Center for Advanced Research Computing
Patrick Bridges
Director

2018 Annual Review Of Category 3 Research Centers/Institutes | March 26, 2019
Mission

To lead and grow the computational research community at UNM.

To fulfill our mission, we will:

• Provide access to high-end computing resources and associated infrastructure;
• Offer specialized expertise and technical support;
• Coordinate and collaborate with other UNM programs that support the community; and
• Grow the collaborative user community through education, workshops, and outreach events.
CY 2018 Goals And Status

• Sustainable funding models
  • **Grants and contracts**: Submitted two grant applications in 2018 for a total of $963,209. One was funded, along with an application from late 2017. Including additional funding on EPSCoR and Anthropology awards, total 2018 new sponsored funding at CARC totaled $1,255,826.
  • **Cost model**: Launched in early 2018 and has been well-received in the research community. A calculation tool on the website also allows researchers to easily determine budgetary needs for their grant applications.

• Revision of Computational Science and Engineering certificate
  • Received three applications for the CSE program, with 2 admitted for Spring 2019 and one admission deferred to later in 2019 at the student’s request.
  • After meeting with stakeholders, a Form C curriculum revision was submitted to:
    • Support a wide range of computational science and engineering programs of study
    • Define a clear progression starting with MA471 for students focused on scientific computing
    • Allow for a new progression for students interested in big data

• Instituted CARC graduate internship program to train graduate students from across campus on best practices in using CARC systems to support their research
  • Supported students from Biology, Physics, Electrical Engineering, Mechanical Engineering
  • Seed funding from Graduate Studies, submitting NSF proposal in 2019 to grow program
Membership of Advisory Committee

Membership List

Patrick Bridges, Ph.D. - Director, CARC; Professor, Computer Science
Karl Benedict, Ph.D. - Associate Professor, Director of Research Data Services. College of University Libraries and Learning Sciences
Vince Calhoun, Ph.D. - Distinguished Professor, Electrical and Computer Engineering, Biology, Computer Science, Neurosciences, and Psychiatry; Executive Science Officer, The Mind Research Network
Jed Crandall, Ph.D. - Associate Professor, Computer Science
Jeremy Edwards, Ph.D. - Professor, Chemistry
Hua Guo, Ph.D. - Distinguished Professor, Department of Chemistry and Chemical Biology, and Department of Physics and Astronomy
Patricia Henning, Ph.D. - Associate Vice President for Research; Professor of Physics and Astronomy
Jane Lehr, Ph.D. - Professor, Electrical and Computer Engineering
Keith Lidke, Ph.D. - Associate Professor, Physics & Astronomy
Barbara McCrady, Ph.D. - Distinguished Professor, Psychology; Director, Center on Alcoholism, Substance Abuse, and Addictions (CASAA)
Monika Nitsche, Professor, Mathematics and Statistics
Brian Pietrewicz, M.B.A. - Interim Deputy CIO, Information Technologies
Andrea Polli, Ph.D. - Mesa Del Sol Endowed Chair of Digital Media Professor, Fine Arts and Engineering University of New Mexico Department of Art and Art History
Edl Schamiloglu, Ph.D. - Distinguished Professor, Electrical and Computer Engineering; Associate Dean for Research, School of Engineering
Gregory Taylor, Ph.D. - Director, Long Wavelength Array; Director, Center for Astrophysical Research and Technology; Professor, Department of Physics and Astronomy
Lee Taylor, Ph.D. - Associate Professor, Biology

Date of CY2018 annual review: not held as of March 2019
CY 2018 Highlights

- After two years serving as Interim Director, Patrick Bridges was named director of the Center
- Implemented new storage system with University Libraries
- Hosted a table at UNM Day at the Roundhouse and delivered information packets to legislators’ offices
- Hosted NM Supercomputing challenge student evaluations
- A featured research story on the CARC website on Heather Edgar’s decedent database project was picked up by Forensics Magazine (online)
- Attended and displayed research at our booth at ACM/IEEE International Conference on Supercomputing
Proposals & Awards

**Proposals**

- **FY 2016:** $200,000
- **FY 2017:** $1,000,000
- **FY 2018:** $600,000

**Awards**

- **FY 2016:** $0
- **FY 2017:** $1,200,000
- **FY 2018:** $1,400,000
Research Expenditures and F&A

Expenditures
Total Research Expenditures for your Organization

F&A
Total F&A for your Organization
FY 2018 Sources of Revenue

- Allocation $668,000
- Reserves $13,268.56

Center Expenditure Details

- Salaries $396,112 (62%)
- Fringe Benefits $144,341 (22%)
- Materials & Supplies $104,004 (16%)

Total: $644,457
Research Center Impacts

- The Center is playing a major role in a project funded by the National Institutes of Justice, led by Heather Edgar. The project will create a national first database. De-identified whole body decedent CT scans, taken at the New Mexico Office of the Medical Investigator, will be added into a searchable database that will be available to researchers free of charge.

- With the addition of the 280-node/2240-core Wheeler capacity compute cluster in late 2017, we saw the amount of jobs finished and CPU hours provided more than doubled in 2018
  - 2017: 99,679 Jobs Finished; 7.2M CPU Hours provided
  - 2018: 217,427 Jobs Finished; 15.4M CPU Hours provided
Return On Investment

• CARC supported 203 users and 75 PIs, with 217,427 jobs finished
• 33 publications in journals such as Nature Methods, Journal of Applied Physics, Financial Review, Chemical Physics, Computational Materials Science, Conservation Genetics, and Optica.
• Awards resulting in publications using CARC resources included funding from the National Science Foundation, National Institutes of Health, National Institute for Environmental Health Sciences, Institute for Space and Nuclear Power Studies, Department of Energy, and the European Research Council among others.
**STRENGTHS**

- Support a broad range of computational research activities by the UNM community
- Provide substantial computational resources to researchers free of charge
- Expert user support staff
- Graduate student ambassador training program

**OPPORTUNITIES**

- Utilize CSE program to expand research computing expertise on campus
- Computational science workforce demand
- Research and Education Funding opportunities within NSF
- Harnessing the Data Revolution Big Idea calls
- Increase collaboration with other computational units on campus (Libraries, IT)
- External collaboration with Labs (SNL, LANL) and industry

**WEAKNESSES**

- Aging systems and facilities
- Understaffed to meet campus demand
- Building with significant security, maintenance, and utilization challenges
- Lack of support for research with specialized needs or that handle sensitive data

**THREATS**

- Staff loss to retirement, external competition
- Major system or facilities failure
- Decreasing price of cloud computing systems
Looking Ahead To 2019

- Promote revised CSE program – outreach to affiliated faculty and departments, develop more specializations
- Develop collaborative research community through outreach, workshops and symposia
- Systems updates
  - An upgrade of CARC’s home directory storage systems will take place in April 2019, quotas will be implemented to avoid overuse
  - A new help ticket system will replace the old AIRS system
  - Resource monitoring tools have been implemented and are available online and displayed on a monitor in the CARC lobby
  - Jupyter notebooks, distributed MATLAB and debugging queues are forthcoming
- Significant grant/contract opportunities
  - Submitted NSF CyberTraining, NNSA MSIPP, HDR DSC grant proposals in early 2019
  - Starting to plan for future DOD DURIP and NSF MRI calls based on lessons being learned from NSF CICI funding
  - Multiple additional opportunities going forward: NSF IUSE:CUE, Potential Mid-scale Infrastructure Collaboration with RMACC, Network infrastructure opportunities with regional partners
Summary

• Made considerable progress on the immediate goals outlined in our strategic plan.
  • We completed a survey of users and have used that information to make decisions about new software and storage to be implemented in 2019.
  • User help documentation on our website has been completely overhauled to provide better resources to our community.
  • Engaged students and staff in departments to educate them to support their research and support CARC users
  • CSE certificate program requirements changed for a planned re-launch in Fall 2019.

• Engaged in major collaborative projects, strengthening cross-campus collaborations that increase center impact for the benefit of the UNM community.
  • Shared storage resource with University Libraries
  • Decedent Information Database with OMI and UNM Arts and Sciences,
  • Sponsored research with Libraries, IT, Psychology, and ECE on infrastructure for supporting research on sensitive data.