

HDR DSC: Collaborative Research: Transforming Data Science Education through a Portable and Sustainable Anthropocentric Data Analytics for Community Enrichment (ADACE) Program

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Abstract

Led by an interdisciplinary team from the UTC, HU, and CSCC, the proposed Anthropocentric Data Analytics for Community Enrichment (ADACE) program will develop a sustainable education and research platform for human-centric data science, where humans are either considered as the research subjects or regarded as a component of data analytics. The ADACE program includes the following activities: (1) advancing or innovating the data science curricula of the participating institutions; (2) recruiting undergraduate students in the program; (3) enriching the local communities by organizing a number of open seminars, workshops, or hackathons; and (4) developing cooperative community projects with the local business and research institutions. These community projects focus on topics pertaining to anthropocentric data science, such as seamless human-machine interaction, interpretable neural networks, human-in-the-loop machine learning, social networks, and AI ethics, etc. Participating institutions will take advantage of their connections to local businesses to expose students to practical data science issues and offer networking opportunities. Through this proposed program, students will acquire systematic data science knowledge, problem-solving abilities, practical experience, and rigorous research training. All curricular materials will be designed to be portable, sustainable, and easily disseminated to ensure their expanded impact. They are being evaluated for measurable outcomes and tailored to include non-traditional students, who form a large portion of the potential data science workforce in the regions surrounding the participating institutions.

Keywords: anthropocentric data science, community enrichment, machine learning, workforce training.

1. Introduction and Objectives of ADACE

The goal of ADACE is to develop an application-oriented, project-based, sustainable and interdisciplinary curriculum that supports resource-sharing and community-enrichment. The above goal is associated with following objectives: (1) developing a systematic, project-oriented educational program for the theories and application of data science; (2) strengthen the collaborations among interdisciplinary institutions, departments, and communities; (3) developing an integrated data-sharing center for the education and AI research; (4) Catalyzing breakthrough, multidisciplinary research of anthropocentric data science; (5): Stimulating the application of anthropocentric data sciences through inter- and intra-community collaboration and information sharing.

1.1. Definition of Anthropocentric Data Analytics

- **By the human:** e.g., Human-in-the-Loop ML, Human-Machine Interaction
- **Of the human:** e.g., Interpretable NN, physics-guided NN
- **For the human:** e.g., AI ethics, Social network, AI-enabled medical device

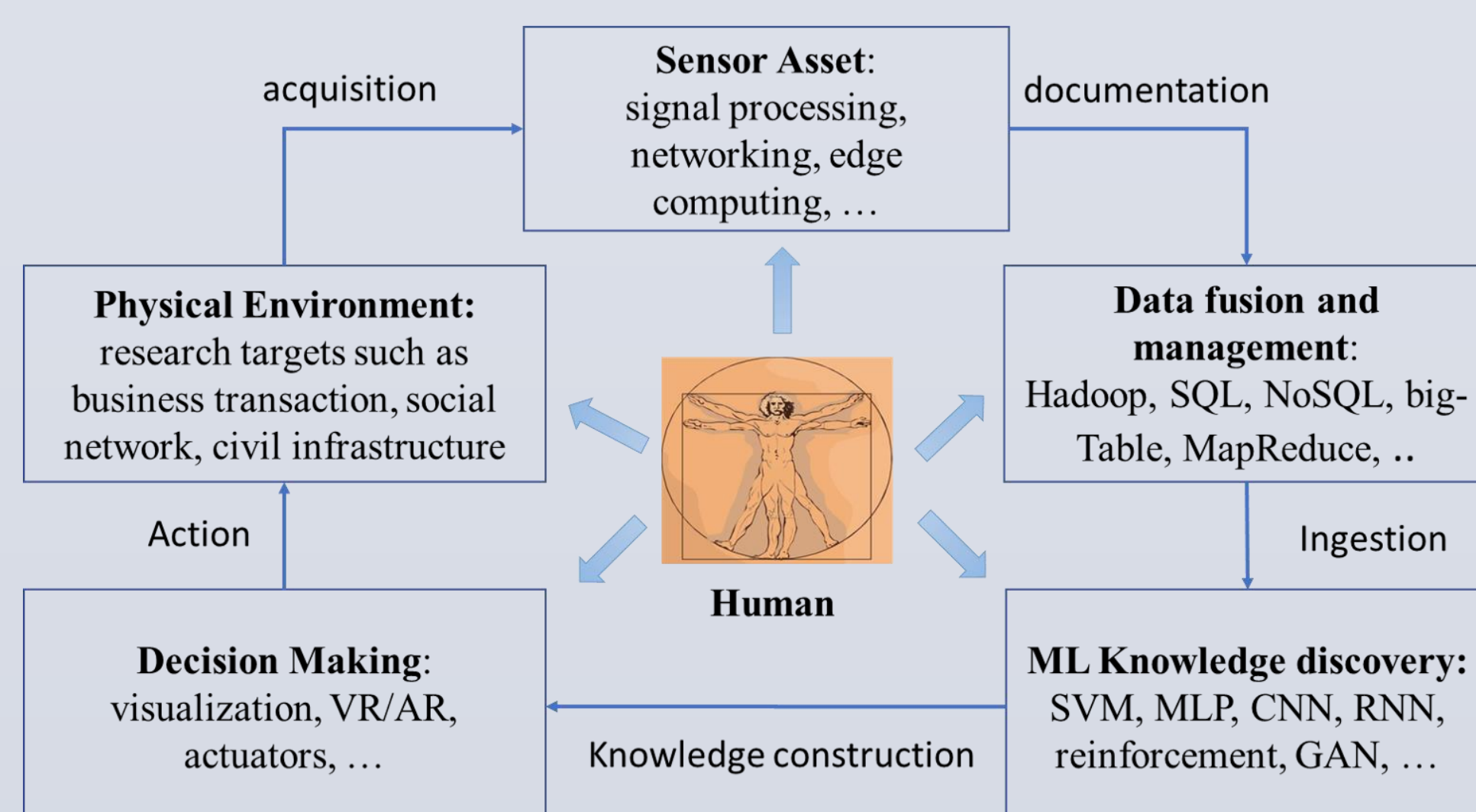


Fig. 1. Framework of Anthropocentric Data Analytics

1.2 Participating Institutions and Stakeholder

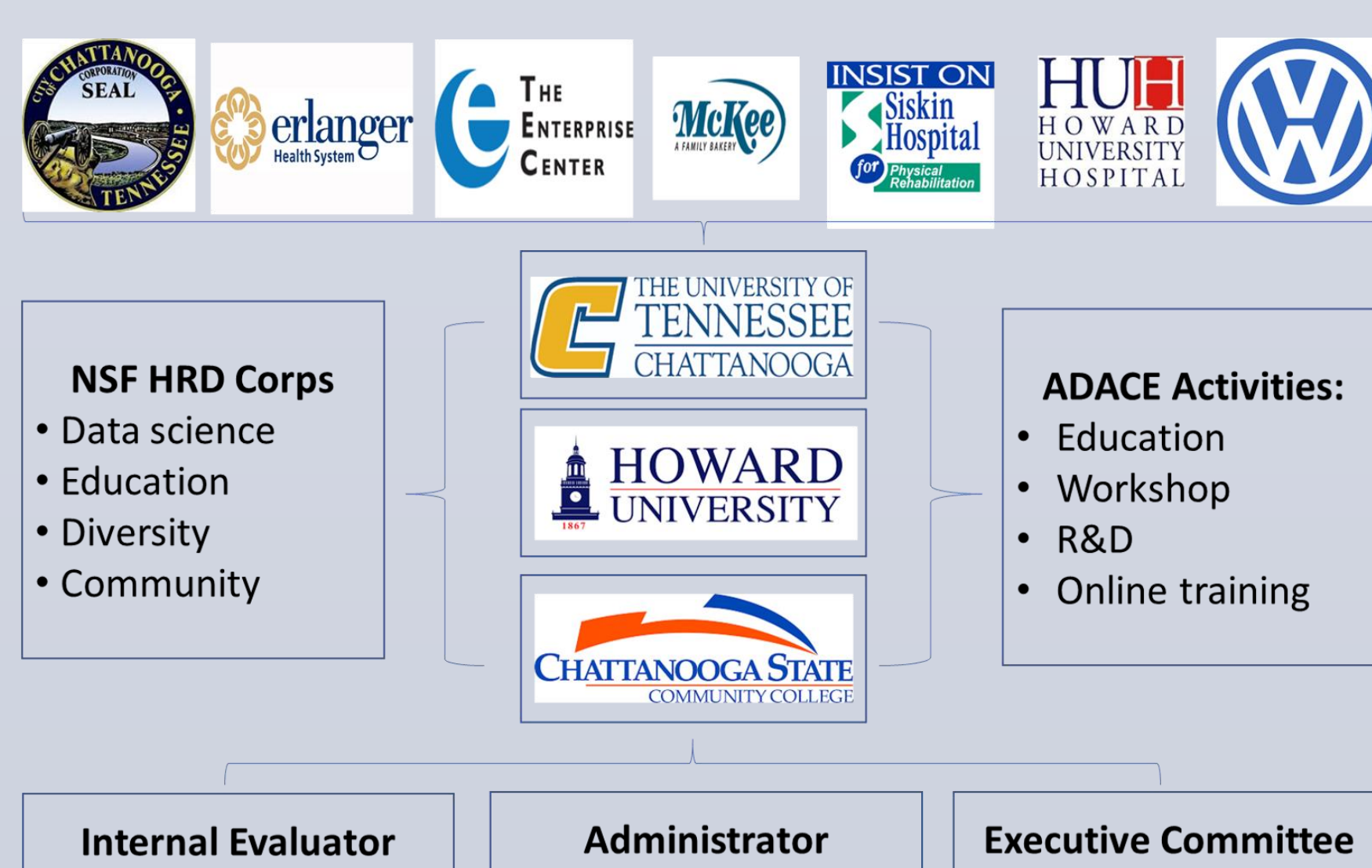


Fig. 2. Organization of Team ADACE

2. Major Activities

- Advancing or innovating the **data science curricula** of the participating institutions;
- **Recruiting** undergraduate students in the program;
- Enriching the local communities by organizing a number of open seminars, workshops, or hackathons; and
- Developing **cooperative community projects** with the local business and research institutions.

2.1 Advancing Data Science Curriculum

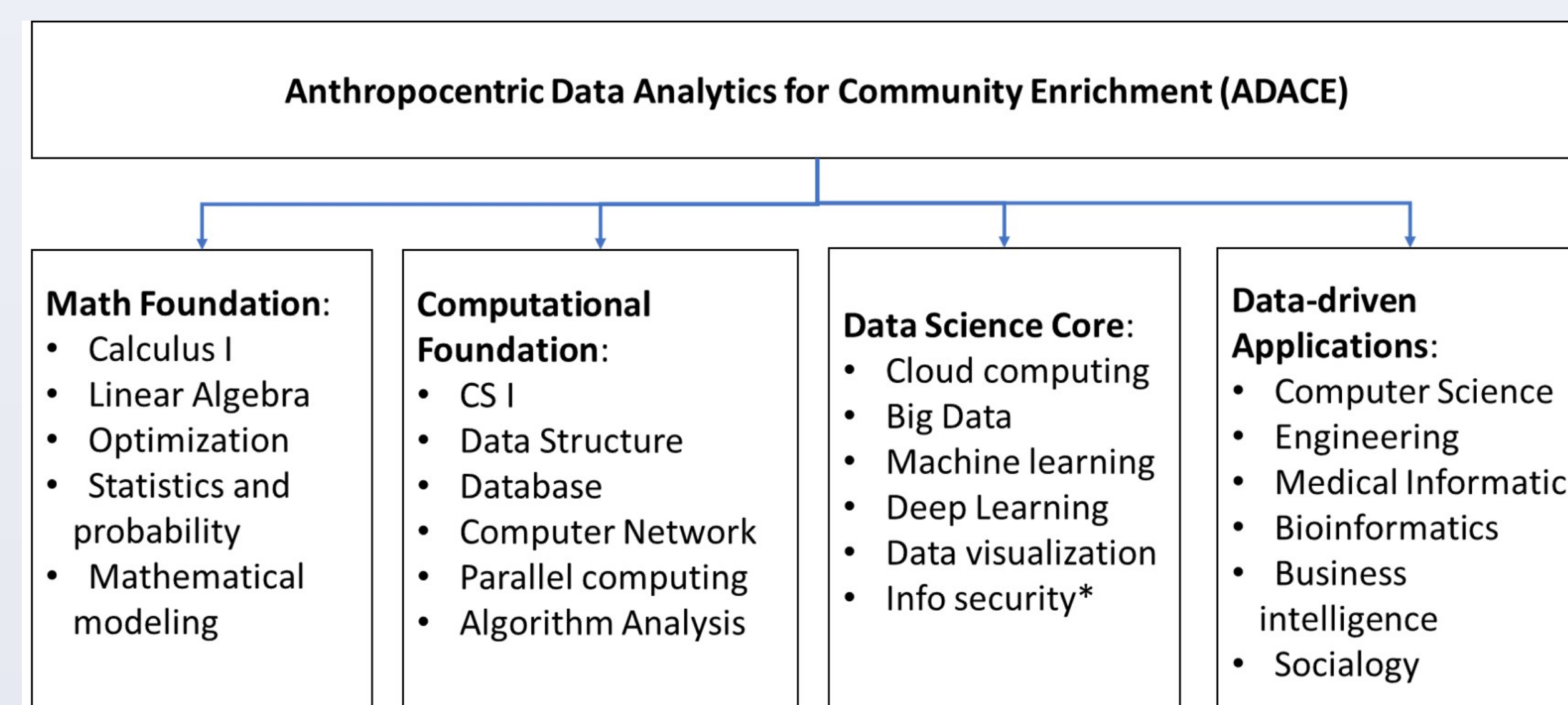


Fig. 3. Hierarchical Infrastructure of Basic ADACE Curriculum

Inspired by ADACE program, the following new programs or curriculum have been developed or advanced:

- UTC: BSDS, MSDS, PhD-DS, MSDA (a joint program between CS and Business)
- HU: BSDS
- CSCC: New courses in “Basis of ML”.

2.2 Representative ADACE’s Research Projects

The representative ADACE-sponsored application projects include

- AI-enabled medical device,
- biomedical informatics,
- non-invasive detection of serviceability of civil infrastructure,
- business prediction, and seamless human-machine interaction.

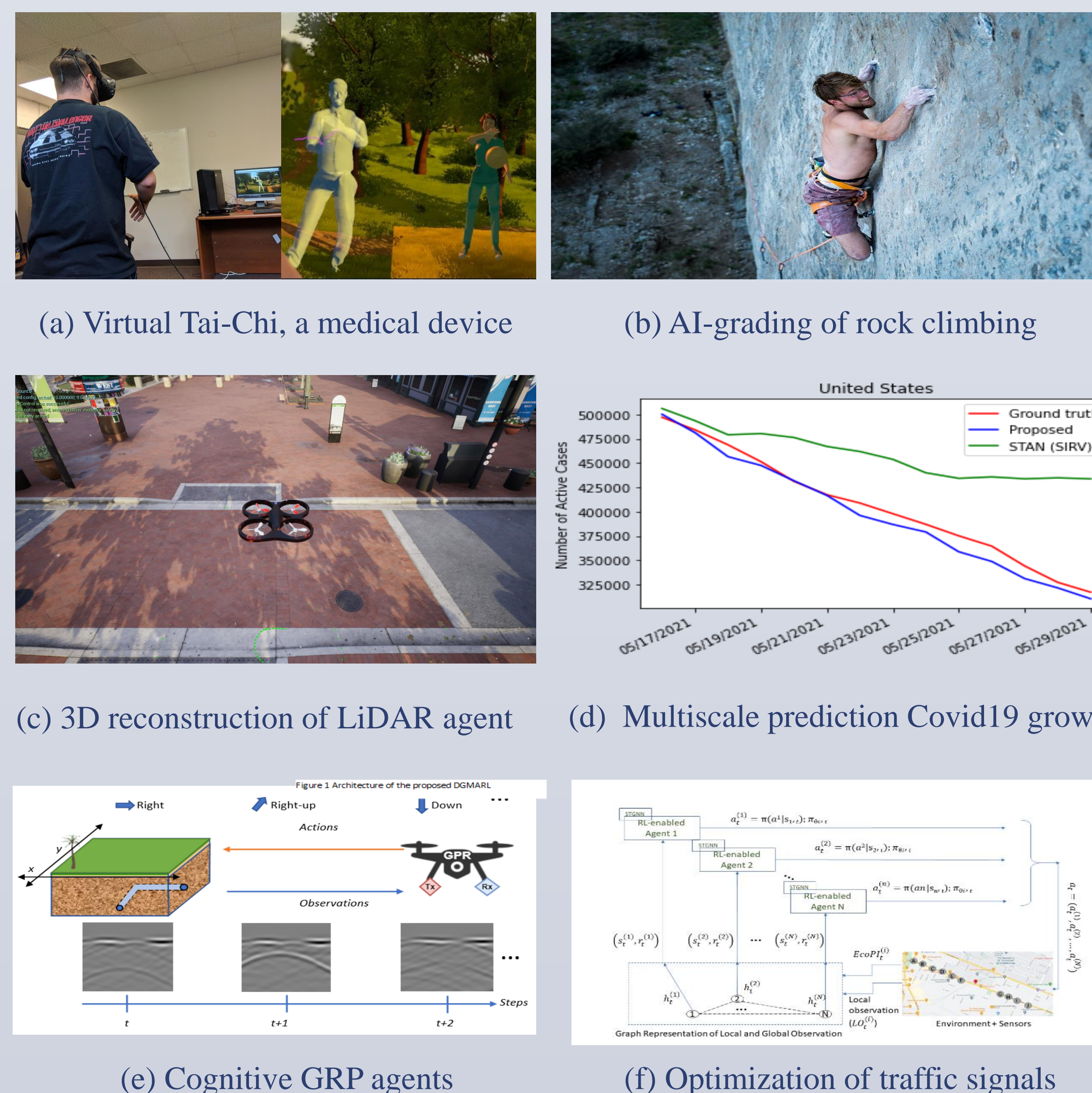


Fig. 4. Representative ADACE-sponsored research projects

3. Products of ADACE So Far

The ADACE project has produced the following deliverables:

- Deliverable 1: developing an interdisciplinary anthropocentric data science curriculum that is open to the public.
- Deliverable 2: workforce training.
- Deliverable 3: organizing workshops/hackathons about the education and research of data science.
- Deliverable 4: introducing the community real-world data-science application projects into the program.

3.1 Dissemination by ADACE

- Publications: about 15 journal papers have been published under the sponsorship of ADACE.
- Shared dataset:
 - Kinetic data about Yang’s Style Tai-Chi 24 forms.
 - The ground penetration radar data about UTC campus
- Online workshop and bootcamp teaching materials about the education and research of data science.
- Subprojects with the local business

3.2 Workforce Training

- All ADACE graduated awardees have received a job offer
- Collaborative training programs with local business

3.3 Representative Achievements of ADACE Students



Fig. 5. Students’ achievements

3.4. ADACE Workshops and Hackathons

Online or onsite workshops or hackathons have been offered to public every summer since 2020.

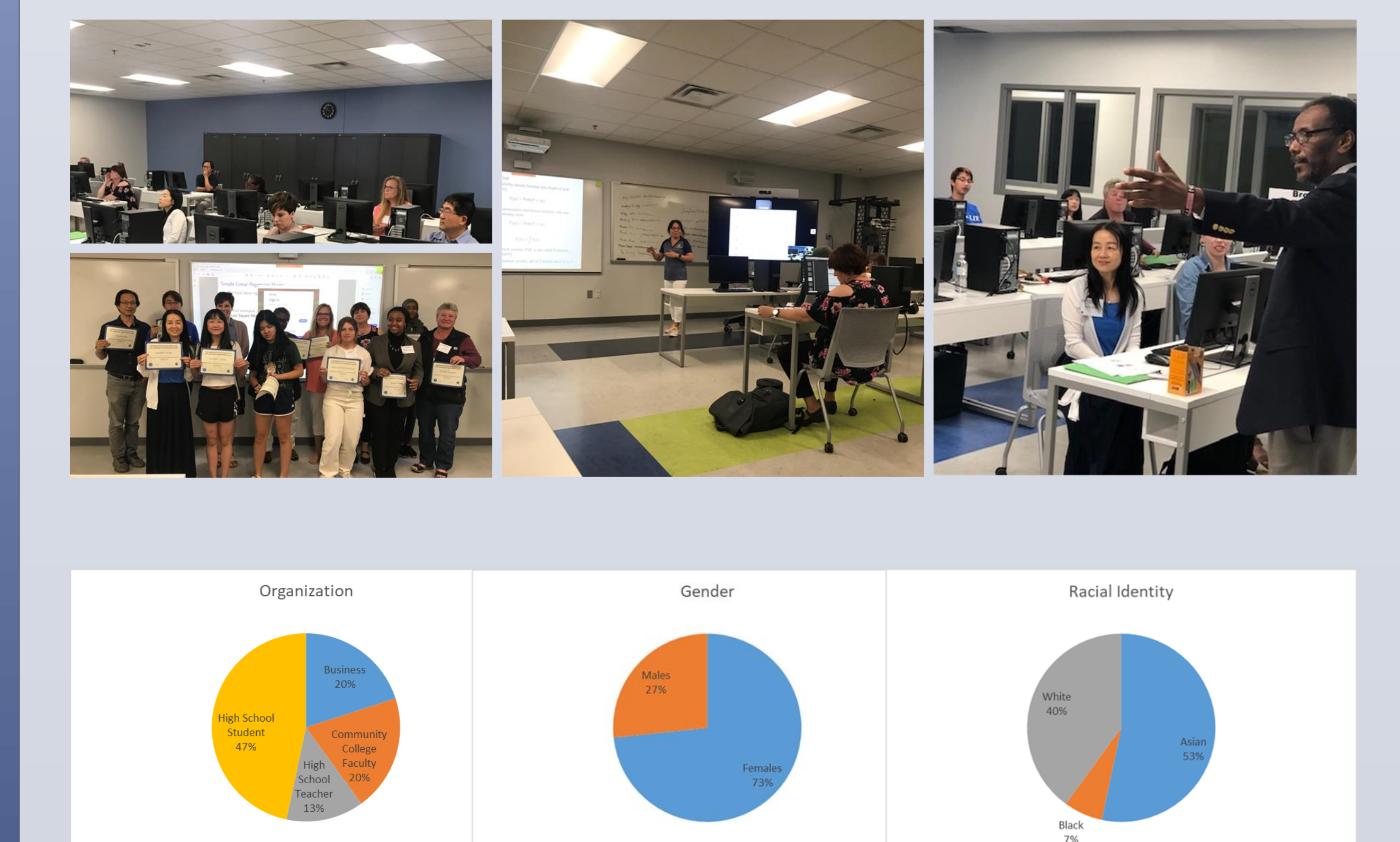


Fig. 6. Participants and Demographics Summary of ADACE 2022 Workshop (05/31-06/02, 2022)

4. Challenges

- Besides Covid19, ADACE program is facing the competitions of local industries in recruiting ADACE scholars