

Students design asteroid impact model for NASA



Every year, NASA Space Apps invites participants from around the world to collaborate on real-world challenges posed by NASA.

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COURTESY OF THE INTERVIEWEES

Engineering students from the [Tec's Querétaro campus](#) participated in the **NASA Space Apps Challenge**, where they developed a **tool that simulates asteroid impact scenarios** using real data.

As part of [NASA's global hackathon](#), six students formed Team **Delta UV**, which worked on the *Meteor Madness* challenge, a competition focused on real-time analysis of asteroid data.

Every year, **NASA Space Apps** invites participants from around the world to collaborate on challenges based on real NASA data, to foster technological, scientific, and social solutions that have a global impact.

“The competition is fierce and tough, but it’s a challenge we decided to take on”, said Ken Ochoa.

A UNAQ aircraft engine in the Jorge Gutiérrez de Velasco hangar, a facility dedicated to aeronautical engineering training and practical exercises.

Photo: Carol Sofía Rodríguez Esquivel



A challenge based on real spatial data

The challenge involved using real-world databases of asteroids in near-Earth orbit to **develop a predictive model capable of analyzing the probability of an impact and estimating the potential consequences** in the event of a collision with the planet.

“Creating a predictive mathematical model to estimate the number of deaths caused by the impact was quite a challenge; I used every tool at my disposal to develop it”, said Sebastián García.

The team drew on expertise from various disciplines to develop an approach that would allow them to **model impact scenarios from scientific, urban planning, and social perspectives**. They based their findings on information available in academic research, specialized articles, and public databases.

The team includes students Carol Sofía Rodríguez Esquivel and Fernando Ken Ochoa Aoki from the Mechanical Engineering program; **Mariano Villagómez** and **Sebastián García** from the Mechatronics Engineering program; **Emiliano Rangel** from the Robotics Engineering program; and **Axel Rocha** from the Data Science and Mathematics Engineering program.

A team of students working on their entry for the NASA Space Apps Challenge. Photo: Carol Sofía Rodríguez Esquivel



Developing an asteroid simulator

Their project was named **AIS (Asteroid Impact Simulator)**. With this tool, users can **select an asteroid** from real-world records or create one with customizable

characteristics, such as diameter and velocity. **The system generates a visual representation of the potential impact at a specific location on Earth.**

“Creating a model that is clear and easy for users to understand requires a lot of work behind the scenes”, said Mariano Villagómez.

“It’s about giving it your all to achieve your goal as part of the team”.- Alex Rocha.

The **simulator includes:**

- *Probability of impact based on orbital data*
- *Mathematical models for estimating human and urban damage*
- *Visual representation of the crater and the affected areas*
- *Calculation of shock wave rings and seismic range*
- *Bilingual version (English/Spanish)*
- *Accessibility for people with color blindness*

The team developed its own approach for the **human impact model** based on **historical records** of explosive energy, such as those documented during World War II. This made it possible to calculate damage based on the **energy released, expressed in megatons.**

“It’s an experience that unleashes our full potential and really shows us what teamwork is all about”, said Carol Rodríguez.

Students participating in the NASA Space Apps Challenge. Photo: Carol Sofía Rodríguez Esquivel



Analysis, design, and visualization

The team also designed a **visual interface** to help interpret the results; this included a **3D representation of the Sun, Earth, Moon**, and asteroid to show their trajectories and the impact scenario.

“The challenge involved conducting research, creating models, programming, and presenting the results clearly to different audiences”, the team said of their experience.

“It’s about giving it your all to achieve your goal as part of the team”, said Alex Rocha.

Experience at the hackathon

This process required **research, design, programming, and teamwork** to bring together the participants' diverse areas of expertise. The project won **first place** at the regional level, highlighting its **comprehensive approach and its ability to explain a scientific phenomenon in an accessible way**.

"It was an experience that allowed us to apply our technical expertise in a global context and work under pressure to achieve a common goal", they said.

NASA Space Apps Winning team. Photo: Carol Sofía Rodríguez Esquivel



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