

A YEAR of Achievement

Indiana University and the federal **2018** government have invested significantly in advanced cyberinfrastructure resources and services implemented, delivered, and supported by the Pervasive Technology Institute at Indiana University. 2018 was a particularly good year, with more than \$10 million in new grant funding to PTI. These investments and the excellent work of the PTI staff and faculty help bring IU CI resources to the IU community, the state of Indiana, and our nation as a whole, accelerating research, discovery, scholarly achievements, and artistic creation.



PERVASIVE TECHNOLOGY INSTITUTE



Jetstream

Jetstream was created to give researchers and students access to computing and data analysis resources on demand, from their tablets, laptops, or desktop computers. The Pervasive Technology Institute at Indiana University is the lead institution on the \$11 million NSF grant to create, implement, and operate Jetstream.

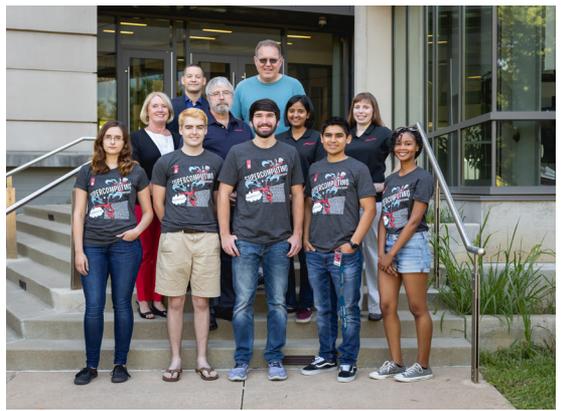


Jetstream has had a significant impact on environmental science, helping scientists deal with the “data deluge” — the massive amount of data about the natural world, which requires enormous computing power to process.

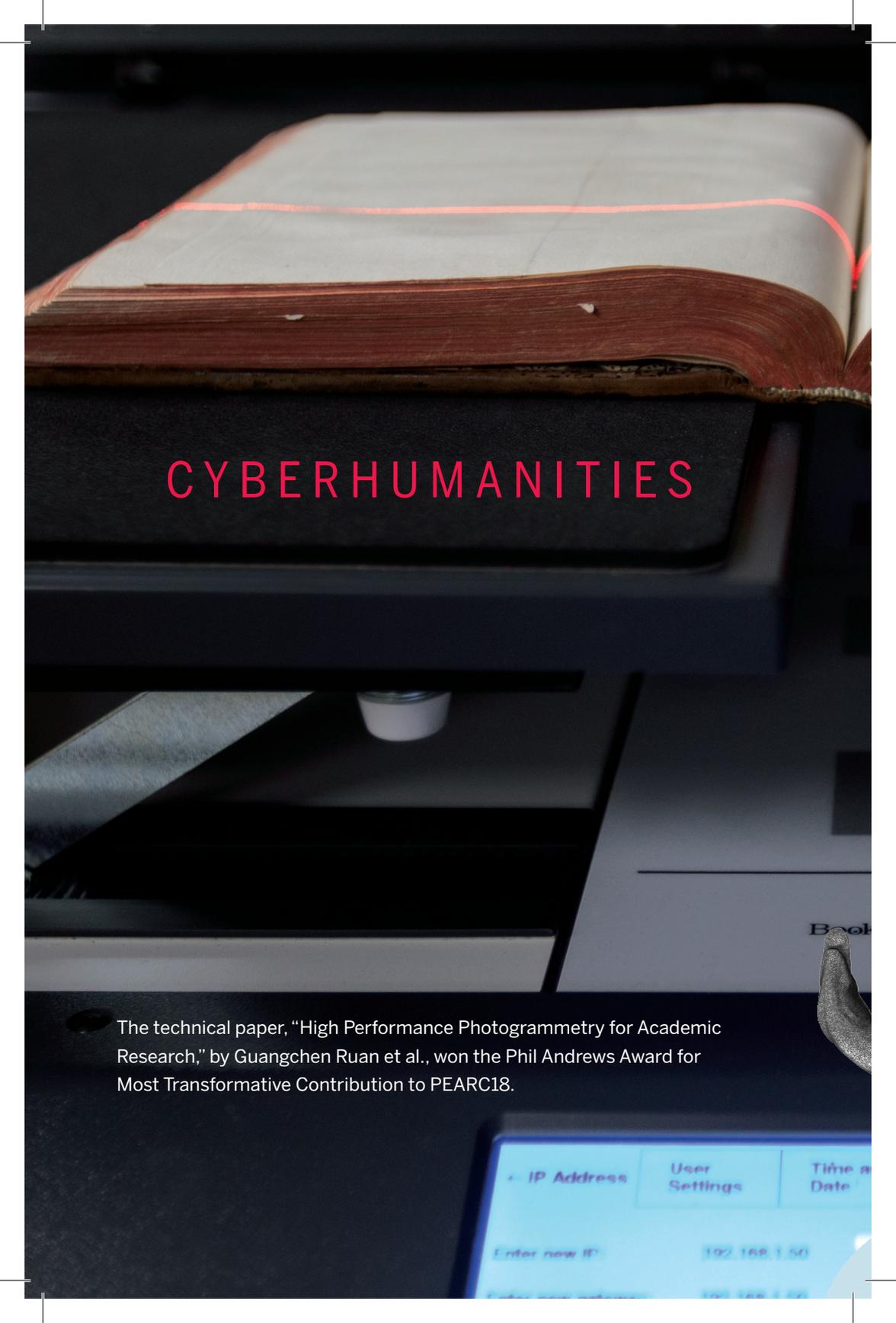
JETSTREAM



Jetstream continues to win accolades for reaching underserved colleges and universities. This year, Jetstream won the *Campus Technology Impact Award* in IT infrastructure and systems.



The Jetstream Research Experience for Undergraduates (REU) program gave students the opportunity to work with Jetstream this summer to conduct their research.



CYBERHUMANITIES

The technical paper, "High Performance Photogrammetry for Academic Research," by Guangchen Ruan et al., won the Phil Andrews Award for Most Transformative Contribution to PEARC18.

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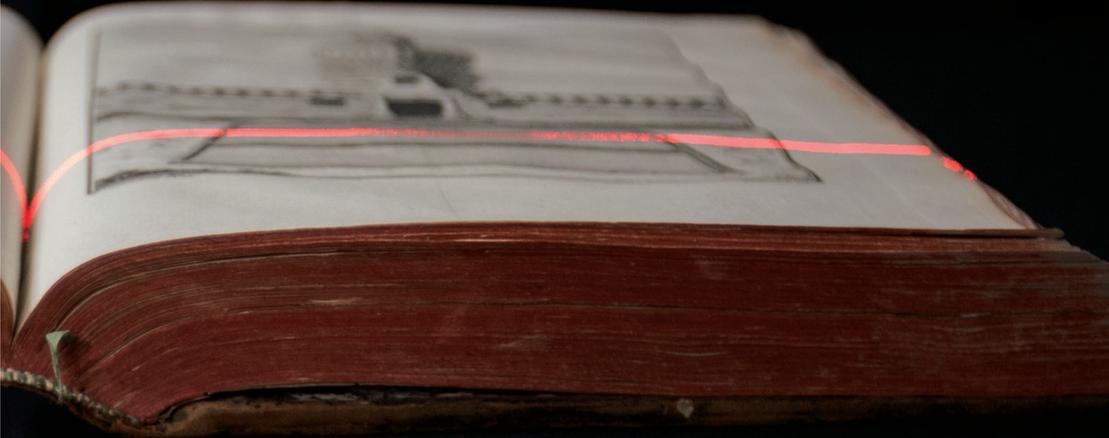
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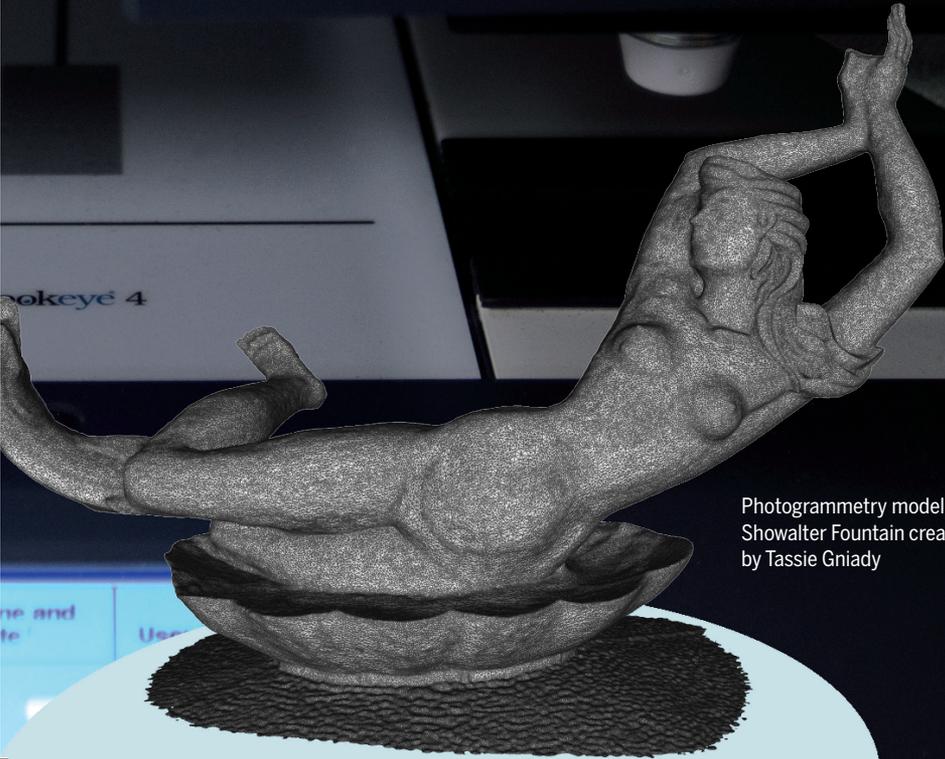
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An open book with a red laser line across it. The book is open to a page showing a technical drawing or architectural plan. The red laser line is horizontal and passes through the center of the page. The book has a dark cover and the pages are aged and slightly yellowed.

The HathiTrust Research Center (HTRC), recently established as a new PTI center, made available copyrighted materials for text and data mining for the first time in October 2018. Previously, only non-copyrighted, public domain materials were able to be used with HTRC's analytical tools.

A 3D photogrammetry model of a woman in a dynamic pose. The model is rendered in a light blue color and is positioned on a circular base. The woman is depicted in a dynamic, almost acrobatic pose, with her body arched and her arms raised. The model is highly detailed, showing the contours of her body and the texture of her clothing. The background is dark, making the light blue model stand out.

Photogrammetry model of Showalter Fountain created by Tassie Gniady

CENTER for APPLIED CYBERSECURITY RESEARCH (CACR)



ResearchSOC

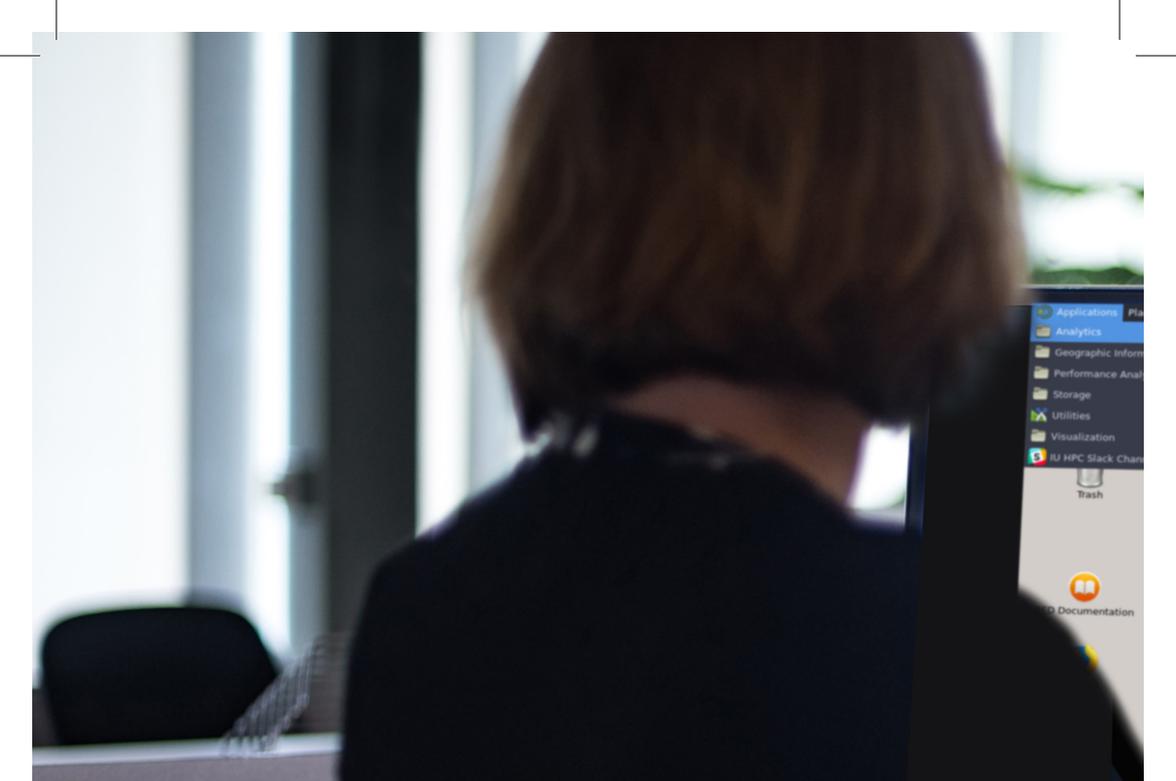
CACR created ResearchSOC this fall. It's a new collaborative response center that addresses the unique cybersecurity concerns of the research community. ResearchSOC helps make scientific infrastructure resilient to cyberattacks and capable of supporting trustworthy, productive research.



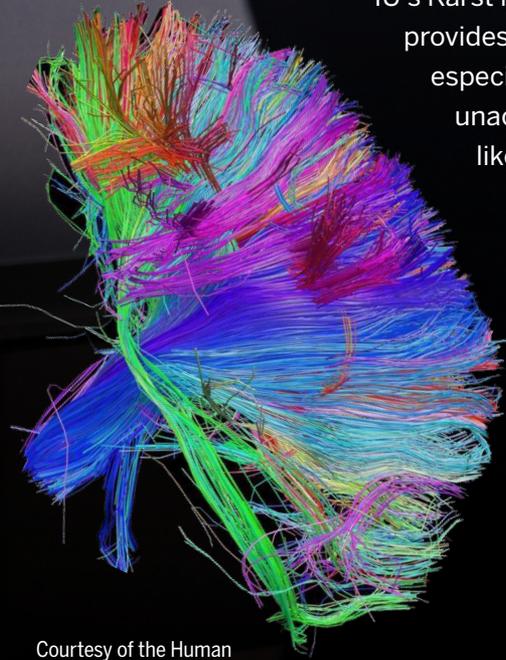
CACR leads Trusted CI, the NSF Cybersecurity Center of Excellence (CCoE), which this year was awarded a \$2.5 million supplemental grant to extend the CCoE through 2019 and expand its activities. Trusted CI leads the community in securing the critical science enabled by the NSF.



CACR and Naval Surface Warfare Center, Crane Division, signed a two-year, \$1.9 million agreement to continue their partnership. This new award will fund the Principles-based Assessment for Cybersecurity Toolkit (PACT), a tool for assessing the toughest cybersecurity problems.



RED was created this year as a remote desktop service for users with accounts on IU's Karst research supercomputer. RED provides numerous features that are especially helpful to users who are unaccustomed to working in Unix-like command-line environments.



RED assisted a PhD student with her efforts to understand the shape of human white matter in the brain. This research could help scientists determine the difference between normal morphological variabilities and variabilities caused by disease.

Courtesy of the Human Connectome Project



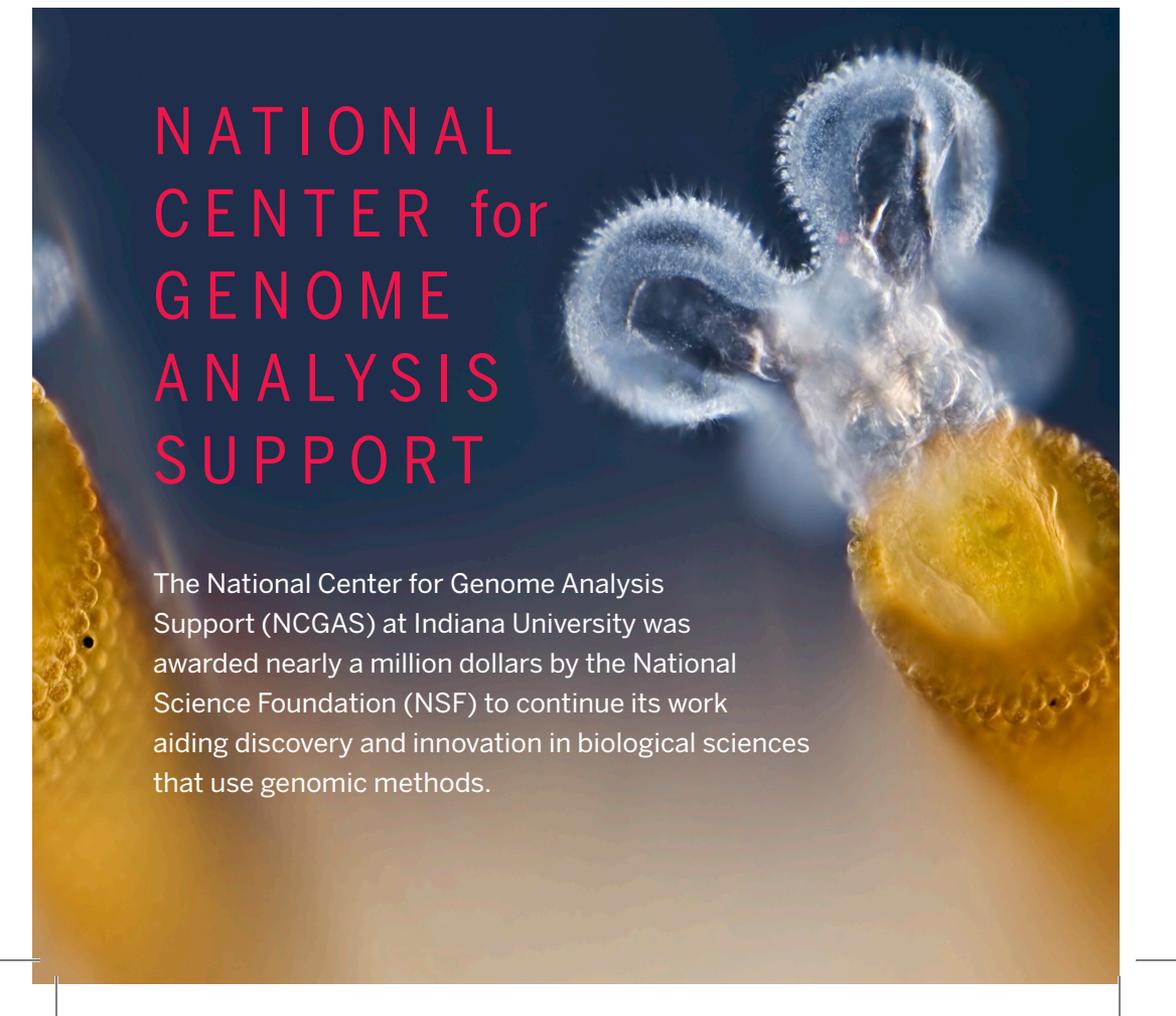
RED (RESEARCH DESKTOP)

RED helped a researcher with little experience using multi-core computing resources further his research into transposable elements in DNA. He created a software package that allows researchers to see where the transposable elements have cut themselves and where they have migrated to. This information is useful in determining how organisms are able to adapt to their environments.



Apache Airavata is open-source middleware that provides a comprehensive set of platform services for supporting science gateways. Indiana University is proposing to adapt it to make it suitable for use by industrial clients.

APACHE AIRAVATA



NATIONAL CENTER for GENOME ANALYSIS SUPPORT

The National Center for Genome Analysis Support (NCGAS) at Indiana University was awarded nearly a million dollars by the National Science Foundation (NSF) to continue its work aiding discovery and innovation in biological sciences that use genomic methods.



THE VALUE of
advanced COMPUTING

The value of new discoveries and knowledge is impossible to calculate in the short run. Artistic creations simply have value in improving our quality of life. Research discoveries take years or decades to reveal their full value. PTI is already at work aiding Indiana's commercial sector, including facilitating startups and assisting established large industrial concerns.

It *is possible* to calculate the value of IU's investments in advanced cyberinfrastructure systems—one of the activities of PTI Executive Director Craig A. Stewart. The conclusions so far? IU's investment in advanced cyberinfrastructure resources and services are a financial benefit for IU as compared to purchasing services from the cloud, and these same investments accelerate research, discovery, scholarly achievements, and artistic creation by members of the IU community and the nation's broader academic community.

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