PROJECT SUMMARY- CREST PHASE II: CYBER-SHARE CENTER OF EXCELLENCE

The Cyber-ShARE ("**Cyber**infrastructure for **Sh**aring resources to **A**dvance **R**esearch and **E**ducation") Center of Excellence at the University of Texas at El Paso (UTEP) was established in 2007 with a **mission** to advance and integrate education and research through cyber-infrastructures that support information exchange and integration, as well as collaborative interdisciplinary research. Cyber-ShARE has been guided by its **core values** 1) championing diversity as a driver of creativity and innovation, including gender, race, ethnicity, discipline, profession, and nationality; 2) transforming the demographics of science, technology, engineering, and math (STEM) disciplines by actively recruiting and involving students, teachers, and faculty from underserved groups; and 3) serving as a catalyst of cultural change by excelling in cyber-enabled interdisciplinary research with integrity and accountability. The Center's cyberinfrastucture (CI) efforts are focused on the following: 1) *CI, computational science, and technology-enabled science research* that links methods across multiple fields in creative ways to innovate in scientific data acquisition, integration, and analysis; and 2) *CI dissemination* that focuses on making CI products and tools accessible and on training individuals on established and innovative tools that are outcomes of Cyber-ShARE and other CI research efforts. Cyber-ShARE Center's **crosscutting expertise** is in collaboration and collaborative environments, semantic-based approaches to knowledge synthesis and representation (ontologies and provenance), and propagation of uncertainty in integrated analyses. Cyber-ShARE is unique in that it focuses on the fusion of both human and machine capabilities, and mechanisms for enabling the synergistic exchange and integration of data, information, and knowledge in integrated human/technical systems. Cyber-ShARE's **renewal goals** are as follows: 1) conduct innovative, synergistic STEM research supported by CI; 2) broaden training and education of interdisciplinary, CI-knowledgeable citizens, including STEM students who receive advanced degrees and represent the 21st century demographics; and 3) extend the network of Cyber-ShARE collaborations to include other major CI projects, international collaborators, and industry partners. The Phase II funding will propel Cyber-ShARE to a sustained national research center that serves as a national resource for collaborative, interdisciplinary research.

Intellectual Merit. Many of the most challenging problems confronting society require interdisciplinary collaboration among scholars who can integrate knowledge, concepts, approaches, and perspectives from different disciplines. The merit of the Cyber-ShARE Center lies in its effort to foster the success of interdisciplinary, collaborative teams; develop research capacity at UTEP; educate diverse, CI-knowledgeable scientists and engineers; and develop project, center, and institutional-level CI that can exploit and contribute to emerging national-level CI. The expected outcomes of the Center are as follows: an increase in the number of students from underrepresented groups who seek advanced degrees; documented effective practices for interdisciplinary team collaborations; scientist-centered tools to document research data, processes, and knowledge to enable sharing and reuse of scientific results; semantically-enabled tools to support knowledge synthesis and reasoning; and new techniques to support visualization of scientific data. In addition, the synergistic and interdisciplinary subprojects bring expertise and experience in using CI to advance knowledge in i) provenance, ontologies, and team science; ii) modeling Earth's structure through integration of data with varying accuracy and sensitivity and model fusing; and iii) characterization of environmental phenomena and processes. Cyber-ShARE investigators are national leaders in broadening participation and the study of interdisciplinary teams. The Center is a vital and useful resource for scientists, engineers, and educators conducting both domain and interdisciplinary collaborative research. With a comprehensive research and education strategic plan and a sustainability plan serving as guides, the Cyber-ShARE Center is on track to become a national resource for scholars engaged in synergistic and interdisciplinary research.

Broader Impacts. The Cyber-ShARE Center's development of CI resources, such as software tools, online services, data repositories, ontologies, and workflows, has far-reaching implications for local and national research projects (e.g., NSF-funded projects such as EarthScope and NEON, both of which aim to collect multivariate data over large spatial areas, and local efforts related to energy and environment). The interdisciplinary expertise supported by the Center contributes to a robust computational science doctoral program, CI-focused curriculum, and tools that integrate research and education. By offering research experiences to students from a variety of backgrounds, providing workshops, and supporting a *Distinguished Lecture Series*, the Center contributes to the development of a diverse workforce with CI proficiency. The Center leverages existing education and outreach efforts, and its activities involve researchers from underrepresented groups outside of UTEP, extending the impact the Center.