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Link to original story: <https://uwm.edu/news/how-math-and-impatient-driving-inspired-students-award-winning-startup/>

Link to video: <https://www.youtube.com/watch?v=86AE-ooq1uE>

**How math and impatient driving inspired student’s award-winning startup**

Written by Laura Otto

Joel Roberts really hates sitting at red lights – especially the ones that hold you hostage while not a single car passes in the cross-direction.

“Sitting in traffic bothers me,” said Roberts, a PhD student in civil engineering at UWM. “So, getting drivers through intersections efficiently is interesting to math guys like myself because it’s basically an optimization problem.”

Now, that everyday frustration has fueled something bigger: an award-winning startup.

Roberts is the founder of Shepherd Traffic, a company that uses computer vision, geometry and smart algorithms to capture more detailed and accurate traffic data than what’s currently available. The idea is to let the computer do the watching – and the counting.

When traffic management professionals need to time a light or redesign roads, the initial data they need are object counts and classifications, which you can take from videos.

His pitch for the company beat out top student innovators from across Wisconsin to [win the $2,500 grand prize](https://www.wisys.org/news-media/2025-wisys-big-idea-tournament) at the [WiSys Big Idea Pitch Competition](https://wisys.org/events/bigidea).

**Smarter intersections, less waiting**

Traffic lights usually run on fixed timing patterns that do not respond to the small nuances of traffic, Roberts said. Timings get the main gist of traffic, but they can’t optimize every exact situation. A fully adaptive system would.

“The first thing I built was an algorithm that recognizes and calculates the delay for every object – cars, trucks, bikes, pedestrians – at any given point when the light changes,” he said. “It figures out the best moment to switch to minimize everyone’s wait.”

His system doesn’t just count objects. It logs trajectories and could help predict movement.

And unlike many competitors who still rely on manual traffic counting (clipboards and all), Roberts’ approach is automated – making it faster, cheaper and more scalable.

**From idea to incubator**

The turning point came two years ago when Roberts took his idea to UWM’s Lubar Entrepreneurship Center. Encouraged by friends, he applied to I-Corps, a national program that helps turn university research into startups.

He applied to the program as a community member and met Xiao Qin, UWM professor of civil engineering and an expert in traffic systems. Qin not only agreed to help him but also encouraged Roberts to pursue his graduate studies at UWM, where he also received an assistantship.

As a graduate student in the department, Roberts could work on his startup as part of his academic research.

That turned out to be pivotal to advancing his goals, Roberts said.

“I needed time to work on this project, deeper expertise and a way to support myself while doing it,” he said. “I’m grateful to Dr. Qin, who also is an expert in many aspects of what I’m building my business on.”

**The road ahead**

Through I-Corps, Roberts learned that it’s not uncommon for 40% of traffic project budgets to be spent just on data collection. That’s a huge opportunity, he said, especially if his system can deliver better results at a lower cost.

Looking ahead, he plans to expand his data capabilities to include pedestrians — often overlooked in traffic studies — and to add the aspect of data involving “near misses,” a topic that Qin has conducted research on.

He hopes his system can one day help forecast risky driving behavior — such as the likelihood of someone running a red light. It’s the kind of insight that could transform how cities plan intersections, adjust signal timing and improve safety.

He’s also exploring two business models: selling the traffic insights directly or licensing the software behind them.

For now, the demand may be modest. But as smart cities grow and infrastructure modernizes, Roberts believes his vision for data-driven intersections will be right on time.