Michigan Tech

MAGAZINE

#!

Artificial intelligence and machine learning are here to stay. Beyond your Netflix queue, they affect who hires you, whether you get a loan, where you shop (if you get that loan). What do these human-made equations reflect back to us? And how do humans remain in the driver's seat?

BIAS IN THE ALGORITHM

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REGULAR FEATURES

Comments to the editor: magazine@mtu.edu

Website: mtu.edu/magazine

Dream Jobs submissions and mailing address changes: alumni@mtu.edu

Michigan Technological University is an equal opportunity educational institution/equal opportunity employer, which includes providing equal opportunity for protected veterans and individuals with disabilities.

From the lab to the lake. A Prince's Point sunrise is one of Michigan's natural wonders—and Huskies can 3D print the paddles to get there.

ANATOMY OF...
A SMART JET SKI

Researchers at Michigan Tech's Marine Autonomy Research Site (part of the Great Lakes Research Center) are making a jet ski into an autonomous surface vehicle (ASV).

The remote-controlled ASV captures vessel motion data and records a navigator's prescribed maneuvering strategies to maximize vessel stability in rough seas. This jet ski also enables researchers to explore advanced environmental sensors to develop next-generation autonomous control systems, capable of making navigation decisions like an experienced driver. Take a closer look at the sweet ride.

mtu.edu/mobility

TIME FROM 0 TO 30 MPH

1.5 SEC*

MAIDEN VOYAGE

AUGUST 10, 2018

SIZE

140" LONG, 50" BEAM
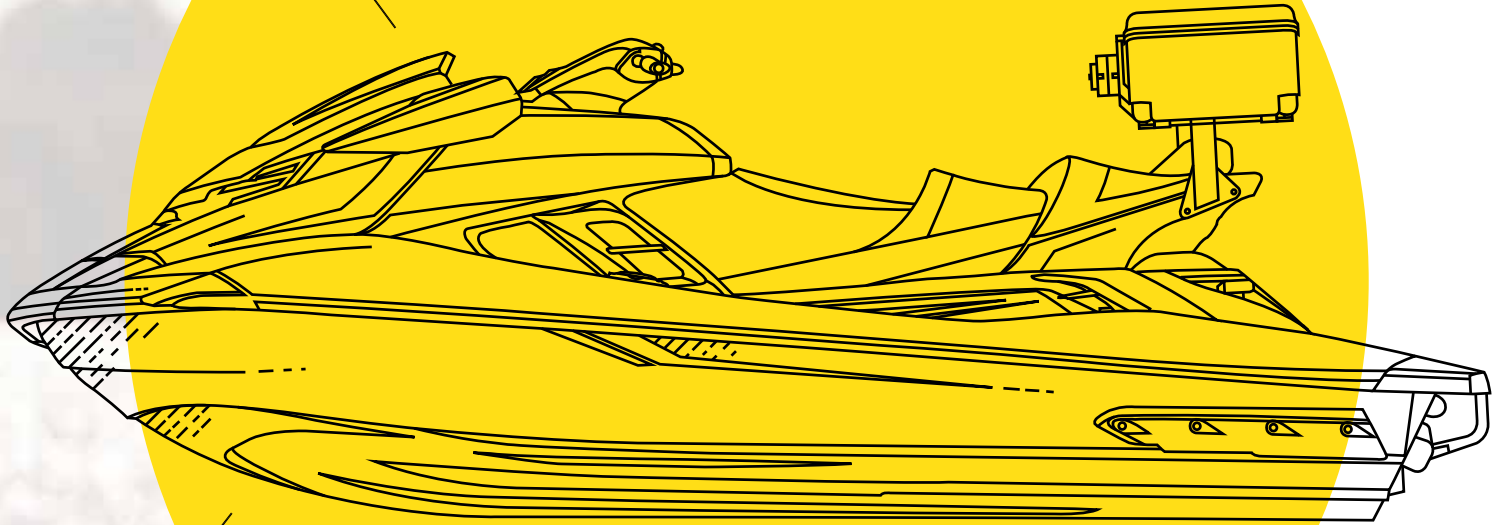
WEIGHT

820 POUNDS

MAKE AND MODEL

YAMAHA WAVERUNNER FX SVHO CRUISER

(1.8L SUPERCHARGED, 4-CYLINDER, 4-STROKE, SUPER VORTEX HIGH OUTPUT MARINE ENGINE, DISPLACEMENT: 1812CC)

TOP SPEED

70 MPH

CUSTOM UPGRADES

Servo actuated dual steering cable** (under rear seat)

Custom Chart Plotter mount with side-scanning sonar and GPS mapping capabilities

Aluminum electronics mount supports a pelican waterproof case that contains the computer/navigation system

2 INSTRUMENT MASTS

Bow and stern: the latter includes cameras and a navigation light, and both masts have GPS receiversa

3 EMERGENCY STOP METHODS

FRICTION BREAKAWAY SYSTEM

Prevents large forces from separating the stern mast from the WaveRunner in a rollover event and causing damage to the vehicle

* When remotely operated, the ASV is kept below planing speed (roughly 10 knots) for safety, but the extra power helps the jet ski respond quickly and have sufficient power to make precise maneuvers in rough seas.

** Added adjustment points allow for quick changes of steering cable trajectory and actuation distance; secondary steering cable allows a human operator to manually steer the jet ski.

MASTER MINDS
BUILD THE FUTURE

ONLINE PROGRAM— MASTER OF SCIENCE IN CIVIL ENGINEERING

Master Minds spotlights one of Michigan Tech's 43 master's degree programs.

Aging infrastructure—from Michigan to Madagascar—needs engineers to design, build, analyze, and execute civil and structural engineering projects. Our 100 percent online Master of Science in Civil Engineering (MS CE) consists of 10 courses taught by licensed professional engineers with field and industry experience.

Designed for working engineers, Tech's program covers topics like seismic design and new energy compliance. Key areas include examining structural dynamics and materials while digging deep into building codes to create safe and sustainable infrastructure.

An online civil engineering degree from Michigan Tech prepares engineers in as few as five semesters. *College Census* named Michigan Tech one of 50 online colleges with the best return on investment in 2019. The MS CE program is coursework-focused; it's intended to advance students' present and future careers.

Our program builds on students' existing professional knowledge, says Audra Morse, professor and chair of civil and environmental engineering. She adds that the program "allows professional working engineers to enhance their knowledge and skills, without having to take a break from their working life."

Just like other Michigan Tech academic programs, this degree program combines academic excellence with professional development: Our programs are nationally recognized for academic rigor, graduate employability, and value—*US News & World Report* ranked eight Michigan Tech graduate programs in the top 100 in the nation—including civil engineering.

Current students and alumni can also get help from Michigan Tech's Career Services, which helps hundreds of Huskies land jobs, co-ops, and internships every year.

Visit mtu.edu/cee/graduate/civil

HUSKIES IN THE CROWD: EMILY BYRD

Emily Byrd became the second All-American in Michigan Tech women's cross country program history at the 2018 NCAA Division II National Championships.

THE GRADUATE: FIRST PHD IN INTEGRATIVE PHYSIOLOGY

Matt Kilgas '13 '18 is the first graduate of the integrative physiology PhD program in the Department of Kinesiology and Integrative Physiology (KIP). The graduate program launched in fall 2017 under the leadership of Jason Carter, founding chair of KIP and now associate vice president for research development, and Steven Elmer, assistant professor and graduate program director for KIP—and Kilgas' advisor.

"Matt's graduation marks a major milestone for the KIP department," Carter says. "When we established the department 13 years ago, we envisioned a highly research-active department that would ultimately be capped off with a strong doctorate degree. Our faculty, staff, and supportive administration deserve the credit for their persistence and steadfast commitment to that goal."

Kilgas' graduate research focused on how partial restriction of blood flow to exercising muscles can improve health and enhance performance. He began a tenure-track faculty position in the School of Health and Human Performance at Northern Michigan University in fall 2018.

Visit mtu.edu/gradschool/programs/degrees/integrative-physiology for information on the PhD program in integrative physiology.

POWERED BY PUBLICS

Earlier this year, Michigan Tech partnered with more than 100 public research universities and systems to increase college access, eliminate the achievement gap, and boost postsecondary attainment. The collaborative effort, known as Powered by Publics: Scaling Student Success, is organized by the Association of Public and Land-grant Universities. Participating institutions work within "clusters" of four to 12 institutions to implement innovative and effective practices to advance student success on their campuses. Michigan Tech is in the tech cluster. Provost Jacqueline Huntoon and Dean of Students Bonnie Gorman serve as the University's liaisons.

Powered by Publics represents the largest ever collective endeavor to improve college access, advance equity, and increase college degrees awarded. In addition to committing to those goals, participating institutions have pledged to share aggregate data demonstrating their progress to help spur lasting change across the higher education sector.

"Michigan Tech has wonderful programs, faculty, staff, and facilities—we have a lot to offer our students," Huntoon says. "Students who have the opportunity to study at Michigan Tech are well-positioned to enter the workforce and enjoy a fulfilling and high-paying career. I am excited to share our best practices and learn from other institutions about their efforts so that we can attract and serve a broader segment of the population than ever before."

MEET HUSKY-BUILT OCULUS-ASR

First nanosatellite deployed from the SpaceX Falcon Heavy

Weighs 150 pounds

Orbits 180–2,000 km above Earth on a nine-month mission to calibrate telescopes

About the size of a mini-fridge

DEEP DIVE

Great Lakes Research Center's advanced technology pinpoints historic shipwrecks.

Nearly every time researchers at Michigan Tech's Great Lakes Research Center (GLRC) deploy side-scan sonar on the Keweenaw Waterway, something previously undiscovered is revealed. In spring 2018, researchers were taking out-of-town visitors on a waterway tour aboard the Research Vessel *Agassiz* when the EdgeTech Tow Fish sonar pulled in a larger-than-usual real-time image on the pilothouse display screen. Further investigation revealed one of the most pristine shipwrecks ever discovered between Keweenaw and Thunder Bay, Ontario (hull paint colors still visible, ship's wheel and bell intact). The latest discovery illuminates new challenges inherent in technological expansion, particularly because marine artifacts that do not lie on Great Lakes bottomlands aren't protected by the state or federal laws that govern submerged cultural resources in the Lakes proper. Determining ownership, and how to best preserve historic artifacts, can be as murky as Michigan's turbid inland waterways. Documentation of the find continues by Michigan State Police.

The trajectory of the mission is clearer but no less mysterious on the Big Lake this summer, as GLRC launches the hunt for two of Lake Superior's most elusive shipwrecks, the World War I era French minesweepers *Cerisoles* and *Inkerman*. The 141-foot vessels, built in Thunder Bay, Ontario, as the last in a fleet of 12 built for the French government, met their fate a century ago in a November gale, claiming a combined crew of 79, the largest loss of life in Lake Superior maritime history. Last spotted off the tip of Keweenaw Peninsula, the ships were reported missing on their maiden voyage when the third ship in the flotilla reached Sault Ste. Marie.

In addition to side-scan sonar, underwater robots and crowd funding are a vital part of the deep-water search, which is based out of Copper Harbor, Michigan, and began in spring 2019. The project is funded through $12,500 in donations raised via Michigan Tech's Superior Ideas crowd funding platform.

Check out superiorideas.org

The 36-foot *Agassiz*, a floating laboratory equipped with side-scan sonar, leads the expedition.

CARESOFT GLOBAL GIFTS MULTIMILLION DOLLAR TECHNOLOGY

In January, engineering solutions company Caresoft Global gifted to the University a software and data program that allows students to gain actionable intelligence and insights behind some of the leading path-breaking vehicles in the world today. The ground-breaking automotive benchmarking technology has a commercial value exceeding $3 million, and Michigan Tech is the first in the nation to introduce and include the software and data program in its mechanical engineering curriculum.

"The fact that Caresoft chose Michigan Tech to be the first university in the country to implement this software demonstrates the world-class reputation and research of both our mechanical engineering department and the institution as a whole," says Janet Callahan, dean of Michigan Tech's College of Engineering. "We are honored by Caresoft's generosity and look forward to building our relationship with the company for many years to come."

Read more at mtu.news/2DEVNge

ISLE ROYALE WINTER STUDY: NEW WOLVES, RADIO-COLLARED MOOSE

Michigan Tech's 2019 Isle Royale Winter Study focuses on the implications of newly introduced wolves and the movements of newly collared moose.

Fifteen wolves, 2,060 moose. Extensive ice and deep, powdery snow. In its 61st year, the annual Winter Study report is the longest-running examination of a predator-prey relationship in the world.

The report chronicles a research expedition to the island, where researchers track—by ski and plane—wolves and moose, and catalog the cascading effects of an ecosystem that has lacked a healthy population of apex predators for a number of years.

Prior to the wolf reintroductions, the wolf population on the remote island had remained at just two—a strongly bonded, but also highly inbred, male-female pair—for three years. The moose population, lacking predation, expanded by an average of 19 percent each year during the past eight years since 2011, when the wolf population first dwindled to fewer than 10.

The National Park Service (NPS) introduced four Minnesota-born wolves. In late October, the male wolf died; in January, one of the female wolves left the island by crossing the ice bridge that had formed on Lake Superior, which reached nearly 95 percent ice cover.

During the winter, NPS, in collaboration with the Ontario Ministry of Natural Resources and Forestry, introduced 11 Canadian-born wolves. There are now eight males and seven females on the island.

Researchers fitted the first GPS-enabled radio collars since 1985 to the newly introduced wolves and 20 moose. The collaring efforts are part of a collaboration with University of Minnesota College of Veterinary Medicine, NPS, and Grand Portage Band of Lake Superior Chippewa.

Collaring the moose will also help researchers understand the effects of predation, as well as other factors that influence the moose population, including forage abundance, parasites, and climate.

"This summer should likewise prove valuable in determining the trajectory of both wolf and moose populations. This is definitely a notable year," says Rolf Peterson, research professor.

Indeed, there is a sense of renewal in this year's report. For the first time in 10 years, the researchers spotted fresh wolf tracks at Windigo, located on the southwest end of the park.

H-STEM COMPLEX PLANNING MOVES FORWARD

In December 2018, the Michigan Legislature granted planning authorization for the H-STEM Engineering and Health Technologies Complex (H-STEM Complex). A $44.7 million capital outlay project, the H-STEM Complex will support Michigan Tech's integrated educational programs that apply engineering and science to improve the human condition.

The H-STEM Complex will comprise newly constructed shared and flexible lab spaces, co-located with renovated classrooms and learning spaces in Michigan Tech's Chemical Sciences and Engineering Building. The project request included a proposed $29.7 million in State support, with $15 million in matching funds. The Michigan Tech Board of Trustees approved expenditures in March 2019 to complete planning and design.

THE NEW COLLEGE OF COMPUTING

It's in our cars and our homes. It affects our bank accounts, our highest levels of governance, our grocery shopping routines. Cybersecurity, data science, and artificial intelligence all feed into software. Tomorrow needs people who can integrate digital tools with the demands of the physical world.

On July 1, 2019, Michigan Tech launched the College of Computing—the first and only college of its kind in the state of Michigan—to meet the technological, economic, and social needs of the 21st century.

Our academic programs are grounded in computing, and many can interface with other disciplines in engineering, business, forestry, health sciences, arts, and social sciences. The core programs include:

- computer science (BS, MS, PhD)
- computer networks and system administration (BS)
- cybersecurity (BS, MS)
- software engineering (BS)
- health informatics (MS)

College of Computing research will have both a core and an interdisciplinary component and will closely align with the Institute of Computing and Cybersystems, Michigan Tech's computing-focused research center with membership spanning 14 different academic units.

The College of Computing has a University-wide service mission and will deliver a computing component in general education, create and staff a Computing Learning Center, and share responsibility for new degrees in computing as well as share oversight of the Michigan Tech High Performance Computing Facility.

Find out more at mtu.edu/computing

Rekhi Hall, current home of the College of Computing

TRAIL BLAZERS

Four races run, and a legacy begun. The Mushing Club at Michigan Tech, first of its kind in the nation, is off to a promising start.

"Readyyyy! Let's go!" The air-piercing yips leave no doubt how these Alaskan huskies, straining forward on bootie-clad paws, feel about the starting command. They're ready to run. And so are the human Huskies who harness, drive, feed, encourage, and ensure that four-footed team members stay healthy, safe, and happy.

"They're all different," says chemical engineering major Andrew Watson, "from looks to how they react on the sled. You learn what to look for and what the dogs will do when they have something going on in their heads."

Spring practice at Otter River Sled Dog Training Center.

Watson is a member of Michigan Tech's Mushing Club, co-founded in fall 2018 by fellow chemical engineering major Adam Schmidt and forestry major Claire Hendricks, both seniors. Schmidt, who began racing competitively in 2016 through Otter River Sled Dog Training Center in Tapiola, Michigan, wanted his fellow Huskies to have the same opportunities for personal growth, development, and challenge that he did. Hendricks, whose dad was a musher, was introduced to the sport as a baby.

"I've had some amazing experiences," she says, "like raising 27 puppies, chasing a cow moose with an 18-dog team, and flying down the trail as fast as the dogs could run!"

Schmidt and Hendricks met via a Facebook mushing group; he was asking for tips on organizing a club. Schmidt later introduced Hendricks to Otter River Sled Dog Training Center owners Tom and Sally Bauer, who agreed to host, and the students found their advisor while helping Tom at the 2018 CopperDog in Calumet, Michigan. Event volunteer Nancy Langston, a Michigan Tech professor of environmental history and social sciences, was assigned to their dog team. When she heard about the club, she immediately agreed to advise (and notes that the student executive team has done 99.9 percent of the work).

ONLY COLLEGIATE MUSHING CLUB IN THE NATION

At Michigan Tech's 2018 K-Day celebration, Hendricks and Schmidt signed up 60 students to the new organization. As far as organizers and the United States Federation of Sleddog Sports know, it's one of a kind.

A core group of 15 participates in races, which this year included the Beargrease 40, the UP 200's Jack Pine 30, and both the CopperDog 25 and 80. The majority of members just want to spend time with the 50 dogs who call the center home—an activity that promotes well-being on both sides of the arrangement. "Taking care

Evan Smith

Speed, endurance, and work ethic are part of the Alaskan husky's unique molecular signature.

"MY FRIENDS WANTED TO SPEND THE WINTER SNOWBOARDING, BUT YOU CAN DO THAT ANY TIME THE REST OF YOUR LIFE. HOW MANY TIMES DO YOU GET THE CHANCE TO RACE SLED DOGS?"

Andrew Watson,
Mushing Club member

of the animals and nurturing them is the first step. We'll have as many as 25 at a time scooping poop, putting straw in houses, and working on hardware," says Tom Bauer.

Tom met Schmidt, who'd dreamed about running a sled since elementary school, at a Michigan Tech Outdoor Adventure Program session.

"He asked for an internship. I designed the program," Tom says. Schmidt scored another internship, in his degree major, the following year. When he returned to Michigan Tech, he went back to the training center with a goal in mind: "He wanted to run in the CopperDog," says Tom, who helped Schmidt train for the 80, an 85.4-mile, two-stage, eight-dog race.

Tom lent the club his trailer and went along to coach the first race, the six-dog, roughly 35-mile Beargrease 40 in Duluth, Minnesota. "Traveling is a whole lot different than the dog yard," he says. The team was self-sufficient for the second race, the 26-mile, six-dog Jack Pine 30, held in conjunction with the UP 200 in Marquette. "They mounted the boxes in the U-Haul truck, did the vet check—everything all on their own," he says. He entrusted them with his beloved dogs.

"They earned that trust with the hours and hours they spent out at the kennel."

"The hardest part is probably the physical aspect," says Watson, who drove in the club's first race at Beargrease. "You need to run up hills in full snow gear. You need to bend down at awkward angles to harness and handle a lot of dogs. At the end of the day you're exhausted."

GRADUATING HUSKIES LEAVE A LASTING LEGACY

Both Hendricks and Schmidt are grateful for the chance to share their sport in a sustainable form that's designed to endure when their time at Tech is over (Schmidt graduated in May; Hendricks is a couple of credits away from her degree).

"I'm really proud of our student mushers and how they handled themselves," Hendricks says. "They were able to get a taste of what mushing is about and I hope some of them will take the next step and move to a kennel to get the full, real experience where the dogs are your life and that's all you talk about!"

Schmidt says safety and fun were the main goals for the first season. "It takes a lot of time and motivation, especially dog care and training, while doing school work. I feel a great sense of pride in the way they take care of the dogs—they understand

that a race is about working with the dogs to get to the finish line safely," he says.

The group plans to expand activities next season to include more volunteer work and events at local schools (this year the club offered sled rides to Winter Carnival visitors). "There is so much potential that they are ready to go after," Schmidt says.

HUSKIES SUPPORTING HUSKIES

Michigan Tech and the Keweenaw are as tightly knit as sled dog racing participants and supporters, so it's no surprise that many team expenses were covered by community contributions. In addition to Undergraduate Student Government funding allocations that are provided to the more than 220 official Michigan Tech student organizations, the Alumni Board of Directors donated. Local businesses Swift's True Value Hardware and Surplus Outlet covered two race fees. Some of the gear used in the 2019 CopperDog was lent by other mushers.

"This CopperDog was special for me," says Schmidt. "The communities are so supportive, and the students are engaging with other mushers. Tom (Bauer) won the Sportsman Award this year for expanding the sport, donating his time for kids' rides and the like, and hosting our teams. I was pretty emotional about it!"

Emotions flow both ways. Tom chokes up when he recalls how—after a fierce late-February blizzard dropped roughly 17 inches of snow on the Keweenaw—students came, unasked, to help dig out the dog yard. Those students included Christian Stevens, a second-year wildlife and ecology management major. "Christian told me this got in his soul," Tom says. "It's been an honor."

Huskies nurture huskies.

BORN TO RUN

Unlike the Alaskan malamute and Siberian husky, which are purebred, the long-legged, deep-chested, winter-hardy Alaskan husky is a mix of many breeds, which may include the former two, and any other that breeders think will produce faster, smarter, highly adaptive racers.

"A lot of them look like mutts," says Tom Bauer of Otter River Sled Dog Training Center. "A lot of breeds will pull naturally."

If you've heard the barking cacophony at the race line, you might think it's sheer excitement. But Alaskan huskies don't just love to run. They're genetically wired to do so, says Bauer. "They're barking because they have to go!"

Animal welfare is paramount. "The best mushers take the best care of the dogs, and form a bond with them," says Bauer. His pack of 50 consumes about 100 pounds of raw beef or chicken daily, along with a 40-pound bag of high-protein kibble. Add eggs and fish meal during racing season, when dietary needs increase to 12,000 calories a day (watch out Michael Phelps!).

RACE RECAP

Beargrease 40
Ben Nicolson team, 4th
Andrew Watson team, 10th

Jack Pine 30
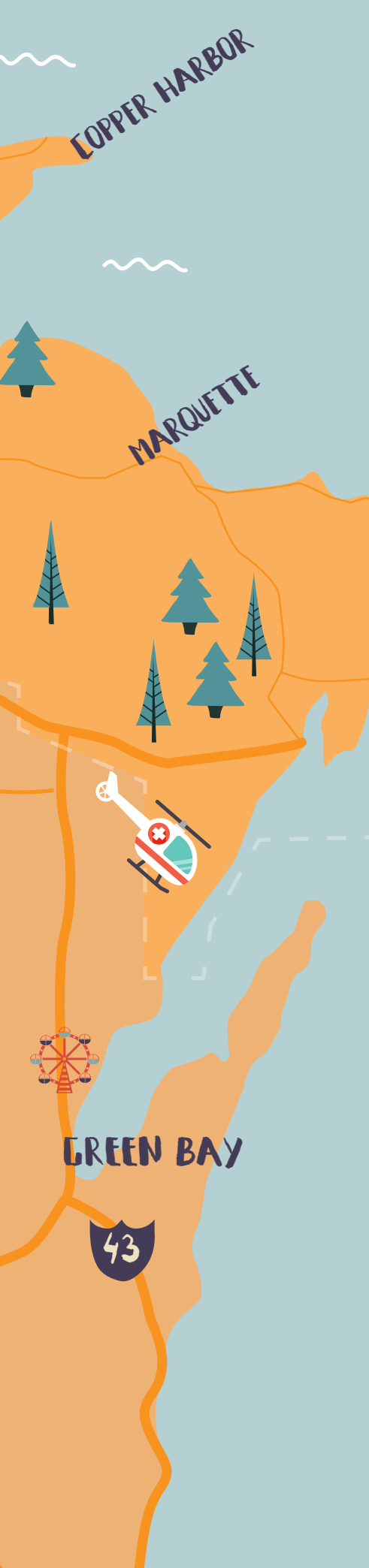Amelia Carusi team, 3rd
Christian Stevens team, 7th

CopperDog 25
Kady Gehrke team, 10th
Ty Longstreet team, 11th

CopperDog 80
Colie Fleming team, *DNF (did not finish, stopped to warm and feed his dogs)*

LAKE SUPERIOR

DULUTH

HOUGHTON

35

2

MAYO CLINIC 380 MI

WAUSAU

WISCONSIN

94

ROCHESTER

90

FIXING THE FRACTURES IN RURAL MEDICINE

There's a scene in the popular medical drama *House* in which the show's namesake is seen scrawling on his left leg with a black permanent marker, "NOT THIS LEG." He's due for an operation on his right leg, and as a doctor himself, he's all too aware that mistakes are made during surgery; he doesn't want the surgeon operating on the wrong leg.

This may seem overly cautious and farfetched, but a 2016 study in the medical journal *The BMJ* found that medical errors, if classified as a disease, would be the third-leading cause of death in the United States behind cancer and heart disease.

To compound what many say is a fractured medical system, it's a recognized fact that rural healthcare in America is up against many challenges. Rural communities face physician shortages and people are often forced to travel long distances. More travel and greater numbers of medical providers increases the likelihood of confused or lost medical records.

Patient misidentification is a leading cause of medical malpractice and skyrocketing medical costs, identified by the Joint Commission of the United States and the World Health Organization. In fact, it is estimated that 33 cents of every dollar in the medical sector is spent on administrative tasks like registration and correcting errors in health records.

Guy Hembroff '98 '16, associate professor in the College of Computing and director of the health informatics graduate program, aims to change that.

"Any type of data exchange between medical providers relies on identifying the patient correctly," Hembroff says, noting that one of the biggest issues is that an individual may end up with multiple record files because of a slight name misspelling.

It's Hembroff's goal to improve patient care and outcomes, particularly in rural areas. To achieve this goal, Hembroff is designing a phased approach that integrates patient care and addresses gaps in care. Using specially developed algorithms, artificial intelligence (AI), wearable sensors, computer vision (training computers to understand our visual world), and image analysis (enhancing or extracting useful information from images), he's rewriting how rural healthcare is administered to help individuals and communities.

UNDER THE UMBRELLA

Hembroff's phased approach includes the development of a global identification algorithm: Unique Medical Biometric Recognition and Enforcement of Legitimate and Large-scale Authentication (UMBRELLA). The algorithm uses touchless biometric identification—fingerprints and secondary biometric verification, such as facial recognition, by using cameras on standard devices like smart phones and laptops—

COPPER HARBOR

MARQUETTE

GREEN BAY

43

HEALTH FACTORS

Health Behaviors	Physical Environments	Clinical Care	Social & Economic Factors

Diet & Exercise	Alcohol, Tobacco, & Drug Use	Healthy Food Security	Isolation	Access to Quality Care	Employment Opportunities	Education	Income

RURAL HEALTH CHALLENGES

LOCAL COMMUNITY

PERSONAL HEALTH LIBRARY INITIATIVE

API-Integrated Health Data for Users	Social Determinants of Health	AI on Digital Health Data	Customized Health Education	Community Health Resources

Virtual Health Societies	Community-Based Participatory Research

Enhanced Health Literacy and Empowerment	Increased Community and Personalized Engagement

Identification of User and Community Needs

IMPROVED HEALTH OUTCOMES

rather than passwords for both patient and provider, which makes medical data more secure. The creation of a unique health identifier ensures that patient records are seamlessly integrated, rather than scattered, and potentially duplicated, between various providers.

"UMBRELLA provides secure identification and authorization for individuals, and feeds into personal health libraries," Hembroff says. "Its architecture provides a solution to integrate a patient's currently siloed digital health data—physical, behavioral, personal—to help ensure a holistic and accurate view of the individual's health, while empowering patients to better self-manage their health."

Hembroff's system puts patients in control of their own health records, and gives patients the power to determine what information they wish to share. In a world where insurance companies, social media companies, and even online shopping portals gather users' personal data, Hembroff's app is a step toward better medical privacy, more understandable interfaces without complicated medical coding, and individual control.

Plus, the approach ensures doctors have all of the information they need to treat a patient—a powerful commodity in a health system where the average amount of time clinical doctors spend consulting with patients is only a few minutes.

COMMUNITY CARE

The second phase of Hembroff's work empowers communities to improve health outcomes by integrating information into community health and safety planning.

Health is more than the results from an annual physical. Health factors include health behaviors, physical environment, social and economic factors, and clinical care. Our medical system focuses on clinical care largely, relegating other factors as less important. However, an individual's environment and social and economic indicators are "social determinants of health," which are responsible for 50 percent of health outcomes, while clinical care is responsible for just 20 percent.

Hembroff's model integrates partnerships and addresses gaps to overcome rural healthcare challenges.

> "THERE'S A BIG ROLE COMMUNITIES CAN PLAY IN THE HEALTH OF THEIR RESIDENTS. CHRONIC DISEASES DON'T OCCUR IN ISOLATION, BUT RATHER ARE CLOSELY AFFILIATED TO AN INDIVIDUAL'S CULTURE, BEHAVIOR, AND ENVIRONMENT."
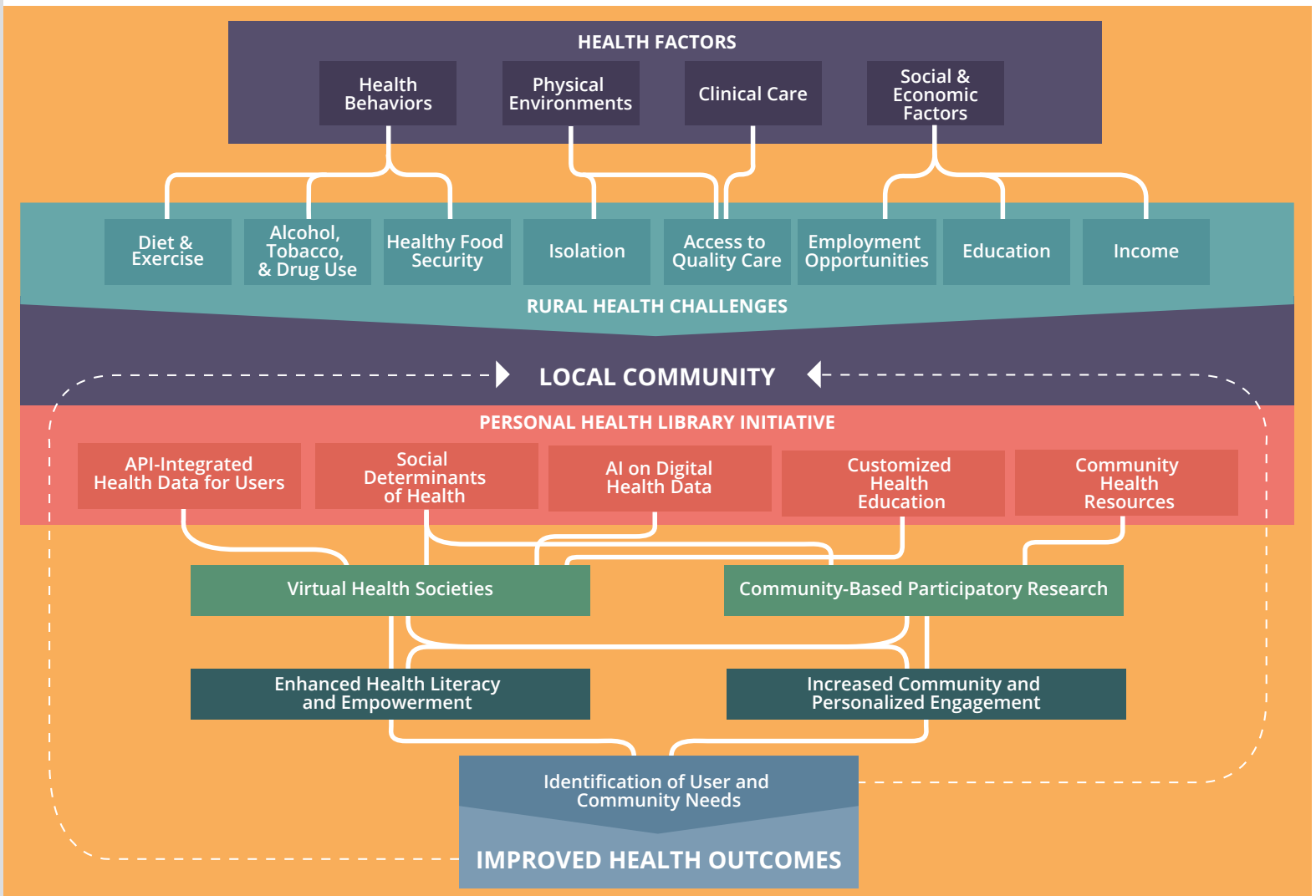
Guy Hembroff,
associate professor in the College of Computing, director of the health informatics graduate program

As an example, if a person can't get in to see a dentist, by the time the person does eventually receive dental care, the care is likely to focus on extracting rotted teeth, rather than on preventative care. Hembroff's integrated model feeds medical information (stripped of personal identifiers) to local health organizations, so communities can collectively improve the social determinants of health. For example, many communities around the country have chosen to fluoridate their water supplies to improve dental health. Another option is to reduce the amount of sugary foods or treats available in schools.

Hembroff is working on algorithms to customize health education and community resources to residents. He gives the example of a person living in a remote part of the Upper Peninsula, working two jobs with weight-related health issues; it could be a daunting task to locate, purchase, and prepare healthy food for their family. Through the person's digital personal health library, preventative education and community-coordinated incentives can be tailored to help find nearby locations to purchase healthy food, explain how to make the healthy meals on a budget, and describe the benefits of doing so. Hembroff's model links users to these resources in the app. But the app can also be used by public programs—police, shelters, food banks—to allocate resources more strategically to community members who need them, wasting less money and creating a culture of community

health and safety as a priority. One community space in particular has a lot of potential.

Nearly 95 percent of Americans live near public libraries, and Hembroff wants to see public libraries become repositories of accessible and reliable health information. Not everyone has access to technology, but libraries are a widely trusted public resource and a place where residents will often go to research different health concerns.

In coordination with community health organizations, libraries are in the position to offer adequate technology access and assistance to those in need. Hembroff hopes community health care professionals could begin holding office hours of sorts at libraries to educate people—a sort of in-person WebMD.

The applicability of Hembroff's work isn't limited to communities bounded by geographic location; his model creates virtual health societies that help people get healthier by interacting with peers. Social isolation, lack of physicians, and inaccessible specialty services are more likely in rural communities than in urban. Virtual health communities are being tested using natural language processing algorithms to identify patterns of user questions and provide validated responses aimed at improving the education and health of those who utilize it.

GOING THE DISTANCE

Phase three, which Hembroff will work on next, integrates secure telemedicine and remote monitoring with AI, to help create a proactive care management approach while addressing gaps in rural healthcare.

Algorithm-assisted medical data scanning can alert providers to potential issues, like potentially harmful drug interactions, risk stratification, disease progression modeling, and precision medicine. Coupled with advanced monitoring applications, such data can shorten the distances between providers and patients to make more frequent visits—the virtual kind—easier and more impactful.

"While there are many challenges associated with rural healthcare delivery, there is a dedicated passion from medical practitioners to improve care delivery and the expense of healthcare in their community," Hembroff says. "If technology is done right, it can help support this passion by overcoming many of the barriers of rural healthcare."

Health informatics graduate students demo mixed reality patient and health records review.

BIAS IN THE ALGORITHM

Algorithms are more than equations. They redefine us.

A few years back, rumor had it that a multinational technology company was making great strides to finalize and implement a computerized hiring tool. Using artificial intelligence (AI), the program scored job applicants on a scale of 1 to 5 and predicted which of the top candidates would be best for the job.

About a year into the tool's development, progress halted when programmers discovered the software was blatantly discriminating against women. Applicants were penalized for graduating from all-women's colleges or even simply using the word "women's" on their résumé.

After some investigation, programmers discovered the bias stemmed from the data inputs—the tool was trained to vet applicants based on résumés the company had received over the preceding decade. The majority of those résumés had come from men, and the majority of resulting hires had been men. Because the hiring tool had been programmed to teach itself which candidates were preferable, it analyzed the data and "learned" that men were preferable to women.

Programmers attempted to make the tool more gender-neutral, but quickly realized there was no way to prevent the program from discriminating on other grounds. The project was quietly disbanded. When word of the experiment leaked to the press, the company publicly stated the tool was never used to make real-life hiring decisions.

If nothing else, the experiment demonstrated an important lesson: in the human world, AI has its limits. So if AI is here to stay, how do humans remain in the driver's seat?

ALGORITHM AND BLUES

The abandoned hiring tool is what's known as a machine-learning algorithm. An algorithm is simply a computational recipe, a process to achieve a specific result, a set of rules to solve a problem. With a machine-learning algorithm, the rules aren't driven by human logic; they're continuously revamped by the computer itself.

Computer algorithms range from the simple (a computer user confirming they are 13 or older in order to set up an Instagram account) to the complex—large, decision-making software systems rapidly assessing a vast array of data for a variety of purposes or outputs.

The promise of mathematical objectivity has resulted in algorithmic decision-making for loans, benefits, job interviews, school placement (both higher ed and K-12), and even who should get bail, parole, and prison time.

"Algorithms are a mathematical manipulation of the complexities of life," says Jennifer Daryl Slack, distinguished professor of communication and cultural studies in Michigan Tech's Department of Humanities. "An algorithm allows you to manage complexity, but it does so by simplifying, prioritizing, and valuing some things over others. It's a fundamentally biased process."

"What we do when we create algorithms isn't an entirely new process," says Stefka Hristova, associate professor of digital media and Slack's colleague in the Department of Humanities. "It's part of the historical trajectory that emerged out of 19th century data sciences. Algorithmic culture is grandfathered in by things like anthropometrics [measuring the human body for identification and variation] and phrenology [studying the shape and size of the skull to predict character and mental capacity]. Our efforts in translating populations into data have now been converted into mechanisms of machine learning."

Machine-learning algorithms function on association—they group data into insular categories, connecting only the seemingly related and disregarding difference. This results in what Hristova calls solipsistic homogeneity, where the algorithm works within itself to create a structure of sameness and then builds on that structure—basically, your Netflix queue.

"It's a system that precludes creativity and innovation because you get more of the same," Hristova says. "It's also a problematic structure when an algorithm is employed within society. What happens when you have
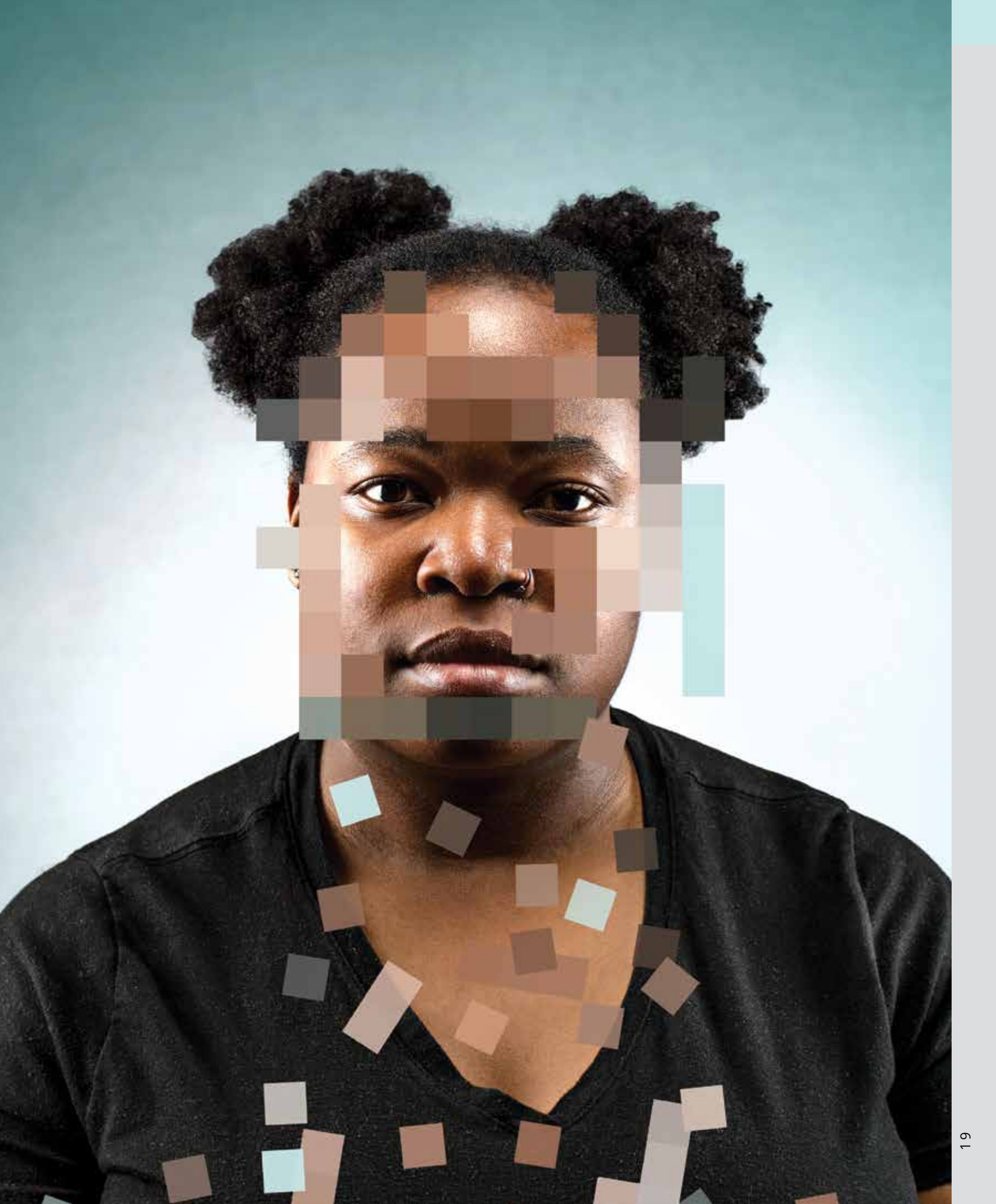
DIRTY, DANGEROUS ENVIRONMENTS

Despite the recent tragedies of the Boeing 737 Max, flying continues to be one of the safest forms of transportation. And this, according to Jeff Naber, the Richard and Elizabeth Henes Professor in Energy Systems in Michigan Tech's Department of Mechanical Engineering–Engineering Mechanics, is largely due to algorithms we commonly refer to as autopilot. But, Naber points out, flying is also one of the most structured and planned forms of transportation, with relatively few obstacles for a plane to bump into. Automating the navigation of passenger cars and other terrestrial vehicles is an entirely different animal.

"It requires much more understanding, recognition, and decision-making—all of which are the traditional purview of human beings," says Michael Bowler, associate professor of philosophy and associate chair of the Department of Humanities. Once a vehicle attempts to take over these functions, unintended consequences can arise even from the proper functioning of an automated system.

"People are rightly concerned about the ethical and social impacts of automation and the construction of intelligent systems," says Bowler. "Engineering and perfecting these systems in dirty and dangerous environments—like extreme weather conditions and off-road settings—is precisely the right way to explore and demonstrate to the public the capabilities of automated and intelligent systems in a safe context; that is, one in which you would not want to risk human life to begin with."

a machine determining who will make a good employee? It connects what is similar, and that's one of the places where bias comes in."

Imagine an algorithm created to determine who should be invited to apply to Michigan Tech. The machine analyzes the data of who's been invited to apply in the past, who did apply, and who was ultimately admitted. From that analysis, it learns who is most likely to enroll at Tech.

"As you narrow down the field to specific features, the algorithm starts targeting those who 'look like' a Michigan Tech student," Slack says. "You lose out on diversity, because it's not an expansive process. And there's nobody to notice who gets left out if everything gets turned over to machines and algorithms."

THE MIND AND THE MACHINE

In the world of finance and insurance, the ability for people to get funding or coverage is often decided by an algorithm, not an expert who reads the file or meets with the applicants in person. The algorithm sets up "points" or markers to determine which applicants are the best (or worst, as the case may be). As decisions on each application are made, it learns more information about who is desirable and who is not, and the points or markers are further strengthened.

"If you live in a poorer neighborhood with more crime, your car insurance will be higher," Slack says. "The purpose of insurance is to spread out costs, but that's not what happens. The algorithm is analyzing the data, not the person at the table. It punishes people who have fewer resources and benefits the better off."

Obviously, Slack says, the more diversity you have amongst the people designing the algorithm, the less biased the algorithm will be. "But if you only focus on the design level, you're missing a myriad of other issues that are going to come into play regardless of diversity in creation," she says.

And many of those other issues stem from bias in an algorithm's implementation.

Earlier this year, governments around the globe grounded the Boeing 737 Max aircraft after two crashes killed hundreds of people. The fourth generation of the 737 model, the Max was upgraded with larger engines and greater fuel

efficiency in order to compete with the Airbus A320neo.

In creating the 737 Max, designers worked to ensure the plane was as similar as possible to previous versions of the 737 in order to bypass costly training for pilots on flight simulators. (It's estimated that such training would cost tens of millions of dollars.) The newer, larger engines, however, had to be mounted differently, changing the aerodynamics and weight distribution of the plane. The new engine placement caused the plane's nose to push upward in certain circumstances, so designers created an algorithm that would automatically bring the plane's nose down.

Media reports indicate that because Boeing was competing with Airbus, it wanted to get the plane to market as quickly as possible and didn't want to pay for training. While it's not publicly known what conversations and processes went on behind closed doors, what is known is that Boeing delivered its product without informing pilots of the algorithm.

"In implementing the algorithm, it appears the company failed to adequately take into account interaction with pilots and possible circumstances where the pilots may need to act," says Slack. "It was a financial decision. A value decision."

No matter how excellent the design of the algorithm may have been, the problem was in the implementation, where someone

"TECHNOLOGY IS A NEW CULTURE, IT'S NOT JUST A BACKDROP."

Soonkwan Hong, associate professor of marketing

Jennifer Daryl Slack's research explores how everyday life interconnects with technology.

> "WE NEED TO INTERROGATE WHETHER THESE ARE THE CULTURAL VALUES WE WANT TO SUPPORT."
>
> Jennifer Daryl Slack, distinguished professor of communication and cultural studies

made a determination about acceptable risk. Slack stresses that you don't have to attribute ill will to Boeing. "This is not a matter of a heinous corporation—this is a matter of algorithms. You can't code real life. You transcode life. And that entails necessary reduction and simplification."

RAGE AGAINST THE MACHINE LEARNING

"Algorithms impact every human system; they're unavoidable," says Soonkwan Hong, associate professor of marketing in the School of Business and Economics.

From dating services to navigation apps, from résumé screening and employee evaluations to police patrols that target specific neighborhoods, Hong—who studies consumer culture—says people don't realize the extent to which algorithms are present in their everyday lives. "People tend to take extreme stances— they celebrate technology or they criticize it. But the best path forward is a participatory stance, one where people—not algorithms—make choices about when to use technology, when to unplug, and what data is or isn't shared."

Slack notes that this can be tricky because, in many instances, "you have no right to know about the algorithm. There's a lack of transparency in the algorithmic environment, and the formula is often proprietary. And no one fully understands the machine learning process," she adds. "It's unsupervised learning."

Slack and Hristova say we must take a look at how easily we hand decisions over to algorithms and ask what we're prioritizing.

"What's not being looked at," Slack emphasizes, "is the part of our culture that values and glorifies the process of shifting to algorithms to do certain kinds of work. Our mindset is to take risks and fix it later. Is that acceptable?"

Hristova and Slack say we must create a process for asking those questions and consider how different moments of design and implementation relate to one another. Together, they're developing a methodological approach for intervening in the design and implementation of algorithms in a way that allows humans to contemplate ethical issues, cultural considerations, and potential policy interventions. Their research will be housed in Michigan Tech's new Institute for Policy, Ethics, and Culture (see sidebar).

"Every stage of algorithmic design and implementation offers different opportunities for intervention," Hristova says. "And an intervention would typically be more like a tweak, not an overhaul. We'd be fine-tuning and accounting for the equation."

"We need a more democratic, open, and ethical culture around the creation and deployment of algorithms," she continues, "but algorithms are just a recipe. An equation. They can be redefined. More importantly, we need to become active seekers of difference. We must seek out alternative views, and communicate with each other to find shared ground."

TOMORROW NEEDS: THE INSTITUTE FOR POLICY, ETHICS, AND CULTURE

In April 2019, Michigan Tech began planning for a new Institute for Policy, Ethics, and Culture (IPEC), which will explore the policy implications, ethical considerations, and cultural significance of the extensive technological changes and disruptive forces of the 21st century. IPEC researchers— including Slack, Hristova, and Hong—will address issues like algorithmic culture; medicine and biotechnology; technology and autonomy; surveillance and privacy; and reconfiguring human relationships in and with the environment.

"Technological advances are necessary, but not sufficient to address global challenges related to human well-being, ecosystem health, and a changing climate," says Sarah Green, professor of chemistry at Michigan Tech. Green co-chaired the Science Advisory Panel for the United Nation's Sixth Global Environmental Outlook (GEO-6) report and is a member of the University working group that developed IPEC. "IPEC will foster innovative and forward-thinking policies, grounded in science and cultural insight. A primary goal of IPEC is to guide the ethical development and deployment of technology toward the 'future we want.'"

DESIGN THE AGILE MIND
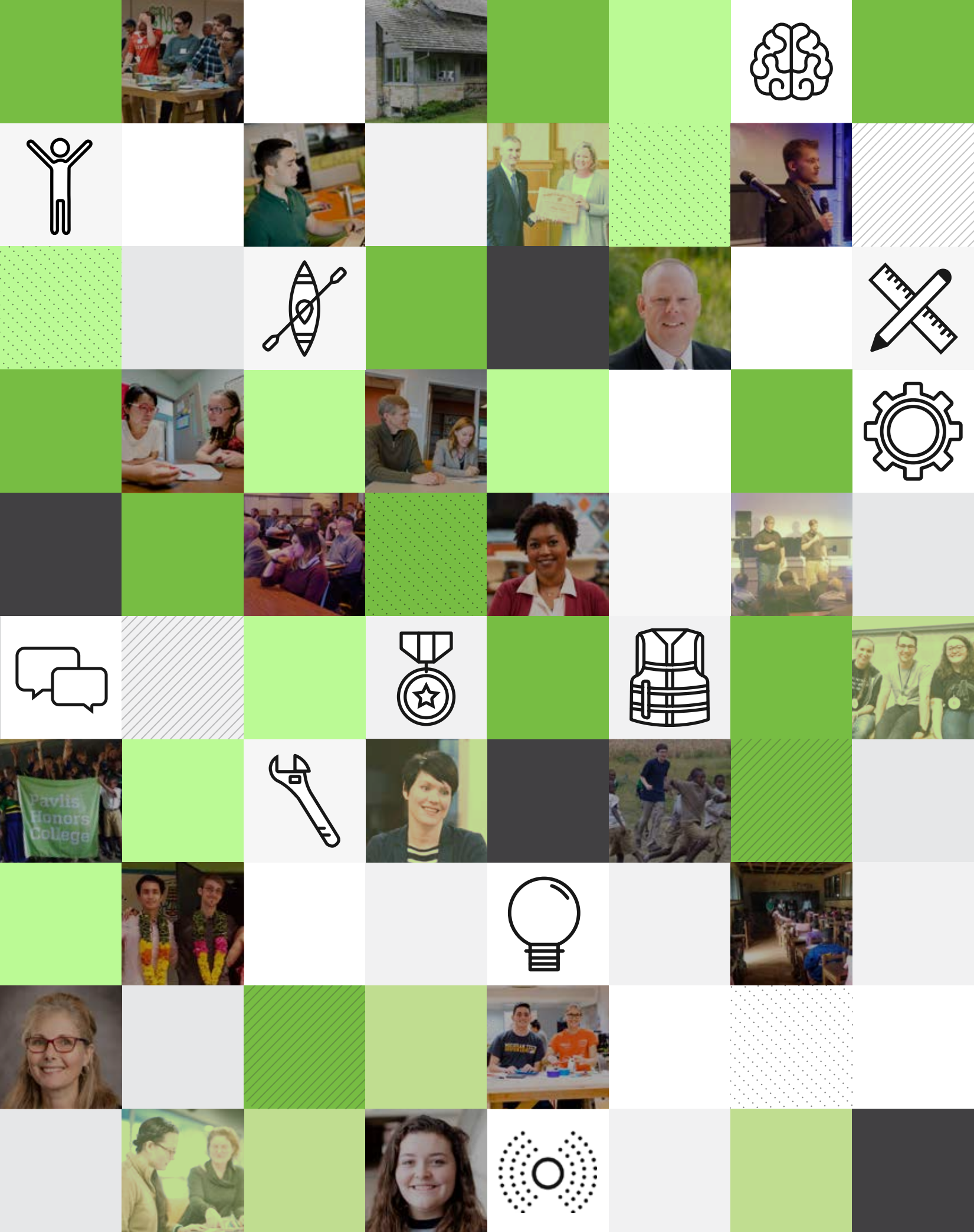
DESIGN THE AGILE MIND

Promoting a mindset that favors nimble thinking through human-centered problem solving.

Heated life jackets. Autonomous vehicles rugged enough for unstructured environments. These Michigan Tech-engineered solutions are the result of design thinking. Some would argue that an engineering education teaches design; after all, engineers define, design, prototype, and test. But thinking like an engineer is often described as procedural, step by step, which can be limiting and fraught with error. Conversely, agile thinkers favor a recursive, iterative, or holistic approach to problem solving.

Using the concepts of design—considering user needs, brainstorming, prototyping, testing—Michigan Tech faculty, staff, administrators, and students are promoting a human-centered approach to problem solving that unleashes creative potential and results in superior solutions.

"Our students are going to be much more valuable as employees if they are innovative—if they are coming up with new ideas, new technologies that create value for the companies they work for. That's one of the reasons why we're promoting design thinking," says Mary Raber, assistant dean of the Pavlis Honors College. Raber is also co-director of the Innovation Center for Entrepreneurship, along with Jim Baker, associate vice president for research administration, and Jonathan Leinonen, lecturer in management.

Raber has played a critical role in bringing design thinking to campus, working behind the scenes with Baker for more than a decade "to incrementally encourage students' and faculty's ability to innovate and create," she says.

Design thinking is a five-phase problem-solving approach: empathize, define, ideate, prototype, and test. But it's not a linear process; it's circular and messy. Most importantly, it puts people first, which is why empathy is its basis.

Cameron Philo, a junior studying electrical engineering, used design thinking to create his startup, Life Pro Jackets. Philo was moved by a story about a family's fatal kayaking trip:

"A family of four went kayaking on Lake Superior and their boats tipped. Only the mom came back because the water was so cold. When I heard the story, I thought, 'They were doing everything right, they were wearing life jackets, but it still wasn't enough.' It got me thinking: for people who are taking the right steps and precautions, how can we make sure it's always safe for them to come back? So, I came up with a way to put some heating elements into a life jacket to prevent hypothermia and put GPS tracking into it so the wearer can trigger it and alert first responders."

Philo's ability to empathize with the story about the family kayaking trip inspired him to find a solution. Talking with first responders

"DESIGN THINKING EQUIPS STUDENTS WITH THE SKILLS AND COMPETENCIES TO BE SUCCESSFUL IN THE RAPIDLY CHANGING ECONOMIC ENVIRONMENT OF THE FUTURE."

Richard Koubek,
Michigan Tech president

and water enthusiasts, and considering the contextual factors of water safety, helped him further define the problem—the second step of design thinking.

"We noticed there are a lot of bodies of water that don't get very warm. The problem with that is people can quickly develop hypothermia," Philo says, noting that first responders pointed out that when someone falls out of a boat on the water, the boat may float away from the person, making search and rescue more difficult. "That's where the GPS comes in," Philo says.

The next step is ideation. Philo worked with teammates and fellow undergraduate students Jacob Formolo (biomedical engineering) and Jared Harber (materials science and engineering) to share and build

Mary Raber championed design think on campus for more tha a decade.

combination of graphics, a visual dashboard, a six-word title, and three questions the plan poses (for example, *Do I have what it takes?*).

Michaelson says the multiple-week, interactive workshops "can be an effective resource for students still trying to figure out what they want out of their education at Tech, so that they can live a meaningful and fulfilling life after graduation."

Lisa Casper, program manager of the Innovation Center for Entrepreneurship, says that design thinking workshops are a key part of Husky Innovate—a new yearly series of co-curricular workshops and competitions that encourage students to identify problems as opportunities and work with teams to innovate solutions.

on their ideas. They thought about how to heat the life jacket safely, considering the installation of either chemical or electrical heating elements as well as manual or automatic triggering of GPS with water or temperature-pressure sensors.

After ideation, Philo says he studied Coast Guard data to calculate water temperatures and lengths of time someone could safely stay in the water.

Philo then demonstrated his idea for its intended user and received feedback to improve the designs—and he did this over and over. He participated in several on-campus activities and in a local effort, "1 Million Cups," where he pitched his idea to diverse audiences for feedback and suggested resources.

The result? A transformation of the traditional life jacket into a wearable technology that provides more safety without requiring the user to, as Philo puts it, "wear a ton of stuff."

At the April 12, 2019, New Venture Competition at Central Michigan University, Philo's Life Pro Jacket won $10,000 for Best Technology Venture.

MAKING THE AGILE THINKER

In 2004, David Kelley, founder of the Stanford School of Design (known today as the Hasso Plattner Institute of Design or d.school) introduced the five phases of design thinking. When the concept took off—classes at Stanford were (and continue to be) packed, spurring interviews on *60 Minutes* and bestselling books—two d.school educators, Bill Burnett and Dave Evans, co-opted design thinking to create "life design." Life design helps students take ownership of their life journey by applying five mindsets—curiosity, bias to action, reframing, awareness, and radical collaboration.

These five mindsets form the foundation of Design Your Life courses taught in various programs across campus. For instance, Melissa Michaelson '16, coordinator of career development programming and a career advisor in Career Services, teaches Design Your Career workshops where students learn and apply the five mindsets on activities like Odyssey Plan, which asks participants to create three alternative versions of their five-year plan. Each plan must include a

Casper says the workshops "empower students with the ability to adapt to changing environments and to make a positive impact where solutions are needed."

Casper arrived on campus last summer, with both industry and academic experience, to help students prepare for events like the New Venture Competition, the grand finale of the Husky Innovate series, where Michigan Tech students like Philo have taken home big prize money for their budding business ideas.

Design thinking also plays an integral role in the Pavlis Honors College. Lorelle Meadows, the College's dean, says design thinking "penetrates everything we do at Pavlis; it's a core strategy we employ. We use it in our classes and as a program when we're developing new ideas."

According to Meadows, design thinking is an important toolkit for students: "It introduces them to the idea that they need to question things, challenge assumptions, and address uncertainty. It's an important set of skills and mindsets to prepare students to address the kind of accelerated change that they will encounter in the world after graduation."

STUDENT INNOVATION

Michigan Tech is one of more than 250 higher education institutions around the globe participating in the University Innovation Fellows program. After six weeks of training in design thinking, Fellows apply the design-thinking principles through a specific project to benefit their campus community. To date, the program has trained 18 Huskies to think and act like designers.

Michigan Tech's Fellows helped to transform the old bowling alley in the basement of the Memorial Union Building into The Alley Makerspace. Now, Fellows help run an open community workshop in The Alley, showing students, faculty, and staff how to create things like sample prototypes.

Fellow Magann Dykema '19 taught design thinking to elementary students by asking them to think of a problem they see in everyday life, like a heavy backpack or leaky water bottle. Once students explored some problems by empathizing and defining, they worked to develop innovative solutions, even building simple prototypes with supplies like

pipe cleaners and playdough so they could test their ideas with real users.

Dykema knows her students will benefit from being exposed to design thinking at an early age. "The mindset has been very valuable for me at Michigan Tech," she says. "It encourages unique problem solving, which allows you to challenge and question things—to try new things that haven't been done before."

FROM IDEA TO I-CORPS

Michigan Tech is one of 100 designated National Science Foundation (NSF) Innovation Corps (I-Corps) sites in the country. The I-Corps curriculum provides an entrepreneurial program for graduate and undergraduate students, faculty, staff, alumni, and community teams to transition innovative business solutions into viable, marketable products. The program is based on what's known as "lean startup" principles, which, much like design thinking, favor iterative design and customer feedback.

Michigan Tech's I-Corps program pushes faculty and students to think about commercialization from a human-centered approach—taking teams outside the lab or classroom to test their ideas over four weeks and in at least 30 face-to-face interviews with potential customers and partners from teams' proposed target markets.

Professor of Chemical Engineering and Dean of the College of Computing Adrienne Minerick '98, then-post-doctoral researcher Kaela Leonard '12, and Raber won first place among 21 teams for their medical micro-device: a quick, portable blood-typing technology they developed during their I-Corps involvement in 2013. This led to follow-on funding through one of NSF's small business technology transfer programs.

Andrew Barnard '02 '04, director of the Great Lakes Research Center, and Amlan Mukherjee, associate professor of civil and environmental engineering, are two of several faculty who have completed the I-Corps program. Their involvement not only led to starting their own businesses, but it also revamped the way they teach their classes. Barnard and Mukherjee, along with

other faculty, help to teach fellow University professors how to incorporate the lean startup and design-thinking processes into their classes and research.

Mukherjee says a design-thinking mindset "changes your approach to everything you do. You start looking at the world from a problem-solving approach. Once you identify the client's needs, the math is the easy part, but being able to do the right math for the right project—that's where the design-thinking mindset comes in. Are you solving a problem that matters, and are you creating value out of it? Creating value in the process of problem solving is the part of the design-thinking mindset that has really affected me."

To further promote the entrepreneurial, design-thinking mindset Mukherjee describes, Michigan Tech recently became a partner of the Kern Family Foundation's Kern Entrepreneurial Engineering Network (KEEN). KEEN partners are higher education institutions committed to instilling the entrepreneurial mindset in their engineering students. Raber says Michigan Tech's program will be geared toward undergraduates.

Whether it's creating value or a novel solution, design thinking is more than a fancy phrase. By taking a human-centered approach, design thinking not only changes mindsets. As evidenced by Cameron Philo's Life Pro Jackets, it can even save lives.

"HUSKIES HAVE A SCRAPPINESS. IT'S INHERENTLY A PART OF OUR CULTURE AND IT WINDS UP BEING AN ASSET. NO MATTER WHAT YOU'RE TRYING TO DO, YOUR FUNDAMENTAL STRUGGLE IS WITH RESOURCE CONSTRAINTS—WHETHER THAT'S TIME, MONEY, PEOPLE, NATURAL RESOURCES. MICHIGAN TECH STANDS OUT BY GIVING STUDENTS THE SKILLS TO BE SUCCESSFUL, USING THEIR SCRAPPINESS IN A RESOURCE-LEAN ENVIRONMENT TO ACHIEVE THEIR GOALS."

Jim Baker '93 '95 '05, associate vice president for research administration, co-director of the Innovation Center for Entrepreneurship

Amlan Mukherjee is one of several faculty members to complete the I-Corps program.

A DAY IN THE LIFE OF A STUDENT-ATHLETE

They're more than athletes and students—they're both.

The term "student-athlete" is not a squished hyphen, a juxtaposition, a default by proximity; it's a deliberate collaboration between coaches, faculty, prospective students, and current students. What makes Michigan Tech Athletics different is the University's culture as a whole: This is a great place for both mental and physical might, and the University focuses on preparing student-athletes for their futures. Every school says it; we do it.

WHAT GETS YOU OUT OF BED IN THE MORNINGS?

LB: Can I say coffee?

VQ: Making my family proud.

GC: First thing I do is open the window and see how the weather is.

JW: Coffee. And I get up and go.

Student-athletes often wake up tired like the rest of us, but the most successful ones—like the Huskies in this story—have discovered a few of life's secrets during their time at Michigan Tech. They have learned that the "balance" our culture obsesses over in work, life, hobbies, joys, and trials is not found by building a static and carefully constructed fulcrum, but by practicing a dynamic mindset every day. Starting with the motivation to get out of bed.

Abbie Botz plays for the Michigan Tech Women's Basketball team and is majoring in exercise science. She says motivation comes from making her family, team, and community proud and that she gets through the day-to-day grind by planning ahead.

"Put your headphones in and focus. You get good at doing that anywhere," Botz says. "In my freshman year, I was really sleep-deprived and that affected my ability both on the court and in the classroom, so I've learned to prioritize going to bed earlier, and I've noticed that I'm more successful and attentive if I wake up a bit earlier, so I work on my homework then."

Her coach, Sam Hoyt, says being a mentor means helping students build those individualized habits and demonstrating that a student-athlete represents the University at all times: "It means saying no to a lot of things in order to prioritize your sport, your grades, and your family. Your grades and your athletic performance reflect your program."

And this isn't bluster. According to stats provided by American universities, the national average GPA at public universities sits around 3.1 and GPAs for student-athletes have tended to be lower. But the Michigan Tech Women's Basketball team upholds a 3.7 GPA, the highest across all divisions in the NCAA, and earned several Great Lakes Intercollegiate Athletic Conference (GLIAC) honors this past academic year, including Botz, who was named First Team All-GLIAC. It's not just basketball players slam-dunking academics. Overall, the 370 student-athletes on 14 competitive teams all keep a GPA above 3.0—averaging a 3.4—and many students receive academic honors, including the 139 on the 2018 Dean's List.

How do they do it?

Abbie Botz plays for Women's Basketball, a team with a 3.7 GPA average.

LIZZIE BLOCH (LB)

MAJOR
Biomedical Engineering.

FAVORITE WORKOUT
Trail runs!

WHAT DOES IT MEAN TO BE A STUDENT-ATHLETE?
Resilience.

DREAM JOB
Clinical Engineering.

TYLER ROCKWELL (TR)

MAJOR
Finance + Minor in Economics.

FAVORITE WORKOUT
Anything but prowlers. On a serious note: Pull-ups.

WHAT DOES IT MEAN TO BE A STUDENT-ATHLETE?
Dedication.

DREAM JOB
Venture Capitalist.

LAURA DEMARCHI (LD)

MAJOR
Biomedical Engineering + Minor in German.

FAVORITE WORKOUT
I really enjoy any workout that involves a volleyball.

WHAT DOES IT MEAN TO BE A STUDENT-ATHLETE?
Commitment.

DREAM JOB
Building prosthetic devices for paralympic athletes.

ABBIE BOTZ (AB)

MAJOR
Exercise Science + Minor in Psychology. Pursuing Master's in Kinesiology.

FAVORITE WORKOUT
Circuit with prowlers.

WHAT DOES IT MEAN TO BE A STUDENT-ATHLETE?
Privilege.

DREAM JOB
Physician Assistant.

GASPARD CUENOT (GC)

MAJOR
Marketing.

FAVORITE WORKOUT
Speed training at the Tech Trails.

WHAT DOES IT MEAN TO BE A STUDENT-ATHLETE?
Opportunities.

DREAM JOB
Entrepreneur in sustainable solutions.

JACOB WENZLICK (JW)

MAJOR
Mechanical Engineering.

FAVORITE WORKOUT
Back squats.

WHAT DOES IT MEAN TO BE A STUDENT-ATHLETE?
Commitment.

DREAM JOB
Working at Milwaukee Tool.

VICKY QUINDE (VQ)

MAJOR
Mechanical Engineering + Minor in Aerospace Engineering + Minor in Economics.

FAVORITE WORKOUT
Running, preferably at the beach.

WHAT DOES IT MEAN TO BE A STUDENT-ATHLETE?
Honor.

DREAM JOB
Writer.

Mechanical engineering major Vicky Quinde is a tennis player.

HOW DO YOU HANDLE CLASS AND STUDYING?

✏️ **AB: It's a learned skill.**

📅 **LM: Google calendar.**

📓 **TR: I have this planner here, which is my whole life.**

📅 **LB: Attitude and schedule.**

Most student-athletes have morning classes followed by afternoon practice. They make sure to schedule time to eat, work out, study, and rest. Many travel on the weekends during season—though some sports travel less, it can be up to 10 trips for hockey and 17 trips for basketball that can run Wednesday to Sunday.
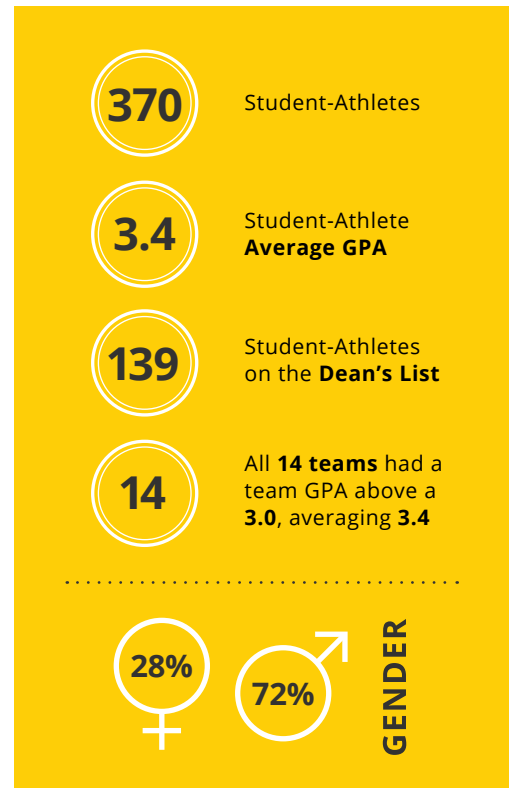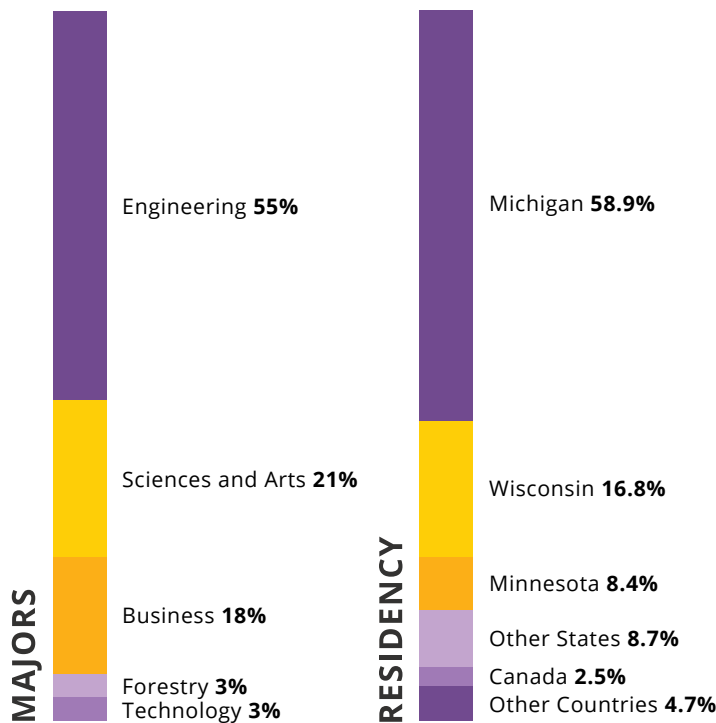
Rhys Edwards is here to help. As the director of NCAA compliance and student-athlete services, he teaches a fall course called Student-Athlete 101 and he sees every single incoming student, 110 of them in the 2018 class, who participates in Michigan Tech sports. Edwards tutors them on study techniques—good habits form from practice, not talent—and offers advice to navigate classes, majors, travel, life.

Coaches and staff recruit student-athletes who are prepared for the rigor of a Michigan Tech education and athletic experience. It's a partnership: Athletics provides the facilities, quality coaching, tutoring, mental health support, and leadership training so the student-athlete can be successful; recruits commit to be the best they can as both students and athletes. Top-notch learning happens at the edge of comfort zones, so the expectations are high, but realistic, and fully supported.

"We break the stigma—if someone needs help, we want them to come to us, we want our students to succeed," Edwards says. "Taking care of their mental well-being and physical well-being makes them all-around student-athletes."

Being both a student and an athlete is what brought Gaspard Cuenot to campus. A former skier for the national Swiss team, Cuenot is a senior majoring in marketing who is willing to brave sub-zero temps for winter Nordic ski races around the region.

"There is the same intensity in the classroom as there is on the trail. I know what my goals are and I don't waste time," he says. "I know there is no shortcut, so I get to work and do my best."

MAJORS

- Engineering **55%**
- Sciences and Arts **21%**
- Business **18%**
- Forestry **3%**
- Technology **3%**

RESIDENCY

- Michigan **58.9%**
- Wisconsin **16.8%**
- Minnesota **8.4%**
- Other States **8.7%**
- Canada **2.5%**
- Other Countries **4.7%**

370 Student-Athletes

3.4 Student-Athlete **Average GPA**

139 Student-Athletes on the **Dean's List**

14 All **14 teams** had a team GPA above a **3.0**, averaging **3.4**

GENDER

28% ♀ ♂ **72%**

WHAT KEEPS YOU GOING DURING A HARD DAY?

💧 **JW: A ton of water.**

📋 **LB: One task at a time.**

🧖 **TR: Sauna after practice.**

Student-athletes seem to smile and laugh and joke as much as any other student, but there is an intensity about them. They're the personification of Michigan Tech values.

"Taking shortcuts is not an option at Michigan Tech. It is not enough to be prepared for athletic competition; it is just as important to be prepared for the academic rigors of the classroom, and it takes a well-rounded and focused person to do that," says Dan Mettlach, associate head football coach. "Mental toughness for a student-athlete at Michigan Tech is crucial, because the challenges you face go well beyond the field."

Football player Jacob Wenzlick says that teamwork carries over from time spent on the field.

"Being around other players who have the same challenges in school helps," says Wenzlick, a mechanical engineering major in his junior year. "When you see other people studying, then it's easier for you to go do your homework, too."

Another part of the intensity is counter-intuitive: Performing well takes deliberate rest. Several student-athletes spoke of their first-year tendencies towards perfection and how they've learned to focus in on what really matters to them.

"Taking time for yourself helps you keep your concentration and keeps you happy because it's easy to get lost and frustrated," says volleyball player Laura DeMarchi, a biomedical engineering major. "Many people focus on how their body is doing, but we also need to check in on how our minds are doing, too."

Afternoon naps, cooking, stretching every night for 50 minutes, taking a phone call from Dad every Saturday morning in the hotel lobby while traveling between games. Everyone has their own way to retreat and recharge. And they're hard-earned lessons.

"Everyone will struggle," says cross-country and track runner Liz Bloch, a graduate student in biomedical engineering. "You're not going to come in and have everything go perfectly, just understanding the important things to get done matters. In the end, it's all important, but the focus of my education is being a student and being healthy."

More than half our student-athletes are engineering majors like football player Jacob Wenzlick.

WHAT DO YOU EAT?

🥣 **VQ: Plain oatmeal for breakfast. Protein, rice, and vegetables for lunch.**

🥕 **JW: I should probably eat more vegetables.**

🥕 **LB: All the vegetables. I hate it but it's true.**

Good food and rest are essential to student-athlete performance. And being both a student and an athlete are key ingredients in the recipe for success.

"I know I'm stressed, I have so much to do—but if I don't go to practice or work out, then I can't focus. I really need the exercise," says tennis player Vicky Quinde, a senior studying mechanical engineering with a minor in aerospace and another minor in economics; next year, she will be an assistant coach. She adds that external motivation is a good pressure that also helps her focus: "You commit."

Commitment is about finding complementary practices. Kristen Monahan, assistant coach with the Nordic ski teams, explains that "more is not always better in regards to training," she says. "Being a student-athlete requires you to

truly be all-in in every aspect of life, every single day; time management, health, sleep, recovery, performance. Being a student-athlete is not easy but is an incredibly rewarding opportunity and an honor."

AT THE END OF THE DAY, WHAT'S SPECIAL ABOUT BEING HERE?

VQ: My teammates come from around the world; here, we feel like family.

AB: Seeing that people really do care.

TR: Professors work with us.

GC: We work well as a team to do well as individuals.

Student-athletes themselves are incredible individuals, but on their own they couldn't thrive and flourish. As much as they personally need sleep, veggies, tailored workouts, and a winning mindset, their collective success grows from the culture established at Michigan Tech by faculty, coaches, fellow students, and the local community.

At the heart of student-athletes' motivation is the importance of their futures. They decided to play for Michigan Tech as much for the academic drive as the athletic. Tyler Rockwell, a second-year studying finance who plays on the Michigan Tech Hockey team, explains why student-athletes are willing to be both.

"It's what we love. You can be good at something if you don't like doing it, but you're never going to be great at it if you don't love it," Rockwell says. "That gets you out of bed for a 7 AM workout; it keeps you awake at night to study; it keeps you going after a seven-day road trip when you're both physically and mentally tired. It keeps you going."

Professors are a big help in that regard. They proctor exams at odd hours, post lessons online, encourage tutoring, and don't skimp on feedback, grading, edits, and challenges for their students who also happen to be athletes. Student-athletes here are expected to be competitive in the classroom and smart in the game—and they know it because they're thinking long-term about their careers, well-being, and happiness.

"As long as there is this passion burning inside you, you can make the magic happen," Nordic skier Cuenot says. "At the end of the day, if you're able to find a job that motivates you, then you won't look at your weekly horrors, you'll do it because you like it."

"OUR COACHES EMBRACE THIS 'STUDENT-ATHLETE-PLUS' CULTURE. EACH IS COMMITTED TO RECRUITING TALENTED STUDENT-ATHLETES WHO CAN PERFORM ACADEMICALLY AS WELL AS ON THE COURT, ICE, FIELD, OR TRACK."

Suzanne Sanregret '93 '06, director of athletics

Find out more at michigantechhuskies.com

Gaspard Cuenot and other Nordic skiers brave subzero temps at 6 AM for races.

COMFORT FOOD

Sweet, savory, and simply delicious—the Parade of Nations and Multicultural Festival has been adding spice to life in Michigan's Upper Peninsula for 30 years.

In Michigan Tech's Wadsworth Dining Hall kitchen, the scent of cilantro mingles with the aroma of chicken breasts pulled golden and bubbling from the ovens. The staccato chop of knives and rhythmic ting of giant metal spoons scraping against industrial-size vats of fragrant sticky rice punctuate the din, as plastic-gloved and capped students from India, Bangladesh, and Nepal prepare giant batches of their favorite foods for the thousands who attend the gastronomic event of the fall season.

More than 20 booths serve dishes from around the globe. There are too many gustatory delights to consume in one sitting; diners in the know bring carry-out containers to stretch out their feasting.

Exotic as it may seem, the festival menu is nothing more and nothing less than comfort food cooked from the heart, satisfying both maker and consumer through sharing time-honored recipes (albeit scaled up to feed a crowd).

Every country has a meatball, a dumpling, a kebab, and a stew. A soup your mom makes for you when you're sick. A casserole of odds and ends when you're ravenous but don't have time to shop, and yes, even some version of Cornish pasties—the portable pocket food encased in a golden crust—an Upper Peninsula delicacy that, alongside pickled eggs, is considered the tastiest of Husky traditions.

The Multicultural Festival, which originated three decades ago at Michigan Tech and morphed into a community-wide celebration, remains true to its roots: don't just wonder about other cultures, break bread together.

The pressure-cooker pace in the kitchens (students are also steaming, baking, and frying up a storm in the Memorial Union Building) eases as initial prep is completed and assembly begins. Shruti Ganjoo, a data and business systems analyst who normally digs into statistics, intelligence, and insights, is wrist-deep in spices and vegetables, shaping patties of Hara Bhara Kebab, a traditional cutlet served as a snack or starter in India.

"When I think about a festival, the first thing that comes in my mind is family and friends," says Ganjoo, who graduated with her master's in data science in spring 2019. "We here at Tech, far away from our families, try to bring the same feeling of being with our loved ones. The community here is our family away from family."

Dish: Thai-style grilled chicken rice

Country of Origin: Thailand

Served with a spicy sauce (tamarind for tang, ground-roasted chili pepper for heat)

Dish: Ash

Country of Origin: Iran

A soup-stew hybrid thickened with pinto beans and chickpeas, onion, cilantro, and spinach

Dish: Momo

Country of Origin: Nepal

Veggie or chicken dumplings mildly spiced with ginger, garlic, black pepper—and steamed 'til tender

Months in advance, all festival recipes are submitted to Michigan Tech Dining Services Executive Chef Eric Karvonen, who oversees student training through the Western Upper Peninsula Health Department to ensure dishes are safely prepared, as well as delicious.

Full-course meals in the $5-8 price range make the festival an affordable family adventure.

Parade of Nations co-founder Betty Chavis opened the cabinets of her antique and collectibles shop to furnish accoutrements for this spread.

Michigan Tech music
faculty are among the
best in the business.

MAKING MUSIC

Michigan Tech is not only home to some of the world's top researchers, but to world-class musicians as well.

Michigan Tech has a secret. It isn't an intentional secret. In fact, students who have been part of any music group, from the Pep Band to the Keweenaw Symphony Orchestra, know the secret well. We'll let you in on it. Michigan Tech's music faculty contains world-class composers, conductors, and performers.

In fact, Joel Neves, Libby Meyer, and Mike Christianson are known throughout the world of music and love teaching at Michigan Tech—a STEM institution without a music major.

"I'm just a guy from a small Utah town who never thought I'd be able to do some of the things I've done in the music world," says Neves, associate professor of music and director of orchestral activities. Orchestral activities include serving as music director and conductor of the highly acclaimed Keweenaw Symphony Orchestra.

Neves is a recent prize winner in the acclaimed American Prize competition, and he just completed his service as national president of the College Orchestra Directors Association. Neves earned his bachelor's and master's degrees from Brigham Young University in his native Utah and a doctorate from Arizona State. He has been at Michigan Tech for 10 years but has hardly stayed put. His gift for conducting has taken him far beyond the Houghton campus.

Neves has conducted orchestras in Barcelona, Spain, and Paraná, Argentina.

One of his most memorable journeys took him to Wuhan, China, in May 2015, where he conducted the Hubei Symphony Orchestra. "They hired me partly because I was a Westerner and could show them how to best interpret Western music."

Neves says while the Chinese audience enthusiastically embraced his selection of Liszt, Wagner, Rossini, and Tchaikovsky, they "weren't trained in Western traditions."

"Initially they clapped at inappropriate places and talked quite loudly throughout the entire concert." Neves says the audiences eventually got better, and he discovered why. "I later found out that ushers were strategically placed throughout the Qintai Concert Hall with signs that read 'CLAP NOW' and 'STOP CLAPPING.'"

Neves said teaching music at a university that doesn't offer a music major is not a disadvantage. "There is incredible freedom here that you don't find at schools that offer a music major," he says, explaining that the

Joel Neves

Libby Meyer

National Association of Schools of Music (NASM) places curriculum restrictions and requirements on those schools. "We don't have those restrictions—and so there's greater freedom."

For Neves, the student body at Tech offers a tremendous advantage as well. "We don't just attract students from a particular region. Thus, we get musicians from throughout the US and even as far away as Asia. They may be majoring in something else, but have a willingness to continue to perform music once they're here."

LOVE AT FIRST SIGHT

Libby Meyer jumped at the chance to move to the Keweenaw when an opportunity at Michigan Tech arose. The Detroit-area native, who holds a Doctor of Musical Arts in Music Composition from Northwestern University, first came to the Upper Peninsula as an Artist in Residence at Isle Royale National Park. That temporary assignment was the beginning of a relationship with the people and places of the region that is only growing stronger.

"After I had spent time on Isle Royale, I was really interested in moving here," says Meyer, a lecturer in visual and performing arts (VPA) and director of the University's Music Composition Program. When her longtime friend Anne Kearney-Looman, who had been teaching strings at Michigan Tech, left the University, Meyer saw an opportunity.

"I was impressed by the beauty of the landscape and the thriving arts community that existed here," she says.

The Keweenaw has been more than a home to Meyer—it's been her muse. She is co-founder of the Keweenaw Soundscape Project, established to document, by sound, the Keweenaw and its surrounding region for ecological, social, and artistic value. She was a member of the team from Michigan Tech that received the University's first grant from the National Endowment for the Arts for the Imagine Your Parks program. Meyer composed music for the project based on soundscapes recorded from national parks and lakeshores on Lake Superior.

Meyer's music has been performed by string quartets, symphonies, and ensembles large and small throughout the country. A recent project includes a new score for the 1925 silent film, *The Red Kimona*. The film, produced and co-directed by Dorothy Davenport, is notable as being one of the few independent productions of the era produced and written by women.

This spring she traveled to Boston, where a CD of her choral works was recorded by Capella Clausura at the studios of Public Radio WGBH.

"The project was funded by a grant from the University's Research Excellence Fund Scholarship and Creativity Grants program," she says. The CD, which will be released in October of this year, will be produced by Houghton native and MIT composer Elena Ruehr. "Elena has been instrumental in making the project happen," Meyer says.

"I WAS IMPRESSED BY THE BEAUTY OF THE LANDSCAPE AND THE THRIVING ARTS COMMUNITY THAT EXISTED HERE."

Libby Meyer,
lecturer of visual and
performing arts and director of
the Music Composition Program

AND THE BEAT GOES ON

In May 2019, Michigan Tech's VPA department announced Adam Meckler as the new director of jazz studies and assistant professor of music. Meckler is the third director in the jazz program's 52-year history.

A trumpet player, composer, and educator, Meckler leads an ensemble that bears his name—the Adam Meckler Orchestra (AMO). AMO's debut album, *When the Clouds Look Like This*, was one of iTunes' Best Jazz Releases of 2014.

Meckler says he is humbled and honored to join Michigan Tech's faculty and work with the "gifted and bright" students in VPA. "I am thrilled to carry the torch forward, striving for the high level of excellence established by my predecessors," he says.

LIVING A DOUBLE LIFE

Because of the deep connection between Mike Christianson and New York City's jazz scene, you might assume the assistant professor and director of bands at Michigan Tech is a native of the Big Apple with extensive training in the American music genre of jazz.

You would be wrong. Christianson is a native of Fargo, North Dakota, and a classically trained trombonist.

Earlier this year, Christianson was nominated for a Grammy Award—for the second time—as a member of the John Hollenbeck Large Ensemble. The nomination was in the Large Jazz Ensemble category. Given his classical music training, success in jazz may be surprising, but his career path as a band director is certainly not.

"The tradition of music in our family goes way back," Christianson says. "My father was a band director. When he died, a 33-voice choir of relatives from both sides—aunts, uncles, and cousins—sang at his funeral."

Band directing is a Christianson family tradition. "Our daughter Michelle represents the fifth consecutive generation in my family to become a band director, and our son Aaron, a student at Michigan Tech, is a student director of Tech's acclaimed Huskies Pep Band."

Growing up, Christianson's exposure to music wasn't confined to family functions. "There were always live performances in Fargo, with some of the biggest names and biggest bands, when I was young. I saw Count Basie, Buddy Rich, Stan Kenton, and all the greats play."

After getting his bachelor's at Minnesota State University Moorhead (just across the Red River of the North from Fargo), Christianson, a trombone and lower brass player, left the prairie for NYC. He earned a Master of Music from the Manhattan School of Music in classical trombone and a Doctor of Musical Arts from Rutgers in wind conducting.

While conducting had "always been an idea," Christianson pursued a career as a professional musician—with considerable success. He has performed in the pit orchestra for more than 40 Broadway and Off-Broadway musicals, including *The Music Man, Showboat, Young Frankenstein, Fosse,* and the Tony Award-winning revival of *42nd Street.*

Out of the orchestra pit, he toured and recorded with some of the biggest names in music. It was an encounter in a parking lot that got the trombone player together with drummer and band leader Hollenbeck.

In addition to playing in Hollenbeck's ensemble, Christianson is also band leader of The Gotham Wind Symphony, of which Hollenbeck happens to be a member. "Mike obviously delights in being at the helm of a group that easily moves from marches to contemporary music to jazz," Hollenbeck says. "I have the deepest respect for him—any school would be lucky to have someone with his high standards and depth of musicality."

Christianson came to Michigan Tech six years ago and figured his days of big-city performing were over. "I did not imagine that I could continue to perform in New York City while working at Michigan Tech."

At Michigan Tech, Christianson conducts the Superior Wind Symphony, Campus Concert Band, and the Pep Band. This past year, following the retirement of Director of Jazz Studies Mike Irish, Christianson directed Tech's two jazz bands.

He discovered, like Neves and Meyer, that performing outside of the University does not take anything away from students but adds to their experience. And like his colleagues, he says working at a school without a music major has its advantages. "Not being confined by the expectations of having a music major gives you freedom you might not otherwise have," Christianson says.

The three also share a passion for music, love for their students, and world-class talent—which means Michigan Tech's secret may not remain secret very much longer.

Michael Christianson

ON THE MONEY

Applied Portfolio Management Program celebrates two decades of hands-on learning.

Before Dean Johnson was appointed dean of the School of Business and Economics (SBE) at Michigan Tech, he was a PhD student, interviewing for his first faculty position—with a very clear vision. "Right away, I intended to establish a portfolio management program for students," says Johnson, who was hired on as faculty in 1996 and became dean of SBE in 2016.

Back then, giving college students a large sum of real money to manage in financial markets was a particularly novel—and perhaps risky—idea, and Michigan Tech was just the place.

Hailing from the University of Wisconsin–Madison, which boasts one of the oldest student investment programs,

Johnson laid the foundations for the then nameless and fund-less investment program during his first year on campus. He recruited undergraduate business students and pitched the concept to campus and donors.

BUILT IT. THEY CAME.

The very first supporters of the would-be Applied Portfolio Management Program (APMP) include Dewaine Olson '62, SBE National Advisory Board member, and Hugh Makens '61, member of the Dean's Advisory Council. Through their initial

donations, the pair made the launch of APMP possible. APMP further evolved in 2003 with a commitment of support from APMP board member Joe Dancy '76, and wife and lawyer Vicky, who sponsored the LSGI Trading Lab. Located inside the Academic Office Building, the space is a technology hub for APMP students.

In the 20 years since APMP's founding, teams of Huskies have grown the portfolio into one of the top 50 student funds in the nation, now valued at nearly $2 million. Students in the program have opened the Nasdaq Stock Exchange and

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"TEAMWORK AND COLLABORATION ARE PIVOTAL IN TODAY'S WORKFORCE, AND APMP HELPED ME DEVELOP THOSE SKILLS."

Tim Bailey '04, deputy treasurer

APMP GRADS—WHERE ARE THEY NOW?

VICE PRESIDENT, NEW YORK CITY

Amanda (Vogt) Conner '10 works for S.N. Phelps & Co., the investment office of the late Stan Phelps, APMP portfolio investor and pioneer of the Wall Street junk bond market, a career she embarked on right after graduation. Conner says that APMP took learning beyond textbooks to applied strategies in real-world circumstances. "Without APMP, I would have never had the opportunity to work where I do."

DEPUTY TREASURER, SAN FRANCISCO

Since graduating from Michigan Tech, **Tim Bailey '04** has worked at large hedge funds. He is a director with a diversified global investment manager, focusing on liquidity management, FX and rates hedging, counterparty risk, and credit facilities. Bailey credits APMP for providing him a base of financial knowledge that he continues to draw upon. "Teamwork and collaboration are pivotal in today's workforce, and APMP helped me develop those skills."

CHIEF INVESTMENT OFFICER, HONG KONG

Maggie Chen '04 oversees a global multi-asset portfolio. Prior to her current role, she managed a large US equities portfolio for China's Sovereign Wealth Fund SAFE Investment Company. According to Chen, APMP was her first real-world exposure to portfolio management and she still turns to the people she met through the program for mentorship when in need of advice.

become regulars on CNBC. And although APMP is a for-credit class, the intensive experience often becomes much more of a commitment—and reward.

EXPERIENCE OF A LIFETIME

"The concept is centered on students managing money, but it's also an entrepreneurial endeavor," says Johnson. "They are founding a new firm, the product of which is portfolio management services." Students fulfill various roles ranging from president to marketing officer.

For spirited competition, the cohort splits into two teams—gold and black. Throughout the year, students work on presentation skills, attracting the client, and getting comfortable taking calculated risks. They report to an advisory board but have full control over their investment philosophy.

Teams are intentionally multidisciplinary, comprised of a blend of business and STEM majors, and there is also a junior-level apprenticeship program.

"APMP students have access to modern portfolio management tools and theories to produce

APMP students opened the Nasdaq Stock Exchange.

detailed buy reports," says Johnson. "This is much more sophisticated than a stock-picking club."

Feedback from employers and graduates working in the industry indicates that APMP experience is what clinches their pivotal first job. "Industry views this almost like work experience," Johnson affirms. So, who gets in the class? That's another benefit to being at Michigan Tech: "You are not vying for a spot amongst thousands of other students. In the School of Business and Economics, if you really want to do something, you will be able to. There are many more opportunities per student than in larger business schools."

SENIOR BUSINESS ANALYST, MINNEAPOLIS

Donzell Dixson's '14 experience and degree in finance led to a tech-focused role with Target Headquarters. Through mentoring and with a hunger to learn more, Dixson delved into software engineering roles, crediting Michigan Tech for merging business with technology. His time at Tech also influenced his desire to explore entrepreneurial pursuits—the former MiCup Scholar founded Dixson Dynamics, a business that motivates and inspires others to achieve their full potential.

SENIOR TEAM MANAGER, SAN FRANCISCO

Annette Felton '11 spent the first five years of her career forecasting companies' revenues and expenses to reflect expected product demand and strategic initiatives. Today, she sensitizes those same revenue and expense forecasts based on hypothetical unfavorable economic scenarios published by the Federal Reserve. This capital stress-testing plays an important role in ensuring sufficient capital is available to firms' clients in the event of a recession or financial crisis.

REGIONAL BUSINESS DEVELOPMENT AND PLANNING MANAGER, SWITZERLAND

Flavio Macorig took part in APMP in 2003 during an exchange program with the University of Lausanne. The experience, he says, had a big impact not only on his now 15-year career in finance for a multinational company, but also on his personal portfolio.

INSTITUTIONAL EQUITY RESEARCH SALES, CHICAGO

In **Jessica Chlopek's '07** role with William Blair, research, sales, and trading converge. From her Chicago-based trading desk, she helps advise multimillion- and billion-dollar institutional-level funds that are based in one of the financial capitals of the world—NYC. "When I pitch a stock, I think about all of the investment tools and strategies that Dean Johnson taught us," Chlopek says. "I talk with intelligent investors every day, and the APMP program helped me to build a strong foundation for these interactions."

Q+A : CURTIS FORTIER

Curtis Fortier '91 '94 made the most of his time at Michigan Tech. While earning a BS and MS in mechanical engineering, he was captain of the swim team (a varsity sport at the time) and recipient of the prestigious Clair M. Donovan Award for service to the University, and his involvement in student government led him to establish Spring Fling. It was also at Tech that Fortier began performing. He appeared in plays and was a member of Tech's improvisational acting ensemble, The Troupe.

Fortier's first job after leaving the University was with Delphi Energy and Engine Management Systems, a former subsidiary of General Motors. He worked in their development lab, making and testing roller-lifters for car engines. It was his first and last engineering job. After two years, he hit the road as a stand-up comic. Now based out of Los Angeles, Fortier has performed with the likes of Weird Al Yankovic, Louie Anderson, and Gabe Kaplan. Recently, he was nominated by the London International Film Festival for best supporting actor in a short film.

Fortier says he still keeps his foot in the world of STEM by tutoring kids in those subjects. But for the most part, he says his career has progressed in a completely different direction from what he studied at Michigan Tech.

Q: You were a renaissance man at Michigan Tech—actor, student-athlete, student government representative, and comedian. Is there anything that particularly stands out?

A: Just how constantly exhausted I was. I really had to stay on top of things. I remember every Sunday night, plotting out my study time, athletics, meetings, and fun, literally by the hour just to stay on top of things. I'm so glad I learned those skills back then from my coaches and teachers. Those skills are invaluable as I live my life today.

Q: Was there a moment while working at GM that you realized you wanted to be onstage?

A: Not a specific moment. I just remember that during the day, I was always thinking about what would be funny in my act and how I could meet the people casting local commercials and how one day I could move

to LA. I mean, I actually enjoyed the job, and making "real money" for the first time in my life was good, but I always had my eye on what was next. And that "next" was out west.

Q: How did performing at Michigan Tech, in particular with The Troupe, prepare you for the life of an entertainer?

A: The Troupe opened a door for me. It showed me I could actually do this full time. When you're in a play, you rehearse for a few weeks, do the play, have a cast party, and then wait for the next play to come along in a few months. Being in The Troupe was a full-time job, so to speak. We were constantly thinking up ideas and pitching each other. We did crazy things to fuel our improv engines. It was constant. And I liked that. I liked the fact that it wasn't solely a few weeks on and a few weeks off. It was all the time. It trained me to think like an actor or a comedian as a full-time job, and most importantly, to treat it as such. How can you be good at something that you only do a few times a year? I wanted to be an actor and comedian consistently so I could get better and better at it.

Q: Your experience entertaining troops in the Middle East was the basis of an episode of the sitcom *Rodney*, on which you guest starred. The experience in Iraq and Afghanistan must have had a profound impact on you?

A: It certainly did. When we were over there, one of the soldiers said to me, "Every day here is a Monday." That really stuck with me. Some of them had shifts that were 12 on, 12 off, seven days a week. Oh yeah, and it was really, really hot in some places. Watching them work in those conditions and still be as upbeat and professional as they were was an inspiration.

Q: You were nominated for your role in *Hide and Seek*, and your film *Secret Santa* was awarded Best Comedy at the Silicon Beach Film Festival. How can we see these and other films you've been in?

A: Yes, it's been an exciting year. I feel very fortunate. You can order *Secret Santa* off the website (secretsantathemovie.com) along

with autographed posters and other fun stuff. *Hide and Seek* is a short film that's still on the festival circuit, so the only place to see it is at a festival where it's screening. Once it's made its festival run and the director releases it, I'm sure it will be online somewhere. Another film I did, *5th Passenger*, is available on all sorts of platforms. If you like *Star Trek*, be sure to check it out. It's a sci-fi horror movie with just a ton of *Star Trek* alumni in it. Another fun project was a rap video. No joke. I appeared in Thomas Hobbs' video for "Aldo," where a good friend of mine played my wife. Just search for it on YouTube.

Q: What's next?

A: A few things. I'll be shooting a sci-fi time travel feature film this summer. You can catch me in the first episode of Ronald D. Moore's (*Star Trek: The Next Generation, Outlander*) new show *For All Mankind* on Apple TV. It chronicles what would have happened if the Russians reached the moon first. I'll be returning to the Silicon Beach Film Festival this year with my own web series, *12-Sided Die*. Put simply, it's a romantic comedy with dice, as in *Dungeons and Dragons* dice. I wrote it, starred in it, executive produced it, and it's finally done. It will be screening at more festivals around the country this year.

Curtis Fortier with his *Secret Santa* co-star Megan Helbing at the 2017 premier of Fortier's film *5th Passenger*.

ALUMNI ENGAGEMENT

2019 ALUMNI AWARDS

These eight alumni have earned recognition from the Michigan Technological University Alumni Board of Directors. They will be honored at the annual Alumni Reunion Dinner and Awards Ceremony on Friday, August 2, 2019. These are their stories:

Know an amazing Husky?

Nominations are open for the 2020 Alumni Awards at mtu.edu/alumni/recognition/awards

Christine (Blood) and Karl LaPeer

HUMANITARIAN AWARD
Christine (Blood) '81 and Karl LaPeer '81

Throughout their lives and particularly in the last decade, Christine and Karl LaPeer have made it their mission to help people around the world: India, Nepal, Nicaragua, Peru, Ghana, Ethiopia, Canada, and the US.

Christine earned a BS in Medical Technology while Karl graduated with a BS in Mechanical Engineering. After earning an MBA from the

University of Michigan, Karl helped found Peninsula Capital Partners, which began with $20 million in capital and has grown to $1.6 billion over 23 years.

"We pour resources (time, talent, and treasure) into people, organizations, and situations that are doing good things around the world," Karl says. "We're convinced that life isn't really about accumulating wealth, but about using that wealth to touch lives now."

What does touching lives look like for the LaPeers? Building orphanages for children and homes for rescued victims of human trafficking. Providing freshwater wells. Distributing meals and medical supplies. Empowering students and business leaders. Funding scholarships and education opportunities.

HONORARY ALUMNI AWARD
Tom Kearly

Tom Kearly was arguably the most influential coach in Michigan Tech football history with a 70-44 record in 11 seasons on the sideline. What's more was his leadership for hundreds of student-athletes and his overall commitment to growing the University football program.

Kearly's arrival at Tech in 2000 coincided with the program's rise into the upper echelon of the Great Lakes Intercollegiate Athletic Conference (GLIAC). Tech won its second-ever GLIAC title in 2012 and earned its second-ever trip to the NCAA Division II playoffs in 2014. He was also instrumental in facilities improvements, including the installation of synthetic turf in 2008 as well as the moving forward of the new stadium project.

Tom Kearly

Perhaps the best summation came from then-president Glenn Mroz upon Kearly's retirement in 2016: "Tom surely has built a team and a program, but more importantly, he has built a culture of high expectations and accountability among the student-athletes both on and off the field. We're euphoric when they win a game and cry with them if they lose. But they always win academically, and the character that's forged along the way is Tom's legacy. It's more than being a coach, it's leading a family. We are grateful."

HONORARY ALUMNI AWARD
David Nielsen

David Nielsen has worked with Michigan Tech since 1997, when he was first engaged to present intensive weekend seminars on estate planning for alumni and friends of Michigan Tech.

Recognized as one of the foremost estate planning counselors in the Midwest, Nielsen has presented a total of 27 weekend seminars,

David Nielsen

touching the lives of hundreds of Tech alumni and their families. The University offers these annual estate planning seminars to alumni and friends who have indicated interest in supporting Michigan Tech at a significant gift level.

Nielsen always includes a motivating session on reasons and ways to support Michigan Tech and other charitable organizations. Those attending

the seminars have praised Nielsen for his integrity, down-to-earth manner, rare ability to clearly explain the complexities of estate planning, and his homespun humor spiced with occasional magic tricks to keep his audience engaged. A total of 158 couples/singles have participated in Michigan Tech's weekend estate planning seminars to date.

Nielsen has shared both his talent and his treasure in support of Michigan Tech's mission, having been quietly assimilated through more than 20 years as a "volunteer alumnus." It is appropriate that Nielsen's status be made official by recognizing him with the 2019 Honorary Alumnus Award.

Lou Anne (Szewczyk) and Fred Koerschner

OUTSTANDING SERVICE AWARD
Lou Anne (Szewczyk) '81 and Fred Koerschner '81

The Koerschners have a long history of volunteering and supporting Michigan Tech.

"The analytical and critical thinking skills I developed at Tech served me well throughout my career. As a marketer at a technical company like 3M, it was especially helpful to be able to work with a technical team and 'speak their language,'" says Lou Anne.

Fred also expressed appreciation for his education. "Not only did Michigan Tech provide the necessary curriculum to do my job, but it also taught me how to think and put me in challenging situations."

Lou Anne spent 25 years at 3M and also worked at Cargill. She has connected Michigan Tech and 3M through the Advanced MotorSport Enterprise and Senior Design, and was a member Michigan Tech's Corporate Advisory Board for Institutional Diversity.

Fred had a 35-year career at 3M, beginning as project manager and numerous other roles, including technical, marketing, and business

ALUMNI ENGAGEMENT

management positions. He served as president of the Michigan Tech Alumni Association from 1998 to 2000.

The Tech twosome helped with construction of a new bocce ball court on campus in 2018 and hosted President Rick Koubek for a reception last year.

DISTINGUISHED ALUMNI AWARD
Iver Anderson '75

Iver Anderson is senior metallurgist at Ames Laboratory (US Department of Energy) and adjunct professor in the materials science and engineering department at Iowa State University. He is also a fellow of the American

Iver Anderson

Powder Metallurgy Institute and the National Academy of Inventors, as well as a member of the National Inventors Hall of Fame.

His research subjects include powder metallurgy, rapid solidification and its implementation into new and innovative magnetic materials, structural components, and lightweight and porous materials. Another focus has been metallurgical joining—in electronic assembly, brazing, and welding—as well as ceramic joining. These contributions and innovations have led to over 265 publications and 45 patents.

As a notable example, Anderson led a team that invented a successful lead-free solder alloy, a revolutionary tin, silver, and copper alternative to traditional tin/lead solder that has reduced environmental hazards. Nearly 20,000 tons of lead are no longer being released into the environment worldwide. Low-wage recyclers in developing countries will no longer be exposed to large concentrations of this toxic material, and it will no longer leach from landfills into drinking water supplies.

"Michigan Tech gave me permission to innovate in my career direction and choice of areas to explore!"

OUTSTANDING YOUNG ALUMNI AWARD
Andrew Baker '11 '14

It was a well-timed phone call from a trusted advisor that brought Andrew Baker to Michigan Tech. "I had an offer to go work for Boeing Rotorcraft in Pennsylvania," says Baker. However, he was contacted by his undergraduate advisor, Steve Kampe, who had moved to Tech. Kampe asked Baker to join him and help set up a lab. The reply: "Count me in!"

Baker went on to earn both an MS and PhD in Materials Science and Engineering. After graduation, Andrew accepted a position as a principal investigator at Boeing and his role and influence has expanded rapidly at the company and across the international aerospace industry. Just six months into his tenure, he took over as program manager and principal investigator for a $10 million DARPA program on additive manufacturing that was far behind schedule and on the verge of being cut, something he entirely turned around.

Andrew is active in his professional organization, The Minerals, Metals & Materials Society, and received that organization's Structural Materials Division Young Leaders Professional Development Award in 2019. The St. Louis Academy of Science recognized Andrew's exceptional potential for future accomplishments in science or engineering with their 2019 Innovation Award, which is presented to an individual under the age of 40.

"Michigan Tech really taught me how to strip away unimportant peripheral characteristics of something— whether that be an idea, a thing, an activity, a place," he says. "Michigan Tech and the Copper Country are places that have, over time, distilled down to pure forms of their core values—hard work, perseverance, community, and an appreciation of aesthetic beauty, both natural and artisanal."

OUTSTANDING YOUNG ALUMNI AWARD

Amberlee Haselhuhn '11 '16

Amberlee Haselhuhn considers the time she spent in Michigan Tech's foundry in the materials science and engineering department as key to her success. In fact, Haselhuhn spent time there as both an undergraduate and graduate student.

"I was able to design my own metal alloys, melt and pour them in the foundry, machine and process them into usable parts, and to test my alloy properties all in one facility," she says. "What a great resource for students!"

Haselhuhn earned bachelor's degrees in materials science and engineering and biomedical engineering in 2011. She went on to gain a PhD in Materials Science and Engineering in 2016. After graduation, she joined General Motors' Manufacturing Systems Research lab as a researcher where she employed fundamentals of materials science and engineering to the welding and joining of dissimilar metals for automotive body light-weighting. Recently, Haselhuhn was promoted to a senior researcher role at GM where she leads projects to develop technical solutions for dissimilar metal joining.

Haselhuhn's career success was recognized with GM's prestigious Boss Kettering Award in 2017 for outstanding innovation related to

Andrew Baker

dissimilar metal joining work. In 2018 she was honored with the 30 Under 30 Award by *Manufacturing Engineering* magazine, in part for her technical achievements and STEM-outreach activities with local youth.

When asked how well Michigan Tech prepared her for her career, Haselhuhn says, "I was provided with an excellent hands-on, laboratory-based engineering curriculum that prepared me to hit the ground running in my first job."

Amberlee Haselhuhn

Michigan Tech's 2019 Alumni Reunion takes place August 1-3.

Visit mtu.edu/reunion for event schedule, details, and registration.

ALUMNI ENGAGEMENT

Apollo 13 was intended to be NASA's third moon-landing mission.

NASA

DICK TEMPLE '58 RECOUNTS HIS PART OF APOLLO 13 RESCUE MISSION

When Apollo 13 was launched on April 11, 1970, America watched as the seventh manned mission rocketed into space.

Dick Temple, a Michigan Tech 1958 alumnus and an employee at General Motors, Delco Electronics Division, was also watching that launch, but he didn't know he would soon find himself participating in the mission.

"My work on Apollo 13 was part of a much larger team effort across the country for sure, but I realized then how important it was to the overall rescue effort," Temple says. While Apollo 13 initially intended to land on the Moon, the lunar landing was aborted

after an oxygen tank exploded two days after launch. The crew faced great hardship caused by limited power, loss of cabin heat, shortage of water, and the need to make repairs to the carbon dioxide removal system.

Temple set up an Apollo Inertial Measurement Unit in a vacuum chamber to simulate the actual spacecraft conditions in order to determine when the astronauts would have to turn on the power. "We called Houston when the temperature reached 32 degrees. The system performance would have degraded below 30 degrees."

The astronauts returned safely to Earth on April 17, 1970. Temple says working on the Apollo program was an amazing experience. "We were doing something that had never been done before. I did repair work on a Lunar Module at Grumman and also component upgrades on guidance assemblies at North American Rockwell in Downey, California." Also, at Cape Canaveral, Florida, Temple was asked to replace a gyroscope on one of the early Apollo systems, something that had never been attempted there before.

Prior to his time with the Apollo program, Temple enrolled at Michigan Tech because "it offered an engineering degree and it was close to home." He chose mechanical engineering since he had a good academic background from his high school in Norway, Michigan.

But Tech was not easy for Temple. "My time there made me work hard to pass and in the end, gave me a good understanding of mechanical engineering. Later at work, my effort at Tech taught me to keep working until the job was done correctly and completely."

After working on Apollo, Temple was transferred to the Titan II, III, and IV (TII, etc.) programs where he

Dick Temple

supported the build and test of the inertial guidance systems for all of those programs. "TII and TIII were military-directed programs, but TIV was used to put many satellites in orbit, including 24 satellites for the military, and then for general use by everyone."

He was promoted to supervisor of the mechanical engineering group and later to department manager. He retired in 1999 after working at General Motors for 41 years.

"Supporting Michigan Tech is an important part of giving back to the very group that meant so much to my career. Michigan Tech is small enough to allow one to feel part of a very special school offering a great education and sound experience."

Dick and his wife, Bernadette, who passed away a few years ago, were married 54 years and raised six children (but none went to engineering school, he jokes).

"We all have the potential to be contributors to our communities and country. We only need to find that niche where we can help make a difference."

Delco engineer Pat O'Malley, astronaut Jack Lousma, and Temple

2019 ALUMNI-STUDENT BROOMBALL

Twelve teams and well over 100 alumni and friends made the journey to campus over Winter Carnival to participate in the 10th annual Alumni-Student Broomball Invitational. Alumni team Pirate Sheep claimed their fourth consecutive championship. Tournament details can be found at mtu.edu/alumni/favorites/broomball/. Want to join in the fun next year? Mark your calendar for February 8, 2020!

Broomball Invitational champs Pirate Sheep

TECH ALUMNI NEWSLETTER

Find out what's happening on campus and in the Copper Country, reminisce about people, places, or events from the past, read profiles on fellow alumni, and much more. Check your email inbox for each month's edition. Email us at alumni@mtu.edu with content ideas or to be added to our distribution list.

SNOWFALL CONTEST WINNER

Every Husky has a story about snow, and every year our snowfall contests give people a chance to put their extensive snow knowledge to the test. This year, Kailee Kovach, a class of 2020 medical laboratory science major, took home the prize in the annual snowfall contest with her guess of 192.25 inches. The 2018-19 snow total was 192.38 inches, measured at Michigan Tech's Keweenaw Research Center (our standard for every contest).

To get in on our monthly and annual snow contests in 2019-20, check out our website, mtu.edu/alumni, next fall.

DREAM JOBS

A degree from Michigan Tech can land you the career of your dreams. Just ask these alumni.

Send us details about your dream job or that of a Husky you know at alumni@mtu.edu.

CORVETTE RACING

Michigan Tech engineers and the automotive industry have a long and storied history. In fact, a number of alumni have been involved in racing. Fewer get to compete in one of the world's top series.

Ben Johnson '07 has worked in motorsports for the last 10 years, moving his way up to program director for Corvette Racing. He directs drivers and crew members for Corvette's entries into the International Motor Sports Association (IMSA) WeatherTech SportsCar Championship Series. Races take place in the US and Canada, January through October. Events include the Rolex 24-Hour at Daytona, Florida; the Chevrolet Detroit Grand Prix; Sahlen's Six Hours of the Glen in Watkins Glen, New York; and Motul Petit Le Mans, a 10-hour race in Atlanta.

"My dream job has always been working in a fast-paced environment where the contributions of effort and talent can truly be measured," says Johnson, a mechanical engineering alumnus. "Motorsports, and specifically endurance racing, is one of the best examples of this environment. There are objective measures—lap time and finishing position—and a field full of skilled competitors with exactly the same motivation."

Highlights of Johnson's young career include championships in IMSA's GT Le Mans division the last three years in a row. His Corvette Racing team competes against entries from Porsche, Ford, Ferrari, and BMW.

His personal highlights reflect more of a focus on the day-to-day of his position: "I believe the biggest highlight is working with a dedicated team of individuals who constantly strive to get the most out of the car, tools, and equipment we bring to the track each weekend."

The key to Johnson's quick rise to racing team director is in his preparation. "I approach every project and season with the goal of doing the absolute best that I can and leaving nothing to chance. I find the closer I get to this goal, the better the outcome tends to be and the more opportunities are presented."

Ben Johnson '07

Johnson is a program director for Corvette Racing.

RICHARD PRINCE/CHEVY RACING

NATIONAL DEFENSE

If you're not sure how driving a Russian missile truck during the aftermath of the Cold War might be a dream job, you'll have to ask Steve Pribish '64.

From 1965 to 1998, Pribish worked with the US Air Force's Foreign Technology Center (now called the National Air and Space Intelligence Center). "I was fortunate to be in the data integration center, using all source intelligence data to determine the capabilities and limitations of foreign missile, space, and aerodynamic systems," he says.

Torn between choosing an electrical engineering or a mechanical engineering degree at Michigan Tech, Pribish opted instead for an applied mathematics degree, which he figured would get his foot in the door to any career. It did just that, leading to a 33-year career in the Air Force, which included work to reduce foreign nuclear capability.

"I joined the Air Force to escape the draft and ended up being assigned to the Foreign Technology Division. From that humble beginning I ended up doing more than I could ever have dreamed."

Pribish, who spoke of his struggles in a mechanical drawing class at Tech, was surprised to see his engineering drawings of missiles being used in treaty briefings. He later spent time in Russia as an inspector following nuclear reduction treaties, overseeing the destruction and disposal of Russian missiles. "My Tech experience came in handy during those Russian winters," he jokes.

Steve Pribish '64

BESTSELLING AUTHOR

Writer. Professor. Podcaster. Critic. Any one of those may be a career goal. For Roxane Gay '10, they're all a reality.

After earning her PhD in Rhetoric and Technical Communication from Michigan Tech in 2010, Gay served as assistant professor of English at Eastern Illinois University. She moved on to an associate professor role at Purdue University in 2014, and served as visiting professor at Yale in 2018.

Her writing plaudits are numerous and include two *New York Times* bestsellers: *Bad Feminist* (2014) and *Hunger* (2017). *Bad Feminist* is a collection of essays covering politics, criticism, and feminism. In *Hunger*, subtitled "A Memoir of (My) Body," Gay wrote about her struggles with weight, health, anxiety, and societal pressure.

Gay has been published dozens of times, from short stories to novels, fiction to nonfiction, poetry to comics. Other major titles include *Ayiti* (2018), *The Best American Short Stories* (2018), *Not That Bad* (2018), *Difficult Women* (2017),

Roxane Gay '10

Black Panther: World of Wakanda (2016), and *An Untamed State* (2014).

For Marvel Comics' *Black Panther: World of Wakanda*, Gay and fellow writer Yona Harvey became the first black women to be lead writers for Marvel.

Born in Omaha, Nebraska, Gay has traveled the world for speaking engagements and appearances. She has served as a columnist

for the *New York Times* and founded a small publishing company named Tiny Hardcore Press. Gay has several books forthcoming as well as television and film projects in the works.

"It's my dream job because I get to be creative every day," she says. "I get to tell interesting stories and travel around the world and meet fascinating people. I get to contribute to change in a small way."

A 21ST CENTURY CAREER

The workplace is changing dramatically. The average tenure of an employee at their current job is 4.6 years, and for workers between the ages of 25 and 34, it's 2.8 years. Roughly 40 to 50 percent of the American population is expected to work as independent contractors or freelancers by 2020. Artificial intelligence and robots are displacing jobs while simultaneously creating new ones that few people are trained for.

Gone are the days of attending college to secure a job in a career that will last a lifetime, solely due to deep expertise.

To be prepared for the kind of change they will experience in the 21st century, students must develop a skill set that empowers them to handle uncertainty. In Michigan Tech's Career Services office, people like Melissa Michaelson —pictured far left with student DeJah Hall—offer Design Your Career courses to help students prepare for the unexpected. Participants apply Design Thinking (see pages 22-25) to map out possible career options unique to them. They come up with different versions of their five-year plan and address potential roadblocks and setbacks. The tools, strategies, and skills they learn can be applied throughout their professional working career.

Students who complete the course say they gained insight about themselves and developed concrete actions for moving forward in their careers. Says one participant, "It's a relaxed, non-judgmental environment that allows students to explore possible futures."

IN MEMORIAM

1938
James E. Gibson
Herbert F. Krohn

1943
Chester J. Taylor

1947
Carl R. Kukka

1948
John P. Neu
Richard E. Smith
James C. Vandertill

1949
Paul W. Kauppila
Shirley M. Lund
Robert R. Mead
James A. Mickelsen
Calvin L. Sleeman

1950
John J. Bodi
Alfons J. DeRidder
John A. Dobb
John A. Donald PE
Earl J. Harrington
John L. Walter
Charles R. Young

1951
Dr. Domenic A. Canonico
Arthur L. Jarvela
Gilbert R. Johnson
Calvin E. Ojanen
Frank L. Suber

1952
George Stencel
Jack A. Zollner

1953
James R. Lizenby
Dr. Dennis E. Teeguarden

1954
John W. Burlingame
Norma J. O'Brien
Leslie C. Talo
Thomas R. Thornton
John H. Volpel

1955
Harold J. Lawson PE
Maxwell J. Sobolewski
Bruce E. Valine

1956
Frederick W. Ahola
Max V. Coburn PE
Leo W. Fallstrom
Allen D. Mellstead

1957
George W. Fish
F. Harold Forburger
Patrick J. Gallagher
Bernard E. Niehoff
Clifford J. Purdy Jr.

1958
Jack Parker
Thomas N. Rushton

1959
Bruce E. Douglas
Gerald J. Ziarno

1961
Godfrey A. Holmstrom Jr.
Dr. Gary L. Jewett
Thomas A. Powers

1962
Clarence J. Kalmer
Donald E. Lutz
Paulus B. Moore PhD
Lawrence N. Witte PE

1963
John J. Arneth Jr.
Thaddeus M. Koziol
Ronald L. Magnus

1964
Robert J. Oswald PE
James L. Smith
Clinton H. Sundstrom

1965
Gary L. Humphreys

1966
Richard A. Miller
Joseph C. Palermo
Dr. Edward P. Simonen
Frederick V. Slocum
James R. Williams

1967
James C. Aumer
Thomas H. Brodine
Maria D. Mustonen

1968
Kenneth J. Girard

1970
James I. Hatala
Robert W. Herrman
Roy H. Isaacson
Theodore Klemp III

1971
Paul M. King
Roger A. Wenk

1972
Thomas R. Duvendack
Frederick H. Hillard Jr.
Anthony P. Landini
Ahmed E. Meligi

1974
Linda G. Schmitt
Robert L. Whipple

1975
Gerald C. Anderson
Fredrick L. Cook

1978
Mark L. McClannahan

1980
Joan E. Allen

1981
Robert L. Farrell

1982
Brian L. Slater PE

1983
Brian A. Fojtik
Eleanor A. Johnson

1984
Michael R. Johnston
M. Keith Kaufman

1985
Matt J. Banovetz

1986
Nancy M. Rothe

1987
Michael R. Griffin
Christopher L. Hautau
Lynn M. Isaacson

1988
Dr. John W. Hilgers

2006
Erik A. Scheffler

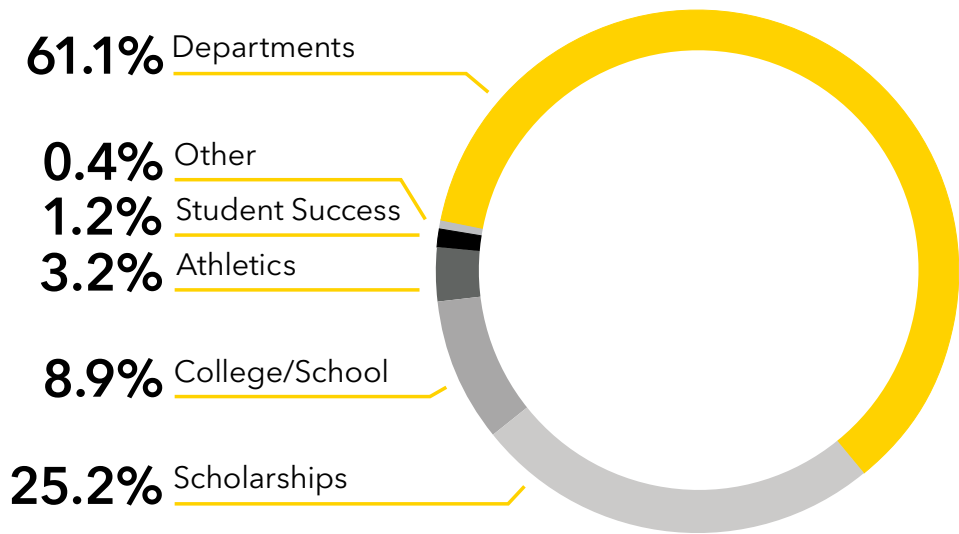# Gold and Black Give Back:
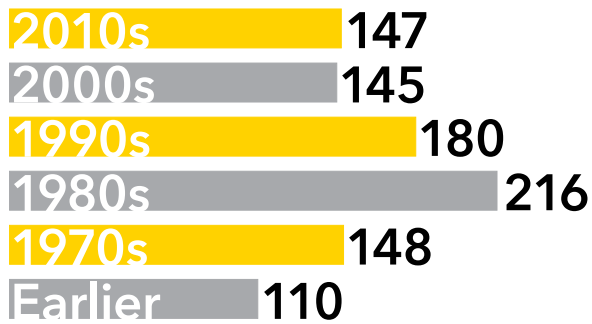
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$570,813 from 1,337 gifts.

248 first-time donors.

338 faculty/staff made gifts.

Gift from alumni class by decade

Decade	Gifts
2010s	147
2000s	145
1990s	180
1980s	216
1970s	148
Earlier	110

61.1% Departments
0.4% Other
1.2% Student Success
3.2% Athletics
8.9% College/School
25.2% Scholarships

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