State University System
Education and General
2022-2023 Legislative Budget Request
Form I

University(s):	**Florida Atlantic University**
Request Title:	University of Distinction Proposal **Applied A.I. & Big Data Analytics ("AI/Data")**
Date Request Approved by University Board of Trustees:	**September 13, 2021** (pending)
Recurring Funds Requested:	**$12.8M**
Non-Recurring Funds Requested:	**$5.3M**
Total Funds Requested:	**$18.1M**
Please check the request type below:	
Shared Services/System-Wide Request	☐
Unique Request	☒

I. Purpose – *1. Describe the overall purpose of the plan, specific goal(s) and metrics, specific activities that will help achieve the goal(s), and how these goals and initiatives align with strategic priorities and the 2021 University Accountability Plan established by your institution (include whether this is a new or expanded service/program). If expanded, what has been accomplished with the current service/program?* 2. *Describe any projected impact on academic programs, student enrollments, and student services. University of Distinction proposals should also address the requirements outlined in the separate guidance document.*

Applied A.I. & Big Data Analytics

Florida Atlantic University seeks to leverage its robust and rapidly-growing focus of **Applied Artificial Intelligence and Big Data Analytics ("AI/Data")** as an exemplar interdisciplinary pillar for FAU and the State of Florida. The university focused on its AI/Data portfolio since first including it as a platform in the *Strategic Plan for the Race to Excellence, 2015-2025*. To increase the rate of acceleration in this area, FAU requests significant investments from the Legislature to continue to build itself as a **University of Distinction.**

This proposal will build on the university's strategies to A) enhance and expand innovative AI/Data academic programs that underpin student success and state economic growth, B) further lift FAU's reputation in applied AI/Data research to support the state economy and national priorities, and C) promote AI/Data-driven engagement with industry in the region and state.

FAU's *Strategic Plan for the Race to Excellence, 2015-2025*

Since embarking on its strategic plan in 2015, FAU has seen rapid success by building on the strength of specified institutional "pillars" and "platforms." These represent formal, FAU Board of Trustees-approved priorities for the institution. Each year, the university's BOG accountability plan articulates its ongoing commitment to invest in and support these priorities.

According to page 5 and 6 of FAU's 2025 strategic plan:

> ***Pillars*** define institutional programs focused on creating knowledge that benefits society
>
> ***Platforms*** represent scholarly activities that apply to and support all *Pillars*

The *Race to Excellence* articulates how the university will operationalize these priorities. The strategic plan notes that the pillars and platforms "guide institutional goals and strategic actions" (p. 5). Furthermore, the document establishes a commitment for FAU to "hire or retain strong interdisciplinary leaders for *Pillars* and *Platforms*" (p. 8), as well as to "develop external funding framework to permanently sustain *Pillars* and *Platforms*" (p. 12). Given the documented success of this plan – with outcomes including more-than doubling the 4-year graduation rate and the research expenditures—it's clear that the *Race to Excellence* is a living and actionable document. Each day, FAU follows its strategic plan, including its support of pillars and platforms.

Strategic Plan Pillars

Since 2015, the university launched research institutes to support each of the four approved pillars. The following framework showcases the commitment of the university to implement its strategic plan:

1. The Institute for Human Health and Disease Intervention (I-HEALTH) supports the Healthy Aging pillar;
2. The Stiles-Nicholson Brain Institute supports the Neuroscience pillar;
3. Harbor Branch Oceanographic Institute supports the Ocean Science and Engineering / Environmental Sciences pillar; and
4. The Institute for Sensing and Embedded Network Systems Engineering (I-SENSE) supports the Sensing and Smart Systems pillar.

Strategic Plan Platforms

Similarly, FAU formalized nine platforms, such as *undergraduate research* (with the establishment of the Office of Undergraduate Research and Inquiry) and *global perspectives and participation* (with the establishment of the Center for Global Engagement). The platforms support FAU's academic and research programs and are signature themes for the institution. The university has embedded platforms in its curriculum and expanded co-curricular activities to ensure adequate infrastructure is in place to support these themes – both in terms of the educational experience for all students and priorities for faculty and student researchers.

The Rise to Prominence of FAU's AI/Data Platform

One of the most widely-supported strategic plan platforms has been **Big Data Analytics**, which in recent years has evolved to also include a focus on the applications of high-volume data science in the world of automation, machine learning, deep learning, and artificial intelligence.

Throughout the implementation of the university's strategic plan, FAU's colleges and units have shown tremendous buy-in regarding the Big Data Analytics platform. The executive leadership team and the FAU Board of Trustees included the topic as the first platform in the *Strategic Plan for the Race to Excellence* due to its emerging success throughout the university's research enterprise. In Fall 2014, while President John Kelly and his leadership team conducted in-depth visits with faculty from each department in the university, researchers repeatedly focused on the theme of Big Data and it's A.I. applications. Now, FAU boasts 80+ AI/Data faculty researchers.

As a result of early investments in infrastructure related to Big Data Analytics and the ability to run highly advanced simulations with massive amounts of information, FAU has positioned itself to become the leader in the state – and potentially the entire Southeastern US – in the field of AI/Data. In September 2014, the NSF awarded $600K – with a $250K institutional match – to Dr. Taghi Khoshgoftaar of the College of Engineering and Computer Science to upgrade the existing data mining lab and expand the university's big data capabilities.

FAU has sought to establish itself as a leader in the field, and the university was proud to host its first academic and research conference on the topic (www.math.fau.edu/big_data_science) in 2018. According to the organizers of that conference, the Big Data platform is "bringing together research interests of FAU faculty and local industrial leaders to stimulate collaboration." Key stakeholders from the private sector, such as FPL, presented on the topic of AI/Data and machine learning in the context of renewable energy. FAU will continue to host this annual summit and others described in this request.

Most importantly, FAU in 2015 committed to the following in its strategic plan:

> This plan must remain flexible in its approach to strategic actions and initiatives, so that Florida Atlantic is able to react to changes in the external and internal environments. Likewise, the concept of *Pillars* and *Platforms* can continuously evolve to meet institutional priorities. **Interdisciplinary programs and activities will be included in the *Pillars* and *Platforms* as they rise to prominence at the University.** The faculty, staff, and students will then have the opportunity to develop new and existing programs into institutional *Pillars* and *Platforms*. (pp. 13-14)

This proposal is the embodiment of this explicit commitment. FAU intends to follow through on the framework laid out in the strategic plan to transition big data analytics from its existing prominent role as an institution-wide platform into **a formal AI/Data pillar – with a research institute to support it.**

In line with the strategic vision for assessment and stability of the strategic plan, the FAU Board of Trustees in June 2019 approved amendments to University Regulation 2.006 – Centers and Institutes. This regulation established a path for emerging laboratories and research programs to become centers and, eventually, institutes once they meet appropriate benchmarks. Already the AI/Data platform appears poised for classification as an institute, which the regulation stipulates must be organized around a broad area that "transcends department, school, college, or even campus boundaries" and "usually will involve a greater interdisciplinary and inter-institutional involvement of faculty." AI/Data already meets these qualifications. The university would use new funds, if allocated, as described in the following proposal to further develop the institution's AI/Data leadership team and to create related organizational infrastructure for academic and research programs in this particular area of distinction.

Investing in the AI/Data Pillar at FAU

There are multiple compelling reasons for the Board of Governors to support a request to the Florida Legislature to transform FAU's existing university big data analytics platform into the state's leading pillar/institute for AI/Data:

- **Building on a record of AI/Data success at Florida Atlantic University-** This request will further launch FAU on a path towards being a *University of Distinction* in the AI/Data world. Peers throughout the region, the state, and the country might already be somewhat familiar with the State of Florida's first NSF-funded AI and Deep Learning (AIDL) laboratory – or the Rubin and Cindy Gruber Sandbox, which houses the Machine Perception and Cognitive Robotics Lab. FAU's AI/Data projects received national media attention, and this will continue to accelerate. By shining a light on the numerous successes in this academic area, and by strategically growing enrollments (both undergraduate and graduate), research programs, and corporate partnerships, FAU will continue to build a strong brand for AI/Data.

- **Establishing a more diverse AI/Data workforce in Florida-** There is a critical national need to produce more AI/Data professional who identify as underrepresented minorities. Roughly only 20% of workers in this field are black or of Hispanic origin. This is an important differentiating feature and strategic advantage for FAU as a *University of Distinction*. By growing AI/Data at the state's most diverse public university (per *US News & World Report* and *Chronicle for Higher Education*), FAU will contribute to a diversified, emerging workforce. The State of Florida has the opportunity to leverage the racial and ethnic diversity among the university's student body, using FAU as a vehicle to award more minority undergraduate and graduate degrees in AI/Data areas. Accordingly, the state can produce more AI/Data professionals who come from underrepresented minority backgrounds.

- **Benefitting from an efficient, rapidly-improving university-** FAU has accomplished so much primarily by leveraging funds earned through its enhanced and continual improvement in the state's performance-based funding model. Performance-based funding set the stage for this AI/Data request. FAU has redesigned itself as a resilient, lean organization—achieving at the highest rates. Significant targeted investments would catalyze more improvements, as outlined in this request for classifying FAU as a *University of Distinction* in AI/Data.

- **Aligning with direction from statewide industry workforce reports-** Growth in the technology sector, in general, is a clear priority for the State of Florida. More specifically, the Council of 100's *Project Sunrise* refers to the need to focus on "Information and Technology" as an occupational area that is primed for growth. Furthermore, the report details Florida's gaps in terms of technological infrastructure. This AI/Data proposal would attend to both recommendations. In addition, the Florida Chamber of Commerce's *Florida 2030: The Blueprint to Secure Florida's Future* talks about the need to "introduce and develop Internet of Things, artificial intelligence, and other emerging technology within state, regional, and local infrastructure" (p. 9). In 2021, the Florida Chamber Foundation, with support from the Bill and Melinda Gates Foundation, listed "IT/Math" as the most rapidly growing sector out of four career areas showing promise of advanced wages and long-term resiliency, with cloud data modeling as an example of such a career (p. 10). FAU sees an opportunity for AI/Data programs to serve the state by developing a workforce that can build, maintain, and operate within the infrastructure of technology.

Three-Tiered Proposal for AI/Data at FAU

As illustrated through the university's SUS alignment of strategic goals document that the BOG approved in 2018, FAU is in sync with the direction of the State of Florida. Importantly, this specific proposal attends to all three major goals of the 2025 SUS strategic plan: A) teaching & learning; B) scholarship, research, & innovation; and C) community & business engagement. The following subsections align with these components.

While the university will continue to improve in these areas without additional state investments, AI/Data growth is a timely issue due to the critical workforce need. With adequate funding, FAU can ensure the transformation of its AI/Data platform into an institutional pillar to benefit all of Florida.

A. Enhancing and expanding FAU's AI/Data academic programs

Following the inclusion of AI/Data as a strategic plan platform, the faculty throughout the university began the process of updating curricula in particular colleges to focus on big data analytics and its applications in artificial intelligence and automation. The university designed and launched these innovative degree programs, often taking advantage of interdisciplinary

collaborations that crossed traditional organizational structures, like departments or colleges. FAU's strengths exist not just in technological capacity but also the *application* of AI/Data a variety of industries and sectors.

As evidenced by FAU's curricular offerings, the university is already preparing graduates to lead in the 4th industrial revolution, which will focus on AI/Data and Autonomy. Funds from this proposal will enhance the university's ability to recruit high-ability students who can succeed in these programs, as well as the faculty who will be teaching in AI/Data degrees. This proposal then is a logical component of FAU's long-term plans – and it simply elevates the existing successful platform of big data analytics into a pillar of excellence.

Recent headcount enrollments in the areas of AI/Data:

- 526 students in Engineering and Computer Science (sample high-enrollment courses include CAP4630 Intro Artificial Intelligence, CAP5768 Intro to Data Science, CAP6618 Machine Learning for Computer Vision, and CAP6673 Data Mining and Machine Learning)
- 107 students in College of Business (includes various Business Analytics concentrations and Big Data graduate certificates)
- 57 students in Charles E. Schmidt College of Science (students working in Computational Biology, Cybersecurity, and Machine Olfaction)
- 260 students in Dorothy F. Schmidt College of Arts and Letters (with students conducting AI-related research in Linguistics, Computational Linguistics, and Language Technologies, as well as Political Science, Archeology, and Visualization of Data)
- 59 students in Harriet L. Wilkes Honors College (with students enrolled in courses such as IDS 3932 Art/Science Data Visualization and conducting research projects related to Computational Science)

As noted, the university previously launched and is continuing to expand on a number of innovative degrees, concentrations, and certificates that cumulatively contribute to the case for FAU to be classified as a *University of Distinction* for its AI/Data programs:

- The Harriet L. Wilkes Honors College and the College of Engineering and Computer Science jointly launched two **BA/BS → MS graduate pathway programs with data analytics tracks** in computer science and information technology management (also in conjunction with the College of Business).
- The Harriet L. Wilkes Honors College launched both a **major concentration in data analytics** and a minor concentration in data science, which focuses on disciplinary knowledge and the emerging field of the ethics of data use.
- The Charles E. Schmidt College of Science and the College of Engineering and Computer Science offer a **joint undergraduate certificate in data science**.

- The College of Engineering and Computer Science offers **a Ph.D. in computer science with a concentration in data analytics**.
- The College of Business and the College of Engineering and Computer Science offer **a joint graduate certificate in big data analytics**.
- In June 2019, FAU's Board of Trustees approved a new **master's in artificial intelligence**, which is offered by the College of Engineering and Computer Science and launched Fall 2019 as the first program of its kind in the State of Florida.
- In June 2019, FAU's Board of Trustees approved a new **master's in data science and analytics**, which is offered jointly by five different academic colleges and launched Fall 2019 with 4 concentrations including data science & engineering; data science *via* scientific inquiry; data analytics in business; and data science in society.
- In June 2020, FAU's Board of Trustees approved a new **bachelor's in data science and analytics**, which is offered jointly by five different academic colleges with more than 60 data science courses across various contexts that can be used to fulfill elective requirements. This innovative new degree program launched Spring 2021 with 3 different concentrations including data science in the natural sciences, data science and engineering, and data science in business. In the coming year, there are also plans to launch a data science in society concentration. The program includes a capstone course for students to address real-world interdisciplinary problems with data-driven tools.
- In June 2021, FAU's Board of Trustees approved a new **master's in business analytics** to prepare future business leaders with skills to collect, organize, visualize, and analyze data in corporate settings. The novel degree program is ready to launch as soon as Fall 2021.
- Beginning Fall 2021, the Christine E. Lynn College of Nursing and the College of Engineering and Computer Science will offer a new **combined program in nursing and artificial intelligence**. The BSN and MS in AI will be key to preparing highly qualified healthcare workers who can use AI for treatment and patient care decision making.

This request seeks to enhance these degree programs in line with the *Strategic Plan for the Race to Excellence* goal of Boldness (i.e. student success). As outlined in the expenditure plan at the end of this proposal, the university will develop a) innovative recruitment incentives to build a globally-competitive student body and b) new models for teaching undergraduates with a plan to overhaul graduate-level teaching at FAU, prioritizing AI/Data students in these efforts.

Locally, startups and established companies have difficulty recruiting AI/Data professionals due to the scarcity of qualified professionals. Nationally, not just the economic side but also the security side, the US needs to invest heavily in AI/Data to be competitive. Other countries spend billions of dollars in AI research and education. The economic imperative justifies these investments.

For instance, increased employer demand for AI/Data-related professionals indicates an opportunity for further enrollment growth and program development. The Florida Department of Economic Opportunity projects **21,716 new jobs statewide** in the area of AI/Data by 2026. The Bureau of Labor Statistics projects that the US will add **491,700 new jobs nationwide** in the area of AI/Data by 2028. Additionally, reported high earnings in relevant occupations will attract even more prospective students to these degree programs. In 2018, AI/Data professionals earned an annual median income of **$86,821 statewide** and **$103,859 nationwide.** These remarkable statistics were compiled using federal Standard Occupation Codes (SOCs) that are cross-listed under the specific CIP codes affiliated with FAU's degree programs in the areas of AI/Data. The projected outcomes could have been even further enhanced with a more inclusive SOC list for more general IT professionals.

Importantly, local projected growth outpaces the state's projected growth, which in turn outpaces the nation's projected growth. The university's geographic location is then well-primed for AI/Data expansion. South Florida is home to many startups and large companies with demands of developing smart devices and products. Recently, a number of local companies such as Magic Leap, Cendyn, and Florida Power and Light (FPL) came to FAU to seek AI/Data professionals, which led to the curricular developments outlined above. Given the demand, degree programs in AI /Data will produce professionals who serve the region, state, and nation. FAU will need to continue to increase the number of graduates of these programs to contribute to meet the needs of these employers. Additionally, more students will support the research enterprise by serving as graduate research assistants. This will all have a positive impact to the local/regional/state economy, as described in detail within the ROI section at the end of this proposal.

As presented in the report by McKinsey Global Institute on "Big Data: The Next Frontier for Innovation, Competition, and Productivity," the United States faces a growing shortage of 140,000 to 190,000 workers with analytical expertise and shortage of 1.5 million managers and analysts with the skills to understand and make decisions based on the analysis of big data. In 2015 4.4ZB of data were generated and less than 10% was analyzed in time. Further compounding this problem, the data being generated is on pace to double every two years.

Also important to acknowledge, McKinsey Global Institute released a February 2021 report on "The Postpandemic Economy: The Future of Work after COVID-19," which highlights that industries across sectors will seek to automate more and deploy AI solutions at higher volumes. This trend will require more AI/Data experts in order to facilitate the coming acceleration, which is driven primarily by reductions to "workplace densities," strategies to address "demand variabilities," enhanced efficiencies and various industries' desires to meet consumer preferences for "contact-free service" (p. 6). With so many uncertainties in a postpandemic economy, one thing that seems clear is the marketability of university graduates who have experience with AI applications and automation technologies.

Of note, on a national basis, less than 10% of students in the field closely related to AI/Data are black, and the numbers are similar for women and Hispanic populations. Currently, the university's highest-enrolled racial/ethnic demographic is Hispanic students (27%), followed by black students (21%). By encouraging minority and women students to pursue studies in AI/Data, FAU will produce more female and minority technology professionals.

The following projections further showcase the increasing (1.5%-2% annually) demand for AI/Data professionals on national, state, and local levels:

Nationwide Occupational Projections for AI/Data-related Professionals

Occupation	Employment		Employment change, 2018-28		Median annual wage, 2018
	2018	2028	Number	Percent	
Computer / Info. Research Scientists	31,700	37,000	5,200	16.5	$118,370
Computer / Info. Systems Managers	414,400	461,100	46,800	11.3	$142,530
Computer Network Architects	159,300	167,700	8,400	5.3	$109,020
Computer Occupations, All Other	412,800	455,000	42,200	10.2	$90,270
Computer Systems Analysts	633,900	689,900	56,000	8.8	$88,740
Database Administrators	116,900	127,400	10,500	9	$90,070
Information Security Analysts	112,300	147,700	35,500	31.6	$98,350
Multimedia Artists and Animators	71,600	74,700	3,000	4.2	$72,520
Software Developers, Applications	944,200	1,185,700	241,500	25.6	$103,620
Software Developers, Systems	421,300	463,900	42,600	10.1	$110,000
Nationwide Projections	**3,318,400**	**3,810,100**	**491,700**	**14.8%**	**$103,859**

Source: US Bureau of Labor Statistics, 2019

Statewide Occupational Projections for AI/Data-related Professionals

Occupation	Employment		Employment change, 2018-26		Median annual wage, 2018
	2018	2026	Number	Percent	
Computer / Info. Research Scientists	544	592	48	8.8	$95,722
Computer / Info. Systems Managers	12,548	14,237	1,689	13.5	$119,870
Computer Network Architects	18,574	20,227	1,653	8.9	$77,022
Computer Occupations, All Other	11,132	12,464	1,332	12	$75,005
Computer Systems Analysts	19,913	21,959	2,046	10.3	$78,874
Database Administrators	7,929	8,973	1,044	13.2	$81,994
Information Security Analysts	5,160	6,489	1,329	25.8	$82,638
Multimedia Artists and Animators	3,454	3,819	365	10.6	$55,474
Software Developers, Applications	37,467	47,389	9,922	26.5	$87,797
Software Developers, Systems	17,263	19,551	2,288	13.3	$97,469
Statewide Projections	**133,984**	**155,700**	**21,716**	**16.2%**	**$86,821**

Source: Florida Department of Economic Opportunity, 2019

Palm Beach County Occupational Projections for AI/Data-related Professionals

Occupation	Employment		Employment change, 2018-26		Median annual wage, 2018
	2018	2026	Number	Percent	
Computer Occupations, All Other	305	346	41	13.4	$70,283
Computer / Info. Systems Managers	869	991	122	14	$136,282
Computer Network Architects	1,552	1,722	170	11	$81,578
Computer Systems Analysts	1,069	1,189	120	11.2	$81,682

Database Administrators	536	612	76	14.2	$86,986
Multimedia Artists and Animators	104	116	12	11.5	$59,987
Software Developers, Applications	2,522	3,215	693	27.5	$95,243
Software Developers, Systems	1,011	1,162	151	14.9	$95,597
Palm Beach County Projections	**7,968**	**9,353**	**1,385**	**17.4%**	**$93,311**

Source: Florida Department of Economic Opportunity, 2019

Broward County Occupational Projections for AI/Data-related Professionals

Occupation	Employment		Employment change, 2018-26		Median annual wage, 2018
	2018	2026	Number	Percent	
Computer Occupations, All Other	643	712	69	10.7	$62,629
Computer / Info. Systems Managers	1,635	1,892	257	15.7	$128,253
Computer Network Architects	1,971	2,189	218	11.1	$82,202
Computer Systems Analysts	2,838	3,198	360	12.7	$79,019
Database Administrators	795	904	109	13.7	$95,867
Multimedia Artists and Animators	140	153	13	9.3	$61,277
Software Developers, Applications	4,583	5,911	1,328	29	$87,235
Software Developers, Systems	1,985	2,286	301	15.2	$86,902
Broward County Projections	**14,590**	**17,245**	**2,655**	**18.2%**	**$88,645**

Source: Florida Department of Economic Opportunity, 2019

This proposal responds to growing demand in the labor market. With preexisting degree programs that could be leveraged for enhancement and expansion, and with ideal positioning between large cities such as West Palm Beach and Fort Lauderdale, FAU is uniquely prepared to produce a workforce that will contribute to the State of Florida's rapidly-growing AI/Data field.

B. Continuing to lift FAU's reputation in AI/Data research

In addition to a growing portfolio of related academic programs as outlined in the section above, research activity in AI/Data is currently thriving at FAU. The university is similarly poised to receive recognition as a *University of Distinction* for its AI/Data – and is growing the number of student researchers who can support the ongoing work in labs and centers.

FAU boasts **80+ faculty researchers** and **$35M in active grants in AI/Data**, which includes some projects that were initially funded nearly a decade ago and those continuously-funded through today, as well as more recent awards.

As a formally-designated *2025 FAU Strategic Plan* platform, big data analytics has succeeded in its ability to support all four of the institutional pillars (and associated research institutes). Under each of the pillars below is just some of many examples of active AI/Data research projects/laboratories.

1. **Healthy aging - Institute for Human Health and Disease Intervention (I-HEALTH),** Executive Director Dr. Gregg Fields
    - $7M grant to faculty in the Christine E. Lynn College of Nursing, focusing on health data analytics and big dataset curation related to older adults and extended care facilities

- Additional projects related to the use of data in electronic medical records, the use of AI tools to stop social media abuse, encryption of biometric data and secure computations, nuances of compliant storage protocols and solutions, cloud-based medical diagnostics, bioinformatics/human genomics, fraud detection in healthcare, and advancement of autonomous robotics and regenerative nerve systems

2. **Neuroscience - Stiles-Nicholson Brain Institute,** Executive Director Dr. Randy Blakely
    - $1M gift from Rubin and Cindy Gruber a 3,400-square-foot the Ruben and Cindy Gruber Sandbox resource center to enable students to directly engage with the fast-advancing field of artificial intelligence
    - Additional projects related to data mining, machine learning, language processing, automating electron microscopy, and neural segmentation
3. **Ocean science/engineering and environment science - Harbor Branch Oceanographic Institute (HBOI),** Executive Director Dr. Jim Sullivan
    - $1.25M grant from the United States Office of Naval Research to support autonomous unmanned marine vehicle platforms
    - Additional projects related to the impact of automation on land use, integration with robotics and bio-robotics (e.g. the novel soft robot jellyfish), as well as the monitoring of marine structures
4. **Sensing and smart systems - Institute for Sensing and Embedded Network Systems Engineering (I-SENSE),** Executive Director Dr. Jason Hallstrom
    - $652,820 grant from the National Science Foundation (NSF) to establish the State of Florida's first NSF-funded Major Research Instrumentation (MRI) Artificial Intelligence and Deep Learning (AIDL) Training and Research Laboratory
    - Additional projects related to media technology (i.e. how virtual reality interfaces improve learning and empathy), spatial computing and eye tracking for autonomous cars, the role of AI in transportation, spatial network data processes, and data-driven evacuation planning in emergency management

The platform of big data analytics has played a growing role at the university. Each one of these pillars houses a number of experts who conduct research in AI/Data, and the time is appropriate, with the formulation of a critical mass of expertise in the field, to **transition to a standalone AI/Data pillar.**

The capacity of the university's AI/Data researchers to support a new pillar occurs through big data analytics, data mining, data sorting, and data processing. All of these mechanisms are possible due to advances in the areas of sensing and computing systems. Without such developments, AI (in which machines have the capability to make assumptions, test, learn, and decide

autonomously) and machine learning (in which data trains machines to learn environments and actively engage in intelligent processes) could not exist.

To showcase the university's expertise in AI/Data with broader audiences, FAU will host a Data Science and Analytics Conference in November 2019, as well as the 18th IEEE International Conference on Machine Learning and Applications in December 2019. In Spring 2020, the university planned to host a conference on Connected Vehicles in Smart Cities: The Future of Transportation and Logistics as well as a National Conference on Emerging Technologies in Multimedia. Due to disruptions from the pandemic, the conference is rescheduled for Fall 2021. Additionally, FAU will soon introduce the North American Computational Linguistics Olympiads.

To rapidly advance the field of artificial intelligence and autonomy, Florida Atlantic University's College of Engineering and Computer Science recently unveiled its "Center for Connected Autonomy and Artificial Intelligence" (CCA-AI), a cutting-edge center designed to accelerate the development of innovative artificial intelligence and autonomy solutions. Housed in the state-of-the-art Engineering East building on the Boca Raton campus, the CCA-AI (ca-ai.fau.edu) is immersed in projects focused on underwater, surface, air and space applications that are supported by autonomous resilient machine-to-machine wireless networking. The center includes a robust team of highly-trained experts in artificial intelligence and real-time operational stage monitoring – all of which is based on software-defined, continuously self-optimized joint communication/computing platforms.

The university also recently created "The Center for the Future Mind," which explores scientific and philosophical innovations to achieve a richer understanding of emerging technologies and the future of the mind. The Center brings together researchers to investigate ethical matters for rapidly accelerating technological advancements and impacts on society.

Additionally, the future for federal spending in the area of AI is bright. The importance of AI as a national priority was memorialized in Executive Order No. 13,859, 84 Fed. Reg. 3967 (February 14, 2019). Federal agency leaders have already been instructed to prioritize their budgets with significant investments in AI, as well as plan for increased collaborations with research universities and industry in order to operationalize these efforts.

The evidence that this proposal will attract research funding exists in FAU's broader track record of increasing total research expenditures over the course of the last five years. The number of funded awards is up from 231 in FY15 to 423 in FY19. In FY15, the university's research expenditures were $29.6M. By FY19 (only four years later) that figure was $70M. Proposals are also trending positively, reflecting the comprehensive faculty buy-in to increase research productivity along strategic themes. In line with its strategic plan, FAU more than doubled research expenditures and will continue to increase.

Federal funding agencies such as NSF, NIH, DARPA and ONR have provided numerous opportunities in AI/Data and its related areas. These funding

opportunities have helped the US capitalize on the full potential of AI/Data to strengthen our economy, better our society, and improve our national security (NSF, 2018). With specialized programs in AI/Data, the university will attract likeminded faculty and students who are passionate about big data, automation, and their applications.

With a formal pillar to support and organize the work being undertaken, it is anticipated that more competitive proposals will be written by the AI/Data faculty with the help of undergraduate and graduate student research efforts.

The following offers some insight into the scope of AI/Data research at FAU:

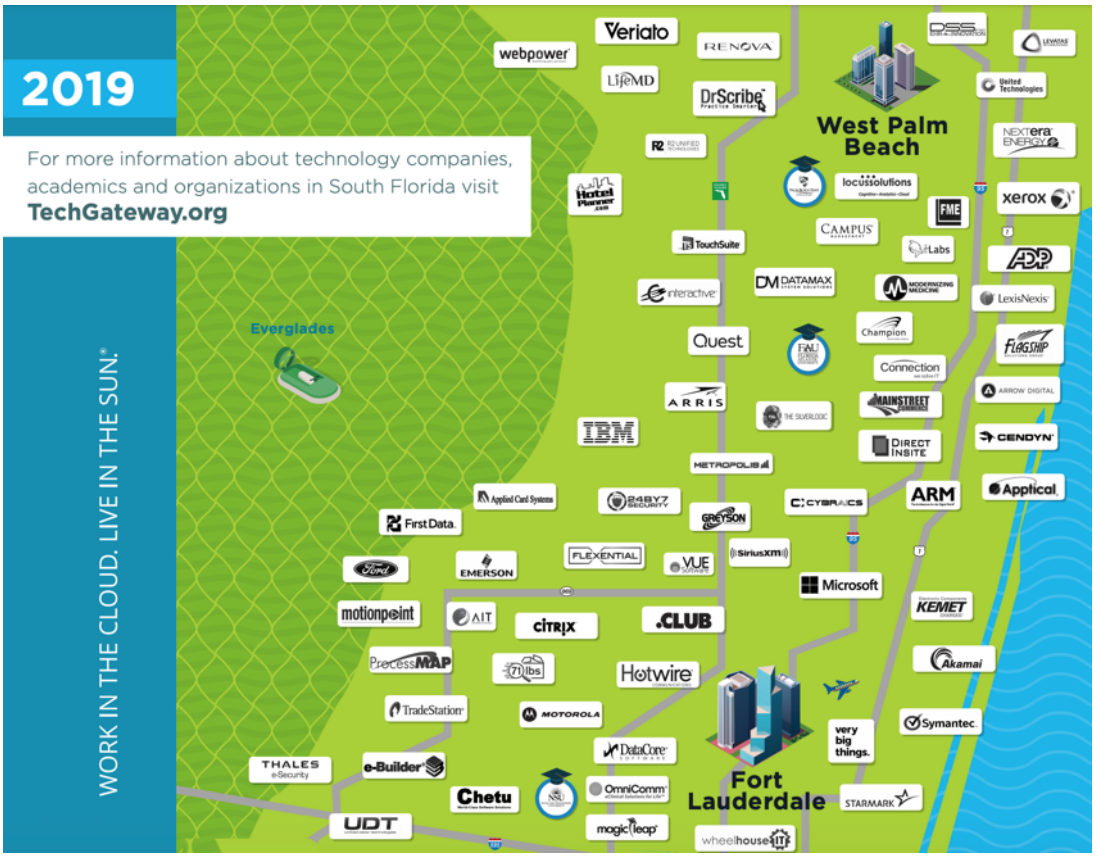
- 32 faculty members in the College of Engineering and Computer Science, including **Eric Engeberg –** robotics; **Manhar Dhanak** - autonomy; and **Stella Batalama -** cognitive networking
- 15 faculty members in the Charles E. Schmidt College of Science, including **William Kalies** - combinatorics and **Francis Motta** - topological machine learning
- 13 faculty members in the Dorothy F. Schmidt College of Arts & Letters, including **Susan Schneider** - philosopher of mind, artificial intelligence (AI), astrobiology, metaphysics and cognitive science who is also a distinguished scholar at the Library of Congress and NASA; **Marcella Munson** - computational linguistics and **Topher Maraffi** - augmented reality and virtual reality
- 8 faculty members in the College for Design & Inquiry, including **Jesse Saginor** - automation of workforce and **Sameer Hinduja** - social media data mining
- 7 faculty members in the College of Business, including **Ravi Behara** - predictive healthcare and **Ken Johnson** - buy vs rent index
- 5 faculty members in the Harriet L. Wilkes Honors College, including **Yaouen Fily –** collective fish movement and **Annina Ruest –** data visualization and technology
- 3 faculty members in the Christine E. Lynn College of Nursing, including **Ruth Tappen –** health analytics and **David Newman –** multilevel modeling and statistics

C. Promoting AI/Data-driven engagement with industry

FAU is geographically well-positioned to become a *University of Distinction* in AI/Data. According to the South Florida TechGateway (a partnership between Palm Beach County's Business Development Board, the Greater Fort Lauderdale Alliance, and the Miami-Dade Beacon Council), the region is home to "nearly 80,000 information and communication technology workers" with an average wage of more than $100,000. Additionally, these three counties rank #1 in the United States for startup activity.

Notably, the first IBM PC was created in Boca Raton, which is home to FAU's largest campus. More than 1,400 technology companies are located in Palm

Beach County alone (Business Development Board, 2019). With global reach and three international airports all within driving distance of multiple technology-based national and international corporate headquarters, South Florida is the third most-populous state but home to the fourth-greatest number of technology companies (BDB, 2019). FAU would like to change this by serving as the nucleus for the AI/Data industry.



One of the university's foremost strengths is in applied research across all of the disciplines. For example, the Council on Undergraduate Research in 2017 ranked FAU as the #1 doctoral-level university in the nation for its robust undergraduate research offerings. Students in any academic field have the opportunity to participate in hands-on projects to better understand basic concepts and to gain valuable experience prior to joining the workforce.

The vision that FAU has for AI/Data is one of intimate collaboration with the large, powerful corporations that neighbor the university. Ideally, the university will leverage its undergraduate and graduate researchers as problem solvers for partners in industry. In other words, a company that encounters an intractable AI/Data problem will articulate the issue to FAU – and the university will pair the company with the appropriate group of students and faculty members to provide a solution. This is a national model for higher education, and FAU already possesses the infrastructure to help.

Additionally, the university would seek to partner with industry in order to pilot AI/Data solutions in a test environment. Universities have access to a diverse array of end users who would be suitable for such opportunities. These

types of reciprocal relationships are the basis for FAU's efforts in community engagement, as defined by the Carnegie Foundation for the Advancement of Teaching. The university submitted its application for "community engaged" classification to Carnegie in Spring 2019 so that it can formally recognize the mutually beneficial partnerships that it shares with its surrounding community. AI/Data serves as an important institutional platform on which FAU can continue to build its community engagement.

The diversity of corporate fields is likewise growing, and FAU is actively involved with preparing highly-skilled workforce that will eventually do jobs related to AI/Data that do not yet exist. With more than 6 million residents, the metropolitan region of South Florida is home to corporations that will have a variety of AI/Data applications, including healthcare, transit/logistics, communications, security/defense, agriculture, tourism/hospitality, manufacturing, and the financial industry, among others. Thanks to enhanced technological capacity through AI/Data, these companies will need to rethink their entire approach to human resource management and planning. Each of these industries will have the opportunity to engage their respective disciplines – throughout all of FAU's ten colleges – for support in discovering solutions to business processes and other AI/Data applications.

FAU's specialization regarding AI/Data is focused on applied research, which is ideal for industry partnerships and corporate contract development. As noted previously, data analytics is a growing area of focus not just for conducting research in basic science and technology – but also for fields that are working with the private sector and benefitting from data mining, high-scale simulations, and AI-powered tools (e.g. FAU has immense analytical capacity to study marketing, finance, real estate, sport management, social media, data visualizations, augmented reality, and medical records). The university's track record of industry collaboration in the robust South Florida economy, paired with its capacity of 80+ AI/Data faculty researchers, makes it ripe to become a *University of Distinction* in this targeted field.

Proposal for FAU's Applied A.I./Big Data Analytics Pillar

The university has outlined the following spending plan for its AI/Data Pillar proposal, which will further fuel efforts as a University of Distinction.

Pillar expenditure plan

Boldness - a uniquely competitive and globalized student body (**recurring)**

$2.8M	Employment-based student incentives
$1.2M	Success networks for undergraduate students
$4.4M	Enhanced instruction *via* graduate students

Synergy - prominent teams of researchers and scholars (**recurring)**

$1.0M	Institute for Sensing and Embedded Network Systems Engineering (I-SENSE)
$2.0M	Harbor Branch Oceanographic Institute (HBOI)
$1.4M	Institute for Artificial Intelligence, Autonomy, and Data Analytics (ArIADA)
$12.8M	**Recurring request**

Synergy - prominent teams of researchers and scholars (**nonrecurring)**

$3.0M	Jupiter High Performance Computing (HPC) - AI/Data processing
$0.5M	Fort Lauderdale Media Technology and Entertainment (MTE) Lab for AI integration with virtual/augmented/extended reality
$1.8M	AI Robotics Testbed - Ocean/sea-surface/ground/air
$5.3M	**Nonrecurring request**

$18.1M	**Total request**

The spending plan for this legislative budget request is rooted in best practices, as well as proven institutional practices. The benefits of such allocations are intended to, in a targeted manner, enhance the experience of FAU's students (both undergraduate and graduate), its research enterprise, and industry relationships as it becomes a ***University of Distinction*** for AI/Data.

Additionally, the proposal leverages FAU's existing *Race to Excellence* strategic plan framework to formally transition the successful big data analytics platform into **an institutional AI/Data pillar.**

Expenditures will generally fall under the following categories:

$2.8M Employment-based student incentives

In order to both recruit and retain the highest-achieving students, FAU will leverage offers to students to participate in on-campus employment and other financial support programs, with priority given to AI/Data students. The university has a preexisting undergraduate research and inquiry framework (ranked #1 in the nation in 2017 by Council for Undergraduate Research) that can engage industry through AI/Data problem-solving. Notably, students who receive offers for employment in on-campus positions are more engaged and more likely to succeed in their collegiate careers. This makes sense, as these students are spending more time with the campus community focusing on their disciplines of choice rather than working in unrelated part-time jobs.

Additionally, employment offers come in the form of stipends or bi-weekly checks, which can indirectly fund their cost of attendance but not necessarily reduce their eligibility for financial aid in the same way that a scholarship would. FAU believes that this program would serve as an effective recruitment and retention mechanism, providing high-achieving students (like those in AI/Data programs) with the opportunity to spend more time on campus, earn a wage, and build a portfolio of experience solving problems for industry.

$1.2M Success networks for undergraduate students

As the university strategically grows its AI/Data enrollments, it will not lose sight of the importance of student success. FAU's role as a *University of Distinction* will rely on having globally-competitive students who will succeed in these rigorous programs. Accordingly, the university will continue to develop a variety of student success initiatives that promote retention and four-year graduation rates. Already, it has established a comprehensive system of analytics and student success support teams who are working daily to monitor student progression and promote timely graduation. At FAU, a "Success Network" is established for each student, consisting of academic advisors, financial aid coaches, and career counselors, in addition to faculty instructors, librarians, and others. This network specifically identifies, in a novel technological platform, the individual members of their own network.

This proposal would allow the university to make strategic investments in order to enhance and grow Success Networks and other student support services. For instance, the university's award-winning academic coaching program will need to enhance its ability to engage students. At the same time, the brand-new Science Learning Center in the Schmidt Family Complex for Academic and Athletic Excellence, which recently opened, will need to continue to boost services, especially if more high-achieving AI/Data students enroll and seek out support from the center. In the coming year, FAU also plans to enhance its Learning Assistant programs across disciplines. New funds would enhance these operations as they provide specialized support.

$4.4M Enhanced instruction *via* graduate students

In order to continue to build a uniquely bold student body that thrives, especially in areas of AI/Data, FAU will need to enhance its undergraduate instruction. In introductory-level college coursework, this often comes through graduate teaching assistants. At FAU, the vast majority of graduate instructors come from master's-level programs. The university will convert these students into doctoral students, with priority given to AI/Data programs. Benefits include growth of doctoral programs and a longer time period for graduate instructors to refine their teaching skills (i.e. 4-5 years rather than just 2).

To attract the finest graduate instructors, FAU will offer competitive stipends. This will also directly support the growth of AI/Data graduate programs throughout all colleges, given the wide breadth of disciplines that already offer AI/Data courses, degrees, certificates, and program tracks/concentrations.

$1M Institute for Sensing and Embedded Network Systems Engineering (I-SENSE)

One of four pillars established in *FAU's 2025 Strategic Plan*, I-SENSE was envisioned as a clearinghouse for sensing, communication, data management, data analytics, and security expertise. It was designed to operate as an interdisciplinary hub, catalyzing research initiatives that crosscut disciplines, academia, government, and industry. The institute's mission is to catalyze a culture of research excellence in sensing and smart systems; to develop, demonstrate, and operate technological solutions with high societal impact; and to attract and support future generations of researchers and practitioners.

The team currently includes two full-time administrative staff, three full-time engineering staff, nine Faculty Fellows, approximately 40 affiliated faculty, approximately 30 graduate students, three postdoctoral researchers, and approximately 15 undergraduate researchers. On average, I-SENSE Faculty Fellows secure, as Principal Investigator, $2.15 for every $1 invested. Affiliated I-SENSE faculty, excluding I-SENSE Faculty Fellows, were responsible for approximately one-third of all new awards in 2019 ($24M). The team's work is broadly supported through active investments from the NSF, NIH, NIST, DOD, state, municipal, and industry partners.

The proposed plan will support emerging opportunities in optogenetics, bio-photonics, tissue diagnostics, and potentially, next-generation networking architectures. Importantly, healthcare-related areas benefit significantly from computer vision expertise.

Attracting outstanding postdocs and graduate students remains an important opportunity to accelerate growth. Fellowship programs are a powerful financial mechanism to attract top-tier talent. The budget includes support to establish a postdoctoral fellowship program and a graduate fellowship program, at levels comparable to analogous federal awards. In each case, use of the internal fellowship funds to attract an external candidate will require a one-to-one match with external, non-state funds. The model retains the

institute's emphasis on external support, while enabling I-SENSE researchers to attract the best postdocs and graduate students in the country.

The proposal includes funding for part-time student employees, and the budget also includes $350K in materials and supplies for start-up laboratory purchases, $15K for graduate student tuition, and $10K for domestic travel

Additionally, this request includes the following personnel:

1. Faculty hire $281.6K (salary + fringe) at full professor rank
2. Staff engineer $80.9K (salary + fringe) as exempt administrative/professional staff member
3. Two postdoctoral researchers $94.4K (salary + fringe) / each
4. Two graduate fellows $30.6K (stipend) / each
5. Two undergraduate student workers $17K (hourly wage) / each

$2M Harbor Branch Oceanographic Institute (HBOI)

As the University's northernmost campus, HBOI's recent research innovations include creating novel autonomous sensing systems, designing next generation ocean-observing tools, developing new shellfish and fish species for sustainable aquaculture and food security, searching the deep ocean for cures for disease, and monitoring fragile Florida ecosystems like the Indian River Lagoon. As one of the four research pillars of FAU, HBOI is building upon the strengths that lie within the institute and the university and embarking on a new quest to expand innovation and success through collaborative research and education.

Florida's coasts and waterways are a critical environmental and economic resource for the state. Unfortunately, Florida finds itself on the front lines of many significant and recurrent problems related to climate change, land use practices and pollution in these environments. FAU proposes to develop the next generation of "in-water" coastal observatory nodes similar to the Land-Ocean Biogeochemical Observatory (LOBO) network HBOI currently supports (http://fau.loboviz.com), but one that is more amenable to expansion and inclusion of new technologies and sensors and with improved data visualization and automated interpretation through artificial intelligence. Development of this transformational technology will provide comprehensive, coordinated and integrated monitoring systems for Florida's estuaries and coastal waters.

The next generation of sensor systems and data loggers will integrate with real-time communications and visualization software. HBOI intends to populate Florida waterways with technology to incorporate novel sensors (e.g. in-situ holographic microscopes, in-situ toxin assays, acoustics, etc.) into the nodes for much improved coastal monitoring and assessment.

When made functional, the coastal network could improve Florida's monitoring of harmful algal blooms (detection and early warning), climate change effects (sea level rise, acidification, coastal hypoxia, etc.), coral reef health, fisheries, eutrophication (nutrient pollution) effects, etc. With this investment, Florida could become a national and international leader is developing the technology and vision for responsible management and control of these problems that have world-wide relevance.

The budget request includes new HBOI faculty hires, post-doctoral and graduate student researchers and engineering technicians as well materials and supplies for system and sensor development. In terms of expenses, the university proposes $375K for permanent sensor installation, $400K for materials and supplies, $400K for faculty research startup funding, $15K for domestic travel, and $30K for graduate student tuition.

Additionally, this request includes the following personnel:

1. Two faculty hires $217.6K (salary + fringe) / each at full professor rank
2. Staff engineer $91.8K (salary + fringe) as as exempt administrative/professional staff member
3. Two postdoctoral researchers $71.4K (salary + fringe) / each
4. Two graduate fellows $30.6K (stipend) / each

$1.4M Institute for Artificial Intelligence, Autonomy, and Data Analytics (ArIADA)

Building on the recently-established Center for Connected Autonomy and Artificial Intelligence" (CCA-AI), a brand-new Institute to support AI / Data will serve to synergize research and curricular development among the faculty and students on all campuses at FAU. Already, the strategic plan platform of Big Data Analytics is a focal point for collaborative research and AI/Data curricular enhancements in all forms. The university will be empowered to expand data curation and data mining techniques and processes across all colleges. Through these activities, the institute will enable FAU to become the leader in AI/Data research, applications, and training in South Florida.

Instead of siloed, discipline-specific advancement of elements in the AI ecosystem, the proposed institute is applied-solution-centered that will create AI/Data products in thematic areas of distinguished research expertise and track-record at FAU. The solutions will incorporate all necessary elements in the AI-ecosystem stack as defined by NSF -- from data acquisition, massive data analytics and management, machine and deep learning, modeling, AI infrastructure – all the way to autonomy and human-machine interaction. FAU will serve as a regional resource, providing access to AI/Data infrastructure and also conducting training for industry and even social service agencies.

Through this funded proposal, the show of support from the State of Florida (and recognition for establishing a new institute for AI/Data) will further

enhance the level of research funding coming from federal and private agencies. Additionally, the State's support will multiply the impact of the already-strong engagement with local and national industry. The focus on applied AI will open the doors of the university to companies that are seeking FAU's research know-how (e.g. FPL, GE) or recruiting the university's well-trained graduates (e.g. Belcan, FPL).

To build capacity, the university proposes to invest $120K in computing hardware and $200K in cloud computing capacity.

Additionally, this request includes the following personnel:

1. Faculty Director $250,000 (salary + fringe) at full professor rank
2. Faculty Associate Director $150,000 (salary + fringe) at associate professor rank
3. Administrative support $75,000 (salary + fringe) as exempt administrative/professional staff member
4. Two faculty hires $150,000 (salary + fringe) / each at associate professor rank
5. Four postdoctoral researchers $300,000 (salary + fringe) / total

$3.0M **Jupiter High Performance Computing (HPC) - AI/Data processing** (nonrecurring)

As a follow-up to the announcement in January 2019 of the NSF MRI-funded AI training and research laboratory, FAU seeks to expand its existing high-performance computing (HPC) center in Jupiter. If funded, this project would result in FAU becoming the number one AI-supporting organization in the State of Florida – and possibly the entire Southeastern United States.

This HPC center would expand existing support provided by the University of Florida's HiPerGator AI supercomputer, which was made available to all of the State University System institutions for both classes and research. FAU has trained one lead faculty member, Dr. Oge Marques, and 4 additional faculty members. Already, Dr. Marques started the process to become an NVIDIA certified deep learning instructor. Currently, FAU and UF offer research projects through FAU's Center of Connected Autonomy and AI (CCAAI) and other research labs as well as course projects offered through the master's in AI. Already, students in the MS degree program can leverage the HiPerGator when implementing developments at higher scales. The Jupiter HPC would just expand this capacity to additional users as outlined below.

FAU seeks $3M for core computing nodes and supporting hardware, which would reside in the existing HPC data center in Jupiter. Upgrades would enable the university to equip two existing computer labs with AI/Data infrastructure to provide students and researchers with direct access to the technology. Additionally, versions of lab units would also be available for use by off-campus industry. Essentially, the upgrades will allow AI/Data users to

directly run jobs on the HPC cluster from one of the two labs – or even their own office if they are equipped with compatible high-quality user interfaces.

Some examples of "shovel-ready" HPC applications across disciplines:

- **Developing personalized (precision) medical systems**, including analyzing patterns in genomics data; machine/deep learning for computer-aided diagnosis/screening; high resolution image reconstruction; predictive modeling for healthcare; clinical decision support systems; and AI-powered drug discovery. Health information is doubling every 76 days. The challenge is how to make meaningful use of high-volume data to create a healthcare model that is more personalized, predictive, and proactive, and that can be delivered at lower cost. Currently, FAU's top NIH-funded genomics medical researcher, Dr. Janet Robishaw, relies on Geisinger Health System and University of Pennsylvania to provide machine learning infrastructure expertise that does not exist at the university (or elsewhere in the state). With the initial investment in infrastructure above, FAU could establish itself as a clearinghouse for Florida's community hospital system.

- **Integrating with the Nikon Center of Excellence at FAU's Stiles-Nicholson Brain Institute,** further supporting collaborations in instrumentation design, as well as providing training courses on basic and advanced microscopy techniques. HPC upgrades could further fuel developments in the visualization of the complex structures and functions of nervous systems in 3D, in multicolor, and with the motion of real life.

- **Hands-on training in deep learning at the Rubin and Cindy Gruber Sandbox in FAU's Wimberly Library,** which would be available to students across a broad range of levels and disciplines (both from within and outside FAU) and would culminate in a certificate in deep learning, one of the first of its kind in the world granted by a research university. The HPC upgrades will also enable students and researchers to run AI jobs at the Sandbox, which will be equipped with advanced visualization stations, robotics, rovers, and project kits. Additionally, the Sandbox is developing a data-warehouse of pre-processed data-sets and models that are ready-to-use in classes and for future research projects. FAU will provide these to faculty throughout the various colleges, as well as to other state institutions.

- **Benefiting methods/analytics courses across disciplines,** allowing students to run HPC jobs in fields like real estate and health administration. Upgrades will benefit spatial analyses in criminology and urban planning.

- **Supporting the recently-launched Max Planck Academy (MPA) at FAU in Jupiter,** which was launched in 2018 in conjunction with the world-renowned Max Planck Society of Germany (FAU is their only dual enrollment high school partner in the world). At the MPA, high school students will have the opportunity to conduct advanced applied research

with some of the world's most successful AI/Data scientists. Already, FAU has piloted the MPA with FAU High School students who studied analytics alongside researchers from the Max Planck Institute. The pilot was so successful that FAU is now pressing forward with expansion with Jupiter High School, which will launch Fall 2020 and benefit from HPC upgrades.

$0.5M **Fort Lauderdale Media Technology and Entertainment (MTE) Lab for AI integration with virtual/ augmented/extended reality** (nonrecurring)

The School of Communication and Multimedia Studies at FAU is uniquely positioned to offer a state-of-the-art, comprehensive, and interdisciplinary approach to AI/Data. Researchers will use cutting-edge technology to work on AI to move and expand the current Media Technology and Entertainment lab to Fort Lauderdale. Projects will include the use of extended reality (XR) technologies to improve learning and empathy (AI in particular will open the doors to new user experiences). Additionally, researchers specialize in the production of games, animation, interactive media (G.A.I.M), which would produce a synergy with the highly-populated downtown Fort Lauderdale by attracting students and making connections with local industry leaders.

Funding would enable researchers in the lab to craft stations where students can have observable/reflective experiences with AI (not just make it – but engage it). In collaboration with the School of Architecture, AI/Data technology ultimately interacts with humans, so a trans-disciplinary lab would include not just the infrastructure for creating such technology, but also space for evaluating its use from a variety of different lenses. This approach can also lead to more developments for empathic and socially-engaged technology.

Much of the research on the impacts of AI/Data throughout the country and the state is taking place in traditional silos, with practitioners, engineers, and developers isolated from rhetoricians, ethicists, and scholars of media, communication, and technology. Because the School of Communication and Multimedia Studies (SCMS) encompasses both cutting edge media production and extensive scholarly research at the intersection of communication, technology, and social change, the School is poised to become a leader in the study and practice of artificial intelligence technologies. This is an opportunity to capitalize upon SCMS's strengths to ensure that developments in AI/Data not only address, but also avoid, the current problems that plague this emerging field. This unique lab will contribute to the AI/Data initiative not only through its technological implementation in virtual reality (VR), augmented reality (AR) and spatial computing, but also in the level of oversight—socio-political, philosophical, and aesthetic—researchers can provide in unravelling the implications of nascent AI/Data technology.

$1.8M **AI Robotics System Testbed - Ocean/sea-surface/ground/air** (nonrecurring)

FAU proposes the university's first shared testbed for research and education in AI, machine learning and multi-domain connected robotics. These resources will help develop state-of-the-art technology, connecting robotic systems across domains such as ocean, sea-surface, ground and air. Interdisciplinary researchers will work together to develop and validate testbed solutions for applications related to AI-driven coastal monitoring and resilience, AI-assisted emergency management, cybersecurity, AI-enabled 5G devices, as well as Internet of Things smart environments.

The system output would involve "autonomy in-a-box." When the "box" is attached to a programmable device (computer, robotic system, drone, vehicle, etc.), it converts/upgrades the programmable device to an autonomous system. Box-enabled individual robotic systems can then self-form networks of connected robotic systems. When a high-level mission/task is issued to one or more of the box-connected robotic systems, then AI technology will enable execution and performance of the mission/task by autonomous members of the robotic network.

Costs for this project include $300K wireless networking platforms and cloud computing. Additionally, FAU will expend $1.5M to develop a network for ocean/sea-surface/ground/aerial robotics, humanoids, bio-inspired soft robots, as well as motion capture space and a drone cage for safe testing.

Summary of total AI/Data expenses broken into spending categories

$2.8M	**Employment-based student incentives**
$2.8M	OPS - undergraduate stipends
$1.2M	**Success networks for undergraduate students**
$1.2M	Expenses - technology and initiatives
$4.4M	**Enhanced instruction *via* graduate students**
$4.4M	OPS - graduate stipends
$1.0M	**Institute for Sensing and Embedded Network Systems Engineering (I-SENSE)**
$470.4K	Salaries and benefits – faculty including postdocs
$80.9K	Salaries and benefits – staff
$76.2K	OPS – graduate stipends
$34K	OPS – undergraduate stipends
$360K	Expenses – materials, startup, equipment
$2.0M	**Harbor Branch Oceanographic Institute (HBOI)**
$578K	Salaries and benefits – faculty including postdocs
$91.2K	Salaries and benefits – staff
$91.8K	OPS – graduate stipends
$1.2M	Expenses – materials, startup, equipment
$1.4M	**Institute for Artificial Intelligence, Autonomy, and Data Analytics (ArIADA)**

$1M	Salaries and benefits – faculty including postdocs
$75K	Salaries and benefits – staff
$320K	Expenses – materials, equipment

$12.8M Recurring request

$3.0M	**Jupiter High Performance Computing (HPC) - AI/Data processing**
$3M	Expenses – materials, equipment
$0.5M	**Fort Lauderdale Media Technology and Entertainment (MTE) Lab for AI integration with virtual/augmented/extended reality**
$500K	Expenses – materials, equipment
$1.8M	**AI Robotics Testbed – Ocean/sea-surface/ground/air**
$1.8M	Expenses – materials, equipment

$5.3M Nonrecurring request

$18.1M Total request

Succeeding in Education, Research, and Industry Engagement

By bridging all the disciplines in its *FAU 2025 Strategic Plan* platform of big data analytics, FAU has already launched novel degree programs, expanded its research enterprise, and promoted economic development. AI/Data is where the federal government is heading, and it's where the local and state industry partners are already working with FAU to enhance the South Florida region's AI/Data capacity. With appropriate resources, the university is prepared to do much more. This proposal comes with the immediate benefits of delivering to the state higher volumes and quality of student and faculty technical experts in AI/Data.

II. Return on Investment - *Describe the outcome(s) anticipated, dashboard indicator(s) to be improved, or return on investment. Be specific. For example, if this issue focuses on improving retention rates, indicate the current retention rate and the expected increase in the retention rate. Similarly, if the issue focuses on expanding access to academic programs or student services, indicate the current and expected outcomes. University of Distinction proposals should also address the requirements outlined in the separate guidance document.*

Measures of Success

- **Year-one accomplishment →** AI/Data enrollments
    a. Student credit hours in AI/Data courses

b. Headcount in AI/Data programs

- **ROI →** AI/Data student outcomes
    a. Degrees awarded in AI/Data
    b. Median salary of graduates from AI/Data programs
    c. Percent of graduates employed from AI/Data programs
- **Year-one accomplishment →** AI/Data research grant proposals
- **ROI →** AI/Data research expenditures
- **Ranking →** *US News and World Report* artificial intelligence program ranks
- **Ranking →** Work with industry to establish new ranking system for applied AI/Data research, corporate contracts, and collaborations

Enhancing the State of Florida's reputation for research and excellence

Despite the fact that Florida is the third most populous state in the country, according to the National Science Foundation (NSF), the state only ranks 8th in federal research expenditures and 19th in industry R&D expenditures (https://www.nsf.gov/statistics/2018/nsb20181/data). The responsibility for positively impacting this figure has fallen on the backs of a select few preeminent institutions, as well as those that are designated as very-high research institutions in terms of their Carnegie Classifications by the Center for Postsecondary Research. This plan thrusts FAU forward from its current designation as a high research institution, helping the state with its standing in research funding, and stimulating the economy as it does so.

The National Institutes of Health (NIH) estimate that every "$1.00 increase in public basic research stimulates an additional $8.35 of industry R&D investment after 8 years" (https://www.nih.gov/about-nih/what-we-do/impact-nih-research/our-society). With the 2025 target of FAU reaching $200M in research expenditures, which is $172M increase from the baseline, the university projects that its efforts to expand its research enterprise will result in approximately $1.4 billion impact in private sector R&D by 2033.

This particular formula does not take into account the economic impact of the increased numbers of degrees awarded at a more efficient pace, or the likewise precipitous rise in the region's tertiary economy that supports the university, its employees, and its students.

III. Personnel – *Describe personnel hiring and retention plans, making sure to connect both plans to initiative(s) and goal(s) described in section I. State the amount of faculty FTE and staff FTE and estimated funding amounts used for retention and new hires in each category. In describing faculty hires, provide overall hiring goals, including academic area(s) of expertise and anticipated hiring level (e.g. assistant professor, associate professor, full professor. Please describe how funds used for faculty or staff retention will help the institution achieve its stated goals. University*

of Distinction proposals should clearly note how anticipated hires or retained individuals will help the institution elevate a program or area to national or state excellence.

The vast majority of the requested expenditures fall under non-personnel expense categories rather than faculty or staff salaries and benefits. Out of the $12.8M recurring funds that make up this *University of Distinction* request, the university would only use $2.3M (less than a fifth of the proposal for recurring dollars) for faculty/staff hires. For the purposes of this request, postdoctoral researchers are treated as faculty. Total faculty FTE in the proposal is 15.0 and staff FTE is 3.0.

In addition to the new hires, the remaining $5.3M in nonrecurring funds and $10.5M in recurring non-personnel expenses will help to retain an additional 80+ existing faculty members by giving them the infrastructure to conduct research as well as fulfillment from working with high-achieving undergraduate and competitive graduate students as noted in the first three components of the proposed expenditure plan. Together these faculty produce an estimated $35M annually in research spending, which will increase in line with the details of the plan above. As noted, FAU has already made significant investments in human capital in line with Board of Governors and university strategic planning and is now seeking the resources to support the existing teams of researchers and scholars that are in place.

The university proposes to use $2.3M recurring funds to create a total of 18.0 FTE *new* positions, which are all AI/Data-focused employees within the context of the respective research institute as outlined below (e.g. computer science or engineering faculty or staff members who have expertise in the application of AI/Data). They will fall under the following areas:

Institute for Sensing and Embedded Network Systems Engineering (I-SENSE) - 3.0 faculty FTE, 1.0 staff FTE

Personnel hired into this research institute will build on six years of I-SENSE pillar success deploying remote sensing technology and analyzing massive datasets. One of the most active units at FAU in terms of research expenditures, adding faculty to this institute will lead to additional federal funding and national recognition for novel application of large-scale embedded systems and the high volume of data produced by these sensing networks.

1. Faculty hire $281.6K (salary + fringe) at full professor rank
2. Staff engineer $80.9K (salary + fringe) as exempt administrative/professional staff member
3. Two postdoctoral researchers $94.4K (salary + fringe) / each

Harbor Branch Oceanographic Institute
(HBOI) - 4.0 faculty FTE, 1.0 staff FTE

Founded as an independent research institute in 1971 and acquired by FAU in 2007, HBOI has a longstanding record of ocean research, particularly in the area of deep sea submersibles. As the University's northernmost campus, HBOI's recent research innovations include creating novel autonomous sensing systems, designing next generation ocean-observing tools, developing new shellfish and fish species for sustainable aquaculture and food security, searching the deep ocean for cures for disease, and monitoring fragile Florida ecosystems like the Indian River Lagoon. With this request, HBOI intends to populate Florida waterways with technology to incorporate novel sensors (e.g. in-situ holographic microscopes, in-situ toxin assays, acoustics, etc.) into the nodes for much improved coastal monitoring and assessment. With this investment, FAU could become a national and international leader in the technology and analysis of concerns such as nutrient pollution and early warning systems.

1. Two faculty hires $217.6K (salary + fringe) / each at full professor rank
4. Staff engineer $91.8K (salary + fringe) as exempt administrative/professional staff member
2. Two postdoctoral researchers $71.4K (salary + fringe) / each

Institute for Artificial Intelligence, Autonomy, and Data Analytics
(ArIADA) - 8.0 faculty FTE, 1.0 staff FTE

Building on the recently-established Center for Connected Autonomy and Artificial Intelligence" (CCA-AI), a brand-new Institute to support AI / Data will serve to synergize research and curricular development among the faculty and students on all campuses at FAU. With additional faculty members to lead and coordinate these efforts, ArIADA will expand data curation and data mining techniques and processes across all colleges. These hires can ensure university-wide coherence, as the institute will enable FAU to become the leader in AI/Data research, applications, and training in South Florida.

1. Faculty Director $250,000 (salary + fringe) at full professor rank
2. Faculty Associate Director $150,000 (salary + fringe) at associate professor rank
3. Administrative support $75,000 (salary + fringe) as exempt administrative/professional staff member
4. Two faculty hires $150,000 (salary + fringe) / each at associate professor rank
5. Four postdoctoral researchers $300,000 (salary + fringe) / total

IV. Facilities (*If this issue requires an expansion or construction of a facility, please complete the following table.):*

	Facility Project Title	Fiscal Year	Amount Requested	Priority Number
1.	N/A	N/A	N/A	N/A

2022-2023 Legislative Budget Request
Education and General

Position and Fiscal Summary
Operating Budget Form II
(to be completed for each issue)

University: **Florida Atlantic University**

Issue Title: **University of Distinction AI/Data**

	RECURRING	NON-RECURRING	TOTAL
Positions			
Faculty	15.00	0.00	15.00
Other (A&P/USPS)	3.00	0.00	3.00
Total	18.00	0.00	18.00
Salaries and Benefits	$2,295,000	$0	$2,295,000
Other Personal Services	$7,402,000	$0	$7,402,000
Expenses	$3,080,000	$5,300,000	$8,380,000
Operating Capital Outlay	$0	$0	$0
Electronic Data Processing	$0	$0	$0
Financial Aid	$0	$0	$0
Special Category (Specific)	$0	$0	$0
_____	$0	$0	$0
_____	$0	$0	$0
_____	$0	$0	$0
Total All Categories	$12,777,000	$5,300,000	$18,077,000