**Title:** iVLM: A collaborative, data-driven approach to innovate biodiversity and environmental monitoring efforts at the Virginia Living Museum

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**Community Partner:** Virginia Living Museum (VLM)

**Collaborating Researchers:** VLM staff in two departments, Ectotherms and Horticulture

**Project Summary**

*Description*

In this project we will develop and apply low-cost, customized sensor technologies and data science tools to enhance biodiversity monitoring and environmental management at the VLM. This project has two facets. The first facet involves refining and expanding on the "ManderMeter," a custom-built handheld environmental sensing device I created, to support the Ectotherms Department's amphibian biodiversity surveys. We will also assist in analyzing data from those surveys and their long-term freshwater turtle biodiversity survey dataset (ongoing since 2010) using AI-based pattern recognition techniques. The second facet involves an emphasis on monitoring indoor environmental conditions for both the Ectotherms Department and the Horticulture Department. We will design Arduino-based systems to continuously monitor relevant conditions within those facilities and alert staff of extreme and health-threatening conditions. We will also create handheld devices for targeted monitoring of individual organisms in their care.

*Objectives and Methodologies*

- We will design, refine, and deploy Arduino-based devices tailored to each department's needs, building on prior successful informal collaborations (e.g., the ManderMeter).
- We will also integrate AI and data science tools to recognize patterns and analyze existing large datasets (e.g., turtle census data) and environmental monitoring data (e.g., exhibit animal and plant monitoring systems).
- We will train VLM staff in the assembly, programming, and use of these systems, and any analysis-related components, ensuring their long-term sustainability.

*Expected Outcomes*

- All devices, scripts, and materials developed through this project will be shared with VLM staff, along with guidance on use. This will build staff capacity to integrate stronger science and low-cost technology into their public-facing (and often public-involved) conservation and husbandry efforts, improving their capacity for data collection, analysis, and sharing.
- The proposed environmental monitoring system and handheld devices should also improve the quality of animal and plant care, and public conservation messaging, at the VLM.
- Efforts should also help generate a strong and sustainable research partnership with the VLM that extends beyond this study (e.g., new device needs and/or new collaborations).

*Use of Data Science / AI*

- AI and data science techniques will enable identification of key ecological trends and outliers within the VLM's freshwater turtle and salamander survey datasets.
- Data visualization and notification systems, along with machine learning (e.g., scikit-learn) methods, will be integrated into environmental monitoring efforts in both departments to improve care and enable early anticipation of changing (or harmful) ambient conditions.