I
nside the Gerri c. LeBow Hall at Drexel, marketing doctoral student Hongjun Ye settles in front of a computer and launches Overwatch, a popular online multiplayer videogame. For the next several minutes, she defends a payload by peppering enemy bots as they try to duck behind the stone pillars of a red pagoda in a futuristic world.

“I like to play video games,” allows Ye, who is a fan of Overwatch as well as other first-person shooter games such as Counter-Strike and Borderlands. But this was much more than downtime from the demands of a doctoral degree. The gameplay inside LeBow’s Behavioral Lab was a dry run for a cutting-edge neuroscience research project involving military veterans that Comcast NBCUniversal contracted with Drexel to design, develop and conduct.

“I really like industry-based projects,” Ye says, during a break from the game. “Students cannot just conduct experiments in the lab and talk about everything in terms of pure theory. It has to connect with the real world.”

Fellow researcher Adrian Curtin agrees. “You consider the impact,” says the post-doc, who was drawn to the project by his research interest in non-invasive neuroimaging. “A lot of times, when you deal with research, you’re focused on knowledge: I want to discover how this works, because I want to know how that works… Working together with private companies gives you a different perspective, a different way to think.”

Adds Ye: “This is a perfect opportunity.”

It’s an opportunity that may never have occurred but for the existence of a unique resource within Drexel called Drexel Solutions Institute. The institute plays a matchmaker role in connecting industry partners with the University’s academic research enterprise. Formed about five years ago as Drexel Business Solutions Institute within the LeBow College of Business, it expanded to a university-wide role in 2019 and dropped business from its name. Now, the three-person unit serves as a gateway for companies, non-profits and governmental entities to partner in a fee-for-service model with Drexel faculty and top students on customized engagements that range from targeted research to co-designed curricula to tailored workforce training. Project fees typically range from $10,000 to $200,000 to cover the expenses of faculty members’ time and project management.
“Organizations have a one-stop shop to access Drexel’s diverse expertise,” says Anna Koulas, who, as vice president of DSI, helps to identify and cultivate partnerships. “DSI is bringing together the best of Drexel.”

So far, dozens of faculty members and about 200 students of all levels have worked with outside organizations on six projects coordinated by DSI. In addition to the esports study for Comcast, faculty and students have helped business partners gauge the sustainability impact of a clean water project in rural India; create a one-of-a-kind experiential program for a social services nonprofit; assess consumer responses to PEYO’s dynamic utility pricing models; and market test a new hot beverage machine for coffee company Lavazza.

This way of arranging external research opportunities on behalf of the entire University — as diverse as they escort the payload to its destination? And if so, what specific aspect of their communication leads to this bonding? The study also considers the difficulty level of the game and how the players’ proximity to each other, looking at both remote and in-person play, impact teamwork.

“Neurophysiological measures of the brain provide us with a unique new perspective on mental processes, and complement and expand up behavioral performance metrics,” Ayaz says. The researchers even get the gaming company that produces Overwatch to customize the game for their experiment by creating special tasks for the players that emphasizes teamwork.

As Ayaz explains, he is most excited about using wearable brain and body sensors to assess team dynamics and simultaneously monitor multiple brains cooperating on the same game scenario. The project combines both fNIRS and EDA (electrodermal activity, or skin conductance) technologies (fNIRS: Functional Near-Infrared Spectroscopy, and wearable neuroimaging more broadly, is Ayaz’s hallmark. While earning his graduate degrees at Drexel, he developed new neuroimaging methodologies and a novel brain-computer interface, and today his lab is a leader in investigating how the brain functions in workplace and everyday settings, which is part of a new field known as neuroergonomics. Ayaz is one of the field’s chief editors for a new international journal called Frontiers in Neuroergonomics.

“With wearable and mobile sensors, we can now monitor the brain activity in realistic settings and even outdoors or in the workplace, so you can do the task just like you would in the real world,” Ayaz says. “Here, we’re outlining the typical environments for gamers, and the groups of teams that they form, to measure multimodal and multimodal biometrics.”

One portion of the project is planned to take place at Nord Street Gamers, a gaming venue in Philadelphia, where researchers will gather more data on teamwork and game dynamics during an actual Overwatch tournament. “This,” Ayaz says, “is pushing the frontier.”

On a recent March afternoon inside the Behavioral Lab, a team of researchers that includes Ayaz sets up two gaming stations on opposite sides of the large room, each running Overwatch.

For the uninitiated, Overwatch is a cooperative, multiplayer combat game set in a futuristic Earth that has been threatened by a robot uprising and dangerous political intrigue. Players are first-person “hero shooters” who collaborate with online strangers assigned to their team to restore order by completing tasks within a time limit — earning experience and “Gold” along the way. “It was for the colorful, fluid workflows and accessible gameplay,” Overwatch became all the rage after its 2016 release by Blizzard Entertainment, earning $1 billion in its first year and drawing as many as 25 million users globally, according to parent company Activision Blizzard.

The key questions: Are team players — whether two vets or two civilians with different experience levels — in sync; that is, literally on the same wavelength through neural synchrony — so they secret the payload to its destination? And if so, what specific aspect of their communication leads to this bonding? The study also considers the difficulty level of the game and how the players’ proximity to each other, looking at both remote and in-person play, impact teamwork.

“Neurophysiological measures of the brain provide us with a unique new perspective on mental processes, and complement and expand up behavioral performance metrics,” Ayaz says. The researchers even get the gaming company that produces Overwatch to customize the game for their experiment by creating special tasks for the players that emphasizes teamwork.

As Ayaz explains, he is most excited about using wearable brain and body sensors to assess team dynamics and simultaneously monitor multiple brains cooperating on the same game scenario. The project combines both fNIRS and EDA (electrodermal activity, or skin conductance) technologies (fNIRS: Functional Near-Infrared Spectroscopy, and wearable neuroimaging more broadly, is Ayaz’s hallmark. While earning his graduate degrees at Drexel, he developed new neuroimaging methodologies and a novel brain-computer interface, and today his lab is a leader in investigating how the brain functions in workplace and everyday settings, which is part of a new field known as neuroergonomics. Ayaz is one of the field’s chief editors for a new international journal called Frontiers in Neuroergonomics.

“With wearable and mobile sensors, we can now monitor the brain activity in realistic settings and even outdoors or in the workplace, so you can do the task just like you would in the real world,” Ayaz says. “Here, we’re outlining the typical environments for gamers, and the groups of teams that they form, to measure multimodal and multimodal biometrics.”

One portion of the project is planned to take place at Nord Street Gamers, a gaming venue in Philadelphia, where researchers will gather more data on teamwork and game dynamics during an actual Overwatch tournament. “This,” Ayaz says, “is pushing the frontier.”

On a recent March afternoon inside the Behavioral Lab, a team of researchers that includes Ayaz sets up two gaming stations on opposite sides of the large room, each running Overwatch.

For the uninitiated, Overwatch is a cooperative, multiplayer combat game set in a futuristic Earth that has been threatened by a robot uprising and dangerous political intrigue. Players are first-person “hero shooters” who collaborate with online strangers assigned to their team to restore order by completing tasks within a time limit — earning experience and “Gold” along the way. “It was for the colorful, fluid workflows and accessible gameplay,” Overwatch became all the rage after its 2016 release by Blizzard Entertainment, earning $1 billion in its first year and drawing as many as 25 million users globally, according to parent company Activision Blizzard.
The game has figured mightily in international esports competitions with six-figure prize pools and professional teams, including the Philadelphia Fusion. Comcast is heavily involved; its unit Comcast Spectacor paid for millions of dollars to sponsor, one of six national city-based teams that compete in Blizzard’s Overwatch League that launched in 2017. Along with the Cordish Companies, Comcast Spectacor also is building a 55,000-seat, $548-million arena at Citizens Bank Park, that is scheduled to open in 2023. In addition, Comcast Spectacor is investing in Philadelphia’s Navy Street Gaming, an esports competition facilities at college campuses and five Below stores in the next few years. The Fusion franchise, never was a team to invest in a single sport, but it has bet its future on Philadelphia as an esports export and on the export industry itself, projecting to hit $8.6 billion in 2022, according to analytics company Newzoo.

Overwatch proved the ideal choice of video game for the experiments, Gray says. “With our company’s commitment to the military community and our Philadelphia Fusion competing in the Overwatch League,” Gray says, “the choice is even more relevant to inform future business decisions.”

In the Overwatch behavioral experiments, two players navigate their avatars to escort pay-loads to new destinations. Each player plays individually against an A.I. opponent, and then against each other, while biomedical device record their body’s responses. As Ye defends against the oncoming opponents and pushes forward along, she wears a 16-inch wide gray band around her forehead — the fNIRS device. The headband monitors her brain activity as she moves through the game’s virtual universe, including how much oxy-gen she consumes. She also wears an electrodermal activity (EDA) device around the index and middle fingers of her left hand, which collects information on her skin conductance to measure emotional arousal.

This study breaks ground because it doesn’t rely solely on subjective self-reporting of the experience, as is typical. The fNIRS and EDA technology generate a dataset of objective information on players’ mental eff orts.

The result was a platform that OFA would never have envisioned, let alone developed, on its own. “That’s really the magic,” Howley says, who was tapped by DSI to consult on the project as a faculty member. “DSI matches the needs of the project to the faculty.” As the pro-ject developed, experts from the School of Education and College of Computing & Informatics suggested meaningful curricular activities and the VR demo.

“The clients love this,” Howley says. “It’s not out of a re-port, it’s not sitting in a room in an article. They’re able to talk to the person who wrote the article, the expert in this.”

Likewise, Philadelphia-based FMC has partnered with Drexel’s expertise from the Wharton School of Public Health and LeBow College of Business to study the health impact and community attitudes toward its clean water project in India. FMC is working with a cross-functional team of innovation leaders from its research and development and global R&D named Community Pure Water, as well as a local research agency in India, to install reverse-osmosis water-filtration plants over several years. A key goal of the effort is to conduct community needs assessments and to collect and analyze health and socioeco- nomic condition data over time. “The opportunity to put this subject in front of really forward-looking, in the lab, we do inventions, but we have to translate our inventions to the market,” Suri says. Ultimately, DSI projects create immense, even global learning environ-ments that “train students to be thought leaders,” Suri says. “Research normally exists in isolation on campus. DSI is the medium to translate the internal to the external and vice versa, looking at what industry wants and bringing students along with us in a meaningful way, while also bringing industry into our research and classroom spaces.”

“That,” he says, “is path breaking.”

Before the institute had a track record, it had difficulty recruiting students to join proj-ects, says Suri. “Now, we don’t.”

No surprise there, considering the robustness of DSI’s collaborations.

In one project that began October 2020, three co-ops and two marketing graduate stu-dents have been helping to run a feasibility analysis of a new program that supports clients of OFA. “We’re excited to see how the study will inform how we create esports experiences tailored to our clients’ needs,” says Suri. “Now, we don’t,” he says. “When they start working, they find it exciting and engaging.”

No surprise there, considering the robustness of DSI’s collaborations.

In one project that began October 2020, three co-ops and two marketing graduate stu-dents have been helping to run a feasibility analysis of a new program that supports clients of OFA. “We’re excited to see how the study will inform how we create esports experiences tailored to our clients’ needs,” says Suri. “Now, we don’t,” he says. “When they start working, they find it exciting and engaging.”

No surprise there, considering the robustness of DSI’s collaborations.

In one project that began October 2020, three co-ops and two marketing graduate stu-dents have been helping to run a feasibility analysis of a new program that supports clients of OFA. “We’re excited to see how the study will inform how we create esports experiences tailored to our clients’ needs,” says Suri. “Now, we don’t,” he says. “When they start working, they find it exciting and engaging.”

No surprise there, considering the robustness of DSI’s collaborations.

In one project that began October 2020, three co-ops and two marketing graduate stu-

...