



THE OHIO STATE UNIVERSITY

*Translational Data Analytics
Institute*

Strategic Plan

Translational Data Analytics Institute

The Ohio State University

2019-2024

April 1, 2019

The Ohio State University

VISION

The Ohio State University is the model 21st-century public, land grant, research, urban, community engaged institution.

MISSION

The University is dedicated to:

- Creating and discovering knowledge to improve the well-being of our state, regional, national and global communities;
- Educating students through a comprehensive array of distinguished academic programs;
- Preparing a diverse student body to be leaders and engaged citizens;
- Fostering a culture of engagement and service.

We understand that diversity and inclusion are essential components of our excellence.

VALUES

Shared values are the commitments made by the University community in how we conduct our work. At The Ohio State University we value:

- Excellence
- Diversity in people and of ideas
- Inclusion
- Access and affordability
- Innovation
- Collaboration and multidisciplinary endeavor
- Integrity, transparency, and trust

CORE GOALS

Four institution-wide goals are fundamental to the University's vision, mission and future success:

Teaching and Learning: to provide an unsurpassed, student-centered learning experience led by engaged world-class faculty and staff and enhanced by a globally diverse student body.

Research and Innovation: to create distinctive and internationally recognized contributions to the advancement of fundamental knowledge and scholarship and toward solutions of the world's most pressing problems.

Outreach and Engagement: to advance a culture of engagement and collaboration involving the exchange of knowledge and resources in a context of reciprocity with the citizens and institutions of Ohio, the nation, and the world.

Resource Stewardship: to be an affordable public university, recognized for financial sustainability, unparalleled management of human and physical resources, and operational efficiency and effectiveness.

What Ohio State does matters. Our responsibility over the next 150 years is to be a fixed beacon to illuminate the path to the American dream and address the most pressing issues of our times. Ohio State's Strategic Plan - Time and Change (2017)

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Letter from the Interim Faculty Director

Dear Colleagues,

Over the last four-and-half years, the Translational Data Analytics Institute (TDAI) - the largest and most cross-cutting Discovery Theme on OSU's campus - has set and shaped its own institutional priorities to promote interdisciplinary research, advance academic innovation, and foster robust external partnerships that bring value to our faculty and students. Within the Institute itself, it is successfully creating an organizational backbone in the form of four faculty communities of practice in disparate domains, garnering significant grants in areas of strategic importance, planning the launch of an innovative Professional Science Master's degree program, and establishing foundational corporate partners for the Institute. Further, TDAI has established a national presence by leading and participating in forums that explore the roles of data science centers in academia and in the larger community.

It was only two years that the Translational Data Analytics initiative became an Institute consolidating its position on campus and establishing itself as a prominent center of data science research and scholarship. The Institute was still in its infancy then. Now during this phase of growth, what is required is a strong and clear sense of identity. This is indeed the path that TDAI has embarked upon namely to create an indelible core and eventually differentiate itself from its peers. TDAI has successfully recruited more than 50 faculty in various TIUs and created the human capital it needs to grow and sustain. It also counts more than 150 affiliated faculty who constantly contribute to ongoing activities and enrich it. It is only because of this wide network that TDAI has successfully initiated many of its on-going activities. What is needed imminently is an organically developed strategic plan that is agreed upon by TDAI's constituent community of scholars and all stakeholders.

The current strategic plan is vastly different from what was presented three years ago. The new plan is being developed with participation by the TDAI community, including constituent faculty and all the various stakeholders. We duly noted the aspirations of the TDAI community in the strategic plan. Further, it also rests on a highly objective assessment of our strengths and weaknesses. While it is TDAI's goal to view this document as organic and evolving, it will also serve as a blueprint and guardrails for TDAI to achieve the heights it aspires to scale, namely, to be a national top five institute of data science and to serve the Ohio State community well.

I thank the TDAI community, the Office of Academic Affairs and the Office of Research for giving me the opportunity to lead TDAI for the last 3 years. It has been an honor to represent the data science community on our campus and grow TDAI into a functioning entity. I will be stepping down from my role by the end of the 2019 Academic year. I only wish the most success to the new leadership when it takes the helm of TDAI.

Sincerely,



Raghu Machiraju, PhD
Professor
BioMedical Informatics and Computer Science and Engineering



I. TDAI Overview

History

Ohio State released an internal request for proposals in data analytics in September 2013 as an inaugural step in the Discovery Themes initiative. A faculty-led group combined 49 proposals into a single “Data Analytics Framework” document released in February 2014. The *Data Analytics Collaborative (DAC) Framework* identified the university’s existing strengths and recommended hiring 100 new faculty leveraging our strengths in data analytics foundations (computer science, mathematics, and statistics) and applied domains of health and well-being, climate and environment, and complex systems and network science. That recommendation precipitated faculty recruitment across Ohio State dedicated to the growth of data science and analytics (DSA). In January 2015 version 1.0 of a program plan for the DAC was issued, and the term *translational* was used in our vision and mission statements. *Translational data analytics* is defined as “application of data analytics theories and methods to generate solutions for real world problems ... in consultation with stakeholders.” In March 2015, the DAC was renamed Translational Data Analytics (TDA) and version 2.0 of a program plan was issued. In April 2017, the University Senate approved the Translational Data Analytics Institute (TDAI) as a university-level institute. At that time, the Institute reported to the Executive Vice President and Provost, Office of Academic Affairs, befitting its reach across the university and the expectation that TDAI integrate and make accessible as possible all university data assets and expertise. Following an external review in January 2018, the Institute was repositioned under the Office of Research (OR), reporting to the Vice President for Research and Senior Associate Vice President for Research.

Vision, Mission & Goals

VISION	To establish the state of Ohio as a global hub for development, application and study of translational data analytics solutions.
MISSION	To create and apply data analytics solutions to issues of global importance in partnership with the external community, while advancing foundational data science theories and methods.

As part of our on-going strategic planning process, the vision, mission and goals of TDAI were made available for comment to TDAI faculty and other stakeholders at the university, as well as external reviewers. The current goals are included in *Succeeding in Our Mission* (Section III). It should be noted that faculty affiliates informed the content of this Strategic Plan via insights and feedback gathered at a TDAI faculty affiliate Town Hall (January 2019), Communities-of-Practice meetings (described below), and a Strategic Planning Retreat (March 2019). Below we highlight value propositions and programs for the various communities that the Institute serves.

Value propositions

We have developed several value propositions for the various community segments that the Institute serves. Below we provide an overarching value proposition and value propositions for three specific segments.

Overarching Value Proposition: First and foremost, TDAI will define data science and analytics as it will be practiced on campus with a strong focus on specific research themes and their manifestation in educational offerings and extensive outreach. For internal and external communities that need DSA integration, TDAI serves as a central hub for faculty, students and staff working in foundational and applied DSA and connects them with industry/external sponsors, each other, and resources for translational team research and workforce development, unlike fractionated DSA resources across the university. We do this by the programs and events we design and implement, the research and academic programming we support, and the space we provide.

Value Propositions for Specific Segments:

- For **faculty affiliates** that need opportunities for data science scholarship that are difficult to pursue on their own, TDAI's centralized resources and services support their efforts in team science through funding and collaborators for advancement of knowledge and societal impact, unlike resources at the department or college levels. We do this by creating robust communities of researchers (e.g., hiring faculty, supporting all faculty affiliates, co-locating teams); pursuing extramural funding in a strategic and focused manner to support team scholarship (e.g., seed grants, proposal development support, communities-of-practice (CoPs)); and leveraging external partnerships (e.g., foundational industry partners, federal and state government agencies, universities), to name a few.
- For **students** that need training and jobs in DSA, TDAI provides a centralized hub for skills-based programs, experiential learning opportunities, and access to employers unlike internal/external opportunities that students would navigate themselves. We do this by sharing the OSU DSA course directory, connect them to recruiting opportunities, create degrees and certificates, provide access to professional development tools, hold challenges and events, and provide space (labs, office, proximity to major) in state-of-the-art facilities.
- For **industry partners** that need a workforce pipeline, training for existing workforce, visibility, and R&D in the DSA arena, TDAI provides access to students and faculty experts, as well as tools, resources and team science opportunities unlike large research universities in the US that lack a centralized DSA Institute. We do this by academic programming, grant proposal development, product testing, recruitment opportunities and access to lab rental and event space.

Institute Membership

TDAI was one of the first Discovery Themes to hire new faculty beginning in 2016. Today, 53 faculty have been hired and join other experts to form the ~150+ TDAI faculty affiliate community spanning nearly every college, Nationwide Children's Hospital, the Wexner Medical Center, and two regional campuses (Appendix B). The Institute does not currently have formal membership for students and other trainees, but plans to add student/trainee membership in near future.

Programs Offered

Programmatic activities are aligned with institute goals in areas of research, education and outreach, and are summarized in the graphic below (Figure 1). To date, there are numerous programs that TDAI has launched, and details of these programs are discussed in *Succeeding in Our Mission* (see Section III). The TDAI community is further bolstered through strategic partnerships designed to leverage and elevate – in addition to creating completely new – DSA programming. This includes a Researcher Exchange program with Nagoya University, co-sponsored trainings and lectures with 15 university centers / offices, a data science summer camp for 8-10th grade women,

and the programming of a 21,000+ square feet of state-of-the-art innovation space and data analytics hub in Pomerene Hall.



Figure 1. Programmatic supported by the Institute.

Points of Pride

Succeeding in Our Mission (Section III) cites key outcomes realized by TDAI while we implemented the *TDA Program Plan V2.0*. Our 2017 and 2018 *Progress Reports* (Appendix B) our FY18 Annual Report and a Business Model Canvas (Figure 2 below) also provide additional context which, combined with the information presented under the *Strategic Scan* (Section II), lay the groundwork for setting 2019-2024 goals and tactics.

The Business Model Canvas

Translational Data Analytics Institute (TDAI)

February 2019

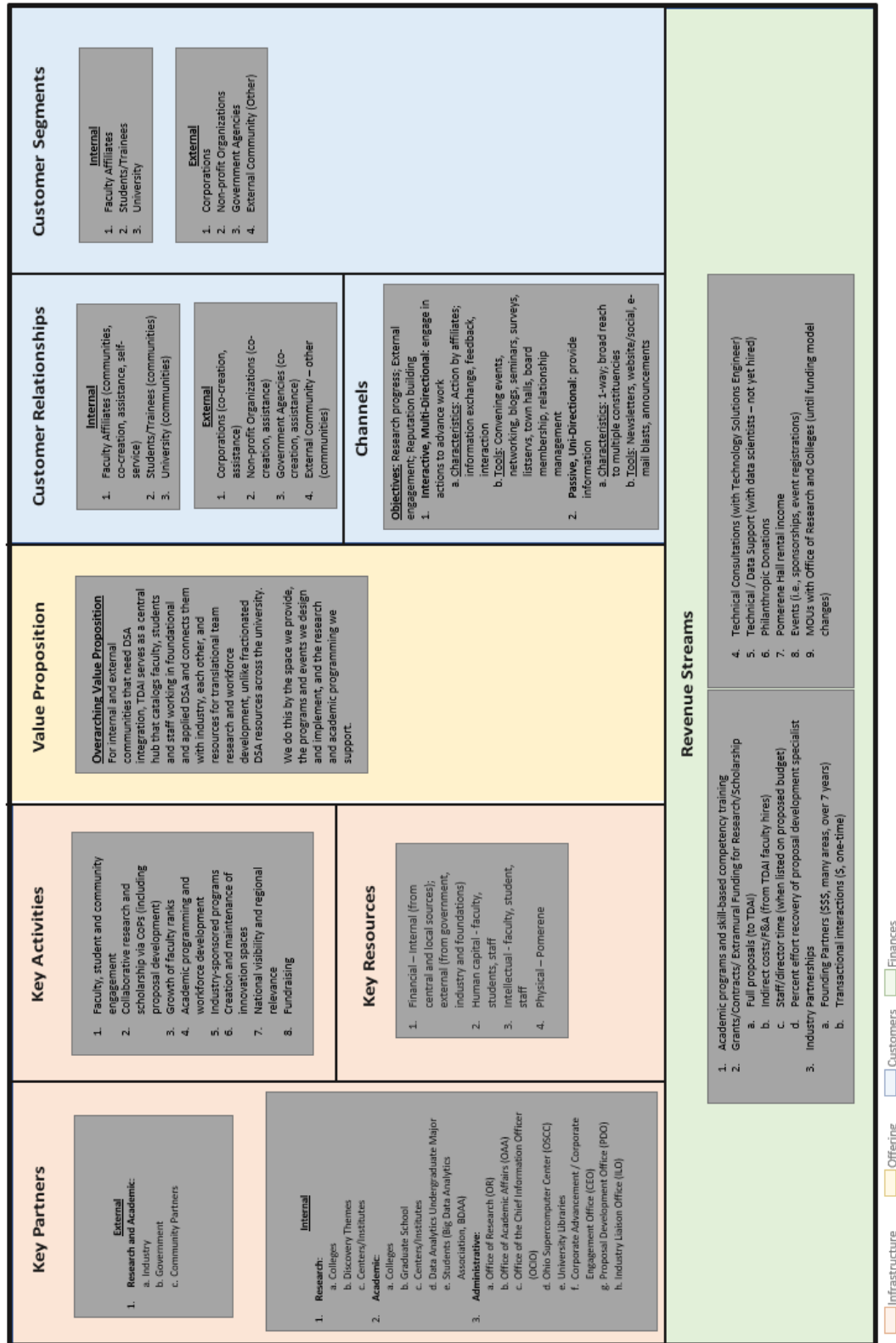


Figure 2. Business Model Canvas for the Institute.

II. Strategic Scan

Societal Issues & Impact

Ohio State is fully investing in the power of data science through the Translational Data Analytics Institute. TDAI provides an overarching structure and framework to strengthen and grow our intellectual community at Ohio State. Faculty affiliates conduct research in foundational data sciences, as well as in applied areas, both of which may develop data-driven solutions to discover new drugs, improve crop yields, increase manufacturing efficiencies, respond to natural disasters, reduce chronic disease impacts, and address complex and devastating societal challenges, such as infant mortality and opioid addiction – collectively generating big data for good! The Institute is also committed to the land grant mission of the university, through dissemination of knowledge to internal and external communities that it serves.

SWOT Analysis

Since 2016 we have continued to assess Ohio State's strengths in DSA that can be leveraged by the Institute, as well as weaknesses that the Institute should address and/or mitigate going forward. In addition, we conducted a competitive landscape analysis of several US universities with DSA institutes, using the report of the Spring 2018 Data Science Summit¹ and the December 2018 Moore and Sloan Foundations report as a guide². Here, we analyzed unique university programs and external trends (threats) and noted areas in which potential competitors were noticeably absent or new external trends in data analytics emerged (opportunities) (Table 1). The resulting SWOT analysis has informed our strategic approach that follows (see Section III. Succeeding in Our Mission.)

INTERNAL SCAN - Strengths

1. **Translational Focus.** Most of our peer institutions choose to focus on either the foundational application of DSA or specific domains within it. Ohio State's focus on translational data analytics is unique, encompassing both rigorous quantitative and computational techniques, as well as critical implementation issues such as human factors, policy level evaluation, and socio-cultural analyses. TDAI has thus created a crucible whereby abstract theories of data topology and structure informs practice of material science and engineering and network science as applied to social problems.
2. **Breadth of Scholarship.** As described earlier, the Institute membership consists of ~150+ faculty affiliates across 13 of the university's 15 colleges and representing 45 tenure-initiating units (TIUs) and an equivalent number of disciplines.
3. **National Reputation.** In addition to the national and international recognition of our individual faculty, the Institute itself is also gaining national recognition. For instance, TDAI co-hosted with the National Science Foundation (NSF) two national workshops devoted to translational data science, contributed to collaborative white papers, and became a BIGDATA Spoke to the Midwest BIGDATA Hub at University of Illinois, Urbana-Champaign. In addition, the Business Higher Education Forum's (BHEF) white paper with PricewaterhouseCoopers cited TDAI for its industry-informed academic programming.³
4. **Data Assets.** As will be described in *Succeeding in Our Mission* (Section III), TDAI is building a Data Commons to support collaborative, interdisciplinary research and education, and to

¹ Data Science Summit report <http://tinyurl.com/2018SpringDataSummit>

² Academic Data Science Centers in the United States: A Study of 20 Universities. Greenberg, Mentzel, Katz; December 2018.

³ Investing in America's Data Science and Analytics Talent: The Case for Action. pwc.com/us/dsa-skills; April 2017.

facilitate access to unique datasets. It is also creating programs which will use both its physical space (Pomerene Hall) and the greater campus to collect data for more analysis and scholarship. Our collaboration with Hewlett-Packard Enterprise/Aruba Networks is a case in point.

5. **Dedicated Discovery Space.** The recent renovation of Pomerene Hall provides the Institute with more than 20,000 square feet of discovery space designed to promote interdisciplinary, collaborative, team-based research and education initiatives. The spaces also support the integration of industry and the larger community as long-term partners in technology, research, and education.
6. **Industry-driven Talent Solutions.** TDAI's approach to talent – both through a Professional Science Master's degree (PSM) and in skill-based certificates – is being created by close consultation with industry, government, and non-profit organizations, identifying educational gaps and unmet talent opportunities in translational data analytics.
7. **Strong University Commitment and Alignment.** The University's commitment to the Institute is evidenced by the hiring of ~53 new faculty, a 21,000-sq-ft data building, and support for research, education and outreach programs. There is commitment by Office of Research to partner with TDAI and all Discovery Themes to build appropriate sustainability plans. Further, the research agenda of TDAI is aligned with the broad dictates and directions set by the Office of Research.

INTERNAL SCAN - Weaknesses

1. **Breadth of Scholarship.** The breadth and depth of scholarship in which our faculty engage is a very powerful asset for interdisciplinary research and scholarship – encompassing 45 disciplines (illustrated in Appendix B). Further, many of the recruited faculty are of junior rank (assistant professors), thus creating a bench with little depth or seniority. Further, there are few mechanisms for TDAI to exert influence as TIUs can. The Faculty Lead does not have a tenure vote. While this interdisciplinarity and breadth is commendable, engaging such a large contingent of faculty affiliates – who may not naturally engage in team scholarship for all the above reasons– remains TDAI's most significant challenge. How do we better engage faculty affiliates in meaningful, valuable and impactful ways?
2. **Difficulty Recruiting a Diverse Faculty.** Of TDAI's 53 newly hired faculty, we have recruited 17 women and 23 underrepresented minorities. Of our total faculty membership, roughly 32% are women and 43% are underrepresented minorities. (Note: Numbers are self-reported to OAA.) It should be noted that the BHEF-PWC report mentioned earlier noted that recruitment of women and underrepresented minorities in data science is a systemic issue nationwide. Still, when TDAI became an Institute a pledge was made to address this issue by proactive hiring and also by leveraging other resources on campus, even though there was a tacit agreement that the lack of diversity was an institutional problem (and not just that of a single institute). In that spirit, TDAI believes more can and should be done on this front.
3. **Untested Financial Sustainability Plan.** Under the Discovery Themes program, the now Institute was seeded with a substantial university investment to hire faculty and run select programs. Via this mechanism, a portion of facilities and administrative (F&A) costs from extramural funding secured by TDA faculty hires currently flows to OAA. A committee was recently formed by university administration to address distribution and use of these funds going forward. While waiting for more specificity in that plan, TDAI is separately developing a financial sustainability model that includes a portfolio of revenue streams not only from the above F&A, but also from proposal development support, academic programs, skill-based

competency training, sponsorships, event registrations, philanthropic gifts, technical consultations, and Pomerene rental income. Still, there are few degrees of freedom that the current operational funds allow given the large expanse of the campus TDAI covers. It has been difficult to incentivize faculty participation and jump start new ventures.

4. **Need for External Alliances.** As more universities enter the field of DSA, strong interinstitutional alliances are critical for success of DSA institutes. Recently, TDAI formed a Foundational Partnership with Aruba Networks, a subsidiary of Hewlett Packard Enterprise. This alliance is based on a philanthropic gift and investments aimed at growing this relationship to include sponsored research projects. It is necessary to also form alliances with Foundations and select universities.
5. **Difficult to Navigate and Communicate.** While the breadth of expertise at the university is a strength, the increased size associated with that breadth can make the university difficult to navigate for both internal and external parties. The Institute addresses this weakness in part by serving as a convener and integrator. Similarly, it has been a challenge to disseminate information and reach given TDAI's very large footprint.

EXTERNAL SCAN - Opportunities

1. **Need for Data Analytics-trained workforce.** Businesses and industry have recognized the increasing need for a workforce that is fluent in data analytics. To that end, it has been estimated that by 2020 there will be 2.72 M new job postings in DSA in the US.⁴ Businesses and industry also acknowledge that their current employees may require some degree of "upskilling" for the company to remain competitive.
2. **Need to Educate Community.** With the increase in data generated from almost every facet of our everyday lives, there is an accompanying increase in the need to educate both expert and lay individuals across disciplines on the power and limitations of data analytics.
3. **Need for Data Analytics to Optimize Business Processes.** Many businesses and industries are generating vast amounts of data that, if integrated and analyzed appropriately, can be harvested to inform process improvements and future product development. Thus, there is a need for these analyses to be conducted in-house or via outsourcing.
4. **Need for Data Analytics Support in State and Local Government.** In recent years, the state of Ohio government agencies demonstrated increasing need for data analytics solutions. For instance, TDAI was pre-qualified by the Ohio Department of Administrative Services to bid on \$25M in contracts to provide "data analytics expert firms, tools and methods" for State needs. As well, there are other opportunities within the State Government in collaboration with the Ohio Colleges of Medicine and Government Resources Center.
5. **Increased Federal Funding for Data Analytics Research and Training.** The National Institutes of Health (NIH) continues to emphasize the importance of data analytics, as evidenced by its Big Data to Knowledge initiative (BD2K), the June 2018 release of its first Strategic Plan for Data Science, and its creation of a new NIH position of Chief Data Strategist. Similarly, the National Science Foundation (NSF) has invested significantly in big data research, education and community-building for many years, as evidenced by its Computational and Data-Enabled Science and Engineering (CDS&E) program, Big Data Regional Innovation Hubs and Spokes, and the Harnessing the Data Revolution (HDR) program. Additional federal government agencies, including the Department of Defense (DARPA, etc.) among others, are also investing heavily in data analytics research.

⁴Data Science and Analytics Higher Education Survey. Gallup and BHEF, December 2016.

6. **Increased Industry Funding for Data Analytics Research and Training.** Corporations are increasingly looking to find partners to develop technologies and address their business challenges. TDAI can strategically target industry sectors (information sciences as represented by Elsevier) to seek new opportunities.

Table 1. Summary of SWOT analysis

INTERNAL SCAN	
STRENGTHS <ol style="list-style-type: none"> 1. Breadth and depth of scholarship 2. National reputation 3. Data Assets 4. Dedicated discovery space 5. Industry-driven talent solutions 6. External connections 	WEAKNESSES <ol style="list-style-type: none"> 1. Breadth of scholarship 2. Difficulty recruiting a diverse faculty 3. Untested financial sustainability plan 4. Need for external alliances 5. Difficult to navigate
EXTERNAL SCAN	
OPPORTUNITIES <ol style="list-style-type: none"> 1. Need for data analytics-trained workforce 2. Need to educate community 3. Need for data analytics to optimize business processes 4. Need to data analytics support in state government 5. Increased federal funding for data analytics research and training 6. Increased industry funding for data analytics research and training 	THREATS <ol style="list-style-type: none"> 1. Increasing numbers of well-funded academic DSA institutes 2. Increasing competition for funding support 3. Industry choice of academic partners 4. Academic partnerships

EXTERNAL SCAN - Threats

1. **Increasing Numbers of Well-Funded Academic DSA Institutes.** In recent years, the number of data analytics academic programs has increased⁵, as have organizing centers and institutes. As examples, Michigan Institute for Data Science (MIDAS) and Columbia Data Science Institute offer academic programs and serve 150-225 faculty with full-time staffs of 10+. In addition, these institutes have sustained programmatic investments (\$80M-100M) and corporate partners (Fortune 500 leaders and national foundations).¹
2. **Increasing Competition for Funding Support.** Extramural funding from federal and local government, industry and foundations continues to be increasingly competitive, and academic peers are investing in support for large-scale proposal development efforts.
3. **Industry Choice of Academic Partners.** With the rise in university-based data science institutes, firms have a selection of academic partners from which to choose. For example, Siemens and State Street Corporation are partners with UC Berkeley's Institute for Data Science. Columbia University Data Science Institute has several industry affiliates, including AWS, Google Cloud, Adobe, Microsoft Research, GE, Johnson & Johnson, and others.
4. **Academic Partnerships.** Several inter-institutional academic partnerships in data analytics have been enabled by extramural funding sources. Exemplar partnerships include the NSF-

⁵ *Data Analytics Program Takes Off.* Inside Higher Ed. <https://www.insidehighered.com/digital-learning/article/2017/03/15/data-analytics-programs-taking-colleges>; March 2017.

supported Midwest Big Data Hub (a partnership of the University of Michigan, Iowa State University, Indiana University, the University of North Dakota, and the University of Illinois at Urbana-Champaign) and the Moore-Sloan Data Science Environments of UC Berkeley Institute for Data Science, NYU Center for Data Science and UW eScience Institute.

III. Succeeding in Our Mission

The Institute strives to become a center of excellence recognized nationally and internationally for thought leadership in data science and analytics in areas such as: foundational data sciences, sensing, and computational social and health sciences, among others. This high-level goal will be attained when the Institute: (1) achieves a significant and diverse extramural funding portfolio for interdisciplinary and inter-institutional research and training; (2) is recognized for its exemplar scholarship, academic programs and training, and outreach; (3) is sustainable long-term; and (4) has a measurable impact on issues of global importance. Toward this end, the Institute has put forth four primary goals, with individual goals mapping to each university core goal area: research and innovation, teaching and learning, outreach and engagement, and resource stewardship (Table 2). As indicated in the *Letter from the Interim Faculty Director*, this draft *Strategic Plan* has evolved from the original put forth a few years ago. That said, activities of the Institute are consistent with the university core goal areas.

In this section, we step through each of the four Institute goals. For each goal, we provide context and summarize select past activities since inception of the Translational Data Analytics Discovery Theme that have supported that core goal area. We then outline implementation initiatives of the Institute going forward, as well as metrics of success associated with specific initiatives. {It should be noted that given the revision of goals from the previous version of the Strategic Plan, not all past activities have been carried forward. In addition, new activities or tactical approaches have been added.}

Table 2. Institute Goals

INSTITUTE GOALS: To create a highly differentiated and impactful brand that is recognized as...	
Research & Innovation	... A top 5 institute for data science and analytics research/innovation nationally, differentiated by an emphasis on translational outcomes and a central, cross-cutting presence on campus that supports a diverse intellectual community.
Teaching & Learning	... A regional hub of workforce development and innovative academic programs in data science and analytics.
Outreach & Engagement	... An active partner with external stakeholders in ventures that strongly align with Ohio State's land grant agenda.
Resource Stewardship	... A model for sustainability and operational efficiency .

RESEARCH & INNOVATION GOAL: *To create a highly differentiated and impactful brand that is recognized as a **top 5 institute** for data science and analytics research/innovation nationally, differentiated by an emphasis on translational outcomes and a central, cross-cutting presence on campus that supports a diverse intellectual community.*

Background: In 2015 the following three areas were identified as critical global challenges around which our faculty could collaborate on a variety of research challenges: health and well-being, climate and the environment, and complex systems and network science. The top-down approach to identifying these research areas failed to gain the support of our faculty affiliates; thus, we engaged faculty in conversations to identify specific research thrust areas.

Building Communities of Practice: In August 2017 TDAI began to promote the concept of research communities of practice (CoPs). True to its own data analytics mission, TDAI engaged in a data-driven functional organization of its affiliates. A divide-and-conquer method identified clusters or CoPs wherein members share a common sense of purpose. After much deliberation and discussion four primary areas consistent with those put forth earlier in the DAC framework were initially identified. Each of the CoPs is led or co-led by Faculty-in-Residence (FiR) charged with building their respective communities and developing relevant research efforts. They will work with TDAI and Office of Research leadership to define the sense of purpose and identify specific areas of research within each CoP and even across CoPs. Further, each CoP will leverage and contribute to TDAI's "Data-as-a-Service" platform and establish center-scale or extension-like activity for outreach. The specifics of each of these meta-activities will best be determined by each CoP. Essentially, each CoP will function as a center with its own set of activities and connect with other CoPs as needed. It should be noted that these initial CoPs can change over the years as needed. We list the four CoPs below, and individual CoP plans can be found in Appendix C.

1. **Computational Social Science (CSS)**

- **FiR co-leads:** Bear Braumoeller, Professor, Department of Political Science, College of Arts & Sciences; David Melamed, Associate Professor, Department of Sociology, College of Arts & Sciences
- **Goal(s):** Research engagement among members through identification of salient topics/areas, development of proposals, and interdisciplinary computational curricular development.
- **Broad Themes:** Methods: Network science, Complexity Theory, Visualization, Big Data; Impact: Novel solutions to social problems, digital communications, political science, public affairs, public health.

2. **Computational Life and Health Sciences (CHLS)**

- **FiR lead:** Shili Lin, Professor, Department of Statistics, College of Arts & Sciences
- **Goal(s):** Development of interdisciplinary team science in salient topics by creating working groups; seek external funding (incl. training grants);
- **Broader Themes:** AI, statistical machine learning, data mining, systems biology; Impact: Contributions to integrative multi-omics, electronic health records and administrative health data, reproducibility research.

3. **Foundations of Data Science (Foundations)**

- **FiR co-leads:** Tamal Dey, Professor, Department of Computer Science and Engineering, College of Engineering; Yusu Wang, Professor, Department of Computer Science and Engineering, College of Engineering

- Goal(s): Build theoretical and algorithmic foundations of data science leveraging the TRIPODS areas including Computer Science and Engineering, Mathematics and Statistics; establish connections to broader campus community including bio-/life sciences, material science, neuroscience, etc.
 - Broader Themes: AI, Cybersecurity, data management, data governance, machine learning, scalable high-performance computing; Impact: Foster and enable large team science projects – NSF TRIPODS center Phase II, NSF Expeditions, etc.
4. **Smart and Connected Communities and Distributed Sensing (Sensing)**
- FiR lead: Anish Arora, Professor, Department of Computer Science and Engineering, College of Engineering.
 - Goal(s): Sustain and grow translational data-centric projects that positively impact communities locally, regionally, and beyond.
 - Broad Themes: Methods & Technologies: Internet of Things (IoT), Wireless Mesh and Sensor Networks, Epidemiology, Geographical Information Systems; Impact: Opioid Addition, Smart City and Community Services (Smart@OSU, SmartColumbus).

The Smart and Connected Communities and Distributed Sensing CoP has been active since the 2017-2018 academic year, with interested faculty collaboratively pursuing funding (i.e., NSF BIGDATA Spoke, NSF Smart and Connected Communities, and NIH Data Commons) and engaging with industry and Smart Columbus efforts. The Computational Social Sciences CoP has been active since the spring of 2018, engaging faculty through conversations with external research scholars who were invited to campus. In the late fall 2018, the last two CoPs launched. The CoP on Foundations of Data Science will leverage the momentum of the prestigious National Science Foundation (NSF) Transdisciplinary Research in Principles of Data Science (TRIPODS) grant (Prof. Tamal Dey, PI). Finally, the CoP on Computational Life and Health Sciences is establishing relationships with key constituencies across campus, namely the Comprehensive Cancer Center and the College of Medicine, among others.

Initially, participation in the CoPs by TDAI faculty affiliates was driven by the FiR leads reaching out to individual faculty and/or by specific interdisciplinary funding opportunities that drew multiple faculty participants. To increase involvement and inclusion of TDAI faculty affiliates in our CoPs, we recently (January 2019) held a Town Hall focused on not only soliciting feedback and insights from faculty regarding efforts of the Institute to date, but also on conducting membership drives for our CoPs. Subsequently, each CoP held a “kick off” meeting to hear specific interests and feedback from their members to inform plans for initial CoP activities. Based on this information, the FiRs of each CoP developed white papers outlining the overarching goals of their communities, as well as tactics to achieve these goals. Details for each CoP’s Research Plans are provided in Appendix D. With our CoP memberships now more structured, FiRs and TDAI staff can more effectively engage faculty affiliates in research-relevant programs of the Institute. Still, it should be noted that some faculty cannot not identify with any of the current CoPs; thus, we anticipate additional CoPs may form organically based on shared faculty research interests and/or extramural funding opportunities. For example, a cohort of faculty expressed a desire in pursuing research addressing climate change. Such special-interest groups can still be of value; for example, the common interest in climate change has led to initial conversations with the Byrd Polar Center, with plans to identify collaborative funding opportunities. It is TDAI’s goal to identify and promote several bridges to salient groups and topics on campus. Thus, in the long term, TDAI will be composed of CoP clusters and bridges to various institutes on campus.

Past Activities: Our activities to date that support research and innovation have focused on (1) building scholarly networks and (2) securing extramural funding.

TDAI has facilitated **scholarly network building** within the university by partnering with other university groups (e.g., TDAI and InFACT Discovery Theme joint faculty networking event; Team Science Workshop for College of Food, Agriculture and Environmental Science, CFAES). We recognize the importance of collaboration with other centers and institutes on campus for strengthening our collective research efforts. Thus, TDAI leadership has held meetings with the Sustainability Institute, Infectious Diseases Institute (IDI), Byrd Polar and Climate Research Center, and the Center for Applied Plant Sciences (CAPS) to discuss mutual areas of interest and potential interdisciplinary research funding efforts. We have also extended our networks externally through seminars and our sponsorship of speakers and panel discussions, including D. J. Patil (Chief Data Scientist, Obama Administration), Joshua Epstein (New York University), and Mason Porter (University of California, Los Angeles). We have scaled our external reach by launching a Faculty Exchange Program with Nagoya University (Japan) and the Digital Innovation Hubs, a program that fosters collaborations between US universities and Japanese universities and corporations.

A major effort has been directed toward leading and/or participating in national conversations on the direction of DSA, as evidenced by our invited and active participation in national and international data strategy meetings (e.g., NSF Data Science Corps.: Winter 2017, Winter 2018; NSF Workshops on Translational Data Science: June 2017, December 2017; Sloan-Moore Foundations First Data Science Leadership Summit: March 2018; US-Japan Digital Innovation Hubs Meeting: March 2018), as well as our service on NSF's Midwest Big Data Hub committees. TDAI plans to continue to facilitate scholarly networking activities going forward.

With a primary focus on helping faculty affiliates **secure extramural funding for interdisciplinary research**, TDAI's support spans the continuum from providing an enabling infrastructure to building interdisciplinary teams to engaging in business development activities to creating win strategies and capture plans (Figure 3).

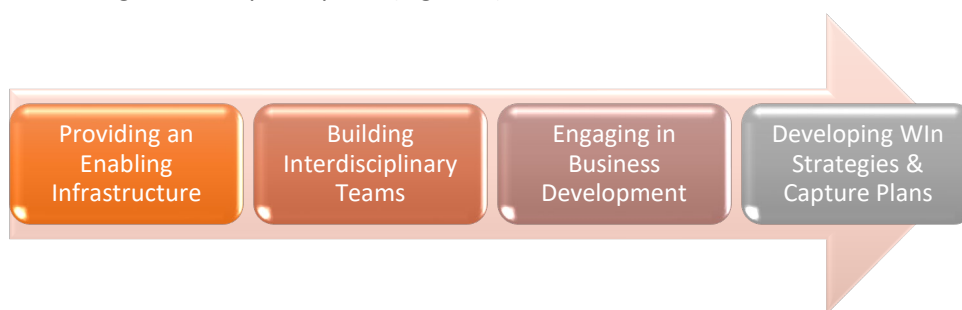


Figure 3. TDAI's approach to securing extramural funding

Building an **enabling infrastructure** means providing easy access to curated datasets and software tools instrumental to the Institute's research and educational efforts. For example, we are currently building a Data Commons, which will be a large repository and archiving space, replete with specialized closed-source, open-source and general computing tools that will help foster collaborations. As depicted below (Figure 4), data storage capacity on the back end will be structured via partnership with the Ohio Supercomputer Center (OSC), while data curation and indexing will be achieved via a Data Registry constructed and maintained in partnership with the OSU Libraries (OSUL). The user community will interface with the Data Commons via the Digital

Market Place, where they can access various analytics tools. A prototype of the Data Commons is now available for use. Currently, efforts are underway to staff positions and identify salient data and methods for inclusion in the Data Commons. TDAI will continue to dedicate resources toward the completion of the Data Commons. Other efforts include providing data-as-a-service through Data Makers (creation of data from sensors and other endpoints, and orchestration and management of associated resources that provide computation and networking); guidance and expertise on the development of data privacy, data usage, and data management plans; and access to living lab testbeds (i.e., Pomerene Hall, Smart@OSU platform); and including resources provided by our industrial partners and engineering/technical assistance by TDAI staff.

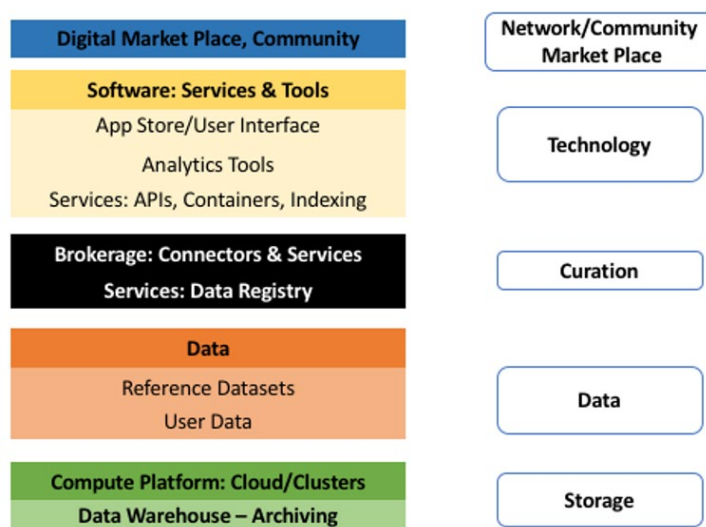


Figure 4. Elements of TDAI's Data Commons

To help **grow interdisciplinary teams** and better position the Institute for success in pursuing future external funding opportunities, TDAI has awarded ~\$200K in seed grants to faculty-led research teams representing 10 tenure-initiating units (TIUs). Awards have been made in areas as diverse as the faculty research in TDAI, ranging from *Quantifying the impacts of rivers on phosphorus exports to Lake Erie* to *Using remote sensing to detect the long-term impact of U.S. bombing of Cambodia* to *Using Learning Analytics in Examining Students' Learning Habits in Online Nursing Classes*, among others. We are currently evaluating the seed grant program to incorporate faculty input on how best the program can accelerate convergent research collaborations and support initial interdisciplinary funding efforts. We have started holding facilitated brainstorming sessions through a process called *Strategic Doing™*, a method developed by the Purdue Agile Strategy Lab to help teams progress quickly through initial stages of new collaborations or projects to arrive at measurable outcomes leveraging connections and resources of a core initiating group. Here, we have used *Strategic Doing™* to build interdisciplinary teams and to generate ideas for potential funding. Our first sessions led to the submission of two prospectuses to NSF's Growing Convergence program. Based upon faculty feedback in the CoP kick off meetings, working groups are going to provide another method of bringing faculty together under specific sub themes for

short-term projects (e.g., targeting specific funding opportunities or developing certification programs).

Business development (BD) activities are characterized by development of university/institute-wide, long-term relationships with targeted sponsors, which are critical to securing external funding. These activities can include conversations and meetings on a regular cadence with Program Officers from target funding agencies (e.g., NSF, DARPA, NIH, Foundations, Industry, etc.), activities that allow our faculty to better understand a sponsor's needs, while at the same time informing a potential sponsor of OSU's value proposition. Importantly, such conversations may help to shape future solicitations from sponsors. To date, TDAI has focused BD activities on a few industry sponsors, and as a result, some faculty have been awarded small research project awards. For instance, TDAI and the Industry Liaison Office worked with GE Appliances to procure a project that was completed by TDAI affiliated faculty in Computer Science and Engineering (CSE) and Industrial Systems Engineering (ISE). A relationship between TDAI faculty and collaborators at the Walter Reed Army Medical Center led to involvement in the writing of a Broad Agency Announcement and follow-on grant application. We will continue our efforts for strategic interdisciplinary relationship building that is based upon prioritized sponsors (from industry, government agencies and/or foundations) in part identified by our faculty members of our four CoPs.

TDAI has worked closely with faculty teams to **develop win strategies and capture plans** for extramural funding opportunities. In this way, faculty teams have been proactive rather than reactive, an approach that greatly increases the chance that large-scale grants will be competitive. Through the Proposal Development Office (PDO) shared staff position with TDAI, we have a proposal development specialist who collaborates with the FiRs and their CoPs to develop funding pipelines based on anticipated and sponsor missions and current interests. Capture planning includes landscape analysis and team building activities toward anticipated funding announcements, as well as proposal development support once a funding solicitation has been released. We help faculty teams develop win strategies via facilitated proposal development and pink and red team reviews, which are also supported by PDO. This model has proven to be successful within TDAI, as evidenced by the proposals submitted and awards won (see Appendix D).

Future Implementation Initiatives: The last five years have provided many teaching moments that have informed TDAI about growing and sustaining its Research Communities of Practice. The consistent growth of TDAI rests on the following tenets:

- **Translation is the Essential DNA of TDAI/.** Data Analytics is a cross-cutting Discovery Theme. Translational Data Analytics differentiates TDAI from other centers of data science. Going forward, translation will be manifest in the credo of each CoP whereby convergence of research from multiple domains will result in useful applications and impactful outcomes.
- **Team Science** - It is essential for a comprehensive center to engender strategic team science projects. This way, TDAI serves as an integrator. TDAI-led mobilization of various communities of practice is enabling the concerted pursuit of large team science grants.
- **Outreach:** Because TDAI emphasizes translational impact, external partnerships are extremely valuable. The Professional Science Master's degree program, when launched, will allow for outreach into the local community. Moreover, many of our team science projects include stakeholders from the outset to maximize community impact whether the goal is to assist healthcare workers at the frontline of the opioid epidemic to providing a summer camp to expose high school minorities to data science as a career.

- **Data Assets:** Going forward, focus will be placed on creating data assets and collecting these into a data commons. In addition to research, innovation, and academic programming products, TDAI's collective data will be used to foster collaboration and accelerate discovery.
- **Organizational Structures:** More can be accomplished with the adoption of specific organizational structures that amplify the innate strengths of TDAI. The standing up of CoPs is an inward-looking exercise. Various successful overarching models are being considered including the extension service centers of agricultural schools associated with major land grant universities. Elements of TDAI's functions and operations, especially pertaining to outreach and education, are already beginning to resemble those of an extension center.

Alignment with University's Research Emphasis: The Office of Research has been promoting inter-disciplinary areas that the university will be investing in (or already are) over the coming years:

1. Mobility
2. Addiction
3. Human performance
4. Smart and autonomous "systems"
5. Quantum information science
6. Human-centered design
7. Trust in autonomous systems

There will be an added emphasis to:

1. Promote "technical readiness" in projects and help groups attain higher readiness levels (or technical readiness levels, TRLs);
2. Facilitate an increase in development activities in addition to research; and
3. Focus on defense sector in addition to the NIH and NSF, and in general seek connections with industry and various foundations.

TDAI is responding to the directions set by university leadership. In particular, we are currently examining the capabilities of various CoPs in light of the above priority areas. Each of the University's emphasis areas can be addressed by the current CoPs, as outlined below.

University Research Emphasis Area	TDAI CoP Emphasis
Mobility	CHLS, Foundations, Sensing
Addiction	CHLS, Sensing, CSS
Human performance	CSS
Smart and autonomous "systems"	CHLS, Foundation, Sensing
Quantum information science	Foundations
Human-centered design	Foundations, CHLS
Trust in autonomous systems	Foundations, CSS

Creating Pockets of Excellence: The pertinent question to ask is how we actually align the directions of the Institute with those of the larger institution. Faculty hiring and dedicating resources to specific projects paves the way. The easiest answer to offer where TDAI should put its money and resources has been "addiction, cybersecurity, machine learning, mobility, etc.". However, there is a need for a nuanced approach dictated by TDAI's history of faculty recruitment and given the breadth and depth of the faculty membership. The goal is not just to pursue recruitment, but to create

thriving research communities that have ample access to resources. Below we provide a summary of tactical activities that will be adopted by each CoP in an agile, adaptive manner:

- Conducting “landscape analyses” of the joint strengths and interest within a CoP, using data analysis tools as well as inclusive engagement with CoP members.
- Leveraging *funding opportunities* to drive creation of projects and teams within the CoP. Funding agencies would include the National Science Foundation, whose ongoing “convergence research” focus is sympathetic with much of the research in our CoPs.
- Leveraging “*strategic finding*” and *similar mechanisms* for creation and subsequent shepherding of multiple teams to target large, visible programs, as they go through the stages of development proposal and winning funding for large research projects.
- Organizing CoPs into a set of mission-specific *working groups*.
- Incubating new ideas and growing them to tangible products within each CoP.
- Using incentives as a tool to achieve sustained, “*sticky*” *engagement* of members in CoPs.
- Eliciting state-of-the-art technical challenges from industry experts who have established relationships with TDAI and OSU.
- Organizing special events, such as:
 - Bring-your-own-data (BYOD) Day where CoP members can pitch the datasets they have created to broad communities of potential users.
 - Eliciting grand challenge problems from specific communities via invited talks and panel sessions with visionary leaders in the field.

A preliminary landscape analysis has revealed, for instance, that the Sensing CoP can benefit from an emphasis on IoT in the mobility and health spaces. Similarly, the Foundations CoP can profit from a renewed recruitment of machine learning experts; as well, informatics expertise for addiction has been completely lacking. Several iterations of these exercises are necessary before TDAI can address all the gaps. A parallel exercise for resources is also necessary. Each CoP will, in turn inform TDAI which will help leadership create an overarching strategy across all CoPs. Given that needs and goals are transient, TDAI will select an appropriate “time frame” (e.g., 5-10 years).

To reiterate, this will be TDAI’s overall strategy – consider current CoP goals and ensure that they are aligned with those of the Office of Research and other stakeholders; determine strengths/interests through landscape analysis; acknowledge “gaps”; and lay a path (hiring, outreach, etc.) to accomplish these goals.

Infrastructure: Internal resources, including personnel and financial resources, are available to support research and innovation efforts of the Institute’s faculty affiliates. Feedback from our faculty affiliates from the January 2019 Town Hall and various CoP meetings indicated that our membership is in favor of the Institute providing opportunities for faculty to interface with external distinguished scholars through invited seminar speaker series, panel discussions, or other venues. There was also interest in the Institute hosting workshops or regional/national conference in Translational Data Science led by TDAI experts on specific topics related to our CoP focus areas. These types of conferences and symposia could also help the Institute grow collaborations with other universities and external partners. To that end, University of Michigan’s MIDAS has expressed interest in co-hosting such a conference with TDAI. Faculty have also requested that seed grants be made available to provide substantial support for new interdisciplinary team collaborations within TDAI and between TDAI and other OSU Centers and Institutes.

Data-as-a-Service will be a key offering by the Institute. Development of the Data Commons (as illustrated in Figure 3) will continue moving forward as planned. With the Data Commons at its core, datasets will be curated from TDAI research projects. Thus, access to datasets and proprietary data (Electronic Health Records, etc.), testbeds, and other potential resources (and funding for access) will be provided. Further, relationships will be strengthened with Centers and OSU Libraries to provide GIS and statistical/biostatistics support at discount to TDAI faculty. Similarly, advanced technical research support from partners (e.g., Aruba Networks) will be made available. The Data Makers will support the creation of data from various endpoints, and orchestration and management of these and associated resources will provide computation and networking support. TDAI will also provide guidance and expertise on the development of data privacy, data usage, and data management plans; as well as access to living lab testbeds, i.e., in Pomerene Hall, including resources provided by our industrial partners and engineering/technical assistance by TDAI staff. Essentially, TDAI recognizes that data is the life-blood of data science: it is essential that there is easy and free access to datasets.

Extramural Funding: As described above and illustrated in Figure 3, the Institute's approach to securing extramural funding is in place. As described in Section III, indicators that the Institute has achieved national/international recognition as a center of excellence in DSA is when we secure significant and diverse extramural funding for research and training, our faculty publish their scholarship, and we recruit and retain acclaimed faculty. With respect to extramural support, we envision this funding portfolio beginning with "center-like" support for team science-oriented, multiple investigator efforts inside OSU, such as those awarded by NSF (Big Data Spoke, Expeditions, Engineering Research Center, Science and Technology Center, NSF Research Traineeship, Integrative Graduate Education and Research Traineeship), NIH (P50 Center grants, U24 Resource Grants, T32 Institutional training grants), Department of Defense (DoD) or other funding mechanisms from industry and foundations. From there, we plan to grow these efforts to form "consortia-like" teams by collaborating with external entities to pursue larger awards (i.e., NSF's Big Data Hub, Harnessing the Data Revolution Institutes for Data Intensive Research, and Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science; DoD's Multidisciplinary University Research Initiative; NIH's HEALing Communities initiatives). For TDAI, these awards are mechanisms by which our faculty-led Communities-of Practice are able to make a measurable impact on issues of national importance. TDAI will also support traditional and individual scholarship models that emphasize the publication of significant manuscripts and the submission of smaller grants that explore disruptive ideas. Given the Office of Research's emphasis on development, we will facilitate efforts toward creating data assets and software products.

Below, we describe at a high-level our approach, implementation initiatives, and metrics of success. Note that the implementation initiatives outlined below are based in part on the plans developed by our Faculty-in-Residence in partnership with their respective faculty affiliate CoP (see Appendix D for individual CoP Plans).

Intra-OSU Collaborations:

- **Working Groups:** We are establishing organic working groups within the CoPs in specific areas of interest to smaller interdisciplinary groups of faculty. These sub-areas can be likened to "Signature Programs" that seek funding from different sources including internal and industry.

- **Elevate CoPs to Centers within the Institute:** These Centers would be funded outgrowths of working groups that achieve federal or industry funding. For example, we could have a Computational Imaging Center based on NSF Expeditions funding. An Industry-University Cooperative Research Center based on Smart Mobility, or a Science and Technology Center.
- **Centers, Discovery Themes, Institutes:** Presently, we have established or initiated purposeful interactions between TDAI and Discovery Themes/Institutes/Centers: Advanced Computing Center for the Arts and Design, Institute for Material Research, College of Law's Data and Governance Program, Criminal Justice Research Center, Sustainability Institute, Infectious Diseases Institute., Byrd Polar, Center for Automotive Research, Center for Human Resources Research, Center for Clinical and Translational Sciences. These strategic collaborations are intended to lead to joint projects and funding as well as increase TDAI membership and relevance on campus.

Premier External Partnerships:

1. **University Engagement:** Seek agreement between institutions of higher education in areas where TDAI can contribute to national needs (for example, artificial intelligence, data risk management, cybersecurity, data privacy and governance, etc.). TDAI has reached out to University of Maryland, College Park, to explore joint collaborations in data analysis and cybersecurity. Similarly, we have worked with Arizona State University, Michigan State University, North Carolina State University, University of Chicago, Wright State University, Shawnee State University, and the University of Michigan on various research and workforce development opportunities. Going forward, TDAI will pursue strategic partnerships to address weaknesses and/or gaps in important areas of expertise.
2. **Federal and State Agency Engagement:** Invite Federal Agency Program Officers to come to TDAI and/or support visits of TDAI delegations to Federal Agencies in Washington DC to discuss some of the flagship programs onsite. Similarly, TDAI will seek partnerships with specific state and local government agencies for access to data for specific projects including the opioid crisis in our state. Through our NSF-funded Big Data Spoke, participation with the Ohio Colleges of Medicine Government Resource Center in State of OH task orders in data analytics, and participation in a recent NIH HEALing Communities proposal, we have established collaborations with state agencies and stakeholders, which we will continue to nurture. There will be a concerted effort to expand spread beyond the "usual suspects" our existing partnerships and to develop agreements with national laboratories such as Idaho National Laboratory and the Air Force Research Laboratory, Dayton, OH.
3. **Engagement and Entrepreneurship:** Focus on relationships that speak to TDAI's strengths and create niche opportunities. Leverage existing relationships that corporations already have with the University. Translate our data science discoveries into real world solutions through entrepreneurship. Examples include the West Campus Innovation District, Corporate membership program (through NSF IUCRC funding as just one model). Strengthen our relationships with the Technology Licensing Office and accelerators, including Rev1.
4. **Translational Data Science Extension.** Develop a mechanism of interactions with the citizens of Ohio modeled after the OSU agricultural extension system.

Regional & Global Efforts:

1. **Visiting Scholar Program:** Strategic invitations to scholars who can serve as resource and collaborator for faculty and students. Intent is to build capacity and collaborations between institutions and researchers in areas needing strength at OSU.
2. **National Translational Data Science and Analytics Colloquia and Symposia:** Led by TDAI experts on specific topics and presentations on research by investigators in specific areas. The Michigan Institute of Data Science (MIDAS) has expressed interest and TDAI will forge a regional coalition with other Midwestern institutions. It is also necessary to play a significant role in the Data Science Leadership Summit. Strategic topic areas can also include Women in Data Science, Broadening Participation, etc.
3. **TDAI Distinguished Speaker Series:** Invite renowned speakers and hold related annual workshop. Further, honors such as the Distinguished Translational Data Science Award can be conferred on deserving scholars, which also serves to increase our prestige on the national stage.
4. **International Research:** Expand efforts beyond the nation of Japan to address institutional interest in capacity building in developing countries; collaborate with Office of International Affairs and global programs on efforts in health and resources.

The table below provides the categories of metrics that will be used to assess success of the research agenda. Specific values for each metric will be developed with the CoP leadership as the individual plans are refined.

IMPLEMENTATION INITIATIVE	METRICS OF SUCCESS
Infrastructure: Internal Resources	<ul style="list-style-type: none">• # outcomes enabled (proposals, awards, publications)
Infrastructure: Data-as-a-Service	<ul style="list-style-type: none">• # datasets in Data Commons• # projects in Data Commons• # projects using living lab• # experts consulting
Extramural Funding	<ul style="list-style-type: none">• # proposals• # funding awards• \$ funding awards
Regional & Global Impact: TBD	<ul style="list-style-type: none">• TBD

TEACHING & LEARNING GOAL: *To create a highly differentiated and impactful brand that is recognized as a regional hub of workforce development and innovative academic programs in data science and analytics.*

Background and Past Activities:

Academic Programming & Workforce Development: Roughly three years ago, faculty-in-residence affiliated with TDA assessed the state of DSA academic programs and courses at Ohio State. Their resulting documentation helped support the rationale for development of the recent planning for a Professional Science Master's degree in Translational Data Analytics (PSM-TDA) offered through the Institute. The first track – a data design and visualization track - being planned for the PSM-TDA is a collaborative effort involving the Departments of Statistics and Design (College of Arts & Sciences, ASC), the Advanced Computing Center of Arts and Design (ACCAD), and the Department of Computer Science and Engineering (College of Engineering, CoE). So that the program is responsive to employers' workforce needs, the Institute engaged industry, businesses, government agencies and non-profit organizations in a series of roundtable workshops during 2017 and 2018. During the roundtables we discussed skills-based needs, obtained feedback on curriculum development thus far, and began designing the experiential capstone course. (See Appendix E for 2018 Roundtable Report.) The Institute was specifically cited in a 2017 national report by the Business-Higher Education Forum (BHEF) and Pricewaterhouse Coopers (PwC) for effectively partnering with industry to advance Ohio State's mission and address workforce needs.⁶

Student Engagement: The scale and breadth of DSA options at Ohio State has driven our approach toward student engagement to be strategic and thoughtful. We actively work with partners across campus to enhance what resources are currently available, identify what gaps exist, and leverage collective strengths to achieve the broadest possible participation in DSA at Ohio State and in the local community. For example, since 2016, TDAI has been an active partner in supporting Ohio State's annual OHI/O Hackathons – which bring together industry and more than 700 students from across the country – and the undergraduate major's annual Datafest – a 24-hour data-focused team event. We support these events through recruitment of faculty mentors, donation of our TDAI staff time to help run / plan the events, in-kind contributions, and funding. TDAI has also forged a strong alliance with the student organization Big Data & Analytics Association (BDAA), a group encompassing more than 200 students across campus interested in data analytics. Together with BDAA, we have engaged more than a dozen companies interested in investing in data science at Ohio State, hosted a networking event for students and more than 100 local tech leaders, and created a dedicated office and staffing hours in Pomerene for BDAA to engage with both students and faculty.

The partnerships formed above also revealed several fundamental gaps in student opportunities, particularly among those students who do not major in a traditional data analytics field. For instance, there was no formal mechanism for current and future students to explore and prepare for educational and career options in data science and analytics. TDAI worked with offices across campus to launch three new initiatives: an online, interactive Data Analytics Road Map; a comprehensive DSA programming page listing academic programs and courses across the university; and a data analytics-focused resume template for students and tip sheet for employers looking for talent at Ohio State. Additionally, we created and distributed a first-of-its-kind video documenting data analytics undergraduate students and their reason for choosing to study at Ohio State.

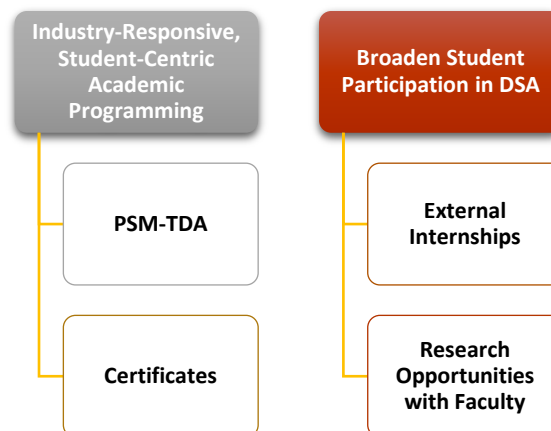
⁶ *Investing in America's data science talent: The case for action.* pwc.com/us/dsa-skills (April 2017).

Future Implementation Initiatives: As mentioned in the opening remarks of Section III, one indicator that the Institute has achieved national/international recognition as a center of excellence in DSA is

To become a regional hub for innovative academic programming and workforce development, the Institute’s primary focus will be on developing professional degree programs and certificates in DSA, in addition to securing federal training grants to support predoctoral students and post-doctoral trainees, as detailed below. Albeit at a lower level than the activities above, the Institute will continue to support undergraduate student programs as it has in the past. In addition, TDAI will enhance research-based student engagement.

Academic Programming & Workforce

Development: In partnership with the two colleges (ASC, CoE) and one center (ACCAD) mentioned above and via the leadership of Mario Peruggia (TDAI faculty-in-residence; Professor, Department of Statistics, College of Arts and Sciences), the Institute will continue to develop the PSM-TDA curriculum and to secure appropriate approvals from the university, the Ohio Department of Education, and the PSM national commissioning body within the next 6-10 months. The anticipated launch of the program will be summer of 2020. Metrics of success are summarized in the table below and in section V. Metrics, and include numbers of students enrolled per year, numbers of graduates per year and number of degree tracks. Contingent upon the program’s early success, more tracks will be added in areas that may include decision sciences or others dictated by the market need.



In addition to the PSM-TDA, to meet the demand of students in other disciplines across campus and external partners, TDAI will continue to explore the need for and scope of a certificate program in data analytics. Our initial market assessment in 2017 for our master’s program in data analytics was conducted by EduVenture in partnership with OSU’s Office of Distance Education and eLearning (ODEE), but the scope did not include certificate programs. Thus, a market assessment will need to be conducted to inform whether we will move forward with developing a certificate program in data analytics.

As mentioned, the field of data analytics has been rapidly growing, and there is an immense need for training to extend beyond the classroom and into research training environments. Since 2015, Ohio State has been awarded just 13 NIH T32 training grants that support research training of predoctoral students and postdoctoral scientists⁷, a number that pales in comparison to many of our peer/aspirational institutions. Of these 13 awards, none specifically call out data analytics as a focus. The complementary training grant program at NSF is the Research Traineeship (NRT), and Ohio State has landed 1 of these awards in the past several years, an award in *Enhancing Learning and Retention in Graduate Physics* that is still active. Similarly, this program does not specifically call out data analytics. NSF also supports Research Experiences for Undergraduates (REU) programs, and Ohio State currently holds six active awards, two of which are in mathematical sciences, one in biomechanics/mechano-biology, one in evolutionary biology, and one in molecular biology.

⁷ NIH RePORTer (<https://projectreporter.nih.gov/reporter>)

Although all current REUs could include elements, data analytics is not a specific focus of these. Thus, securing training grants will be a focus of the Institute going forward.

Finally, regional and national collaborations are also sought. In collaboration with Arizona State University, and North Carolina State University an NSF proposal was submitted to jointly train Japanese and American college students in engineering and social aspects of mobility. More recently, TDAI teamed with MIDAS to solicit funds from NSF for a training program dedicated to the reskilling of faculty and students of community colleges in Michigan and Ohio.

Student Engagement: TDAI will continue its partnerships with the DA undergraduate major and the BDAA student association to sponsor and participate in various events. Other student groups will also be considered. In addition, the Institute will focus on student engagement that is geared toward creating research/scholarship opportunities. For instance, TDAI is in the process of finalizing an external alliance with an international management consulting company that will result in an Institute-administered undergraduate student internship program over a period of at least the next seven years. The Institute will also implement a new program to help TDAI faculty affiliates identify students for research projects under their direction.

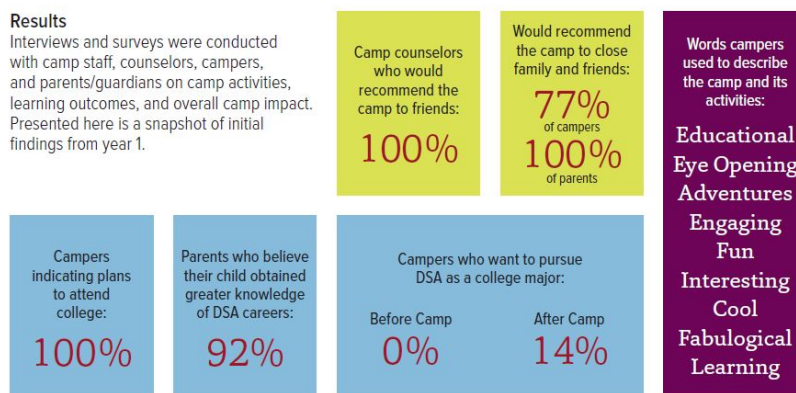
IMPLEMENTATION INITIATIVE	METRICS OF SUCCESS	YEAR 3 TARGET	YEAR 5 TARGET
Academic Programming: Professional Science Master's Program in Translational Data Analytics (PSM-TDA)	<ul style="list-style-type: none"> • <u>Milestone:</u> 2020 launch • # students enrolled/year • # graduates/year • # degree tracks 	<ul style="list-style-type: none"> • 60 enrolled/year • 60 graduates/year • 1 track 	<ul style="list-style-type: none"> • 120 enrolled/year • 120 graduates/year • 2 tracks
Academic Programming: Certificate Program in Data Analytics	<ul style="list-style-type: none"> • <u>Milestone:</u> Go/no-go decision and/or program launch • # students enrolled/year • # certificates awarded/year 	<ul style="list-style-type: none"> • # enrolled/year • # certificates awarded/year 	<ul style="list-style-type: none"> • # enrolled/year • # certificates awarded/year
Workforce Development: Training Grants	<ul style="list-style-type: none"> • # training grants awarded • # pre-doctoral trainees • # post-doctoral trainees 	<ul style="list-style-type: none"> • 1 NRT training grant; 1 NIH pre-doc T32; 1 Harnessing Data Revolution workforce development grant • 34 predoc trainees 	<ul style="list-style-type: none"> • 1 Postdoc T32 and 1 Predoc T32 training grants • 4 predoc trainees • 4 postdoc trainees
Student Engagement: Internship Program	<ul style="list-style-type: none"> • # interns/year • # companies or organizations 	<ul style="list-style-type: none"> • 10 interns/year • 2 companies or organizations 	<ul style="list-style-type: none"> • 20 interns/year • 4 companies or organizations
Student Engagement: Faculty-Directed Research Projects	<ul style="list-style-type: none"> • # student projects • # faculty mentors 	<ul style="list-style-type: none"> • 3-5 student projects • 5-8 faculty mentors 	<ul style="list-style-type: none"> • 15 student projects • 25 faculty mentors

OUTREACH & ENGAGEMENT GOAL: *To create a highly differentiated and impactful brand that is recognized as an active partner with external stakeholders in ventures that strongly align with Ohio State's land grant agenda.*

Background and Past Activities: The Institute's focus on outreach and engagement begins with fostering a culture of engagement and service. We seek to establish partnerships that bolster and leverage the collective strengths of our internal stakeholders, which ultimately lead to more robust and sustainable relationships with external partners. In our role serving all of Ohio State, we are fully committed to diversity and inclusion – both in people and in ideas.

From 2016 to 2019, our outreach efforts encompassed everything from k-12 education to agriculture to international policy. For instance, TDAI co-led the first Amazon Web Services' "Agriculture in the Cloud Day" event at Ohio State, which brought together more than 100 university and industry experts, students, and members of the local community to discuss the use of big data and the cloud to address challenges in agriculture. We also piloted a new interdisciplinary training program designed to improve research communication among 25 faculty in TDAI, the Chronic Brain Injury Discovery Theme, and the InFACT Discovery Theme (Spring 2018). Collectively, we have spearheaded and partnered with offices across campus to host/sponsor more than 50 events focused on the use of big data for positive societal and global impact, including Data Analytics Month (held annually), a Provost Lecture Series and panel discussion with DJ Patil (Chief Data Scientist of the United States Office of Science and Technology Policy under the Obama administration), faculty networking events, Florence Nightingale Day, TDAI Fall Forums, and two NSF workshops. We have further extended the reach of our faculty and the TDAI brand through our "Big Data for Good" series, a collection of 5 videos, marketing materials, and a website devoted to featuring faculty research and its impact. In the first quarter of 2019, our partners at OSC held two workshops at TDAI, including an *Introduction to Supercomputing* and *Getting started at OSC – Hands On workshop*.

It is well-known that there is a dearth of women and underrepresented minorities (URM) in data science and analytics nationally. In summer 2018, the Institute created a summer camp aimed at reversing this trend. The Data Science for Women Summer Camp is a week-long, 100% free camp designed to increase exposure to and interest in DSA in Central Ohio among middle and high school women, especially underrepresented minority women. Each day of the camp was designed to introduce young women to DSA concepts, methods, applications, and people. An emphasis on skills development included hands-on learning, presenting, team building, analysis, problem solving, and critical thinking. Collectively, the summer camp engages more than two dozen faculty, staff, and students, a dozen local non-profits/companies, and six schools from the Columbus City and Metro school districts. Via philanthropic gifts from companies, the summer camp is currently financially sustainable for the next four years.



Future Implementation Initiatives:

Going forward, the Institute will focus on educational outreach both internal to OSU and with external partners, specifically programs designed to foster greater inclusion in data science. For externally focused efforts, we plan to continue our efforts with the Data Science for Women Summer Camp program, and perhaps expand it through our partnership with Metro High School and Columbus City Schools to include additional schools and/or minority males. Although conceptual at this stage, we will explore opportunities to “upskill” educators from underserved communities through hands-on training courses, so that in turn they are ultimately able to better integrate data analytics into their middle and high school courses. The training program TDAI is creating with MIDAS (see above) will also upskill faculty and students of community colleges in Michigan and Ohio leading to very tangible gains in the community and URMs.

In addition, the Institute will pilot a Translational Data Science & Analytics Extension program, a mechanism of interactions with the citizens of Ohio modeled after the OSU agricultural extension system. Initial targets for this educational outreach effort will include Ohio and Michigan community colleges, a goal that will be quickly realized if our collaborative efforts with MIDAS on the recent NSF training grant program is successfully awarded.

For internally focused efforts, we will conduct training sessions on software and other tools that are used and/or are being adopted for use across campus. These trainings may include applications of commercially-available tools such as Amazon Web Services, use of tools integrated into the Data Commons, tools created at the University, bootcamps on R and Python, among other possibilities. The trainings will target students, post-docs, faculty and staff across campus. Rather than duplicate efforts, the Institute will integrate and leverage other training efforts across campus via its partnerships with the Office of the Chief Information Officer (OCIO), the Ohio Supercomputer Center (OSC), and others. For instance, OSC recently offered a workshop at Pomerene on an *Introduction to Supercomputing at OSC* with roughly 55 participants.

IMPLEMENTATION INITIATIVE	METRICS OF SUCCESS	YEAR 3 TARGET	YEAR 5 TARGET
Educational Outreach: External Data Science for Women Summer Camp	<ul style="list-style-type: none">• # students• # schools	<ul style="list-style-type: none">• 35 students annually• 10 schools	<ul style="list-style-type: none">• 170 students (total over five years)• 25 schools
Educational Outreach: External Train the Educator	<ul style="list-style-type: none">• # teachers• # schools• # modified courses at home school	<ul style="list-style-type: none">• 15 teachers• 3-5 schools• 1 modified course at home school	<ul style="list-style-type: none">• 50 teachers• 15-20 schools• 3-5 modified courses at home school
Educational Outreach: External TDSA Extension	<ul style="list-style-type: none">• # county-level offices involved in• # citizens who use services• \$ funding for program	<ul style="list-style-type: none">• Planning underway	<ul style="list-style-type: none">• Prototype established in 1-3 counties• # citizens who use services (TBD)• \$ funding for program (TBD)
Educational Outreach: Internal Tools training sessions	<ul style="list-style-type: none">• # total enrolled/module• # of sessions• # of training modules	<ul style="list-style-type: none">• 50-76 enrolled/module• 6 sessions• 3-5 training modules	<ul style="list-style-type: none">• 200 enrolled/module• 12 sessions• 8-10 training modules

RESOURCE STEWARDSHIP GOAL: *To create a highly differentiated and impactful brand recognized as a model for sustainability and operational efficiency.*

Background and Past Activities: The University's stated focus on resource stewardship is to create models of "operating more efficiently, while also operating more effectively." Since its inception, TDAI has devoted considerable time and efforts working with others to create new models for operational efficiency and sustainability, and to fully leverage the \$42.8 million investment made by the State of Ohio into making Pomerene Hall a data analytics hub.

In June 2018, renovation was completed on TDAI's new home in Pomerene Hall – with more than 21,000 square feet of interdisciplinary research and teaching space. This vibrant new facility was designed to provide an unparalleled research and teaching space, with the three brand new data makerly laboratories, a two-story Ideation Zone, flexible project team workstations spaces, and event spaces. Every inch of TDAI's new space is designed to foster discovery and collaboration among faculty from every college. TDAI partnered with architects, Facilities and Operations Development (FOD), five companies, and faculty/staff across 12 units on designs, furnishing concepts, and data/IT infrastructure. The entire process took more than three years of planning and coordination with units across campus, from development of usage policies and rental rates to creating new staffing structure to lead building operations (required by FOD), event management / planning, industry engagement models, and faculty engagement opportunities.

While Pomerene Hall is important to creating opportunities, leveraging the strengths of our internal and external partnerships bring those opportunities to bear. Faculty and students are often challenged to find resources and data sets across campus. Those challenges are why we are creating the Data Commons and why we have piloted a Shared Services consulting space with OCIO, Ohio Supercomputer Center, Libraries, and the Technology Commercialization Office (TCO) to help researchers, students, and staff explore resources and solutions for data science and analytics projects. We have further partnered with OCIO on a multi-year service model aimed at providing on-site IT support for TDAI and its faculty, including security assessment and contingency planning. Since 2016, we have also leveraged partnerships with the Industry Liaison Office, Office of Academic Affairs, Office of Legal Affairs, Business and Finance, University Marketing, and Corporate Advancement to help establish and manage core Institute functions and explore more efficient modes of operating.

Efficiency and sustainability are hallmarks of many of our national peers, many of whom have built targeted staffing models and funding models. Our goal at TDAI is to achieve the same, but within the mission and goals of a land-grant university. To that end, we have built a highly efficient team of professional staff that leads TDAI efforts in faculty engagement, interdisciplinary proposal development, space planning /events, business development, operations, and technology implementation. Two of these positions are sustained through collaborative cost sharing with the Office of Research and OCIO, while a third will be covered completely through our new revenue stream for event rentals in Pomerene Hall spaces. It should be noted that in the current fiscal year, revenue from rentals is already exceeding our initial projections by more than 15%. In addition to this resource, TDAI worked with Corporate Advancement to establish more than \$5 million in naming rights for TDAI spaces in Pomerene Hall and build multi-year industry partnerships. The first of those Foundational Partnerships is a 10-year, \$2M partnership with Aruba / Hewlett Packard Enterprise that includes creating a living laboratory for Internet of things research and teaching. In addition, we have secured more than \$20,000 in grants and \$32,000 in other philanthropic gifts to support the first 4 years of the Data Science for Women Summer Camp.

Future Implementation Initiatives: The efforts noted above serve as a vital foundation for the Institute’s future. We are currently cultivating additional industry partnerships that will allow TDAI to invest into students, faculty, and outreach efforts. While our focus will continue to be on establishing long term Foundational Partnerships with industry, we will also begin exploring partnerships that focus on research and development for large-scale proposals and projects. We further expect that TDAI will recoup funding through proposals written by our Proposal Development Specialist, who both develops win strategies for interdisciplinary team science opportunities and writes proposals for these large team efforts. Finally, we expect to launch three boards in the coming year to ensure that TDAI continues to be a good steward of resources: Re-engaging a Faculty Advisory Board (originally launched in 2017 with 30 faculty from 11 colleges) and launching an External Advisory Board and an advisory board for the PSM-TDA program.

IMPLEMENTATION INITIATIVE	METRICS OF SUCCESS	YEAR 3 TARGET	YEAR 5 TARGET
Philanthropy: Foundational Partnerships	<ul style="list-style-type: none"> • # Foundational Partnerships • # of Total Giving 	<ul style="list-style-type: none"> • 3 Foundational Partnerships • \$600,000 annual giving 	<ul style="list-style-type: none"> • 5 Foundational Partnerships • \$1M annual giving
New Revenue Streams: Rental Income; F&A Recovery	<ul style="list-style-type: none"> • Amount of Annual Rental Revenue • F&A recovery from extramural awards 	<ul style="list-style-type: none"> • \$65,000 Annual Rental Revenue • \$ F&A recovery 	<ul style="list-style-type: none"> • \$85,000 Annual Rental Revenue • \$ F&A recovery
Institute Oversight: Advisory Boards	<ul style="list-style-type: none"> • Faculty Advisory Board • External Advisory Board • PSM Advisory Board 	<ul style="list-style-type: none"> • All boards active 	<ul style="list-style-type: none"> • All boards active

IV. Financial Plan

	Projections		
	FY19	FY20	FY21
Beginning Equity	651,172	681,232	237,732
Sources:			
DT Ops Budget	403,993	403,993	403,993
TDA Allocation	563,200	0	0
Cost Share Revenues	0	0	0
Sponsorship / Gifts	628,286	984,500	984,500
Grant Fund Summary	19,000	10,000	10,000
Rental Income (Pomerene)	47,555	50,000	51,000
New Org 40480 Beg Equity	-13,685	0	0
Total Sources	1,648,349	1,448,493	1,449,493
Uses:			
Administration Costs:	1,127,599	1,395,493	1,444,575
Personnel	632,825	860,734	900,128
Benefits	208,423	282,844	292,132
Fee Authorizations	0	0	0
Student Aid	0	0	0
Supplies & Service	286,351	251,915	252,315
Equipment	0	0	0
Program Costs	261,000	308,500	326,500
Seed Grants	30,000	100,000	100,000
Events/Conferences	19,500	30,000	32,000
Targeted Investments	99,500	73,000	80,500
Marketing/Communications	100,000	84,000	90,000
Business Development	12,000	21,500	24,000
Faculty in Residence	229,690	188,000	188,000
Total Uses	1,618,288	1,891,993	1,959,075

V. Metrics

IMPLEMENTATION INITIATIVE	METRIC	CURRENT PROGRESS	YEAR 3 TARGET	YEAR 5 TARGET
RESEARCH & INNOVATION GOAL: <i>To create a highly differentiated and impactful brand that is recognized as a top 5 institute for data science and analytics research/innovation nationally, differentiated by an emphasis on translational outcomes and a central, cross-cutting presence on campus.</i>				
Infrastructure: Internal Resources	<ul style="list-style-type: none"> # outcomes enabled (proposals, awards, publications) 	In progress	TBD	TBD
Infrastructure: Data-as-a-Service	<ul style="list-style-type: none"> # datasets in Data Commons # projects in Data Commons # projects using living lab # experts consulting 	Data Commons in progress	TBD	TBD
Extramural Funding:	<ul style="list-style-type: none"> # proposals # funding awards \$ funding awards # publications 	In progress	TBD	TBD
Regional & Global Impact: TBD	TBD	TBD	TBD	TBD
TEACHING & LEARNING GOAL: <i>To create a highly differentiated and impactful brand that is recognized as a regional hub of workforce development and innovative academic programs in data science and analytics.</i>				
Academic Programming: Professional Science Master's Program in Translational Data Analytics (PSM-TDA)	<ul style="list-style-type: none"> Milestone: 2020 launch # students enrolled/year # graduates/year # degree tracks 	In development	<ul style="list-style-type: none"> 60 enrolled/year 60 graduates/year 1 track 	<ul style="list-style-type: none"> 120 enrolled/year 120 graduates/year 2 tracks
Academic Programming: Certificate Program in Data Analytics	<ul style="list-style-type: none"> Milestone: Go/no-go decision or program launch # students enrolled/year # certificates awarded/year 	Concept	<ul style="list-style-type: none"> # enrolled/year # certificates awarded/year 	<ul style="list-style-type: none"> # enrolled/year # certificates awarded/year
Workforce Development: Training Grants	<ul style="list-style-type: none"> # training grants awarded # pre-doctoral trainees # post-doctoral trainees 	Concept	<ul style="list-style-type: none"> 1 NRT training grant; 1 NIH pre-doc T32; 1 Harnessing Data Revolution workforce development grant 34 predoc trainees 	<ul style="list-style-type: none"> 1 Postdoc T32 and 1 Predoc T32 training grants 4 predoc trainees 4 postdoc trainees
Student Engagement: Internship Program	<ul style="list-style-type: none"> # interns/year # companies or organizations 	In development (with 1 company)	<ul style="list-style-type: none"> 10 interns/year 2 companies or organizations 	<ul style="list-style-type: none"> 20 interns/year 4 companies or organizations
Student Engagement: Faculty-Directed Research Projects	<ul style="list-style-type: none"> # student projects # faculty mentors 	Concept	<ul style="list-style-type: none"> 3-5 student projects 5-8 faculty mentors 	<ul style="list-style-type: none"> 15 student projects 25 faculty mentors

IMPLEMENTATION INITIATIVE	METRIC	CURRENT PROGRESS	YEAR 3 TARGET	YEAR 5 TARGET
OUTREACH & ENGAGEMENT GOAL: <i>To create a highly differentiated and impactful brand that is recognized as an active partner with external stakeholders in ventures that strongly align with Ohio State's land grant agenda.</i>				
Educational Outreach: Data Science for Women Summer Camp	<ul style="list-style-type: none"> # students # schools 	<ul style="list-style-type: none"> 35 students 8 schools 	<ul style="list-style-type: none"> 35 students annually 10 schools 	<ul style="list-style-type: none"> 170 students (total over five years) 25 schools
Educational Outreach: Train the Educator	<ul style="list-style-type: none"> # teachers # schools # modified courses at home school 	Concept	<ul style="list-style-type: none"> 15 teachers 3-5 schools 1 modified course at home school 	<ul style="list-style-type: none"> 50 teachers 15-20 schools 3-5 modified courses at home school
Educational Outreach: External TDSA Extension	<ul style="list-style-type: none"> # county-level offices involved in # citizens who use services \$ funding for program 	Concept	Planning underway	<ul style="list-style-type: none"> Prototype established in 1-3 counties # citizens who use services (TBD) \$ funding for program (TBD)
Educational Outreach: Tools training sessions	<ul style="list-style-type: none"> # enrolled/module # sessions # training modules 	<ul style="list-style-type: none"> 55 enrolled/module 1 session of 1 module 1 training module 	<ul style="list-style-type: none"> 50-76 enrolled/module 6 sessions 3-5 training modules 	<ul style="list-style-type: none"> 200 enrolled/module 12 sessions 8-10 training modules
RESOURCE STEWARDSHIP GOAL: <i>To create a highly differentiated and impactful brand that is recognized as a model for sustainability and operational efficiency.</i>				
Philanthropy: Foundational Partnerships	<ul style="list-style-type: none"> # Foundational Partnerships Amount of Total Giving 	<ul style="list-style-type: none"> 1 Foundational Partnership \$575,000 annual giving 	<ul style="list-style-type: none"> 3 Foundational Partnerships \$600,000 annual giving 	<ul style="list-style-type: none"> 5 Foundational Partnerships \$1M annual giving
New Revenue Streams: Rental Income; F&A Recovery	<ul style="list-style-type: none"> Amount of Annual Rental Revenue F&A recovery from extramural awards 	<ul style="list-style-type: none"> Rental Income (in progress) \$0 F&A recovery 	<ul style="list-style-type: none"> \$65,000 Annual Rental Revenue F&A recovery (TBD) 	<ul style="list-style-type: none"> \$85,000 Annual Rental Revenue F&A recovery (TBD)
Institute Oversight: Advisory Boards	<ul style="list-style-type: none"> Faculty Advisory Board (FAB) External Advisory Board (EAB) PSM Advisory Board 	<ul style="list-style-type: none"> Inactive FAB EAB – concept PSM Advisory Board – ready to invite members 	<ul style="list-style-type: none"> All boards active 	All boards active

Appendix A1: TDAI Faculty Affiliates by Primary Discipline



As of February 7, 2019

Appendix A2:

TDAI Faculty Affiliates by College and Tenure-Initiating Unit

College & TIU Breakdown					
	Count	% of all AF		Count	% of all AF
Arts & Sciences	66	42.0%	Business	9	5.7%
Anthropology	1	0.6%	Law	2	1.3%
Chemistry & Biochemistry	1	0.6%	Libraries	1	0.6%
Communications	3	1.9%	Nursing	4	2.5%
Dance	1	0.6%	Pharmacy	3	1.9%
Design	3	1.9%	Public Affairs	2	1.3%
Economics	1	0.6%	Public Health	6	3.8%
EEOB	3	1.9%	Social Work	2	1.3%
Geography	5	3.2%	Vet Med	1	0.6%
History	2	1.3%	Knowlton (Architecture)	1	0.6%
Linguistics	1	0.6%			
Mathematics	4	2.5%			
Microbiology	2	1.3%	Engineering	38	24.2%
Philosophy	1	0.6%	Biomedical Engineering	1	0.6%
Political Science	5	3.2%	Computer Science & Engineering	21	13.4%
Psychology	4	2.5%	Civil, Environmental & Geodetic Engi	5	3.2%
Sociology	8	5.1%	Electrical & Computer Engineering	5	3.2%
Statistics	19	12.1%	Integrated Systems Engineering	6	3.8%
Music	1	0.6%			
			Food, Ag, and Env. Sciences	7	4.5%
Education & Human Ecology	5	3.2%	Entomology	1	0.6%
Educational Studies	3	1.9%	Food, Agriculture, and Biological Eng	5	3.2%
Human Sciences	2	1.3%	Food Science & Technology	1	0.6%
			Medicine	10	6.4%
			Biomedical Informatics	3	1.9%
			Davis Heart & Lung Institute	1	0.6%
			Internal Medicine	3	1.9%
			Surgery	1	0.6%
			Oncology	1	0.6%
			Pediatrics	1	0.6%

Appendix B: 2017 and 2018 Progress Reports

FY 2017 HIGHLIGHTS

Translating into success: TDAI progress and accomplishments

Established in 2017, the Translational Data Analytics Institute (TDAI) represents a long-term commitment by The Ohio State University to data science and analytics to solve real-world challenges. It supports the university's vision to establish Ohio as a global hub for developing translational data analytics solutions and talent. The offspring of the TDA program that launched in 2014 as a cornerstone of the university's Discovery Themes, the Institute is dedicated to fostering a diverse and inclusive community of innovators to translate big data for social and economic good and to prepare students for workforce success. Presented here are highlights of progress toward these ends.

FINANCIAL PERFORMANCE

Secure competitive grants

- Won a National Science Foundation award to use innovations in big data and technology to address the high rate of infant mortality in Greater Columbus
- Supported winning NSF proposals to apply data science and analytics in the areas of health and wellness and food security
- Won a bid to compete for \$5 million in State of Ohio projects – uniting 60 faculty, 22 centers and labs, and six industry partners

Establish strategic partners

- Launched a research exchange program in data science and analytics with Nagoya University, placing two faculty and one staff member and establishing strategic relationships with Japanese entities
- Initiated formation of public-private partnerships with multiple not-for-profits and corporations committed to improving access to data science and analytics education for underrepresented groups
- Began serving on NSF Midwest Big Data Hub planning committees and working groups to advance use of data science to solve regional problems

Develop philanthropic gifts

- Established multiple engagement and investment opportunities centered on students, research, and the future home of TDAI, Pomerene Hall

CUSTOMERS AND STAKEHOLDERS

Outreach and engagement

- Hosted and sponsored 19 events that brought together students, affiliates, other faculty, and industry partners. Among these: the TDAI Fall Forum, featuring faculty and students using big data for positive societal and global impact, and the university's first-ever Data Analytics Month, a campus-wide series of workshops, trainings, and special events from 11 university offices
- Co-led Amazon Web Services' first "Agriculture in the Cloud Day" event at Ohio State, which brought together more than 100 university and industry experts, students, and members of the local community

Teaching and learning

- Completed an analysis of academic programming in data analytics across Ohio State's 15 colleges, resulting in plans endorsed by Council of Academic Affairs to develop two new masters programs
- Commenced development of a Professional Science Master's in translational data analytics, hosting three town hall discussions with faculty and students and an industry roundtable with 10 companies on its design and curriculum
- Sponsored student-specific events including the OHIO Hackathon that convened industry and more than 700 students from across the country, and the 2017 ASA Datafest hosted by the undergraduate data analytics major
- Increased focus on students, creating tools to guide those seeking careers and providing speaking opportunities with corporate leaders
- Co-created a new visualization track within the undergraduate data analytics major

Reputation and visibility

- Cited in national report by the Business – Higher Education Forum and PwC, *Investing in America's data science talent: The case for action, for effectively*



FY 2017 HIGHLIGHTS

partnering with industry to advance Ohio State's mission and address workforce needs

- Featured in a 10-page *Ohio State Alumni Magazine* article highlighting TDAI faculty innovation and the university's commitment to data science and analytics
- Covered in two *Columbus Business First* articles detailing university investment in TDAI and the renovation of Pomerene Hall into a data analytics hub
- Expanded TDAI's digital footprint with a "What is 'translational'?" video and new Installments in the "Big Data for Good" video series

INTERNAL BUSINESS PROCESSES

Engage existing faculty

- Grew membership to 130 faculty affiliates representing 40-plus disciplines, 13 colleges, and three campuses, including 52 faculty hires in 18 tenure-initiating units
- Awarded more than \$176,000 in seed grants, which were supported with nearly \$164,000 in matching funds, to advance the discovery and application of data analytics methods and tools to solve challenges from managing memory for Alzheimer's sufferers to improving pedestrian and cyclist safety with new, low-cost sensor networks
- Forged a partnership with other DTI focus areas and the STEAM Factory, resulting in "Research Short and Sweet" faculty networking events

Recruit superior talent

- Recruited nine new faculty in statistics, food science, and more, partnering with six tenure-initiating units
- Hired a proposal development specialist to assemble and lead university-wide teams to pursue strategic, large-scale funding opportunities for the TDAI community

GROWTH AND TRANSFORMATION

Resource stewardship

- Programmed 21,000 square feet of research, teaching and innovation space for the future hub of TDAI within Pomerene Hall, partnering with three companies, architects, Facilities and Operations Development, and faculty/staff across 12 units on designs, furnishing concepts, and data/IT infrastructure
- Contributed to the selection of a public art investment in Pomerene Hall through the University Arts and Memorials Committee



A rendering of the Grand Atrium in Pomerene Hall, where TDAI's new home will open in spring 2018

- Leveraged partnerships with the Industry Liaison Office and Advancement to establish and manage business-university relationships

Research and Innovation

- Established first of several faculty-led Communities of Practice to define interdisciplinary research agendas and related funding capture plans in areas such as sensing and smart/connecting communities
- Launched the creation of a dynamic Data Commons resource with input from researchers, data users, and data managers throughout the university and exploring industry and community partnerships

Demonstrate leadership

- Co-chaired and sponsored the first NSF Workshop on Translational Data Science at the University of Chicago, with next to follow at Berkeley, influencing a national conversation
- With support from 18 external partners and Ohio State offices, approved as a university-level Institute – the Translational Data Analytics Institute – to drive the development, application, and study of translational data analytics solutions across the university
- Developed core operational initiatives that are now used across Discovery Themes, including a budget model, onboarding workshops, promotional materials, and other business tools



Power through partnership

The Ohio State University's Translational Data Analytics Institute advances data science and analytics by fostering a diverse, inclusive community of innovators who utilize big data for good and prepare students for success. Presented here are key accomplishments from July 1, 2017, through December 31, 2018.

MISSION FOCUS

Research and innovation

- > Launched four Communities of Practice to define interdisciplinary team science agendas for TDAI in the areas of smart / connected communities, complexity, data foundations, and biological / life sciences.

Outreach and engagement

- > Launched an annual five-day Data Science for Women Summer Camp aimed at increasing interest in and familiarity with data science and analytics for 30 middle- and high-school women and minorities.
- > Hosted and sponsored 23 events that brought together students, faculty, staff, and industry partners. Among these: Data Analytics Month, Provost Lecture Series with DJ Patil, faculty networking events, Pomerene opening events, Florence Nightingale Day, and an NSF workshop.

Teaching and learning

- > Engaged faculty from Statistics, Design, Computer Science and Engineering, and the Graduate School in design of new curriculum for the PSM.
- > Fostered partnership with the Business – Higher Education Forum to guide development of curriculum, recruitment strategies, and industry engagement models for the PSM.
- > Launched an online Data Analytics Road Map designed to help current and future students explore educational and career options in data science and analytics.



THE OHIO STATE UNIVERSITY
TRANSLATIONAL DATA ANALYTICS INSTITUTE

FACULTY TALENT

Faculty engagement

- > Developed dual membership models aimed at engaging faculty who are heavily involved in data analytics and those who are new to the field.
- > Piloted a new interdisciplinary training program designed to improve research communication among 25 faculty within TDAI, Chronic Brain Injury, and InFACT.
- > Engaged faculty from five colleges in listening sessions to solicit input and strategic planning considerations for the faculty director search.
- > Developed a mobile app with Aruba / HPE for Pomerene Hall that gives faculty instant access to TDAI facilities information, news, and educational opportunities.

Talent recruitment

- > Recruited three junior faculty in Biomedical Informatics; Food, Agricultural and Biological Engineering; and Evolution, Ecology and Organismal Biology, bringing the total number of hires since 2015 to 56.

FINANCIAL PERFORMANCE

Competitive grants

- > Secured \$800K, multi-university National Science Foundation (NSF) Big Data Spoke award to use community-driven data engineering to combat the opioid epidemic in rural Midwest.
- > Submitted a NSF Convergence in Harnessing the Data Revolution proposal (\$1M over three years) with faculty expertise from 12 research disciplines.
- > Leading development of \$100M National Institutes of Health and Substance Abuse and Mental Health Administration: Optimizing HEALing in Ohio proposal, partnering with government and multiple disciplines, universities, and community partners.

- > Developing five additional research proposals valued at \$17M and focused on high performance computing solutions, opioid addiction, smart and connected health solutions, and computational imaging decision support.

Strategic partnering

- > Led roundtable discussion with leaders from more than 30 organizations, including industry, government, and nonprofits on the design of a new Professional Science Master's (PSM) in translational data analytics geared toward early-career professionals.
- > Collaborating on PSM curriculum and sustainability options with the departments of Computer Science and Engineering, Design, and Statistics, and the Advanced Computing Center of Arts and Design.

Philanthropic support

- > Secured a 10-year, \$2M partnership with Aruba / Hewlett Packard Enterprise that includes creating a living laboratory for Internet of things research and teaching.
- > Secured \$20,000 in grants and a \$5,000 gift from Women in Analytics to support two years of programming for the Data Science for Women Summer Camp.
- > Cultivated additional industry partnerships valued at more than \$2.5M that will be invested into students, faculty, and outreach efforts.

GROWTH AND POSITIONING

Staff talent recruitment

- > Hired three professional staff to lead new TDAI efforts in special events, space planning and building coordination, and technology implementation.

Resource stewardship

- > Established new revenue stream for TDAI with development of rental policies, rates, and procedures for Pomerene Hall spaces.

- > Garnered support from four career offices and the offices of Legal Affairs and Business and Finance to design a new flexible internship model that is responsive to changing industry needs.

- > Partnered with OCIO on a multi-year service model aimed at providing on-site IT support for TDAI and its faculty, including security assessment and contingency planning.

- > Completed renovation of 21,000 square feet of research and teaching space in Pomerene Hall for TDAI's 150+ faculty affiliates and their projects teams / collaborators.

- > Piloted a Shared Services consulting space with OCIO, Ohio Supercomputer Center, Libraries, and TCO to help researchers, students, and staff explore resources and solutions for data science and analytics projects.

Demonstrated leadership

- > Participated in four national data strategy meetings: BHEF Data Science & Analytics Taskforce, NSF Data Science Corps Meeting (Winter 2017-18), second NSF workshop on Translational Data Science (Winter 2017-18), First Data Science Leadership Summit (March 2018), and US-Japan Digital Innovation Hubs (March 2018).

Reputation and visibility

- > Created and distributed a first-of-its-kind video documenting data analytics undergraduate students and their reason for choosing Ohio State.
- > Debuted an interactive video wall in Pomerene Hall to share news, events, and opportunities across campus.
- > Utilized TDAI's spaces to host more than 20 events serving 350 alumni, donors, faculty, community members, and students, including the Board of Trustees; Alumni Association; Ohio State Retirees Association; Big Data and Analytics Association; and the offices of Diversity and Inclusion, Research, and Academic Affairs.

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Appendix C: Communities-of-Practice Plans

FOUNDATIONS OF DATA SCIENCE

Introduction:

What we are doing: This CoP aims to build a community at OSU focusing on the foundation of data science. It will center around the theoretical and algorithmic foundation of data science, with core members spanning across the TRIPODS areas or pods which include Computer Science and Engineering, Mathematics and Statistics. It will also build connections to the broader data science campus community in a radial manner: starting from more fundamental areas such as geometric/topological data analysis and machine learning, to other topics of data science and analysis and application domains. The community will focus on new fundamental methodologies as well as new analytical algorithms for analyzing diverse data structured and unstructured. To achieve this goal, this CoP also aims to reach out and bridge researchers from application areas, such as bio-/life sciences, geographical information science (GIS), material science, neuroscience, etc., so as to tackle fundamental questions that arise in the application domains. It also aims to connect to researchers in other data analytic and data management areas, such as cybersecurity, data governance, mobility, and scalable high-performance computing. These goals also align with those of the TRIPODS center TGDA@OSU (Topological and Geometric Data Analysis) that has been funded by NSF for Phase I, as well as the theme for potential Phase II of this TRIPODS center.

Why we are doing it: The CoP will produce effective and efficient algorithms for modern data analysis, as well as to gain understanding for the abstract structures behind data analysis problems. These fundamental algorithms can potentially be used for a broad range of application domains, from science to engineering and onto social sciences. The ensuing algorithms have potentially important impacts on several aspects for societal challenges in fields such as cybersecurity, health, manufacturing, and engineering.

Why at Ohio State: OSU has a strong team in TGDA or Topological and Geometric Data Analysis, consisting of faculty members from Computer Science, Mathematics and Statistics. OSU also has strong researchers in (statistical) machine learning, data privacy, security, and optimization. It also boasts of strengths in data management, high performance computing and AI including machine vision and natural language processing. Through this CoP, we plan to combine our many existing strengths and essentially constitute the core of this CoP. The methodologies developed can be applied to a broad range of application domains, including material science, neuroscience, medical images analysis, GIS, and so on. This CoP envisions to utilize the strength of research and developmental activities already existing at OSU both at the technical and organizational fronts. There is no dearth of application domains at OSU which can connect to this core. For example, OSU has strong presence in material science thanks to a NSF Material Science Engineering research Center (MSERC and the Discovery Theme Institute of Materials Research, bio-/life sciences given the Wexner Medical Center, geography and spatial analysis viz. the Center for Urban Analysis (CURA) and the Discovery Theme on Sustainability, Resilience and the Environment (SRE) and public health and epidemiology given a burgeoning Institute on Addiction among others. This CoP along with the initiative of NSF funded TRIPODS at OSU is a timely undertaking. The presence of various centers and institutes such as TDAI

itself, Math Bio Institute, the NSF MSERC can help shape the outreach activities for the foundational research.

CoP-Specific Goals:

- Short-term: Initiate the Foundations CoP on campus. Understand goals and needs of community members through public events and landscape analysis. Develop activities to facilitate these goals.
- Long-term: Establish the strong identity of being the platform for Foundation of Data Science, with both regular, broad scale activities / events, as well as facilitate grass-roots activities while bridging with other domains / CoPs/ Discovery Themes.

Tactics to Achieve Goals:

- To achieve the short-term goals, as a first step we plan the following activities: (i) A survey will be carried out to collect members' incentives, goals and needs which will be followed by a network-based landscape analysis. (ii) An initial lunch seminar series will be launched to help community members learn the interest and work of each other. (iii) A poster session for students / postdocs presenting relevant research from the entire CoP will be organized. This poster session is potentially extendable to a one-day workshop which also highlights talks from CoP members or invited speakers.
- To achieve the long term goals, as a first step, we plan: (i) to invite external (outside OSU) speakers to give vision talks, and/or to leverage existing speakers on-campus from different departments and groups to meet with CoP members; (ii) to initiate multiple clusters within the CoP based on members' interests and expertise focusing on specific themes in foundations, and facilitate the building of teams for potential cross-disciplinary collaborative projects / funding; and (iii) to have a workshop to connect some core clusters in CoP with application domains.

Metrics of Success:

- One measure will be the extent of participation and involvement of CoP members in these activities; as well as the involvement of new members.
- The formation of sub-clusters / collaborative teams (with potentially joint work and grant applications) will be another way to measure the effectiveness of the activities.

Core Community: Departments such as Computer science, Mathematics, Statistics, Electrical engineering, Industrial and Systems Engineering, the College of Law (for e.g., data governance) will play a key role in this CoP. Centers such as NSF TRIPODS Center, Mathematical Bioscience Institute (MBI), Erdos Institute, will also be important.

COMPUTATIONAL SOCIAL SCIENCE

Introduction: Using computational techniques and big data to address concerns related to human behavior, or to gain insights into basic social processes that cannot be identified with conventional methods. We hope to facilitate research within the educational and social sciences and team science between disciplines, and to develop methodological tools to evaluate novel theories that cannot be evaluated with conventional tools. In doing so, we hope to see the development of novel methods and the formation of solutions that could not be identified with conventional methods.

CoP-Specific Goals:

1. Identify research areas that are germane to this CoP and are aligned with TDAI's and Office of Research's goals.
2. Explore graduate interdisciplinary specializations and graduate and/or undergrad certificates in areas relevant to computational social science
3. Research engagement among members of the CSS CoP through creation of data assets, identification of salient topics/areas, and development of proposals.

Tactics to Achieve Goals:

1. Using landscape and network analyses identify "disciplinary" and "topic" clusters already existing within the CoP; further convene to explore research topics of common interest.
2. Create events with specific themes (e.g., network science, visualization, natural language processing, etc.) relevant to the social sciences.
3. Identify relevant courses within CoP community and identify clusters of offerings; work with pertinent TIUs, Colleges, and the Graduate School to plan and offer GIS/certificates.
4. Target potential funding sources and specific opportunities for inter- and cross-CoP collaborations including training grants and research proposals.

Metrics of Success:

1. Submission activity to federal agencies and foundations and success rate of cross-CoP grant submissions
2. Publication record of cross-CoP initiatives
3. Progress towards or completion of GIS and grad/undergrad certificates that cross-cut social sciences and foundational disciplines
4. Engagement in a series of meetings amongst community members

Core Community:

Anthropology, Communications, City and Regional Planning, Computer Science, [Criminology](#), Economics, Educational Research, Integrated Systems Engineering, Political Science, Public Affairs, Public Health, Sociology, Statistics; Institute of Population Research, Math Biology Institute.

COMPUTATIONAL HEALTH & LIFE SCIENCES

Introduction: There has been an explosion of data in all areas of life and health sciences. Big data is now the norm rather than the exception. Such huge sets of data in diverse areas may in fact be inter-connected, and big data analytics, including modeling and data mining methods, are essential for distilling information for convergence into the understanding of an array of phenotypes. Strong bonds between data scientists and domain area experts are needed more than ever. This CoP was conceived to bring the community together to address such challenging problems. Instead of fragmented efforts with limited resources, teams of researchers formed under this CoP can access shared resources facilitated by TDAI, including rich, inhouse databases and repositories, to maximize their integrative efforts. This CoP is a platform that can provide researchers speaking different scientific languages a forum to communicate with one another, to exchange ideas, to come up with novel integrative ideas, and to translate such ideas into the development of new technology, new data, or new methodology. The translational values of the research from the teams will address real problems our society faces, and we will continue to re-evaluate the translational aspect of our research agenda through partnering with entities within and outside of OSU. The outcomes can have real impacts on life sciences and treatments/preventions of an array of health conditions, including obesity, cancer, and cardiovascular diseases.

Core community: Biostatistics, statistics, biomedical informatics, computer science and engineering, microbiology, biomes, environmental health, public health, food science and technology, diabetes, metabolism, cardiovascular medicine, critical care, trauma, burn, hematology, cancer, radiation oncology, ophthalmology, pharmacy, pharmacy practice and science.

Goal 1: Fostering cross-disciplinary collaborative activities and opportunities

Rationale: Members of the CHLS CoP come from diverse areas with the common objective of using quantitative methods to perform impactful research in health and life sciences. To realize this common goal, a platform on which members can share, discuss, and create common research themes is extremely valuable.

Tactics:

- Form thematic groups to bring together scientists with similar research interests and those with common research aims who employ a diverse array of tactics based on their areas of expertise. Groups will meet on a regular basis to discuss topics, novel approaches, and grant opportunities.
- Foster cross-group interaction through rotating seminar series between groups featuring both group members and outside speakers.
- Establish data commons for members to share existing and new datasets to facilitate effective and efficient collaboration.
- Hold monthly “Tea Time” after a seminar to encourage interactions among all TDAI affiliates in a relaxed atmosphere.
- Host annual Research Day for members to showcase their research and explore others’ work.

Metrics of success:

- Joint publications of research/review articles.
- Growth of the community.

- Raised research profiles of CHLS CoP members.
- Well-established joint research projects, including those involving partners inside and outside of OSU.

Goal 2: Development and submission of interdisciplinary/team science grant proposals to external funding agencies

Rationale: The research of a number of members of our CoP are driven by grant funding. Therefore, Goal 2 is essential to keep our members actively engaged in Goal 1.

Tactics:

- Identify and encourage members to participate in training opportunities on writing strong interdisciplinary proposals.
- Regularly meet with the TDAI proposal development specialist to identify relevant RFAs from funding agencies.
- Encourage members to scan for opportunities that involve data analytics for their specific disciplines.
- Discuss proposal ideas and funding opportunities in group meetings.

Metrics of success:

- Submission of competitive proposals.
- Successful obtainment of funding.

Goal 3. Training of interdisciplinary researchers, outreach to internal/external partners, and K-12 outreach in data science

Rationale: A challenge for researchers in the domain areas of life and health sciences lies in staying up to date on big data analytics methods and understanding how to use them correctly. Training programs provided by this CoP will also help train the next generation interdisciplinary researchers. Furthermore, engaging partners within and outside of OSU is crucial to ensure the translational values of the research projects. The opportunity is also ripe for community engagement in data science through K-12 education.

Tactics:

- Offer annual workshops on rotating topics to train researchers on using data analytics methods in various health and life sciences domain areas, especially omics analysis.
- Outreach to potential internal/external partners to organize brainstorming sessions on potential collaborative projects. We will also encourage partnering units/organizations to join us for relevant thematic group meetings and the annual Research Day.
- Organize workshops jointly with partners.
- Work with the TDAI Data Science for Women Summer Camp to identify opportunities to organize activities that are related to health and life sciences.
- Partner with the Ohio Florence Nightingale Day Committee to organize a mini data fest for middle and high school female students from Ohio.

Metrics of success:

- Successful organization and execution of well-attended workshops and mini data fest with positive feedbacks.
- Establishment of collaborative relationships with entities within and outside of OSU.

SMART & CONNECTED COMMUNITIES AND DISTRIBUTED SENSING

CoP-Specific Goals:

- 1. Sustain and grow on a year-to-year basis a pipeline of translational data-centric projects which impact communities locally, regionally, and beyond.***

We regard the pipeline of projects as desirable for multiple reasons. For one, we have a rather large community, so our CoP has the bandwidth for rather diverse engagements over time. The initial projects in the CoP have emerged by organic self-selection among its members catalyzed by funding opportunities and TDAI facilitation efforts; this pattern is effective and expected to continue. Looking ahead, we anticipate that to achieve translational impact, follow-up projects in the pipeline will emerge as the desired translational deliverables grow, get refined or refocused. Also, the experience with the projects in the pipeline will help in the CoP's self-discovery of its potentially unique strengths, which in turn will lead to refinement of the CoP's strategic foci.

- 2. Leverage and contribute to TDAI's "Data-as-a-Service" platform.***

TDAI has positioned itself to provide a variety of data services. To name a few, these include: Data Commons, where data sets curated from projects such as the ones conducted by our CoP projects are maintained, accessed, and used; Data Makery, which supports the creation of data from sensors and other endpoints, and orchestration and management of these and associated resources providing computation and networking; access to data sets that are important for TDAI stakeholders; guidance and expertise on the development of data privacy, data usage, and data management plans; and access to living lab testbeds, i.e., in Pomerene Hall, including resources provided by our industrial partners and engineering/technical assistance by TDAI staff.

Projects in our CoP will use TDAI's data-as-a-service platform, as will other projects in the diverse domains which *Smart@OSU* is strategically planning to develop. Conversely, as is typical of work cultures that promote eat-your-own-dogfood in Living Lab activities, we expect projects in our CoP will refine and extend the TDAI platform. We anticipate the TDAI platform will by itself would give our CoP, TDAI, and OSU a competitive edge in executing on the *Smart@OSU* strategy. Moreover, as its forward-looking capabilities are materially beyond those being currently realized in the *Smart Columbus Operating System*, in due course TDAI could transition these capabilities to *Smart Columbus* itself and other adopters.

- 3. Establish center-scale or extension-like activity.***

TDAI has advanced the proposition that data in service of communities is core to OSU's mission as a land grant university. Should the evolution of our CoP show potential for measurable impact on diverse communities in our state, our CoP could strategically reframe its structure to incorporate an extension-like. Alternatively, should the evolution of our CoP

clarify an area of unique strength and opportunity, its aspiration will be to establish a center-scale activity in that area.

Tactics to Achieve Goals: As a meta-tactic, our CoP will embrace an agile, adaptive approach. We plan to conduct focused, measurable experiments with creative tactics, and operationalize a fail-fast approach for down-selecting tactics which are unproductive. More specifically, our tactics include:

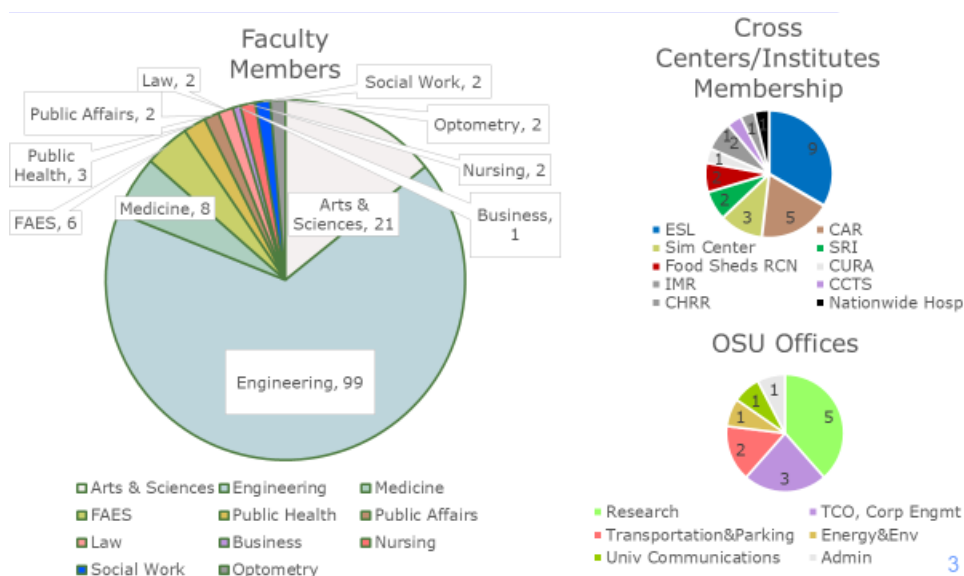
- Leveraging funding opportunities to drive the creation of projects and teams within the CoP. Funding agencies would include the National Science Foundation, whose ongoing “convergence research” focus is sympathetic with much of the research in our CoP; other governmental agencies at the national, state, and city level; industry-supported programs; and programs seeded by OSU and TDAI.
- Leveraging “*strategic finding*” and *similar mechanisms* for creation and subsequent mentoring of multiple teams targeting large, visible programs, as they go through the stages of development proposal and winning funding for large research projects. Teams which show the most potential for success would become eligible for additional forms of support from TDA, i.e., proposal development support, access to facilities and equipment, and other appropriate forms of cost-share.
- Organizing the CoP into a set of mission-specific *working groups*. Working groups will facilitate and provide synergies for the activities of projects on a related theme, enable creation of teams for new projects in that theme, and provide continuity for translational efforts that involve a series of funded projects.
- Leveraging TDAI seed grants, particularly those that are earmarked for CoP members.
- Leveraging of TDAI incentives as a key tool in achieving sustained, “sticky” engagement of members in our CoP. To this end, our CoP and TDAI will explicitly identify the available resources that meet diverse and discretionary needs of faculty from different colleges and disciplines.
- Encouraging quid pro quo in the award of incentives. For instance, awarding access to data sets or access to data platforms may be prioritized for members or teams who are able to contribute based on their project activities additional data sets or data analysis tools that other users of TDA platforms can benefit from, or who are able to engage in living lab activities that promote the use and growth of the TDAI data-as-a-service platform, as articulated in Goal 2.
- Conducting “landscape analysis” of the joint strengths and interest within our CoP, using data analysis tools as well as inclusive engagement with CoP members. This will serve as input to working groups when new teams are being created, it will also serve to assess the potential for creating center-scale activities, as articulated in Goal 3.
- Supporting an ongoing seminar series that engages and invigorates both faculty and students.
- Organizing special events, such as:
 - Bring-your-own-data (BYOD) Day where folks can pitch the data sets they have created to broad communities of potential users.
 - Eliciting grand challenge problems for specific communities via invited talks and panel sessions with visionary leaders in the field.

- Eliciting state-of-the-art technical challenges from experts invited from industry partners who have established relationships with TDAI and OSU.
- Engaging students beyond research and development projects, via capstone project courses defined by CoP members, potentially via smart city hackathons, and in joint activities with industry partners.
- Encouraging open sourcing of the data-as-a-service platform contribution, to encourage adoption beyond OSU.

Metrics of Success: For the first goal, we seek to measure the disciplinary output of the project team members as well as the impact on the communities that the projects are involved in. While the former metrics are relatively standard for the academic setting, the latter will be defined on a project basis. We expect community feedback will provide valuable metrics and will encourage mechanisms for incorporating the feedback as a mainstream activity in projects' community outreach activities.

For the second goal, we seek to measure growth and usage of the data-as-a-service platform. These measures will be used by TDAI on a regular basis to prioritize and reallocate resources as desired. We will also track project contributions to the platform and use those measures in the allocation of TDAI incentives, as articulated among the tactics.

For the third goal, which is a medium to long term goal, we will begin by measuring in the first three or so years the cumulative performance of working groups (by aggregating the finer measures for the projects associated with that working group). That experience should lead to a strategic decision whether to proceed with center or extension activity. In the long term, the center/extension activities would be measured by metrics similar to that of the first goal.



Core Community: The current membership of the CoP is reflected in these pie charts, indicating broad engagement of faculty from different disciplines. Given the basic role of data, sensing and

control techniques, tools, and infrastructures in CoP projects, it is not surprising that a substantial part of the membership is from Engineering and Arts& Sciences. That said, the members with domain expertise in fields such as medicine, agriculture, public health, nursing, social sciences and optometry are critical for executing on smart community projects. As the working groups evolve, we anticipate engaging more domain experts. Likewise, colleagues in Law, Public Policy, and Cybersecurity are already playing a special and much needed role in many of the projects that are underway and under planning.

Our CoP has considerable overlap with faculty working in existing centers and institutes at OSU, which again is natural given the scope of our CoP. The network of connections accessible through these overlaps is expected to provide the scaling benefits. For instance, in the case of Food Sheds Research Coordination Network, these connections go beyond OSU. And in the case of CHRR, we hope to get their help in enlisting and obtaining community stakeholder feedback.

We expect to maintain our engagement with various OSU offices, as they promote or enable CoP activities in materially relevant ways. For instance, the Office of Research has facilitated our strategic finding sessions. Corporate engagement has already brought industry resources to TDAI which are directly relevant for Living Lab experiments our CoP can conduct. And Transportation and Parking has supported proposal activities which were successfully funded.

Appendix D:

Capture Plans, Proposals and Awards

(May 2017- March 2019)

OPPORTUNITY	PI LEAD (AFFILIATION)	FUNDING	TEAM	STATUS
National Science Foundation (NSF): Big Data Spoke: Community-driven data engineering for opioid and substance abuse in the rural Midwest	Machiraju (CSE/BMI; TDAI Led)	\$1M for 3 yrs	COE (CSE), CoPH, COM; GRC, CHRR, OSC, CPHP, CTSA, CURA; MBDH, OHMAS, NWChildrens, ODH, ATRN, U Chicago, Wright St. U, Shawnee St. U, Iowa St. U; CovewrMyMeds, HPE, Tableau, Arora, Hyder, Salaberry, Lynch, Nandi, Panda, Stewart, Srin	Awarded
Department of Defense (DoD): A Pre-Hospital Data Commons for Development of an Automated TRaUma Medical AssistaNt (TRUMAN)	Machiraju (CSE/BMI; TDAI Led)	\$1.6M for 3 yrs	N/A	Awarded
National Institutes of Health (NIH): Healing Communities Research Site	Jackson (COM; TDAI contribution)	\$50M for 4 yrs	ASC (Sociol, Geog) EHE OSU-Extension, COE (CSE), CoPH, COM (BMI and others), CON, Glenn, CTSA, Biostats, Ctr. Crim J, OMHAS, Ohio Univ, U Cinci, CWRU, U Toldeo, Univ Hosp (Cleve Clinic), Wright St. Univ. Raghu, Salsberry, Hyder, Root, Haynie, Miller, Li, Hardy (TDAI Affiliates)	Award Pending
NSF: Mathematical Biosciences Institute	Best (MBI; TDAI contribution)	\$25M for 5 yrs	Calder, Machiraju, Kurtak (TDAI Affiliates)	Pending
NIH: BD2K TCC	Hardy (Nursing; TDAI contribution)	Application to participate in IDEAS lab	N/A	Pending
NSF: Harnessing the Data Revolution (HDR): Ideas Lab	Arora (CSE), Paul (Stats), Wang (CSE), Allen (ISE) (TDAI contribution)	Applications to participate in Ideas Lab	N/A	Pending
NSF: HDR: Data Science Corp	Machiraju (CSE/BMI; TDAI led)	\$215K for 3 yrs	Ramnath (TDAI Affiliate)	Pending
State of Ohio: Office of Developmental Disabilities	Sahr (GRC; TDAI contribution)	\$185K for 6 mos	GRC	Pending
NSF: Major Research Instrumentation Program (MRI): MRI-Self-Learning Systems for Computational Imaging Decision Support	Panda (CSE; TDAI led)	\$5.6M for 4 yrs	CoE (CSE, MSE) COM (Pathol) Agrawal, Srin, Blanas, Chen, Machiraju, Ramnath, Sun	Pending
NSF: Expeditions in Computing-Collaborative Research: Self-learning systems for computational imaging decision-support	Panda (CSE; TDAI led)	\$6.6M for 5 yrs	Lehigh University, Emory University; COE (CSE, MSE, ISE) COM (Pathol, BMI) , Optom, ASC (Design); CEMAS, ACAAD Ramnath, Mraghu, Chen, Lewis, Srin, Agrawal, Rayo	Pending
Schmidt Futures: Alliance for American Dream	Community Action Wayne/Medina Counties (TDAI Led)	\$1M for 18 mos	Carrel (TDAI Affiliate)	Not awarded

OPPORTUNITY	PI LEAD (AFFILIATION)	FUNDING	TEAM	STATUS
NSF: Transdisciplinary Research in Principles of Data Science (TRIPODS)+X: Complex Network Relationships in Metabolomics and Metagenomics	Mathe (BMI; TDAI led)	\$200K for 3 yrs	COM (BMI), COE (CSE), ASC (Stats) Lin, Machiraju, Dey, Wang, Kurtek	Not awarded
State of Ohio: Dept. of Admin Svcs.- Infant Mortality	Ranbom (GRC; TDAI contribution)	\$1M for 6 mos	GRC	Not Awarded
NSF: National Science Foundation Research Traineeship (NRT): Geospatial	Johnson (ECE; TDAI Contribution)	\$3M for 5 yrs	COE (ECE, CEGE, CSE), ASC (Geog, Earth Sci) Machiraju, Srin, Arora, Miller (TDAI Affiliates)	Not Awarded
NSF: Smart Connected Communities-Buckeye Edge	Arora (CSE; TDAI Led)	\$3M for 4 yrs	COE (CSE), Law, Glenn, CoPH, COM; Hyder, MAchiraju, Hirsch, Lynch, Landsbergen (TDAI Affilaite)	Not Awarded
State of Ohio: Dept. of Rehabilitation & Corrections: Opportunities to Improve Outcomes for Individuals in the Criminal Justice System	Bellair (Sociology; TDAI led)	\$500K for 6 mos	Vuolo (Sociology)/TDAI Affiliate	Not Awarded
NSF: Smart and Connected Communities	Arora (CSE; TDAI Led)	\$3M for 4 yrs	COE (CSE), Law, Glenn, CoPH, COM; Hyder, Machiraju, Hirsch, Lynch, Landsbergen	Proposal Development
NSF: Growing Convergence Research-Robotic Biology	Machiraju (CSE/BMI; TDAI Led)	\$2.6M for 2 yrs		Proposal Development
NSF: Fairness and AI	(TDAI Led)	\$2.5M for 2 yrs	TBD	Planning
NSF: Cyberinfrastructure for Sustained Scientific Innovation	(TDAI-Led)	\$5M for 5 yrs	TBD	Planning
NSF: Convergence Accelerators Phase I	(TDAI-Led)	\$1M for 9 mos	TBD	Planning
NSF: TRIPODS Phase 2	Dey (CSE; TDAI Led)	TBD	Kurtek, Memoli	Planning