc Institute for International Peace Studies and the Clingen Family Center for the Study of Modern Ireland, supported the migration of the Colombian Truth Commission's digital archives of transmedia (TM) content, which encompasses over 200,000 audiovisual and textual materials, to the University of Notre Dame's servers and global platform. With the financial support of Humanity United Foundation, the University of Notre Dame gives the world unfettered access to the TM on a secure online platform open to expert and non-expert audiences, victims, civil society groups, artists, and scholars alike.

Members of the Truth Commission's team, experts in this vast transmedia archive, joined us at Notre Dame to share their insights on the internal processes of the work of the Commission during its mandate. The lessons learned from the data and technical work surrounding the peacebuilding and reconciliation activities will be relevant to faculty and fellows, researchers, and graduate and undergraduate students in the social sciences, data science, and humanities.

IMPROVING RESEARCH CAPABILITY IN ALGERIA

Led by Pulte Institute for Global Development, the Algeria Research Hub is dedicated to enhancing research capacity, fostering public-private partnerships, and facilitating both domestic and international collaborative research endeavors within Algerian and North American universities. The Lucy Family Institute is collaborating with Pulte Institute and National Higher School of AI, Algeria, on research and educational initiatives. The hub aspires to catalyze transformative innovation with socio-economic significance.



ENVIRONMENTAL INTELLIGENCE INNOVATIONS IN VIETNAM



Nitesh Chawla serves on the advisory board of the Center for Environmental Intelligence at VinUni, Vietnam, which will serve as a technology hub for future innovators and facilitate connections among experts from around the world to collectively solve sustainable development issues on a global scale.

OTHER INTERNATIONAL PARTNERS



CHILE

Data Observatory project, an innovative public-private alliance with the Chilean Government.



INDIA

Indian Institute of Management Bodh Gaya
Indian Institute of Technology, Gandhinagar and Jodhpur
Indo-U.S. Science and Technology Forum



ISRAEL

Tantur Ecumenical Institute and University of Notre Dame at Tantur
The Israel Data Science Initiative (seven of Israel's research universities)



ITALY

University of Pisa



MEXICO

Hospital Infantil de México Federico Gómez in Mexico City, Mexico



POLAND

Poznan University of Technology
Wroclaw University of Science and Technology (WUST)



PORTUGAL

University of Porto



UKRAINE

Ukrainian Catholic University

ETHICAL DATA SCIENCE EDUCATION: ACCESS, CAPACITY, LEADERSHIP

EDUCATION FOR DATA-DRIVEN FUTURE



Lucy Family Institute offers a range of programs focused on ethical data science education and experiential learning.

ITREDS

Entering its fourth year, the NSF-funded **Interdisciplinary Traineeship for Socially Responsible and Engaged Data Scientists (iTREDS)** program stands tall as a remarkable tale of achievement and impact. Not only does it boast an impressive rate of women and minority participation for when compared to other data science programs, but also many student capstone projects are informed by real-life problems and are implemented to make a real difference.



Sugana Chawla

Data Science
Education Program
Manager

Reflections from Sugana Chawla, iTREDS Program Manager

Envisioning the future, we set out to create an exceptional data science education program that not only empowers students to harness the potential of data and technology but also cultivates their ability to contemplate its impact on society. Thus, iTREDS was born—an embodiment of this visionary idea. Through an interdisciplinary and hands-on learning approach, we foster collaboration between students and stakeholders to tackle data-driven challenges while honing essential skills within a well-structured curriculum. At its core, iTREDS embraces the convergence of data-centered and human-centered methodologies. The iTREDS program encompasses a range of carefully crafted objectives:

- A comprehensive data science curriculum that fosters data acumen and provides interdisciplinary experiential learning opportunities, with a focus on creating a positive societal impact.
- A year-long capstone project that serves as a tangible framework for experiential learning and showcases the utility and value of data science in driving positive change in society.
- Programming that nurtures the principles of design thinking and encourages students to collaborate closely with stakeholders from diverse backgrounds and varying levels of expertise, thereby enabling collective and innovative problem-solving.
- A curriculum infused with a strong emphasis on data ethics, ensuring students develop a keen sense of responsibility and ethical awareness while working with data.
- Enhanced professional development for undergraduate students that enables them to communicate complex concepts effectively to decision-makers and the broader public.
- Valuable practicum opportunities through internships that allow students to gain real-world experience and apply their knowledge in practical settings.

Looking back at three years of iTREDS, we are proud of the program's accomplishments. Our comprehensive recruitment efforts have resulted in a diverse and inclusive cohort, ensuring the program's long-term scalability and sustainability. As we prepare to welcome cohort #4, inspired by valuable student feedback, we are making a slight pivot by introducing workshops and seminars to kickstart the capstone project discovery process earlier. Our commitment to continuous improvement drives us to create an even more enriching experience for our students.



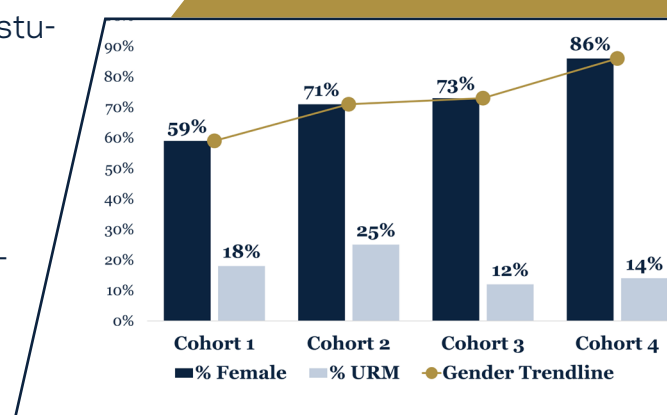
ITREDS

Enrollment Statistics

Over the four years, iTREDS enrolled a total of 86 students:

- Cohort 1 - 22 students
- Cohort 2 - 24 students
- Cohort 3 - 25 students
- Cohort 4 - 15 students

Percentage of female students in the program continues to grow year over year, with an average of 71% female enrollment. Average percentage of underrepresented minorities across four cohorts is 17%.



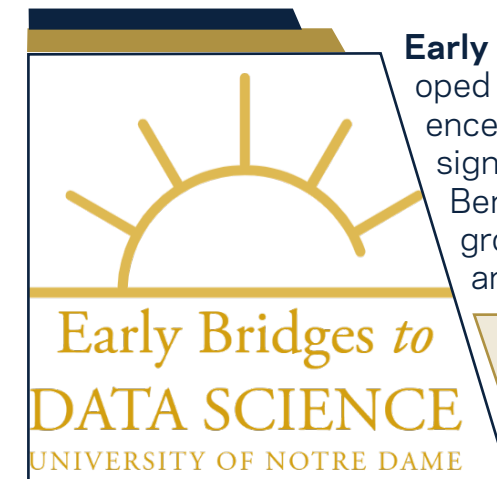
Education with Impact: Student Capstone Project Topics

The first two cohorts produced 12 projects, all of which aimed to address wicked problems in the society. The topics show the breadth and scope of undergraduate research work of iTREDS scholars.

<p>Social and Economic Determinants of Health Outcomes in Oncological Patients in LMICs: the Mexican Context</p> <p>Madison Wagner, Ana Calderon, Jesus Robles</p> <p>Supervisor: Angélica García Martínez</p>	<p>Harm Reduction via Fentanyl Test Strips and FTS Reader Application</p> <p>Luna Chen, Thomas Killian, Sarah MacLachlan</p> <p>Supervisor: Marya Lieberman</p>	<p>Food Information Communication in the Online Environment: Exploration of Ethical Food Information Representation Techniques</p> <p>Flores Ciamei, Nie Hunt</p> <p>Supervisor: Ronald Metoya</p>	<p>Co-Creating Spaces with Local Nonprofits to Expand Civic Data Analysis and Visualization Capacities</p> <p>Grace Connors, Rachel Salamone, Matelda Sweis</p> <p>Supervisors: Matthew Sisk, Katherine Liu</p>
<p>An Analysis of Approaches by International Organizations to Address the Issues of Agriculture, Food Security and Climate Change in Low-Income Countries</p> <p>Eli Nordan, Emie-Elvire Sabumukama, Julia McKenna, Trinity Cha</p> <p>Supervisor: Paul Winters</p>	<p>Implementing FAIR Principles and Linked Open Data with the PDYi</p> <p>Will Burgis, Kendall Carnes, Patrick Gerard, Tess Spesia</p> <p>Supervisor: Thomas Mustillo</p>	<p>Archdiocese of Chicago: Effects of School Closure on Parish Vitality</p> <p>Michaela Delaney, Milena Fava-Pastilha, and Natalie Volling</p> <p>Supervisor: Thomas Mustillo</p>	<p>Modeling a Pandemic (Covid-19)</p> <p>Alexia Velazquez, Yu Min Lee, Heather Farrell, He Leng</p> <p>Supervisors: Kristin Kuter, Nitesh Chawla</p>
<p>Mental Health Impact of Pandemic (Covid-19)</p> <p>Megan Geller, Jamie Heneghan, John Gordley, Juliana Ramos, Caitlin O'Brien</p> <p>Supervisors: Danielle Wood, Christopher We-drychowicz</p>	<p>Developing an Early Child Platform for Mexico</p> <p>William Gentry, Patrick Soga, Komal Wani, Claudia Patterson, Elizabeth Medina</p> <p>Supervisors: Nitesh Chawla, Ann Marie Conrado</p>	<p>Developing a Gig Platform</p> <p>Brian Carridi, Ryan DeStefano, Conor Holahan, Emma Dudrick, Samantha Allison</p> <p>Supervisors: Tom Mustillo, Nitesh Chawla, Ron Metoyer</p>	<p>Data Literacy Platform</p> <p>Hongrui Zhang, Yize Qi, Tarik Brown</p> <p>Supervisors: Donald Howard, Ronald Metoyer</p>

EDUCATIONAL INITIATIVES

EARLY BRIDGES TO DATA SCIENCE



Early Bridges to Data Science is a groundbreaking program, developed to bridge the divide between traditional middle school data science curriculum and the ever-evolving needs of the workforce. Designed for 6th to 8th-grade math or science teachers in the South Bend - Elkhart region, this program offers unparalleled professional growth and upskilling opportunities in STEM teaching, learning, and assessment, with a special focus on data science.

1. A three-day summer series where local middle school teachers participate in interactive workshops and pedagogy training at ND so that they can learn methods for teaching data science in their classrooms.

2. Curriculum coaching during the school year from content experts and experienced teachers to help teachers develop and implement lesson plans of data science concepts while meeting national and state standards in math and science.

SEEDS

The Summer Education and Engagement in Data Science (SEEDS) is a 3-week immersion program in the field of data science for local High School students in underserved communities to promote positive attitudes & engagement among underrepresented minority students in STEM. The program focuses on hands-on project-based learning. Through this program, students will complete & present a Data Science project on a socially imperative topic to demonstrate competency, foster ethical digital citizenship, and further educational attainment.

Designed with the "near peer" concept, SEEDS is also an 8-week internship for undergraduate students to design, teach, and research a Data Science immersion program and mentor high school students. Supervised by experienced faculty members, undergraduate students will develop mentorship, leadership, teaching, research and presentation skills through this program.

First launched in the summer of 2022, the program had another successful run in the summer of 2023. The 2023 cohort of SEEDS undergraduate mentors include 3 undergraduate students, two from St. Mary's and one from ND. The 2023 cohort of SEEDS mentees include 6 female local high school students from the Upward Bound program.

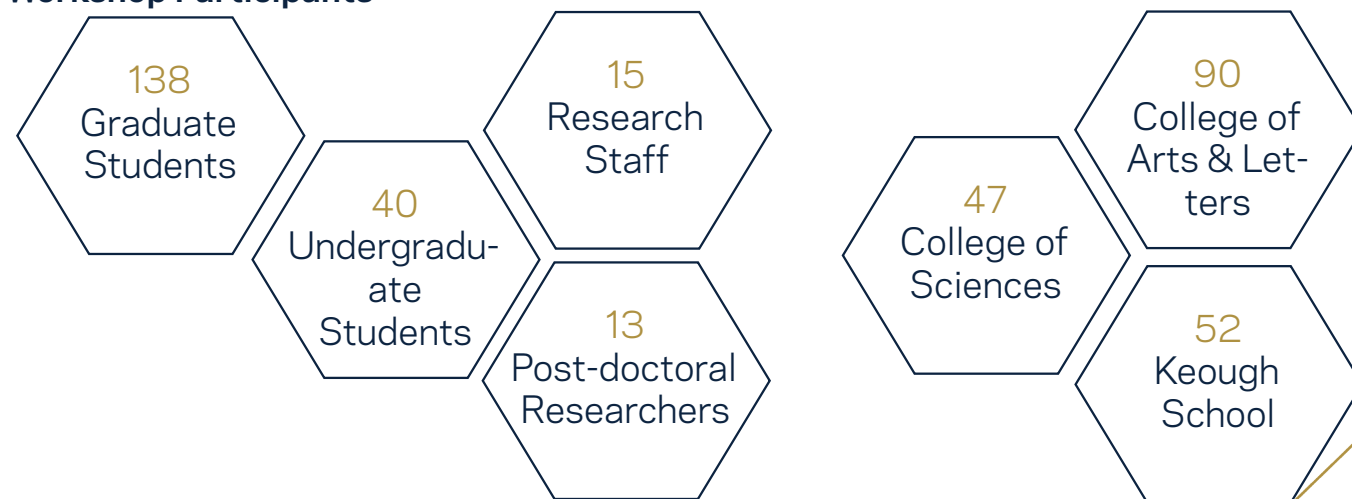


WORKSHOPS AND TRAINING

WORKSHOPS AND TRAINING

The Lucy Family Institute offers a wide variety of free trainings, workshops, and guest lectures, offered to Notre Dame faculty, staff, graduate, and undergraduate students. These events cover programming techniques and methods ranging from basic to advanced levels. Workshops are facilitated by CSSR and are taught by the Institute faculty and staff.

Workshop Participants



Workshop Topics

In FY 2022-23, the Institute offered the following topics for its workshops:

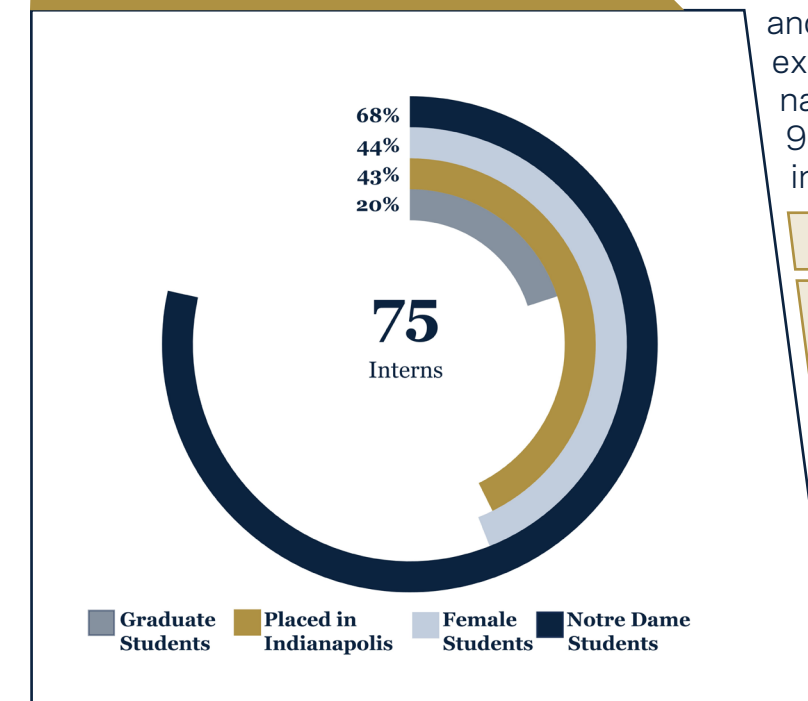
- A variety of workshops introducing software, programming languages, and packages within languages (Stata, R, Python, Tidyverse, RShiny)
- Introduction to linear methods: linear regression and generalized linear models
- Introduction to special data types: geospatial data (GIS analysis), relational data (network analysis), longitudinal data (time-series analysis)
- Introduction to special methods and approaches: web scrapping, machine learning
- Introduction to special methodologies: item response theory

GIS Day

We partnered with the Hesburgh Library Center for Digital Scholarship for GIS Day on November 16, 2022. Lucy Graduate Scholar, Meghan Forstchen, led an Introduction to GIS workshop. In the afternoon, the Institute hosted a Convergence Seminar where Prof. Jason Rohr (Biological Sciences) and Prof. Matthew Sisk (Lucy Family Institute) presented current research projects that involve using GIS and spatial analysis for addressing environmental problems within communities.

LUCY SUMMER INTERNSHIP PROGRAM

In summer of 2022, Lucy Family Institute opened its doors to summer interns for the first time. We welcomed nine students - six through AnalytiXIN program, who were placed at companies in Indianapolis, and three through the SEEDS program, who stayed on campus.



The goal for 2023 was to expand the program, and the results surpassed our most optimistic expectations. Between two locations - Indianapolis and South Bend - we have placed over 90 interns with local Indiana companies, 75 in the summer 2023.

15 interns (20%) were graduate students

32 interns (43%) were placed with companies in Indianapolis; the rest - in South Bend - Elkhart region

33 interns (44%) were female

51 interns (68%) were Notre Dame students. The rest were from Indiana University, Purdue University, IUPUI, University of Maryland, University of Washington, University of Wisconsin, Loyola, and DePaul University.

Internship Initiatives and Industry Partners

Students were placed through one of three initiatives - AnalytiXIN, AETL internship program, and SEEDS (Summer Education and Engagement for Data Science) internship program. Unlike the other two programs, which place students to work directly with industry partners, SEEDS interns teach and mentor high-school students who come to campus to learn about data science disciplines. Industry partners employing AnalytiXIN and AETL interns include both large, well-established companies, and small entrepreneurial ventures, and internship program includes weekly skills development days, taught by Lucy Family faculty and staff.



LUCY SUMMER INTERNSHIP PROGRAM

Testimonials

"Thank you for the amazing summer. I learned a lot by working for my [industry partner] in terms of data and computer science. More importantly, however, I experienced tremendous personal growth by listening to guests' lectures [during on-site training days]."

"From the moment I joined the Lucy Institute, I knew I was in the presence of something truly exceptional. [The mentors'] guidance, support, and encouragement have played a pivotal role in shaping my growth and development as a person."

"The past three months have been an extraordinary journey of growth and discovery, and I couldn't have asked for a more supportive group of individuals to share it with."

"The Friday sessions led by the Lucy faculty only fueled my love for this field of analytics. As a result, I've decided to change my specialization from Investment banking to Financial Analytics, all thanks to the invaluable experiences gained here and during my previous internship."

"I have now concluded our summer internship under the AETL Lab, and it has been an unforgettable experience. For me, a business undergrad with a modest background in R, Statistics, and business-related fields, this internship has been nothing short of transformative."

"To the entire Lucy family, I cannot express my gratitude enough for the truly memorable experience you have given me. Your support, mentorship, and guidance have made this journey one that I will cherish forever."



THANK YOU

As we conclude another remarkable year at the Lucy Family Institute, we extend our heartfelt gratitude for your unwavering support and collaboration. Together, we redefine intelligence beyond 0s and 1s, and each day, we continue to play like champions in our relentless pursuit of data-driven solutions to society's wicked problems.