BUILDING AN AI UNIVERSITY:

AN ADMINISTRATOR'S GUIDE

LESSONS GLEANED FROM THE UF AI INITIATIVE

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INTRODUCTION

Artificial intelligence (AI) has exploded onto the higher education scene, most notably since late Fall 2022, when ChatGPT and other powerful forms of generative AI became generally available.

ChatGPT's intriguing capabilities and behaviors have captured the public's imagination and spurred considerable excitement and concern in universities. It has heightened interest in all facets of AI and its myriad applications — including its importance for the economy, national security, and university research, and how our students will prosper in a world rapidly evolving under AI's influence. But ChatGPT is only one slice of the unfolding AI revolution, and university leaders will need to harness a variety of new AI technologies in service to university constituencies and stakeholders.

AI's importance is increasingly obvious as it reshapes the world in which our faculty and students live and work. But it may not be obvious how administrators can incorporate AI on university campuses. Where to begin? How to promote AI's integration into research, instruction, outreach, and university operations? How to do it effectively and create buy-in among many stakeholder groups? How to best marshal faculty time and effort and limited university resources? How to maximize AI's benefit to your students, your faculty, your institution, your community, and the nation?

We will address these questions in this essay. The advice below is based on the University of Florida's experience grappling with them. UF was fortunate to begin rebuilding itself as an AI university as early as 2020.

Through a combination of generous philanthropy, some good decisions, a little luck, and a few minor miracles, UF is well on its way to weaving AI into the entire fabric of the university. In doing so, we have gleaned some principles that will be useful to any president, vice president, and dean intent on integrating AI into their university.

We focus mostly on systemic and institutional transformation and on building an AI university. Some universities may be uninterested or unprepared to engage in such an extensive project and may wish to limit efforts to "AI in the classroom" or "AI in faculty research" or "AI in university operations." The discussion below will be equally useful for those administrators who wish to dip a toe in the water before taking the full plunge.

Our main intent is to provide administrators with guidance in launching a successful AI initiative at their institution. We do not intend to lay out the bag of AI techniques (machine learning, large language models, digital twins, etc.) or in which disciplines and applications they are most useful. Nor do we intend to explore how best to integrate AI techniques into your teaching, research, and outreach missions. We will discuss how to gather a team to drive the initiative, assemble resources, foster buy-in, and design an AI ecosystem to sustain the initiative.

> " Everything that is written here is based on my own experience guiding UF's AI Initiative between January 2020 and July 2023. (In particular, no part of this essay has been written by ChatGPT or any other generative AI system.) It has been and remains a creative and rewarding endeavor that touched every corner of the university, including:
> - modifications to UF's data center,
> - a gift of an AI supercomputer and other philanthropic opportunities,
> - new curricula and degrees in UF's 16 colleges,
> - legislative support and engagement,
> - new faculty hires in AI,
> - new research efforts in AI and applications,
> - development of an AI ecosystem needed to support the initiative.

This agenda required the enthusiastic participation of a talented leadership council, the engagement of deans who understand the unique opportunity and imperative of this technological advance, and the willing participation of faculty eager to try the latest tool to advance their research and teaching.

This essay will help you to marshal the personnel and financial resources in your university to begin your journey to AI. There are compelling reasons for you to do so and to do so quickly. Your faculty will want to use this tool in their research and in industry partnerships. Because AI is invading all sectors of the economy, your students will need AI literacy, AI competence, and AI expertise to succeed in the marketplace. As AI business tools become commonplace, you will be expected to demonstrate judicious adoptions of these tools in university operations and demonstrate efficiencies achieved. As society grapples with increasingly thorny issues of AI ethics, governance, and regulation, your university will likely want to participate in these important conversations.

There is a national imperative at work, as well. As explained in the [National Security Commission on Artificial Intelligence final report](), the United States has not succeeded in growing an AI-enabled workforce at the same rate as competitor nations. This is both a national security threat and an economic threat that must be addressed. The report did not offer many strategies to resolve this quandary. In our view, the best approach to rectifying this situation is for universities to educate their thousands of students broadly through an "AI Across the Curriculum" strategy, such as the one adopted by the University of Florida.

Each chapter of this essay begins with a discussion of an organizing principle or a piece of advice for a president, vice president, or dean that applies to any university. In many cases, that discussion is followed by a snippet from UF's experience to illustrate the general discussion. Those vignettes are in italic typeface, so if UF's anecdotes do not interest you, then skip the italics!

How is it that UF began its journey to AI as early as 2020? The inspiration for the journey was due to Chris Malachowsky. He is a UF alumnus and a co-founder of NVIDIA, a corporation that manufactures graphical processing units (GPUs). While GPUs initially drove computer graphics (as in video games), they also turned out to be the current preferred hardware to power the computational capabilities of AI supercomputers. Malachowsky offered an AI supercomputer to UF in early 2020, and UF pledged to teach "AI Across the Curriculum", a concept that was unprecedented at the time. NVIDIA CEO Jensen Huang and NVIDIA partnered with Malachowsky in gifting the supercomputer to UF. The heroic delivery and two-month assembly of HiPerGator from its component parts by NVIDIA and UF Information Technology staff in the middle of the COVID-19 pandemic is a story worth telling at another time and in another place. Delivery of the component parts began in November 2020. Thanks to the collective expertise of the two staffs, HiPerGator was up and running by February 2021, and UF began to expand its vision from simply teaching "AI Across the Curriculum" to "Becoming an AI University."

The gift and its delivery involved the first bit of luck UF experienced in this story. Was UF prepared to receive and operate such a magnificent machine? HiPerGator is a room-sized supercomputer, and we were fortunate to have ready and waiting (largely due to the chief information officer's foresight) a modern data center with enough capacity to house and operate the machine. Even so, the provost and the Vice President of Research had to invest $15M into upgrading the power and HVAC systems to meet HiPerGator's operating demands (it draws 1.1 megawatts when running at full capacity).

Without Chris Malachowsky's prescient gift to UF, we likely would not have embarked on this project when we did. We will always be grateful to him for his generosity, foresight, and leadership not only for UF but for the lessons we have learned that will be useful to other universities as they wend their way on this journey. NVIDIA has remained an incredibly supportive partner to the university, providing us with guidance operating and optimizing HiPerGator, partnering in research projects, and enthusiastically promoting our efforts to create "AI Across the Curriculum" and to build an AI university. (See ITIF's white paper on the UF-NVIDIA collaboration.)

❝ For those who wonder if an AI supercomputer is a required prerequisite on this journey, the answer is "no." While it helps — particularly in advancing large faculty research projects — AI computing resources can be accessed through a variety of means discussed in Chapters 4 and 5.

BRIEFLY, WHAT IS AI?

AI is more than ChatGPT and other generative AI systems:

"In its most fundamental form, AI is the capability of a computer program or a machine to think and learn and take actions without being explicitly encoded with commands. AI can be thought of as the development of computer systems that can perform tasks autonomously, ingesting and analyzing enormous volumes of data, then recognizing patterns in that data. The large and growing AI field of study is always oriented around developing systems that perform tasks that would otherwise require human intelligence to complete — only at speeds beyond any individual's or group's capabilities. For this reason, AI is broadly seen as both disruptive and highly transformational.

"A key benefit of AI systems is the ability to actually learn from experiences or learn patterns from data, adjusting on its own when new inputs and data are fed into these systems. This self-learning allows AI systems to accomplish a stunning variety of tasks, including image recognition; natural language speech recognition; language translation; crop yield predictions; medical diagnostics; navigation; loan risk analysis; error-prone boring human tasks; and hundreds of other use cases." (source: https://www.nvidia.com/en-us/glossary/data-science/artificial-intelligence/ *)*

In the past decade, we have seen stunning advances in AI. It is rapidly transforming many sectors of the economy including engineering, business, medicine, education, and agriculture. It is the future of personalized medicine and personalized education. It drives robotics, remote sensing, and autonomous vehicles. The marriage of AI and the financial services industry is spawning a new field called fintech. The techniques and applications of AI are wide and varied, although much of the public's attention is focused currently on a sub-field of AI called generative AI.

"Generative AI enables users to quickly generate new content based on a variety of inputs. Inputs and outputs to these models can include text, images, sounds, animation, 3D models, or other types of data.

"Generative AI models use neural networks to identify the patterns and structures within existing data to generate new and original content.

"One of the breakthroughs with generative AI models is the ability to leverage different learning approaches, including unsupervised or semi-supervised learning for training. This has given organizations the ability to more easily and quickly leverage a large amount of unlabeled data to create foundation models. As the name suggests, foundation models can be used as a base for AI systems that can perform multiple tasks.

"Examples of foundation models include GPT-3 and Stable Diffusion, which allows users to leverage the power of language. For example, popular applications like ChatGPT, which draws from GPT-3, allow users to generate an essay based on a short text request. On the other hand, Stable Diffusion allows users to generate photorealistic images given a text input." *(source:* https://www.nvidia.com/en-us/glossary/data-science/generative-ai/ *)*

AI and its applications are advancing rapidly and will spur fundamental change in universities and society. If this claim seems overblown, consider the following precedent. In the early 1980s, there were no personal computers. There was no email, no World Wide Web, no Amazon, no Google, no electronic library books, no online courses, no online banking, etc. The advent of PCs in the mid-80s rapidly changed the way the U.S. economy operated, and now, one cannot imagine a world without all of the changes that sprang from them.

The same is happening with AI. It is already changing the way we educate, do research, and conduct business. It will likely be even more transformative than the PC revolution.

And there will be surprises along the way. As PCs arrived, the world anticipated a revolution in *computation.* While they certainly delivered impressive computational capabilities, their true impact was felt in *communication.* Who can be completely sure what lies ahead as AI reshapes society? Universities must be engaged. They must lead the way and prepare students to meet the surprises of this new technology head-on.

WHY BUILD AN AI UNIVERSITY?

An AI university is a university that has infused AI into its teaching, research, and service missions and into its clinical, extension, and administrative operations.

Depending on the extent of your vision, your ambition, and the scope of the project, building an AI university can be a considerable undertaking. It will entail changes in university culture, business practices, organization, and pedagogical emphases, all of which require some effort and resources. But the return on investment will far outstrip your initial investment.

You may wish to assess the readiness of your institution to undertake an AI initiative and choose the scale of the initiative accordingly. For example, if you plan to acquire hardware, do you have a data center at the ready? If you would like to add GPUs to your current computing hardware, what is the state of your research computing infrastructure? Will you find broad support among faculty, staff, and administrators as you undertake this project? Are there partners outside the institution who can help move this initiative along? Are your health and agricultural extension systems ready and eager to incorporate AI tools into delivery systems? Can you bring appropriate funding to this initiative through internal funds, state funds, or philanthropy? Will you be able to sustain this initiative in the long run?

If a complete systemic integration of AI into your university seems daunting and perhaps unreachable in the short term, it can be broken into more manageable chunks. For example, you might begin on the instructional side by creating a university certificate in AI and introducing appropriate coursework in various departments, or you might begin on the research side by incentivizing faculty engagement with AI and access to AI computational capabilities.

It is important for you and your team to agree on the scope of your AI-integration project. One or more focus areas can be chosen from the following list.

- **Incorporate AI into the instructional program of your university.** Try to make it available to all students at your institution. Once you have instructional programs underway for your students, how can you make course material available to working professionals and others outside the university who need to learn about AI? What is your role in bringing this revolutionary new technology into K-12 in your area or state?

- **Encourage faculty to make use of AI in their research programs.** You may need to explain how AI can be used, how faculty can access AI resources, what types of problems can be tackled with AI, and how they can access relevant datasets. Consider how you can simplify access to and use of AI at your institution. How can you incentivize new research efforts?

- **Many universities have service obligations to the community through health systems and agricultural extension systems.** AI is rapidly becoming an indispensable tool in these outreach areas, and you might leverage the capabilities of these university sectors to introduce AI.

- **The teaching, research, and service missions of your university are underpinned by a substantial administrative and business enterprise.** What new AI tools are being introduced in the marketplace that can be adapted to ease the administrative workload and generate efficiencies?

In choosing where you will concentrate your AI efforts, you should develop a consensus around the vision and goals of the project and consider how this project will benefit the stakeholder groups your university serves.

- **Do this for your students.** They are graduating into a world that is rapidly integrating AI into every sector of the economy. They need AI literacy, AI competency and/or AI expertise in their skills portfolios. Employers will demand it.

- **This will be important for recruiting new and returning undergraduate, graduate, and professional students.** They will want to know if they can learn about AI at your university. They will see this as a key component of their education.

The two bullets above apply to <u>all</u> your students, not just students majoring in engineering and computer science. Because AI is changing the way every sector of the economy conducts business, every student needs the opportunity to become AI-enabled. Each institution may introduce AI and AI instruction according to its own plans, but we strongly encourage the adoption of an "AI Across the Curriculum" philosophy. Make AI instruction available to all students in every major and at all levels (undergraduate, graduate, and professional).

> " In its first commitment to teaching "AI Across the Curriculum," UF intended to ensure that every student in every major and at every level could become AI-literate, AI-competent, or AI-expert, depending on the student's investment of time and effort.

In its first commitment to teaching "AI Across the Curriculum," UF intended to ensure that every student in every major and at every level could become AI-literate, AI-competent, or AI-expert, depending on the student's investment of time and effort. This was envisioned originally as a university-wide certificate. At its most basic level of AI literacy, the certificate consisted of three courses, the first being an introduction to AI fundamentals, the second a course on ethics, data and technology, and the third an AI applications course in a disciplinary context.

One of the minor miracles that followed the introduction of this certificate was the broad faculty embrace of "AI Across the Curriculum" and their determination to integrate AI into the disciplinary curricula in each college. This has been done through the introduction of new AI applications courses and through the integration of AI modules into existing courses. Students at UF can now learn about AI in the context of their majors and how it may affect

their occupational goals. College ownership of the curricula has also led to different emphases in the AI techniques and applications taught. For example, AI is revolutionizing agriculture through robotics, remote sensing, and drones, so these applications are emphasized. In business, AI is revolutionizing the financial services industry through a new field dubbed fintech. The AI application digital twins is extremely important for students in building construction and architecture.

Several new degrees have been created, as well. An undergraduate degree in data science was created in 2020. While technically a degree offered in the Department of Statistics, it relies on the combined efforts of the Departments of Statistics, Mathematics, and Computer and Information Sciences and Engineering (CISE). Two master's level degrees have also been created: a master's in applied data science, and a master's in AI systems.

UF is required to develop a Quality Enhancement Plan (QEP) once every ten years in conjunction with reaccreditation by its regional accreditor. UF is being reaccredited next year and has chosen "AI Across the Curriculum" as its QEP. The QEP explores how UF has integrated AI across the curriculum and establishes student learning outcomes and metrics. More about this later.

- **Do this for your faculty.** AI is the latest technological tool to advance research. It offers incremental improvements to old research methodologies and entirely new leaps in tackling problems of critical importance. Faculty need access to the best tools if they are to advance basic and applied research and will be disadvantaged without access to AI technology. This will be a significant consideration in recruiting new faculty, just as it will be for recruiting students. On the teaching side, as AI infuses every discipline, faculty will need to remain abreast of developments in their field and be able to communicate these in the classroom, the laboratory, and fieldwork.

- **Do this for your state economy.** PwC predicts that AI's contributions to the global economy will approach $15.7 trillion by 2030 (source: https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html). Your state will want its share of that remarkable growth. Your university can assist the state in growing an AI-enabled labor force by educating

your students, providing continuing education for working professionals, partnering with state industries, and encouraging tech transfer.

- **Do this for the nation.** In its final report, the National Security Commission on Artificial Intelligence pointed out that the United States is not growing an AI-enabled labor force sufficiently rapidly to outcompete other nations. This represents a national security threat and an economic threat. While the commission did not provide a blueprint to resolve this problem, "AI Across the Curriculum" presents a replicable and scalable solution to it that can be adopted at any university.

    UF took seriously its responsibility to help address this national challenge. Even though UF graduates thousands of students per year, this alone will not solve the nation's problems. To multiply our impact, UF extended access to HiPerGator to all the institutions in the State University System of Florida to encourage AI instruction and research. Similarly, UF joined a consortium of SEC universities to foster AI instruction and research throughout the southeastern United States.

- **Do this for the entire university community.** Engaging the university in a systemic AI transformation will excite stakeholder groups, including students, faculty, alumni, donors, legislators, and industry partners. They will also be reassured that the university is remaining current and relevant and is continuing to equip students with the tools they need upon graduation.

    This was certainly the case at UF. Stakeholders understood the significance of this project and were asked to participate. Alumni and donors contributed to student scholarships and endowed chairs. Understanding AI's importance to the state economy, the state legislature appropriated $20 million to enable hiring an additional 100 faculty and staff emphasizing AI and its applications. All academic units were eligible to compete for some of these new positions, and every college received at least one. This was a significant incentive for participation in the AI initiative. It was made clear that this was a university-wide initiative and that all units were strongly encouraged to participate. This, in and of itself, was a significant incentive for participation.

YOUR LEADERSHIP COUNCIL

Whether you plan a systemic change involving all aspects of the university (research, instruction, outreach, operations), or whether you plan to start with only one of these areas (such as instruction), you will want to ensure that the effort is well-received by university stakeholders, that it is sustainable, and has robust infrastructure support. This will work best if it is a team effort with a group of administrators bringing a variety of skills, interests, and resources to the table.

You may be lucky enough to have faculty and students demanding AI on campus, so all stakeholders become easily aligned. In other cases, you may have to educate stakeholder groups about the importance of an AI initiative. It is likely your initiative will need a "champion." By this, we mean someone who keeps advancing the institutional vision behind your AI initiative. Many of the team members discussed below will have specific areas of responsibility and may not wish to serve as the champion. Any of them can fulfill this role, but oftentimes, they are more focused on their own areas of responsibility. The champion ensures that efforts are coordinated and are advancing the goals and implementation. The champion should have a good grasp of the institution's overall vision for AI and should be an effective spokesperson on the subject.

- While the **President** need not be a member of the leadership council tasked with the details of implementation, the president must be fully supportive and prepared to explain the importance of the initiative to stakeholder groups, particularly external groups including

alumni, donors, and legislative and industry leaders. Because of AI's importance in business and the state economy, the president has an opportunity to seek the support of these leaders. Because this initiative can have far-reaching consequences for the university's internal operations and its future prospects, it is sure to catch the attention of the **Board of Trustees**. The president should help the board understand the importance of the AI revolution for the institution, its students, and its faculty and seek its support in realizing the promise of the initiative.

- The **Provost**, who is normally the university's chief academic officer, must be fully engaged in this initiative and prepared to explain its importance to stakeholder groups. Where the university has determined to integrate AI into the curriculum, the provost's leadership among the deans and department chairs is particularly important. Aside from the academic considerations involved with introducing new curriculum, the provost is often in a position to smooth the approval process for new course proposals.

- The **Vice President for Research (VPR)** is normally interested in initiatives to promote and advance the university's research enterprise. The VPR can encourage faculty and students to apply new AI capabilities to continuing research projects and to tackle new research projects that might have been out of reach previously. While this can be done by "jawboning," the VPR and the provost can entice faculty to consider new areas by making available small seed grants. The VPR is often responsible for tech transfer and partnerships with industries, and the university's new AI capabilities will constitute an enlarged platform for collaboration and partnerships.

> " Universities cannot maximize the promise of AI by retaining a culture that allows individual faculty members to acquire and run their own machines and computing clusters.

- The **Chief Information Officer (CIO)** plays several important roles on this team. The CIO is responsible for ensuring the availability of research computing on campus. As faculty and student need for AI computing resources grows, the CIO must identify and facilitate access. This can be done in an increasing number of ways:

  - by purchasing GPUs to create an on-campus AI computer,
  - by purchasing AI cloud computing resources,
  - by partnering with a federal laboratory or other nascent federal computing resource, such as the National AI Research Resource (NAIRR).

As indicated in the first bullet, a university may augment its existing research computing hardware with GPUs to create an AI computer. Because large research projects can require a significant number of GPUs, this can represent a substantial investment. However, if the main purpose is to provide computing resources to support student instruction in AI, a smaller investment in GPUs may suffice at a cost well within reach of any university.

If the university is determined to provide a central computing resource on campus, the CIO, in partnership with the provost and the VPR, should create strong policies encouraging shared use of central computing resources with major capabilities. Universities cannot maximize the promise of AI by retaining a culture that allows individual faculty members to acquire and run their own machines and computing clusters. That culture disperses the university's compute dollars, produces many small computer installations incapable of running significant research problems, compromises campus cybersecurity, and distracts faculty attention from their primary research goals to the problems of running their own little computer systems. Much of AI relies on big machines analyzing big data sets.

For well over a decade, the UF CIO and VPR have enforced a policy to limit the acquisition of computer clusters by individual faculty members. The only exceptions occur when it is demonstrated that the university's central research computing facilities cannot meet the faculty member's needs. When new faculty are recruited to campus, they often request clusters as part of their start-up packages. Typically, the VPR allocates funds for them to use the central research computing facilities. The designated funds are transferred to the CIO to invest in the acquisition and maintenance of hardware.

The CIO has at least two other major responsibilities. The CIO should be a player (perhaps with the VPR) in making it "easy" to use the university's AI capabilities. A biologist or sociologist should not need to abandon their disciplinary research to learn how to "run" or "program" the university's central facility to use its AI capabilities (see more about this in Chapter 5).

Finally, the CIO is responsible for establishing a robust and sustainable computing environment, which involves creating policies that respond to the following questions.

- How is access to computing resources to be established and funded?
- If the university owns hardware, how is that hardware maintained and replaced?
- How can faculty who are not AI experts take advantage of the university's capabilities?

The importance of building a sustainable funding model for AI technology (whether it is on campus or in the cloud) cannot be overemphasized. If cloud computing is chosen, there will be annual charges that must be covered. If you acquire hardware, then it will require maintenance and renewal. The CIO can estimate what these annual costs are and work with the administrative team to identify continuing sources of revenue to meet them. Sources may include: the university general budget, special appropriations from the government, faculty grants and contracts, contributions from industrial partners, and philanthropy.

- Building an AI university is an exciting transformative project, and the **Vice President for Advancement (VPA)** will find it to be one that appeals to alumni and donors.

Everyone is becoming conscious of AI and how their lives are changing as a result. The VPA can engage them in this project, whether their interest is in student welfare, faculty research, advancing medicine, or promoting the state economy. There are opportunities to solicit their participation through support of student scholarships, graduate fellowships, research projects, endowed chairs, and facilities.

The UF VPA played an active and inspirational role in the UF AI initiative, going far beyond his chief fundraiser responsibility. In fact, he and Chris Malachowsky were in conversation about the possibility of an AI supercomputer long before any other people on campus were involved. Following the gift, he participated actively in the evolution of the initiative, its implementation on campus, in keeping various stakeholder groups informed and engaged, and in the development of the "Building an AI University" campaign. In particular, he established a "Global AI Task Force" that included many of the university's alumni and business executives from around the world. He also was key to fostering the continuing partnership between UF and NVIDIA that has been so important to the initiative's success.

- The **Vice President for Government Affairs (VPGA)** will help state government and state industry understand their vital stake in the success of your AI initiative. Having an AI university pumping out thousands of AI-savvy graduates annually will boost the state economy and help keep it competitive. Industries will welcome a steady stream of new employees who understand the technology. Those industries looking to incorporate AI tools will welcome university know-how in their areas. The federal conversation about AI continues to evolve, and the VPGA may wish to advertise your university's engagement with AI and help leverage federal opportunities.

Thanks to the efforts of the VPGA, the Board of Trustees, the president, and the VPA, another major undertaking was pursued at UF that is complementary to the AI Initiative. That was the planning and construction of a new data science and information technology building, now named Malachowsky Hall. As I write this, Malachowsky Hall is about to open, providing new space for researchers in multiple colleges to collaborate in data science and AI-related projects. This 263,000-square-foot academic building was funded largely by the state legislature and philanthropy.

- It is important that all university stakeholders are informed about this project, its successes, and its impact. The **Vice President for Strategic Communications and Marketing (VPSCM)** serves a critical role in outreach and awareness.

    Universities rarely have an opportunity to engage in transformative projects that excite public awareness off campus. AI is one of those rare opportunities. The UF VPSCM staff took full advantage by publicizing and marketing the UF AI initiative on campus and to external stakeholders. They took the lead in playing off UF's invention of "AI Across the Curriculum" and were key players in formulating the subsequent "Building an AI University" brand.

- The **Deans** need to be active participants in this initiative since much of what happens does so in the colleges. One or two deans should be included on the leadership council to provide their perspective and to keep all deans informed.

- The **leadership council** described above is broad because it is leading a systemic change to the institution — even if your AI initiative is limited to one area, such as instruction. Each team member has an area of responsibility and may not have much bandwidth outside that area. Consequently, the initiative needs a **Champion**, someone who keeps the initiative moving and coherent and who can explain it to anyone who needs it explained. Any member of the leadership council described above can function in this capacity, or an additional member can be designated.

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Now that you have assembled your leadership council, do you need a tremendous investment in computer hardware to build an AI university? In general, the answer is no.

For pedagogical purposes, it is important for students to "flex their AI muscles" through practice. Modern AI technology relies on Graphical Processing Units, or GPUs. Any university can purchase a small number of these at a relatively modest cost for pedagogical and instructional purposes. Faculty research projects and university operations may need more GPUs and more powerful GPUs. There are several options to secure these advanced resources, including purchase, cloud computing services, and using the computer facilities of neighboring universities through consortium arrangements. The federal government aims to "democratize" AI resources, and it may soon be possible to access them through the nascent National AI Research Resource (NAIRR) project underway. Your CIO will be able to expand on this list of options and suggest what works best for your institution.

Everything costs money, and it is worth thinking about the financial structure that underlies this initiative. Possible sources of funds include: central administration, grants, philanthropy, state support, and industrial partnerships. UF was fortunate to have HiPerGator donated, but UF still needed to invest $15M in HVAC and power upgrades into its data center to receive and operate this massive machine. New faculty who ask for research

computing resources are given allocations of time and space on the machine, and the associated money is allocated from the central administration for maintenance and upkeep of HiPerGator. Faculty with grants also contribute to maintenance and upkeep through the purchase of computer resources.

Universities that want to empower their research faculty with the latest AI techniques should consider other forms of support as well. Disciplinary specialists such as biologists, sociologists, and even engineers should not have to divert their time and attention to learn how to operate an AI supercomputer. It would be helpful to provide specialists in AI computing to help people get their problems on the machine, run them, and get the results off the machine.

UF employs 10 staff specialists who interface between users and HiPerGator. The CIO supervises them and allocates their time and effort to faculty research projects. The specialists work directly with faculty members and their research staffs to help them prepare their problems to be run on HiPerGator. They allow the users to concentrate on their research problems while taking advantage of advanced AI techniques.

FACULTY AND STUDENT BUY-IN

To achieve maximum return on investment, it is important that faculty and students understand the importance of the AI initiative and buy into the project.

It is an easy sell for students who incorporate new technologies into their lifestyles as quickly as the technologies mature. They will understand the importance a portfolio of AI skills has for their success in life, particularly if your Career Center begins to emphasize the AI initiative to students and employers.

Some administrators may wonder where they will find talented instructors to teach an AI curriculum. It is likely that you already have them, and they may not all be in your computer science department or engineering college. Faculty in many disciplines have been using slices of AI (like machine learning) for decades and many faculty members have incorporated newer AI techniques into their research programs in recent years. It is worth considering how to compile and catalogue the expertise you already have on campus. Survey the faculty to discover who is using AI, what their expertise and capabilities are, and their interest level in bringing their expertise into the classroom!

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On the other hand, pockets of faculty may be resistant to the initiative for several reasons. First, your AI initiative may appear "top-down," meaning an imposition from the central administration. Second, there is some concern among faculty members about generative AI and how it may disrupt time-honored pedagogical practices. Third, the speed at which AI is penetrating scholarly disciplines varies considerably. For example, it has penetrated all the engineering disciplines, but is likely slower in penetrating humanities and arts disciplines. Nevertheless, good examples of its power are becoming apparent in all disciplines. This may well be a situation where some interested faculty will lead in adopting AI techniques in research and teaching, while others may watch from the sidelines for a while. It will be important to provide introductions, tutorials, seminars, and workshops for curious faculty, perhaps through your teaching center and your VPR's office.

The role of the champion should not be underestimated in helping faculty and students buy into the initiative. The champion should be able to explain in easily understandable terms the university's vision for the initiative, the benefits of learning about AI, and how the university is prepared to help students and faculty do that in the simplest, easiest, least painful, and most profitable way!

The UF AI initiative did indeed begin as a top-down initiative. As mentioned previously, one of the small "miracles" we experienced was its quick and broad adoption by faculty and students. Some have suggested that this success occurred because the central administration was willing to "let go" of the initiative and to let colleges and departments "own" it in their own way. The deans of the colleges deserve a lot of credit for this smooth transition. There were also a few classic financial inducements along the way, including seed funds from the provost and the VPR. The Florida Legislature provided funds for 100 additional faculty in AI and applications, and all colleges were eligible to submit proposals for the new faculty members. Every college received at least one new position.

To promote AI on campus, the AI² Center sponsored "AI Days" last fall. One of the days was focused on student engagement with AI, while the other focused on faculty engagement. The event seemed to be a success, and AI Days are being expanded to nearly a full week of activities in Fall 2023.

AI ACROSS THE CURRICULUM

AI and its applications are transforming every sector of the economy. Every occupation and every employer will need people who are AI-enabled. Consequently, students in every discipline and major need the opportunity to learn about AI, and universities can offer these opportunities in several ways.

The simplest and most generic way is to begin with one or more university-level certificates in AI. Ideally, the certificates should be staged so students who wish to become AI-literate may do so with a modest investment of time and effort, while those students willing to invest more energy can pursue AI-competence or AI-expertise.

Another approach is to encourage departments and colleges to offer AI instruction contextualized within department and college disciplines. This gives faculty more control and will help students understand the use and application of AI within disciplines and related occupations.

While AI instruction can be offered in stand-alone courses, the path to graduation may already be chock-full of prescribed coursework. Departments should consider the trade-offs between stand-alone AI courses and AI modules incorporated into existing courses. (see "Developing a Model for AI Across the Curriculum: Transforming the higher education landscape via innovation in AI literacy" in Computers and Education: Artificial Intelligence 4 (2023))

UF began with a university certificate, but AI instruction is increasingly centered in departments and colleges. As part of its reaccreditation process, UF must adopt a Quality Enhancement Program (QEP) designed to enhance some aspect of the university. UF has chosen "AI Across the Curriculum" for its QEP to be submitted in early 2024. A 35-member task force led by two department chairs has nearly completed it. It specifies pedagogical programs, a taxonomy for AI courses, student learning outcomes, and appropriate metrics for their assessment. UF will be required to collect outcome data for the QEP over several years

and created the AI² Center to function as the data collection arm of the QEP and a coordinating entity for AI instruction (see www.ai.ufl.edu)

As a powerful new technology, AI is not without its problems. For example, it is well-known that bias can be built into AI systems, and that bias is often introduced from training data. For example, early facial recognition systems excelled at recognizing people from certain groups but failed miserably at recognizing people from other groups. It is important to ensure that AI systems do not incorporate training bias or biases that exist currently in society.

The simple example above illustrates the need for ethical training in the creation and use of AI. Every plan of AI instruction should incorporate training in the ethics, policy, regulation, and responsible use of AI. There are several ethical frameworks proposed for AI.

UF chose to subscribe to the Rome Call for AI Ethics, a set of six ethical principles formulated by IBM and Microsoft and supported by the Pontifical Academy of Rome (www.romecall.org). They are:

- **Transparency**: All systems must be understandable to all.
- **Inclusion**: These systems must not discriminate against anyone because every human being has equal dignity.
- **Accountability**: There must always be someone who takes responsibility for what a machine does.
- **Impartiality**: AI systems must not follow or create biases.
- **Reliability**: AI must be reliable.
- **Security and Privacy**: These systems must be secure and respect the privacy of users.

While the Rome Call serves as a foundation for UF's commitment to AI ethics, AI ethics is an active area of research at UF, involving faculty from philosophy, law, humanities, and many STEM disciplines. Given the current AI state of the art, there is some work to be done to satisfy these principles!
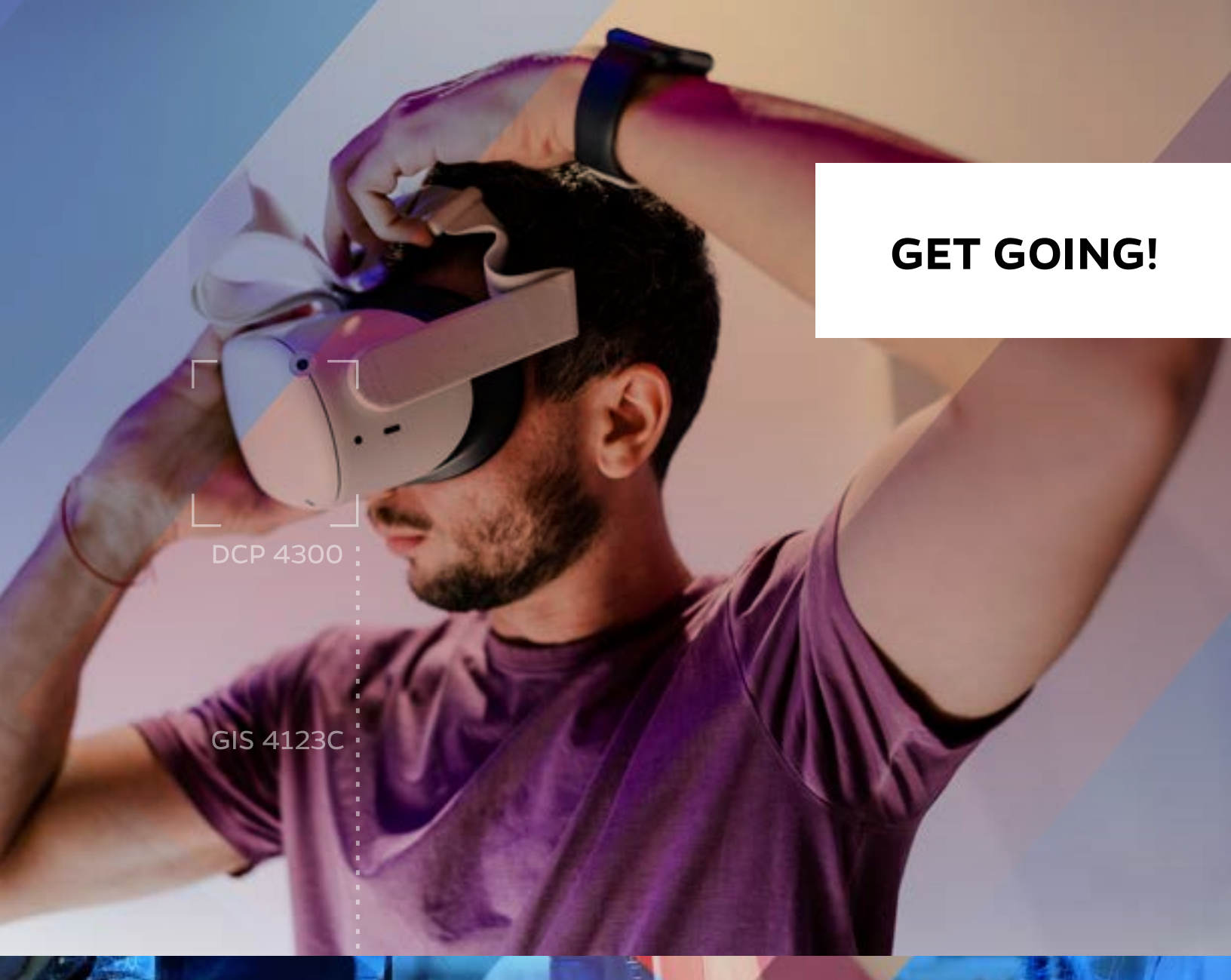
GET GOING!

We hope that the insights in this essay are useful to you as you begin or continue your journey to build an AI university.

There is a lot of ground to cover and administrators who are not particularly comfortable with the new technology may hesitate. But it is important to get going. The pace of development in AI and its infiltration into the economy and daily life is accelerating.

While the vignettes herein have all been drawn from UF, there are many universities that have begun this journey and can offer guidance and insight. In addition, many corporate partners are available to help as well. IBM, Microsoft, and NVIDIA have been particularly helpful to UF in its journey to AI.

Best of luck as you incorporate this revolutionary new technology into your university.

ACKNOWLEDGMENTS

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Many people have helped to drive UF's AI Initiative from its inception, and they all deserve the university's thanks.

Chief among them is Chris Malachowsky, who sparked the whole initiative. The AI supercomputer that he, NVIDIA CEO Jensen Huang, and NVIDIA donated to UF has been a game-changer, and we are forever in their debt. NVIDIA has continued to partner with UF in rebuilding and rebranding UF as an AI university. Cheryl Martin, the NVIDIA Global Director of Higher Education and Research deserves enormous recognition and thanks for her amazing efforts to spur the development of UF's AI teaching and research programs. We would not have gotten half as far without her active participation and support. Thanks are due also for the supportive role played by Ned Finkle, NVIDIA's vice president for external affairs and to Microsoft and IBM for helping to move UF along this journey. There were several other key players at NVIDIA whose contributions have proved invaluable, including:

- Kaleb Smith, who runs the NVIDIA AI Technology Center,
- Mona Flores, the global head of medical AI at NVIDIA. She was the NVIDIA lead on the GatorTron project, the first large scientific/medical project run on HiPerGator, and
- Bob Sherbin, NVIDIA's VP for Corporate Communications.

The talented members of UF's AI Leadership Council did yeoman's work for several years and can claim substantial credit for launching UF's systemic transformation. They include: David Norton (VPR), Elias Eldayrie (CIO), Tom Mitchell (VPA), Mark Kaplan (VPGA), Nancy Paton and Steve Orlando (VPSCM), Saby Mitra (Dean of the Warrington College of Business), Cammy Abernathy (Dean of the Herbert Wertheim College of Engineering), and David Reed (Director of the AI² Center).

Singled out for special mention and thanks:

- Erik Deumens (Senior Director) and Craig Prescott (Architect) in UF Research Computing. Their efforts to assemble and vet with the UFIT staff and NVIDIA technicians the AI supercomputer HiPerGator in the midst of the pandemic is the stuff of legend.
- Sarah Mathias, the Assistant Vice President for Federal Relations, for her efforts to spread the gospel of UF's good works in Washington, D.C.
- Kati Migliaccio (Chair of the Department of Agricultural and Biological Engineering) and Jane Southworth (Chair of the Department of Geography), who co-chaired the task force that developed the "AI Across the Curriculum" Quality Enhancement Plan (QEP).
- Associate Provost Andy McCollough for his interest in extending our growing expertise in AI to working professionals.

The deans and directors of UF's many colleges, centers, and other academic units (such as the Library and the Florida Museum of Natural History) were willing and enthusiastic partners and continue the work of integrating AI throughout UF.

Thanks to President Emeritus Kent Fuchs for backing this risky, daring, but ultimately rewarding experiment. Finally, thanks to the UF Board of Trustees for its enthusiasm, interest and support. And a special shoutout to the Board Chair, Mori Hosseini, for bringing the initiative to the attention of the governor and the legislature and for his successful advocacy of the legislative appropriation in support of additional faculty in AI and applications.

Finally, thanks to the faculty, staff, and students of the University of Florida for seizing this remarkable opportunity with gusto.

ABOUT THE AUTHOR

Joseph Glover received his bachelor's degree in mathematics from Cornell University and master's and doctoral degrees in mathematics from the University of California, San Diego. After brief sojourns at the University of California, Berkeley, and the University of Rochester, he joined the Mathematics Department faculty at the University of Florida in 1982. There, he served as department chair, associate dean in the College of Liberal Arts and Sciences, associate provost, interim provost, and interim dean of the College of Liberal Arts and Sciences. He served as Provost and Senior Vice President for Academic Affairs for three presidents from May 2008 until July 2023.

ABBREVIATED TIMELINE OF UF AI INITIATIVE

January 2020	Chris Malachowsky and NVIDIA agree to give to UF the AI supercomputer we named HiPerGator. UF is fortunate to have a data center that can accommodate the machine. The concept of "AI Across the Curriculum" is invented. UF delegation visits the governor and legislative leaders to explain the AI opportunity for the state.
February 2020	Inaugural meeting of UF AI Leadership Council.
March 2020	The COVID pandemic hits! Delays delivery of HiPerGator.
April – December 2020	$15M upgrade to HVAC and power systems in UF Data Center to receive and run HiPerGator.
July 2020	Public announcement of the $70M AI partnership with NVIDIA.
August 2020	Undergraduate degree in data science is created. Vice President for Research publishes solicitation for AI research seed grants.
November 2020	Delivery begins on components of HiPerGator. UFIT and technical experts from NVIDIA begin assembly, involving over 15 miles of cables.
December 2020	20 faculty research teams selected to receive internal funding through Artificial Intelligence Research Catalyst Fund plus HiPerGator access to pursue AI research opportunities in health, agriculture, engineering, education, and other cross-disciplinary areas. Selected research projects included early detection of Alzheimer's disease, identification of academically at-risk K-12 students, and evaluating ground-penetrating radar images to identify agricultural pests in soil.

January 2021	Assembly of HiPerGator is complete, and the system is turned on for testing.
	UF offers use of HiPerGator to students and faculty across the State University System.
	UF establishes corps of computing specialists reporting to CIO to assist faculty and students in prepping projects to be run on HiPerGator.
	Office of Research awards $1M to 21 AI proposals and another 75 proposals received HiPerGator resource allocations.
February 2021	First large project run on HiPerGator – GatorTron – processing over 90 billion words from medical notes stored in electronic medical records system.
March 2021	UF offers use of HiPerGator to students and faculty in the Southeastern Conference (SEC).
	Inaugural meeting of AI Advancement Global Taskforce comprised of experts, UF advocates and donors.
April 2021	Glover on NVIDIA Global Technology Conference (GTC) panel to talk about "AI Across the Curriculum."
June 2021	HiPerGator's rankings among world's supercomputers:

June 2021 (continued):

- Green500:
  - No. 1 in US
  - No. 2 in world

- Top500:
  - No. 8 in US
  - No. 22 in world

- Higher Education
  - No. 2 in US
  - No. 3 in world

Legislature appropriates $20M to hire 100 faculty members in AI and applications.

October 2021	Establishment of QEP Task Force (35 faculty members). A Quality Enhancement Plan is required for the next re-accreditation cycle. It will focus on AI Across the Curriculum, particularly in the undergraduate arena. It will discuss curriculum, student learning outcomes, and assessments (metrics).
March 2022	AI^2 Center created to serve as focal point for academic initiatives.
	Incentives to encourage publication in AI and data science instruction, curriculum and pedagogy created for period 2022-2025.

April 2022	SEC conference on AI in the curriculum.
	Master's degree in applied data science created.
May 2022	NSF director visits.
	HiPerGator supported over 60 courses for 2021-2022 academic year.
July 2022	[ITIF (Information Technology & Innovation Foundation) white paper on UF-NVIDIA collaboration]().
	A second, large project on HiPerGator used 1,000 GPUs for turbulent flow simulation to show how smoke moves through a drywall during an active fire.
November 2022	UF signs the Rome Call for AI Ethics. This is an ethics framework for AI formulated by IBM, Microsoft, and promoted by the Pontifical Academy for Life in Rome.
January 2023	Congressional earmark for AI for Palm Beach State College funded for $1M. UF will train faculty at PBSC in AI this summer.
	UF/Glover featured on NVIDIA podcast on "Building an AI University."
	Multiple UF authors publish paper "[Developing a Model for AI Across the Curriculum: Transforming the higher education landscape via innovation in AI literacy]()" in Computers and Education: Artificial Intelligence 4 (2023).
February 2023	Shiga University visits UF to learn about the AI Initiative.
March 2023	NVIDIA publishes "The Roadmap to Becoming an AI University" freely available through the *Chronicle for Higher Education.*
April 2023	USDA NIFA AI in Agriculture conference hosted by IFAS in Orlando.
	AI4Health: Improving Health through Artificial Intelligence hosted by College of Medicine in Orlando.
	"AI in Education" workshop.
Fall 2023	Master's degree in AI systems degree is offered.