PhD Offer at Worcester Polytechnic Institute

Strengthening conservation partnerships by advancing molecular and analytic tools for disrupting illegal wildlife trade

At Worcester Polytechnic Institute, Worcester, MA, USA
- Supervised by: Dr. Renata Konrad
- Funding: 36 months PhD scholarship from the National Science Foundation
- Starting date: Preferably in January 2026
- In collaboration with United for Wildlife, Florida International University and the University of Maryland

Project Description Disrupting illegal wildlife trade by enabling molecular identification of sharks, rays, and turtles (link)

Focusing on certain species of sharks, rays, and sea turtles, this groundbreaking project aims to disrupt the illegal wildlife trade. The interdisciplinary effort combines expertise in operations, computer science, biology, and social science to develop innovative tools for researchers and law enforcement.

The project is one of 10 projects funded by the Partnership to Advance Conservation Science and Practice (PACSP) program (link), a first-of-its-kind collaboration between the National Science Foundation and the Paul G. Allen Family Foundation, a philanthropic organization founded by the late Paul G. Allen (co-founder of Microsoft) that, among other endeavors, supports the use of science and technology to protect wildlife. The program is designed to promote deep collaboration between researchers advancing basic science and conservation partners engaging in on-the-ground conservation.

Driven by demand for exotic pets, traditional medicines, and luxury goods, the multi-billion-dollar illegal wildlife trade poses a severe threat to biodiversity and the survival of numerous species. Law enforcement agencies around the world face significant challenges in identifying and intercepting illegal wildlife products, particularly when only fragments of animals, such as fins or shells, are involved

Using a method called high-resolution melting, the team is developing an inexpensive test kit, similar to commercially available COVID-19 tests, that can quickly and accurately feed unique molecular markers into an artificial intelligence-powered database of 20,000 samples from 185 protected species. This method provides physical evidence of illegal trade.

The project will also set up an online infrastructure to analyze social networks where illegal wildlife trade is often discussed. By tracking keywords, using machine learning to detect when illegal wildlife trade is being discussed, and employing data analytics and rapidly evolving large-language artificial intelligence models, end users will get a look at both real-time results and long-term trends. Thus, the team will have both physical and cyber evidence of illicit trade.

However, with limited intervention resources, the fundamental question is how, when, and where to deploy these resources. Thus, the aim of this PhD thesis is to develop an algorithmic framework to support operational decisions related to intervention decisions. Maximizing the efficiency of scarce resources is a fundamental aspect of problems addressed through optimization. The PhD thesis will center on developing network interdiction models by developing an algorithm that draws on the strengths of the knapsack problem and multi-armed bandit approach. Simulation testing, sensitivity analyses, and the use of empirical data will validate these computational techniques and algorithms being proposed.

Candidate profile:
An ideal candidate for this PhD position holds a Master of Science in Industrial Engineering, Operations Management, Data Science, Operations Research, or Applied Mathematics.

In addition, the candidate is expected to meet the following requirements:

- Excellent background in mathematical modeling. Experience with stochastic modeling methods would be an asset.
- Good programming skills.
- Interest in optimization and data science.
- Good oral and written skills.
- Self-motivation and autonomy.

Application
Interested candidates are invited to submit the following documents, before July 30th, 2025:

- A detailed CV
- Academic transcripts (including grades and class ranking)
- Contact information for two academic references

Applications should be sent by email to: rkonrad@wpi.edu