Employer Needs Assessment:
Artificial Intelligence, Technology, and Society

Prepared for: Nazareth College

TABLE OF CONTENTS

PROJECT OBJECTIVE

Nazareth College (Nazareth) is interested in exploring employer needs for and perceptions of its proposed undergraduate degree program in Artificial Intelligence, Technology, and Society. Nazareth intends to use these data to help tailor its forthcoming program to address key industry needs and ascertain the desire for graduates with this unique intersection of skills in Artificial Intelligence.

✓ Uncover what **skills and/or knowledge** employers are looking for in graduates of ethically- and society-focused AI programs.

✓ Understand **current industry trends** that should be reflected in a cutting-edge and interdisciplinary AI program.

✓ Identify how employers **partner with higher education institutions** with AI educational programs.

METHODOLOGY

Hanover Research conducted **ten (10) in-depth interviews** with technology professionals involved in the hiring of graduates working in AI.

Note:

Qualitative research is exploratory and designed to add insight and a depth of understanding to a particular question or topic. Qualitative findings provide commonalities and trends but are not intended to be statistically significant or to provide generalizable conclusions.

RECOMMENDATIONS

1 **Nazareth's program must cover the various models and use cases with AI, as well as a decision framework to determine the impact of AI solutions.** Students should learn key topics in data management and be well-versed in basic philosophical principals such as inclusiveness, transparency, and security.

2 **Nazareth should emphasize building soft skills like problem solving and collaboration.** Graduates must be able to demonstrate critical thinking, work well within a team, and explain AI concepts and methodologies.

3 **Ethics-focused AI programs should cover global laws and regulations surrounding AI.** In preparation for stricter regulations, the curriculum should cover existing precedents for ethically regulating AI such as those found in the UN UDHR and many European laws.

4 **Curricula should incorporate case studies and exposure to business processes.** Because industry-specific certifications increase candidate credibility, Nazareth should also consider partnering with companies to offer webinars or certifications.

HR | EMPLOYER NEEDS ASSESSMENT

KEY FINDINGS

- **After a rapid early adoption of AI, companies are now looking to put more emphasis on implementation and the societal impact of AI solutions.** In the midst of increased public scrutiny and anticipation of increased regulations, companies see a need to define responsibility and analyze the implications of their AI solutions.

- **Emerging concerns around AI center on data privacy, decision-making, and job automation.** The growth of machine learning and cloud-based systems has increased awareness and concerns over data use among the government and public as well as mistrust and fears of bias and discrimination.

- **As technology becomes simpler, soft skills are growing in importance.** Employers predict that programming skills will become less critical, while emotional intelligence, problem-solving, and the ability to work across teams is becoming more desirable. Exposure to business processes is a value add.

- **Major technology companies see value in partnering with an ethically- and socially-focused higher education program.** Participants see internship opportunities focused on product development and client strategy sessions as areas where students can participate. One respondent suggested that a program like this should consider developing an industry-standard ethical decision-making framework in AI to serve as a leader in the field.
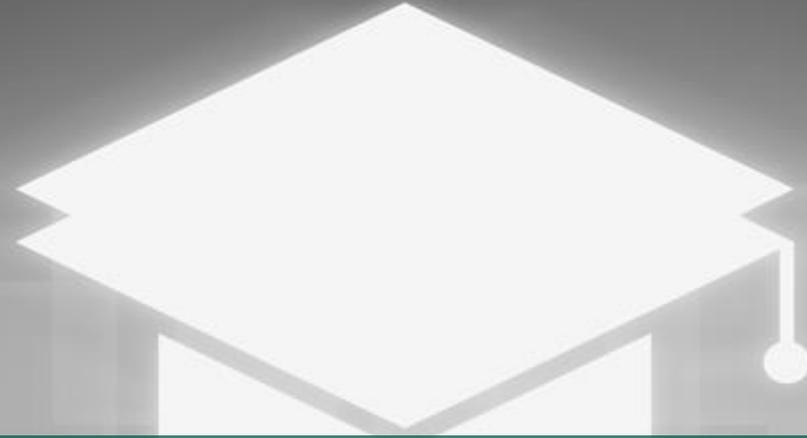
AI INDUSTRY TRENDS

"

[AI is being used now for] a lot of process automation. So I usually tell people the first place to look for AI as a solution is where your largest sources of waste are.

-P2, AI Architect

AI HAS BEEN WIDELY INTEGRATED ACROSS ALL MAJOR INDUSTRIES

Technology professionals share that Artificial Intelligence is being adopted for use in a **variety of different industries** and market use cases to leverage company data.

Machine-learning models, in particular, are being utilized to guide product development, develop predictive models, and increase the efficiency of automated processes.

Participants also highlight **Internet of Things (IoT)** and **Blockchain** as growing trends within the AI space.

*"We are seeing a lot of machine-learning models push the edges for **drones**, small cameras with operating systems for **public safety**. Hurricane recovery, we are seeing a lot of **disaster response**. (...) We are already doing data centers **under the ocean**, but now we are looking at doing some predictive analytics and custom vison models on **satellites**."*

-P2, AI Architect

IoT, is going to be very important *(…) IoT and all the data it captures is what feeds and makes the AI more powerful.*

–P9, Marketing Manager

COMPANIES ADOPT AI TO MAGNIFY BUSINESS IMPACTS AND REVENUE

*"A change of sorts in different companies is to **leverage AI technology** to see if it can help generate some **business opportunity or revenue.** They don't have knowledge, but know it's the way to go."*

-P4, Software Engineer

" AI technology is seen by many companies as a strategic asset; or, a way to more effectively **gather, manage, and make decisions using data** that is vital to maintaining and growing business.

*"There are a variety of tools that make our job easier when it comes to **tracking metrics and analytics for specific KPIs**. Before there was a lot of manual guesstimating, but now there are a lot of tools that can scrape the internet and **AI-powered tools that help people scale their work**."*

-P3, Manager

" AI has **simplified many of the traditional ways** that companies track vital metrics and helps businesses see trends sooner and adjust strategies accordingly.

CLOUD-BASED SYSTEMS ARE BECOMING THE INDUSTRY STANDARD

While major tech companies build their own systems, most companies rely heavily on **cloud-based AI systems to reduce the costs** associated with on-premises analysis.

Companies prefer a hybrid cloud model that allows for both private and "public" cloud use to protect sensitive and proprietary data while still allowing for integration.

*Most companies are constantly switching around and looking for the best [cloud service]. Maybe something is better in Amazon and another is better for them at Microsoft. **Data processing on-prem is rapidly going away**.*
-P2, AI Architect

*Major tech companies provide the AI service with a **hybrid cloud** (...) so if a company has some data that needs to be secure, you can put that into private cloud.*
-P4, Software Engineer

EMPLOYER NEEDS ASSESSMENT

COMPANIES ARE CATCHING UP TO ETHICAL CONCERNS WITH AI

Rapid Early Adoption...

Companies were eager to adopt AI and machine-learning as a way to improve their ROI, but bypassed many of the potential problems associated with gathering, storing, and analyzing customer data.

*"There's a lot of **hype about AI**. Everyone has been trying to jump on the AI and machine-learning bandwagon **without fully understanding the implications** with respect to either **ethical, social, or legal concerns**."* -P6, Designer

...is a Growing Concern

As AI becomes more widespread and integrated in business practices, customers and governments are more aware of and concerned with how personal data is used and monetized by various companies.

*"We are seeing a lot of customers come in with ideas of what they want to do and most of these things we can do with AI are **not going to be implemented** because the **legal and government** has caught up a bit."* -P2, AI Architect

CONCERNS CENTER ON AUTOMATION, PRIVACY, & DECISION-MAKING

Job Automation / Loss
Employees are anxious that the use of AI to help automation will lead to the loss of their jobs, particularly in factories and customer services.

Data Privacy
Customers often consent to give up some rights to data, but rarely understand how it is used and who has legal access to their information. This is a growing concern as large companies absorb smaller ones and acquire access to their data.

AI Decision-Making
The applications of data use are often fraught with problems or biases that can negatively impact lives, like misidentifying race or gender.

> *Companies are beginning to use AI to automate, replace, and **cut down the headcounts** and that is having a big negative impact.*
> -P6, Designer

> *Large companies are gathering information from us **whether we know it or not** and using that data for other means.*
> -P1, Designer

> *Is it okay that police use facial recognition software, but it's not 100% accurate? **There's a huge risk of somebody being wrongly accused.***
> - P2, AI Architect

SHIFTING FOCUS FROM SOLUTION CREATION TO IMPLEMENTATION

As ethical issues around AI become more visible and more concerning, participants indicate a need to implement **decision frameworks early in the product development process** to consider long-term social and ethical implications.

66

*It is not just coming up with a solution, but actually helping us implement the solutions (…) What's **not sometimes clear to me is if a solution is well thought out at all levels before even being developed**. Many times, all we are looking for is a business case, will we make a profit or not. But (…) I've not met too many engineers who understand how to take a solution - an AI solution - and then understand what are the ethical, legal, and social impacts on that solution.*

-P6, Designer

66

*[Employees need] a decision framework or an **understanding of the question to ask** around ethical AI implementations and kind of common pitfalls that we see*

-P9, Marketing Manager

INCREASED AUTOMATION HIGHLIGHTS NEED FOR HUMAN ELEMENT

Participants predict that as machine learning takes over easier tasks, more time will be spent on **integrating 'human skills,'** such as empathy, into technology.

While certain tasks can be completely automated, AI will create more opportunities for **human – computer interaction,** including how machines are trained to make decisions.

*[Functions like data aggregation], that's something that AI will be able to do. We will spend more time on making decisions, on creating relations with customers, on things related to creativity, on **things related to collaboration, empathy. Those kind of skills are more human skills**. Those are the ones that we need to increase.*

-P8, Director

*A lot of people think artificial intelligence takes over what humans do and contribute, that's not necessarily the case. In order **for any artificial intelligence platform or strategy to be successful there has to be human interaction** in place. And the challenge customers are trying to find now is what that balances is.*

-P7, Data Specialist

U.S. LAW LEADS TO CONFUSION OVER COMPANY DATA RESPONSIBILITIES

*"**Europe is way ahead of the U.S. when it comes to handling data** – data mapping, data security, anonymity – If it's okay that somebody says, 'Yes, you can take a picture of my face.' Now, what do you do with the data and how do you implement that? (...) **What's the liability** on the provider side? There's a lot of **confusion** over where a lot of this **responsibility** lies."*

-P2, AI Architect

Tech companies are interested in addressing customer and government concerns over data use, but have **trouble interpreting outdated or non-existent U.S. laws** about data collection and use.

As the field of AI grows, participants predict **increased attention and regulation**.

Several respondents note that **European data laws derived from the UN UDHR are clearer,** and they are interested in hiring **candidates with the legal answers to ethical questions** specific to AI utilization in different regions.
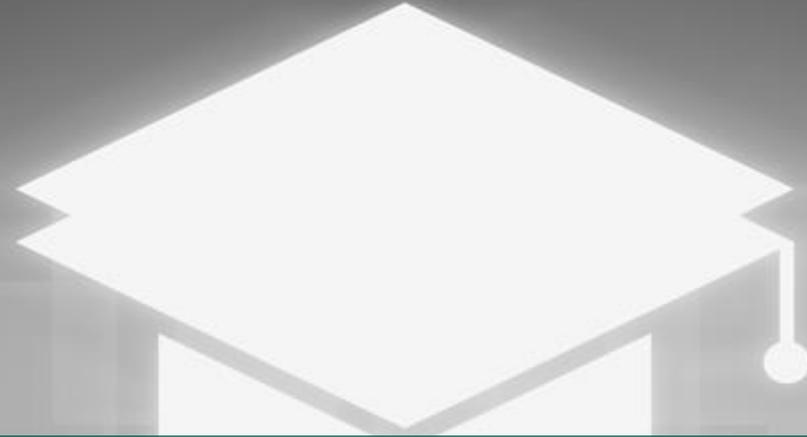
SKILL NEEDS AND GAPS

" We are looking for people who are passionate about the things that we do as a company, if they have good problem-solving skills, and that they do not give up.

-P4, Software Engineer

SOFT SKILLS LIKE PROBLEM-SOLVING ARE PRIORITIZED

Due to the rapidly evolving nature of AI, employers emphasize soft skills that will stand the test of time.

Prospective employees must be critical thinkers, able to identify a problem and persistently search for a solution.

A prospective employee needs to be able manage ambiguity and adjust to new understandings of the field.

Problem-Solving Skills	Adaptability
Passion	Team-Oriented

Employers look for candidates who are passionate about the company, industry, and the AI field in general.

Employers value collaborative employees who can coordinate across teams and are open to new ideas.

PROGRAMMING SKILLS WILL BECOME LESS ESSENTIAL IN THE FUTURE

*I think as we see the technology evolving, **you no longer, surprisingly enough, need programming skills** in things such as Python (…) in order to do a machine learning or AI application.*
-P5, Marketing Manager

*[It's] always about that **concept of accessibility and transparency, accountability, fairness, security, privacy** (…) they need to be very deep in those topics to understand exactly what are the implications.*
-P8, Director

Employers anticipate that knowledge of programming languages, such as Python, will become less relevant in the long run.

As AI solutions become simpler to design, employers will place a greater emphasis on a more comprehensive understanding of the AI landscape, including social and ethical implications.

HR | EMPLOYER NEEDS ASSESSMENT

ABILITY TO EXPLAIN TECHNOLOGY IS A GROWING NEED

Due to the nature of some AI algorithms, employees oftentimes create solutions without having a true understanding of how they actually work.

"

*We are looking for skills like software skills where you understand how to implement these algorithms and also good presentation skills and **ability to sell the solution to an audience** (…) what ends up happening is when you go to some customer, **they are a little hesitant to even use the solution** (…) they do not trust these solutions.*

-P6, Designer

Participants say they need employees who can **explain AI solutions to help sell them to clients and build trust** around their usage. As concerns around the ethics of machine decision-making grows, this skill will be increasingly valuable.

"

*Those applications will need to be explainable (…) So one skill is being able to create those models. But the second is those people that will focus on having a repository of all those algorithms, **understanding exactly how they were, why they were designed or where they are designed**. (…)[that's] extremely important because, at some point, people will **need that level of understanding of the algorithms to trust them.***

-P8, Director

HR | EMPLOYER NEEDS ASSESSMENT

INCREASED INDUSTRY COLLABORATION REQUIRES A BROADER SKILLS BASE

The skillset of an individual is starting to have to broaden a lot faster. **The markets eventually are becoming more joined.** *It creates this unified platform for analytics.*
-P5, Marketing Manager

[Data scientists] **need to be able to work across all three clouds** *- Google, Amazon, and Microsoft - because most companies are constantly switching around and looking at the best way to do that.*
-P2, AI Architect

Prospective employees will need to become adept at multiple skillsets and cloud platforms.

Previously, employees could specialize in siloed analytical functions, such as data warehousing or Adobe systems. Now, due to increased coordination between these different areas, prospective employees will need to broaden their skillsets.

Employees will also need to be familiar with multiple cloud platforms across **Google**, **Amazon**, and **Microsoft** as companies are increasingly using all three.

TECHNICAL CERTIFICATIONS MAKE CANDIDATES STAND OUT

Some big tech companies are **dropping requirements for undergraduate credentials.** Roles not requiring specialized training (e.g., data engineering) may not require accredited degrees.

> Two of the big tech companies (…) recently just dropped college requirements (…) it is less about formal education than it is about your **willingness to locate the problem and to remedy it** no matter what.
>
> -P1, Designer

Industry or technology-specific **certifications can give candidates more credibility** than a standard computer science degree and help them to stand out. Certifications may come from educational institutions or companies like Amazon or Google.

> I look for some industry certifications in whatever technology I'm hiring for (...) they really stand out to me.
>
> -P5, Marketing Manager
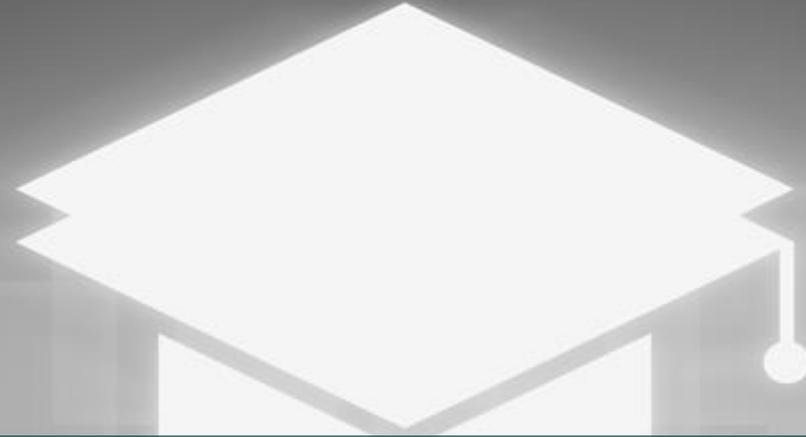
CURRICULUM
AND PARTNERSHIPS

> "I think we need special courses. I think there needs to be really vertical hold in courses on the major components of artificial intelligence. That way there's just a general understanding.

-P3, Manager

ALL PROGRAMS SHOULD INCLUDE A BACKGROUND IN AI TECHNOLOGY

" *I think you need to **introduce AI 101** something like that. And then you can introduce some more **intermediate or advanced course about the AI impact on society**, something like that. I would see that maybe more of a **logical step**.*"

-P4, Software Engineer

" *We also need to make sure that **every other kind of degree includes a little bit of the AI 101**, let us say, and ethical AI 101. They need those kind of skills everywhere.*"

-P8, Director

Employers indicate that any program dealing with AI, especially one focusing on ethical implications of AI, should include **foundational courses on the history and development of AI.**

Foundational knowledge is generally helpful for job candidates, but invaluable when moving on to discuss the **ethics of specific uses of AI** within a company.

Students need to have the training and knowledge to **make decisions about AI that are justifiable** to both technically and non-technically literate audiences.

AI MUST BE CLEARLY DEFINED ACROSS AND WITHIN SPECIFIC INDUSTRIES

When we talk about artificial intelligence they should understand the different-- what artificial intelligence means because (…) now artificial intelligence is kind of a marketing term. **It can be a broad umbrella.** *So it's implemented in different ways and it's being used in different ways. So* ***understanding the main use cases of artificial intelligence, the potential it has across industries.***

> -P7, Data Specialist

General clarity given how much AI has been used as buzzwords, that's one piece. Secondly, this might be specific to how [our company] is thinking about AI, but we are increasingly thinking about AI (…) from an industry lens, just because **AI is not necessarily one size fits all, and the models are unique**.

> -P9, Marketing Manager

Several participants highlight the fact that AI has been used as a 'buzzword' and stress that program graduates must have a solid understanding of what AI means, and the contexts in which various models and use cases are employed.

One participant recommends incorporating real-world case studies into a curriculum, **including ethical failures and how these were addressed.**

CURRICULA NEED TO COVER ALL ASPECTS OF DATA MANAGEMENT

Data Integrity

Employers think that courses should provide a firm understanding of the **best practices of data collection and management** to provide the best quality data and AI machine learning models.

> "If we want the machine learning to run as we expect, **we need high-quality data**. And data that integrates all the information within the organization. Data that is managed as a **single asset within the organization** and then we can build models on top of it."
>
> -P8, Director

Data Modelling

Courses should include **in-depth coverage** of different types of data models, data modelling processes, modelling methodologies, and their use cases in a business environment.

> "I see areas where there is a lack of trained data scientists. The **data scientists are really critical** to implementing AI solutions. And there are not enough so companies cannot implement them (...) **data science training is very valuable**."
>
> -P9, Marketing Manager

AN UNDERSTANDING OF BUSINESS PROCESSES GIVES A HEADSTART

> " *You need to understand the business process, right? (…) Because ultimately, the solutions that we provide within AI are **going to impact an organization and how they run their business**, right?*
> –P10, Marketing Manager

> *I think **understanding how to translate business needs and socioeconomic needs into how is this going to be paid for** because none of this is free (...) So just being able to take a **real business problem** and **build a model** around it, **deploy it**, and then kind of **monitor** that over time, see how it goes.*"
> -P2, AI Architect

Employers share that **programs that offer students experience with business processes** are extremely valuable. Candidates are the most attractive when they can **implement ethical AI models within a traditional product development process** and increase company revenue.

Programs can provide this training through **internship placements or with unique courses**.

CURRICULA SHOULD TEACH RELEVANT LAW AND REGULATIONS

"

Folks need to understand what laws are planned forward and what laws are getting in place to help monitor artificial intelligence.
                                        -P3, Manager

The ability to work with our lawyers, knowing when to kind of raise your hand and say, "I'm not sure this is okay," the ability to be patient and make sure that your models are using the right data set.
                                        -P2, AI Architect

Employers emphasize that prospective employees should be **aware of laws and governmental regulations** surrounding AI, and stay up-to-date on policies and regulations as they continue to emerge.

AI employees should also be able to **converse and coordinate with lawyers** when developing AI solutions or models.

TECH COMPANIES PARTNER FOR RECRUITMENT, INTERNSHIPS, & RESEARCH

"

*We have **internships** that we offer. We also have graduate programs and undergraduate programs that they hire for as far as right out of school.*

-P7, Data Specialist

We have partnerships with many universities on all kinds of areas. From telecommunications related to basic sciences, to AI, ML, and so on.

-P6, Designer

Employers' primary form of partnerships with universities are internships.

Other forms of partnerships include providing financial support for academic programs in the form of research grants and donations.

SOME TECH COMPANIES PROVIDE THEIR OWN TRAININGS

" *We have our own higher education program as well so we actually provide our own courses and webinars as well too. We also do a lot of products meetings with a lot of colleges out there to help aid their research.*

-P3, Manager

We're offering that kind of online course for free for more kind of business side as well as a lot of technical MOOCs for technical people that want to learn how to develop AI applications and AI machine learning models.

-P6, Designer

In addition to partnering with higher education institutions, major tech companies themselves provide courses and certifications on technical and business trainings.

Companies may partner with institutions or companies to provide upskilling or reskilling programs to ensure that current employees are equipped with necessary skills within an evolving landscape.

OPPORTUNITIES FOR ETHICS-FOCUSED PARTNERSHIPS

*There may be some kind of a technology initiative which you envision to be deployed in a mass way. And **a student or a group of students really could help understand or analyze this initiative,** and the solution (…) So that if there is a lot of negative impact in those areas, then maybe the initiative itself would be either stopped or modified accordingly.*

-P6, Designer

*As far as the internship, I think what would be helpful for us is when we're in these meetings it's always good to kind of understand what the customer's visions are (…) it would be helpful when we're trying to **prepare for customer meetings and proposals.*** -P7, Data Specialist

Participants see potential for internships with an ethically-focused program, envisioning student participation in **product development meetings and strategy sessions** that think through client perspectives and long-term impacts.

One participant also highlights the possibility of a '**thought leadership' partnership** for companies and universities to work together in developing AI decision frameworks, etc.

Maybe there's a reality where if that institution became a thought leader around ethical AI, maybe some sort of a partnership could be struck (...) and have an ethical AI decision framework that we created or something that we apply
-P9, Marketing Manager
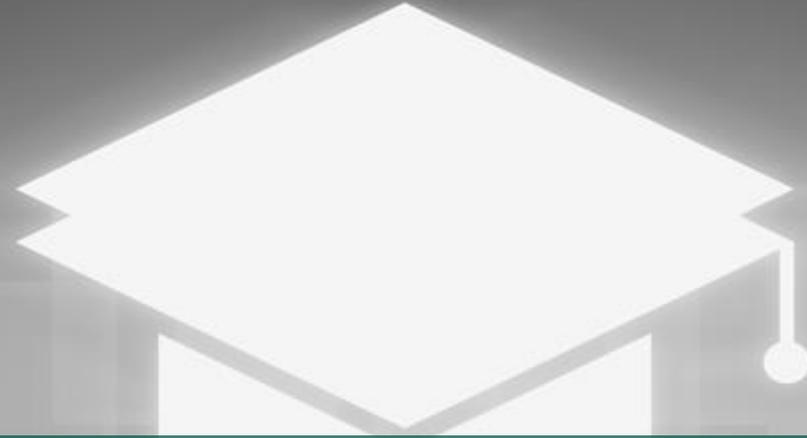
APPENDIX

PARTICIPANTS

P#	Title	Company
P1	Designer	Anonymous
P2	AI Architect	Anonymous
P3	Manager	Anonymous
P4	Software Engineer	Anonymous
P5	Marketing Manager	Anonymous
P6	Designer	Anonymous
P7	Data Specialist	Microsoft
P8	Director	Microsoft
P9	Marketing Manager	Anonymous
P10	Marketing Manager	Anonymous

Companies Contacted:

Accenture
Adobe
AliveCor
Amazon
Dataiku
Facebook
Google
IBM
Intel
Lenovo
Microsoft
MoTek

Nara Logics
Nokia
NuTonomy
NVIDIA
Panasonic
Pinterest
Samsung
SRI International
Uber
Wells Fargo
Workday

CONTACT:
David Sale
Content Director, Higher Education
202.559.0032
dsale@hanoverresearch.com
www.hanoverresearch.com

HANOVER RESEARCH