STATEMENT OF INTEREST

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Computational Agricultural Sciences · MSc / PhD applicant · 2027 cohort

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The first time I tried to grade coffee leaf rust by eye, I could not agree with myself. A leaf I called *moderate* on Monday read *severe* on Tuesday. The ordinal severity scale used in tropical phytopathology, 0 for healthy, 5 for collapse, has a precision that field reality refuses to give it. That problem became my graduation thesis at EARTH UNIVERSITY: training knowledge-distilled vision transformers to perform ordinal severity grading of *Hemileia vastatrix* (roya) and *Mycena citricolor* (ojo de gallo) from field-captured leaf imagery. It also became the question that pushed me toward graduate research.

I came to this work by way of two countries. From Haiti, where I grew up watching coffee, mango, and breadfruit production lose entire seasons to disease, post-harvest collapse, and a brittle food system, and where the gap between extension recommendations and farmer reality was the everyday weather of agricultural life. From Costa Rica, where EARTH University's curriculum on tropical agriculture met my own curiosity about machine learning, and where I discovered that the work I most wanted to do lived at the intersection of computational rigour and tropical biology.

What I have built so far rests on three undergraduate efforts. **Mi Salvador** (mi-salvador.com) is a web-based population-genetics laboratory I designed and maintain: Mendelian inheritance, Hardy-Weinberg equilibrium, allele-frequency drift under selection, all reproducible from a single seed. It is used now as a teaching tool and is the substrate for my interest in computational genomics. **My graduation thesis** brings vision transformers, paired with an ordinal regression head, into a problem domain, smallholder coffee phytopathology in Latin America, where they have not yet seen serious deployment, and is in preparation as a first-author manuscript targeting *Computers and Electronics in Agriculture*. **My internship at Auburn's E.W. Shell Fisheries Center** (September–December 2025) put me on a coupled tilapia–tomato aquaponic system and gave me a season's worth of water-quality, fish-health, and yield data. Across all three, a quieter thread runs: an open-source toolchain (**RflowLabs**) for reproducible scientific computing in low-resource settings, because the most ambitious AI methodology is useless if a colleague with patchy internet cannot re-run it six months later.

The graduate research I am applying for is one in which I can extend three lines of work:

- **Multi-disease, multi-species plant pathology with calibrated uncertainty.** A single field-deployable model that diagnoses tropical staple-crop pathologies (coffee, cassava, plantain, breadfruit) from a smartphone, returning not a class label but a calibrated probability and an interpretable cue. The deployment target is a smallholder in Limón or Les Cayes, not a research station.

- **Computational genomics for under-represented tropical-crop populations.** A breeding-simulation framework that is variant-aware, polygenic, and tuned for crops whose genomes are still poorly characterised. Mi Salvador is a teaching tool today; what I want to build at the graduate level is a research platform for population-scale simulation of selection in real cassava, coffee, and tropical-fruit germplasm.

- **Digital-twin modelling of integrated production systems.** Hybrid mechanistic-plus-machine-learning

models of aquaponic and integrated agro-aquaculture systems, with control strategies that match or beat human operators on smallholder farms. Auburn taught me the data; the graduate work would be the model.

These threads share a methodological commitment: *reproducible scientific computing built for the conditions of tropical agriculture*. That means open data, open code, calibrated uncertainty, and tools that compile on the laptop a graduate student in Guácimo or Port-au-Prince actually has. It is a commitment I want to sharpen under good supervision.

I am applying for fully funded MSc, integrated MSc-to-PhD, and direct PhD positions. I bring a B.Sc. in Agricultural Sciences from EARTH University with cumulative GPA 9.2 / 10, a working command of Python, R, PyTorch, and the QGIS / scientific Python stack, four research languages (French, Haitian Creole, English, Spanish), and a temperament suited to careful, long-form research.

The leaf I could not grade is now the leaf my thesis grades reliably. The next set of questions (pathology at scale, genomics for tropical crops, digital twins for integrated systems) is bigger than one leaf, and I am applying to take them on under a supervisor whose work treats fieldwork and computation as one practice, and whose lab values rigour, openness, and the slow craft of building tools that last.

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