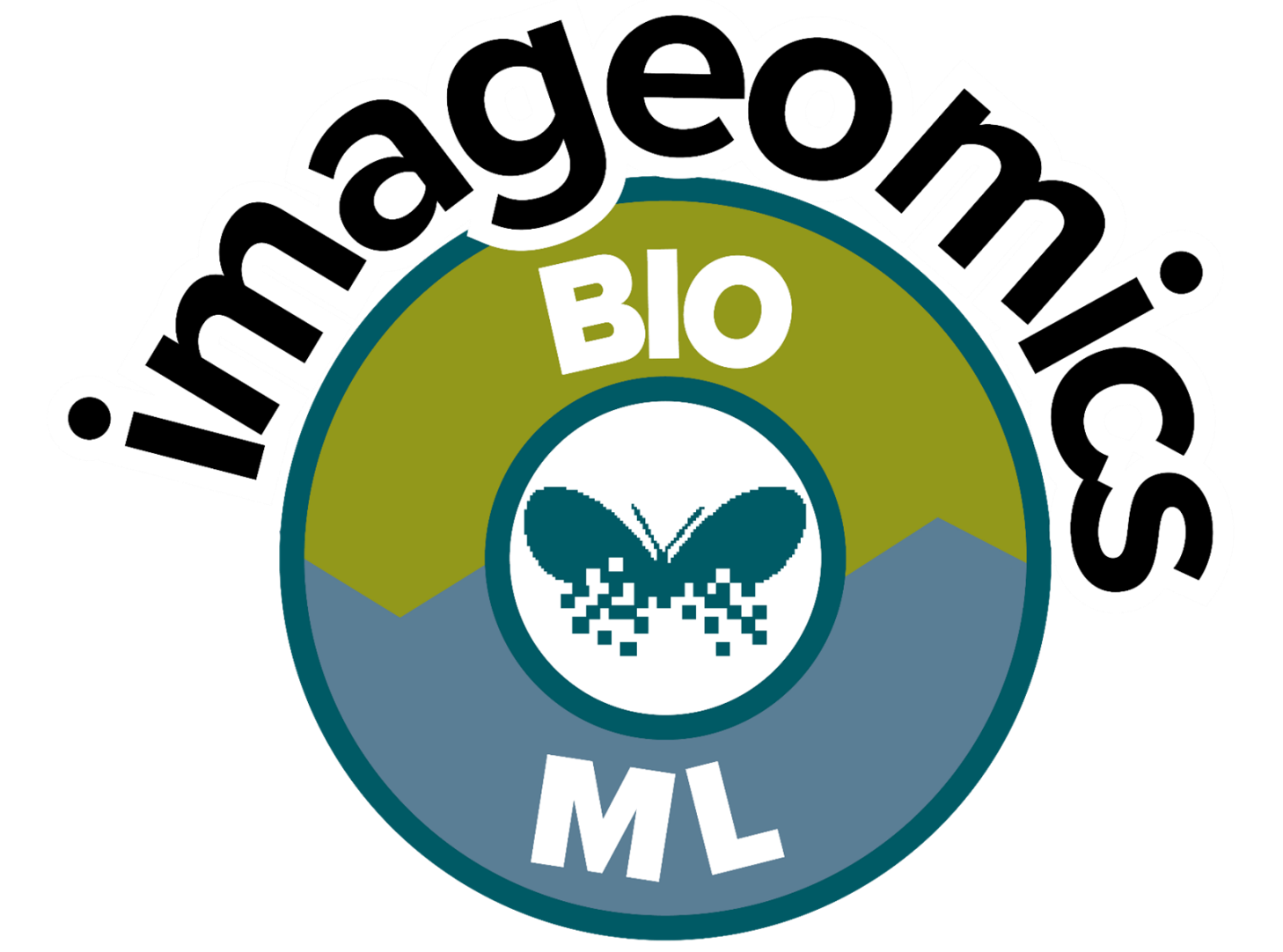# Education and Outreach in Imageomics
Engaging Communities to Advance Science

Diane Boghrat, The Ohio State University; Leanna House, Virginia Tech; Daniel Rubenstein, Princeton University

Imageomics Vision

*Imageomics will transform how **students, scientists, teachers**, and members of the **general public** come together as a community and combine their collective expertise to learn, innovate, and inspire environmental and social change.*

What is Imageomics?

An interdisciplinary scientific field focused on understanding the biology of organisms, particularly the biological traits and observable phenotype, from images.


Data → ML /Analytics → Explainable AI
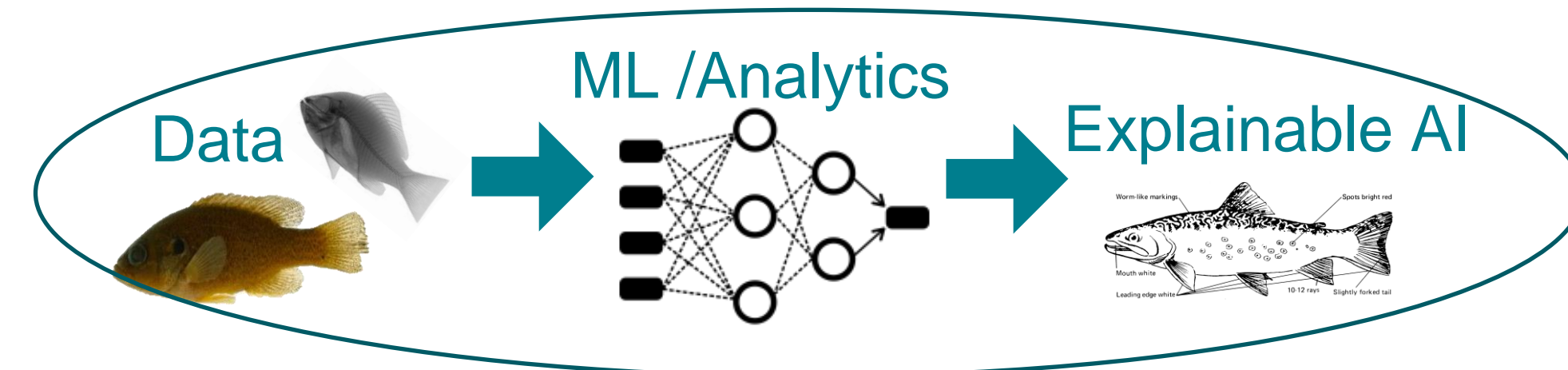
Current Efforts

★ **Graduate students and scientists**:
- ✓ Experiential field course
- ✓ Next-Gen days
- ✓ Traitfest
- ✓ Image Datapalooza
- ✓ Collaborative projects and interdisciplinary mentoring

★ **Undergraduate students**:
- ✓ Undergraduate research
- ✓ Data Science Camps (mentors)

★ **K-12 teachers and students**:
- ✓ Teacher training QUEST, then teachers apply what they learn in class
- ✓ ML for Wildlife module for Data Analytics Summer camp for grade 7-9

★ **Public**:
- ✓ Developed open-source software, Andromeda, to explore high-dimensional data both visually and analytically; video tutorials & examples to be released
- ✓ Public lectures at: Science Pub, Ohio Science Day, Science Sundays, …
- ✓ Imageomics seminars open to the public

OSU Data Analytics Summer Camp

What: Teamed with TDAI[†]; free, 1-week camp
Who: Underrepresented minority students in rising grades 7, 8, and 9
Outcome: "ML for Wildlife" module to ~30 students in 2022 (virtual) & 2023 (in person)

[†] TDAI: Translational Data Analytics Institute (https://tdai.osu.edu/)
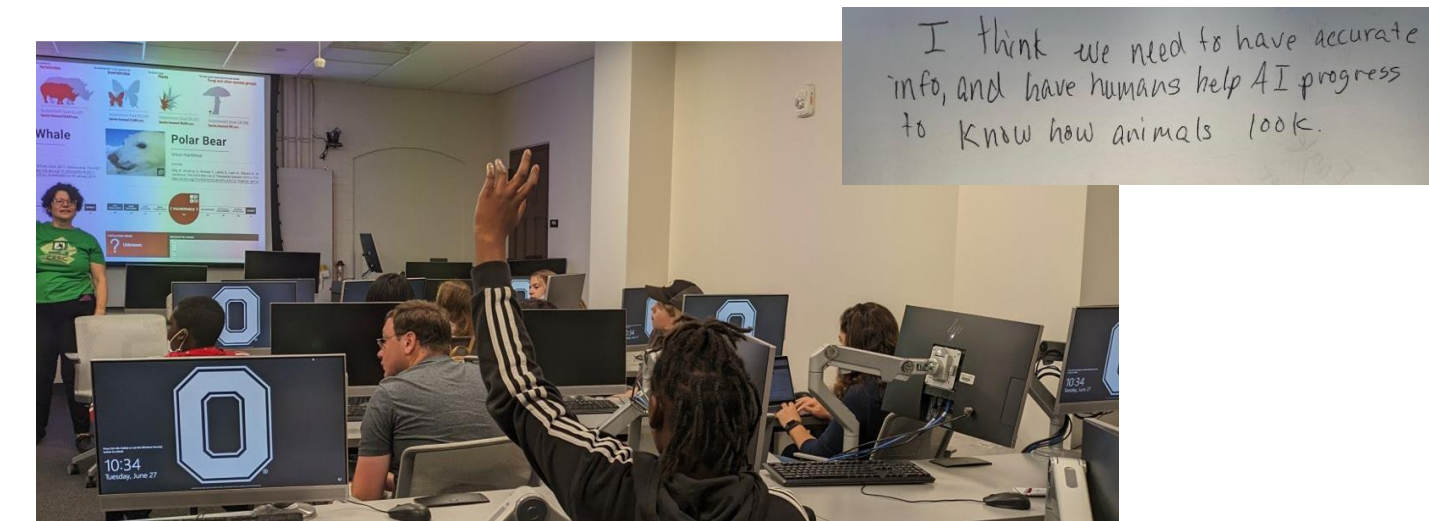
Experiential Field Course in Kenya

What: Foundational, interdisciplinary, team-based, project based, experiential field course in USA and Kenya

Who: 21 students from 4 US + 2 EU universities, taught by 12 professors in CS + Bio from 9 universities and institutes

Outcome: 4 interdisciplinary teams completed projects (**gecko, fish, giraffes-zebras, and birds**)

Part I Fall 2022
Part II Jan 2023
Part III Spr 2023

QUEST

What: Teamed with Princeton University; a teacher preparation course, called Questioning Underlying Effective Science Teaching (QUEST)
Who: ~10-15 K-12 Science Teachers
Outcome:
- July 2022: "Machine Learning: Discovering the Rules of Life through Images"
- July 2023: "In Our Back Yards: Human Impacts on Pollinator and Plant Populations in Local Environments"
- Andromeda: Interactive analytic software
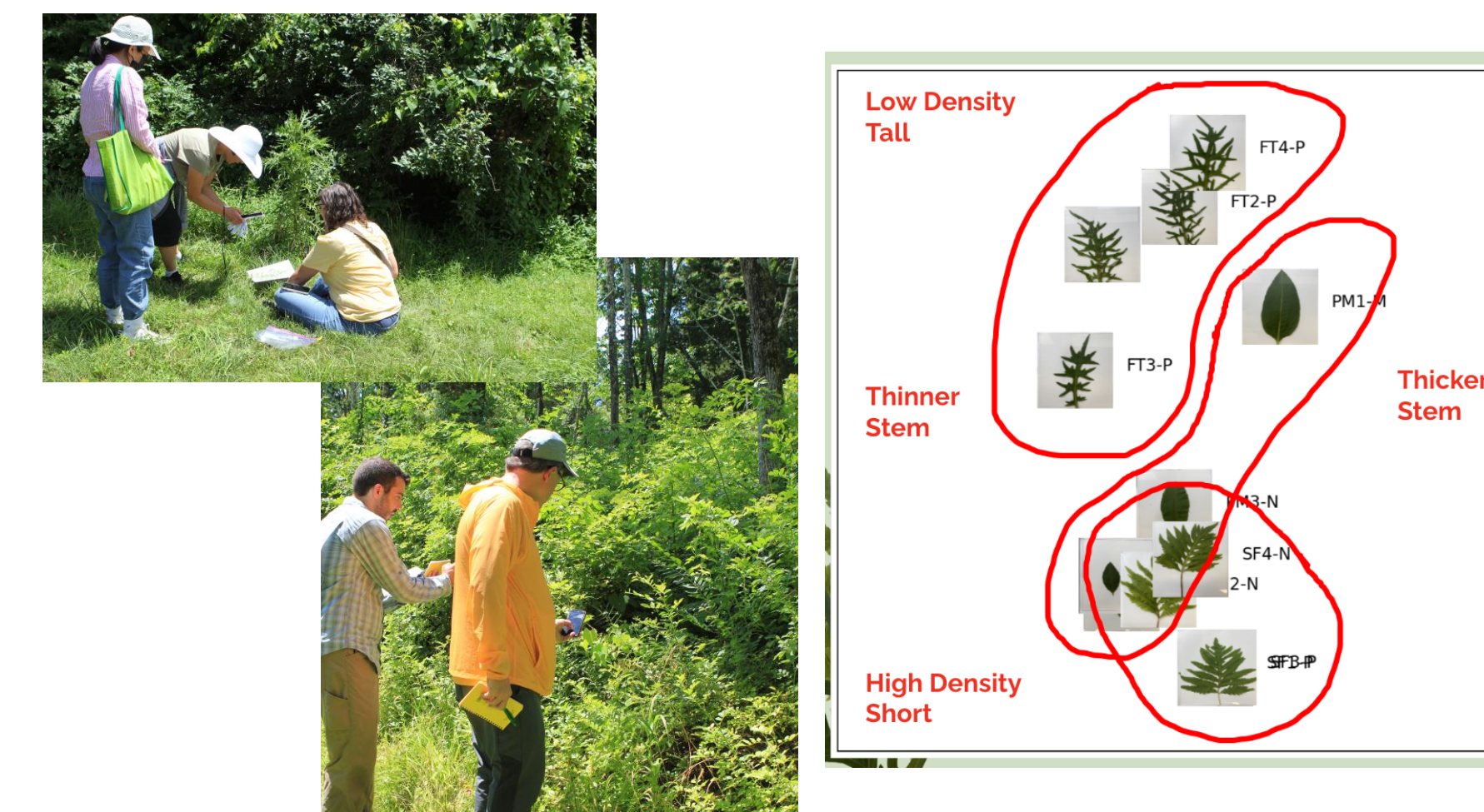
Andromeda

What: Interdisciplinary imageomics team developed general-use, data exploration software called Andromeda for QUEST and the public at https://andromeda.imageomics.org
Outcome: Analysts at all levels may explore high-dimensional image data.
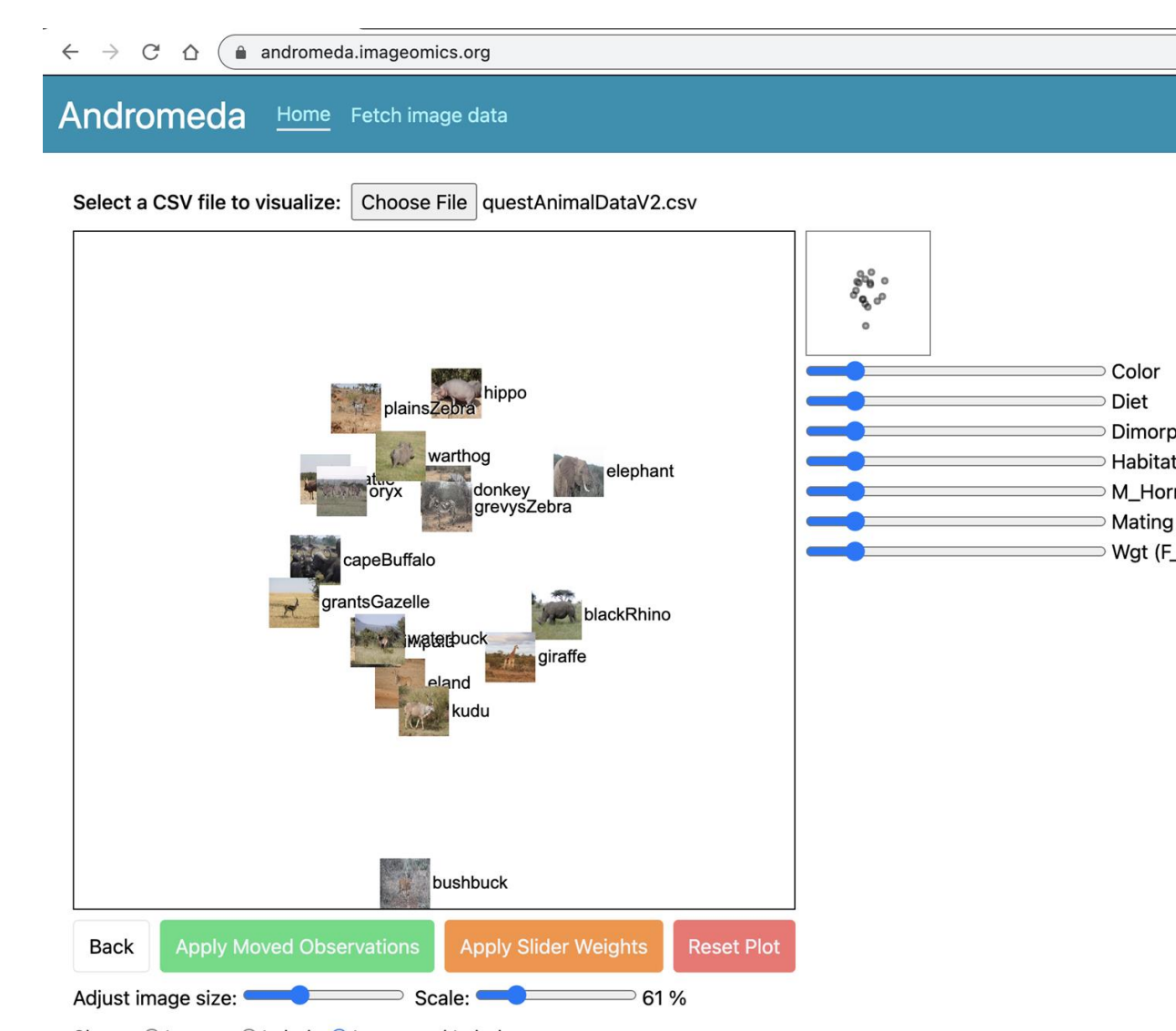
Hurdles we overcame

- **Logistics**: Scheduled courses and international field experience across universities.
- **Enticing participants**: Chose applications that may interest graduate and K-12 students.
- **Cost**: Teamed with established entities (TDAI and Princeton) for win-win outcomes.
- **Relevance/Accessibility**: Offered access to advanced analytics via user-friendly software.
- **Increased Awareness**: Reached new communities of researchers.

Ongoing challenges

- **Continued:** Logistics, Enticing participants, Cost, Relevance/Accessibility, Awareness
- **Assessment:** Measuring effectiveness, scope, satisfaction, usefulness, etc.
- **Team Engagement:** Including institute members in preparing educational efforts.
- **Advertising:** Identifying potential audiences and places to advertise.
- **Public Engagement:** Communicating public tools and opportunities.

What's next?

- **Expansion**: Bring field course, data camps, and QUEST to other locations
- **Funding**: Apply for NSF education and outreach grants to support participants and diversify experiences.
- **Resources & Tools:** Improve existing software, datasets, curriculum, and sharing of new educational tools and resources.
- ★ **Collaboration**: Collaborate with **YOU** (others in HDR ecosystem) to advance and broaden education and outreach efforts!

Contact Us!

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