

Resources for NCSA affiliates, FY 2020-21

First session – Aug. 20, 2020

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NCSA | National Center for
Supercomputing Applications

Today's speakers

- **Dr. Donna Cox**, Director of the Advanced Visualization Laboratory (AVL) ; lead of Research & Education (NCSA)
- **Olena Kindratenko**, Senior Education & Outreach coordinator, R&E (NCSA)
- **Alice Delage**, Senior Research Coordinator, R&E (NCSA)
- **Dan Lapine**, Technical Program Manager (NCSA)
- **Vlad Kindratenko**, Senior Research Scientist (NCSA), Adjunct Associate Professor (ECE), Research Associate Professor (CS)
- **Tim Boerner**, Assistant Director, XSEDE & Delta project offices (NSCA)



Today's program

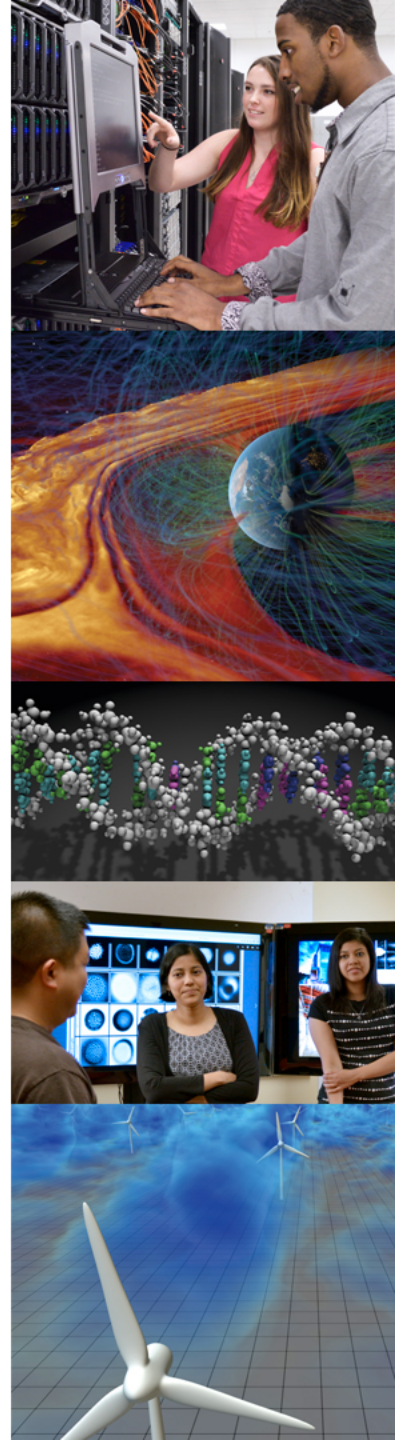
- **Introduction** - Dr. Donna Cox, donnacox@illinois.edu

R&E resources:

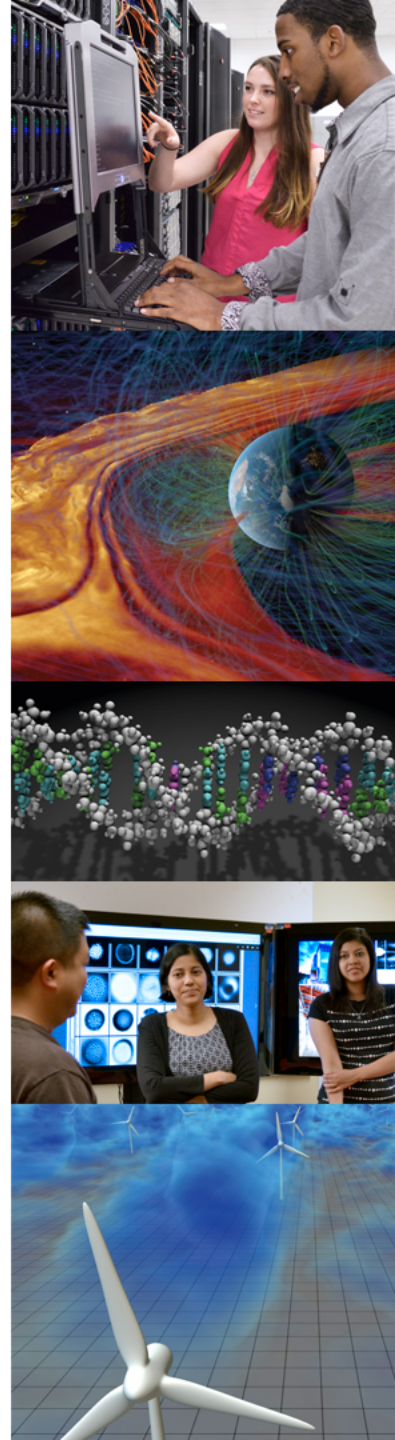
- NCSA Students Pushing INnovation (**SPIN**) & other Ed. programs - Olena Kindratenko, kindrat2@illinois.edu
- NCSA **Faculty Fellows program** - Alice Delage, adelage@illinois.edu

Computational resources:

- NCSA queue on the **Campus Cluster** - Dan Lapine, lapine@illinois.edu
- **HAL Cluster** for ML/DL- Vlad Kindratenko, kindrtnk@illinois.edu
- **Delta** - Tim Boerner, tboerner@illinois.edu



Research & Education resources (a sample)



Research & Education Student Programs

Olena Kindratenko

Senior Education & Outreach Coordinator

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Student Program - SPIN

- NCSA's Students Pushing INnovation (SPIN) internship program lunched in 2012
- UIUC undergraduates in any major work on leading-edge research projects with the world-class NCSA researchers and faculty affiliates
- Program activities:
 - Academic Year or Summer session
 - Paid internships
 - Summer: 20 hours a week for 8 weeks
 - Academic Year: 5 hours a week for 16 weeks each semester
 - Pay rate: \$12.50 in hours
 - Research, professional development, and social events
 - Eligible for Fiddler Innovation Undergraduate Research Award
- Student Participants:
 - Domestic and international students
 - Trained 332 undergraduates since the program inception
 - 24% female students
 - 17 SPIN interns received Fiddler Innovation Undergraduate Research Award



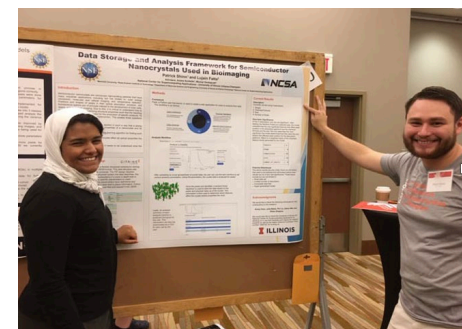
Student Program – INCLUSION REU

- Incubating a New Community of Leaders Using Software, Inclusion, Innovation, Interdisciplinary and Open-Science (INCLUSION) Research Experience for Undergraduates (REU) is a software-in-research training experience
- NSF REU Site lunched in 2017
- Program activities:
 - 10 summer weeks - includes \$500/week stipend, room and board, travel allowances
 - Pairs of students work with pairs of mentors from different disciplines on socially-impactful projects
 - Eligible for Fiddler Innovation Undergraduate Research Award
- Student Participants:
 - Domestic students from and outside of Illinois
 - Trained 34 undergraduates
 - 75% were minority and underrepresented in STEM
 - 3 INCLUSION REU students received Fiddler Innovation Undergraduate Research Award

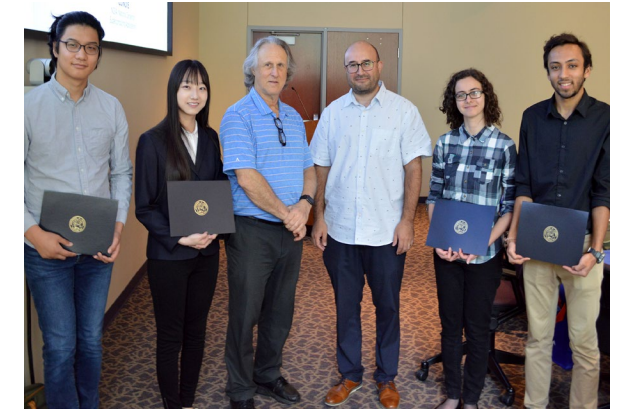
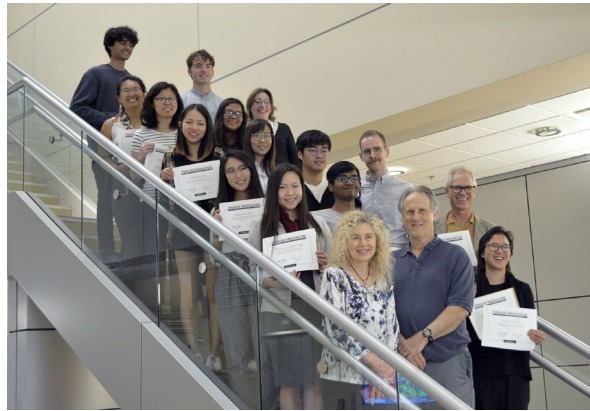


Student Program – NCSA International Research Internship

- Lunched in 2018
- Program activities:
 - 10 week-summer research program
 - Participants work with mentors from different disciplines on socially-impactful projects
 - Participants paired with REU INCLUSION and/or SPIN students
 - Research, professional development, and social events
 - Students responsible for program fees, campus housing, airfare, health insurance, and visa fees
 - Program fees: \$2,500
- Student Participants:
 - International students who are currently enrolled in any major and in any year of studies in U.S. university
 - foreign students enrolled in universities in their home countries
 - in good academic standing



Fiddler Innovation Endowment Award



The Fiddler Innovation Undergraduate Award is part of an endowment from Jerry Fiddler and Melissa Alden to the University of Illinois in support to the Emerging Digital Research and Education in Arts Media (eDream) Institute, which is based at the National Center for Supercomputing Applications

32 undergraduate, graduate, and NCSA faculty affiliates received the award

FIDDLER INNOVATION ENDOWMENT

I ILLINOIS NCSA

Professional Development Program – CIP

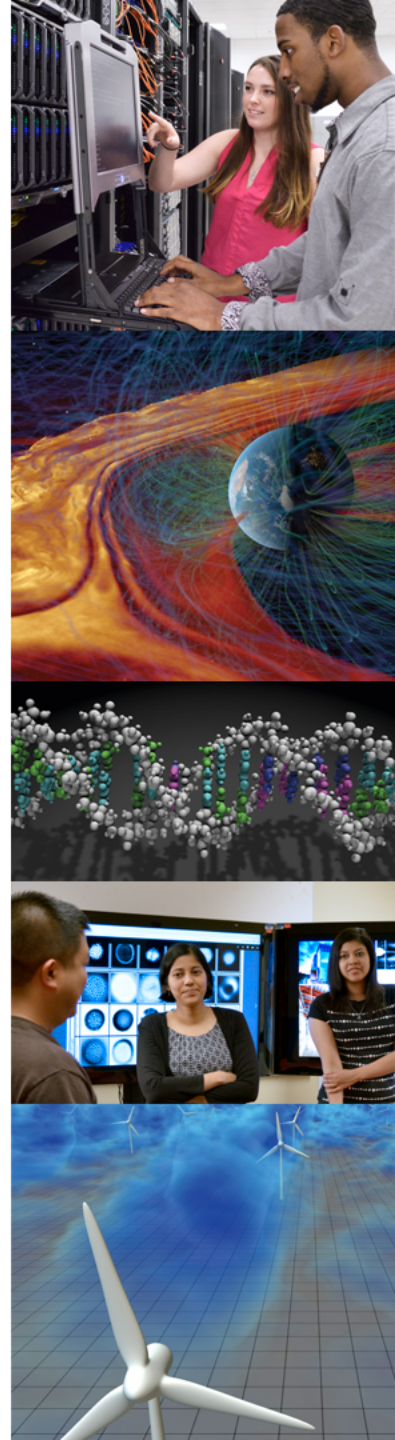
- Cyberinfrastructure Professional Intern Program (CIP) designed to address the shortage of a workforce with the specialized skills needed to support advanced CI operations
- NSF CIP Site lunched in 2017
- Program activities:
 - Fall or Spring semester
 - Paid internships
 - Work directly with NCSA engineers to gain hands-on experience in the cyberinfrastructure operations
 - Spend the first two weeks training and learning about the different cyberinfrastructure aspects
 - Paired with one of the advanced infrastructure groups
- Student Participants:
 - Domestic and international from undergraduates to PhD level
 - Trained 17 interns
 - 24% underrepresented in STEM and veterans with disabilities



NCSA Faculty Fellow program

- Goal: to catalyze and develop long-term research collaborations between Illinois departments, research units, and NCSA.
- Competitive program provides seed funding for demonstration, start-up projects, workshops, and/or other activities with the potential to lead to longer-term collaborations around research, development & education.
- New projects that include NCSA staff as integral contributors to the project.
- Open to all faculty and researchers at UIUC
- Up to \$25K for one year
- Application period : usually Jan.- Feb. ; Awards : July 1-June 30 of the following year.
- More information and how to apply at <http://www.ncsa.illinois.edu/about/org/fellowships>
- Questions to adelage@illinois.edu

Computing, AI & Data resources (a sample)



Campus Cluster

NCSA Investment on Campus Cluster

- NCSA's ICC Tech Rep is Matt Long
- Have 60 TB of allocated storage on the shared GPFS
- Have 16 older IvyBridge nodes
 - 8 have K40 gpus
 - All have 20 Cores, 64GB RAM & FDR IB connectivity
 - These go out of service next April
 - We are looking at replacement options for some or all of these
- Have 4 newer Haswell nodes
 - All have 24 Cores, 256GB Ram and EDR IB connectivity
 - These remain in service until 2023
- All users with access to the ncsa queue can use any of these

Campus Cluster

Campus Cluster Secondary Queue

- Many ICC nodes allow jobs from the secondary queue if there are no jobs queued from the primary investors on their resources
- These jobs are limited to just 4 hours
- All users have access to all the nodes within the secondary queue in addition to our primary investment
- There are 250+ nodes available for this usage, with a variety of core and ram counts.

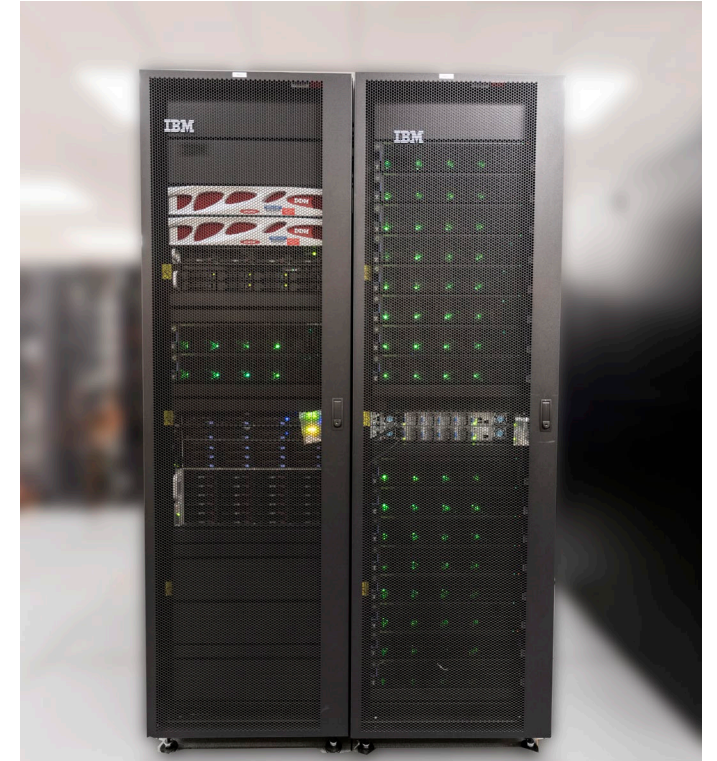
ICC website: <https://campuscluster.illinois.edu/>

Appy for 'nrsa queue' access: https://campuscluster.illinois.edu/new_forms/user_form.php

HAL Cluster

- In 2017, NCSA was funded by the NSF's Major Research Instrumentation program to develop and deploy a computational "instrument" for supporting deep learning applications at scale.
- The machine was named *Hardware Accelerated Learning* (HAL) cluster. It became operational in March 2019 and will continue to operate for the foreseeable future.
- Its purpose is to serve *deep learning* community on campus; any UIUC researcher can get an account on it. System details and account application instructions are here:

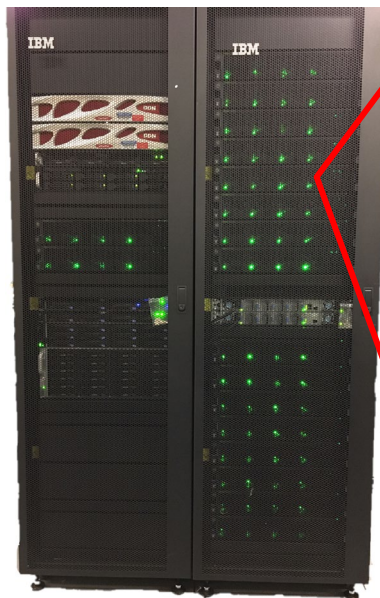
<https://wiki.ncsa.illinois.edu/display/ISL20/HAL+cluster>



HAL cluster

Hardware Accelerated Learning

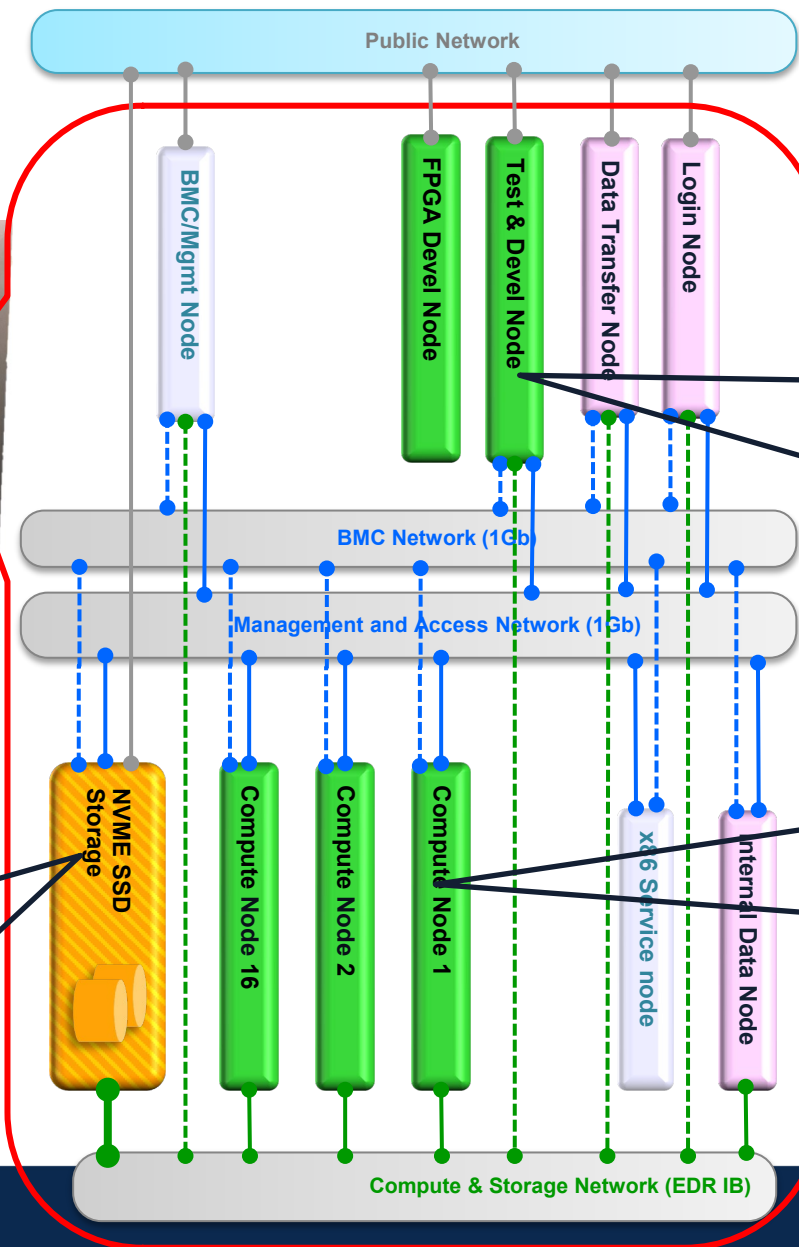
- RHEL/CentOS 7.6
- CUDA 10.1.105, cuDNN 7.5.0, NCCL 2.4.2
- IBM XLC 16.1.1, IBM XLFORTRAN 16.1.1
- Advance toolchain for Linux on Power 12.0
- IBM Watson Machine Learning Community Edition 1.7.0 (TensorFlow, PyTorch, RAPIDS cuML and cuDF)
- SLURM & Open OnDemand



DDN GS400NVE Flash Array

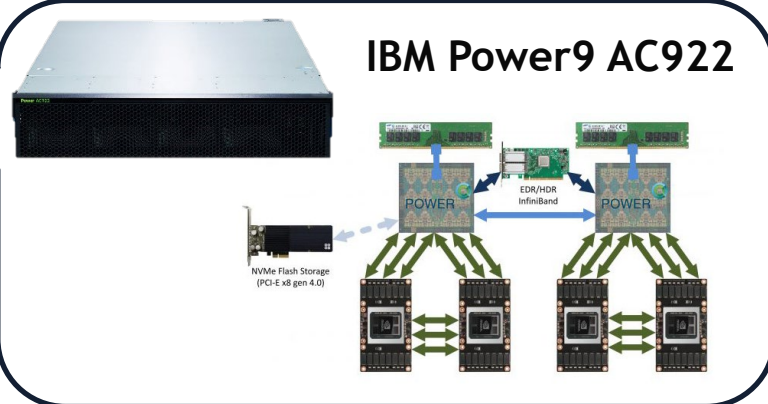
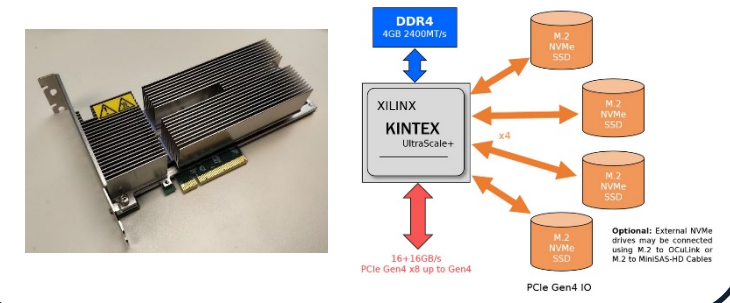


- 244 TB usable
- NVME SSD-based storage
- Spectrum Scale File System



- 16 IBM AC922 nodes
 - IBM 8335-GTH AC922 server
 - 2x 20-core POWER9 CPU @ 2.4GHz
 - 256 GB DDR4
 - 4x NVIDIA V100 GPUs
 - 5120 cores
 - 16 GB HBM 2
 - 2-Port EDR 100 GB IB ConnectX-5 Adapter

Nallatech 250S+ CAPI FPGA board



Center for AI Innovation

Three Primary Themes

1

Research
(Academic)

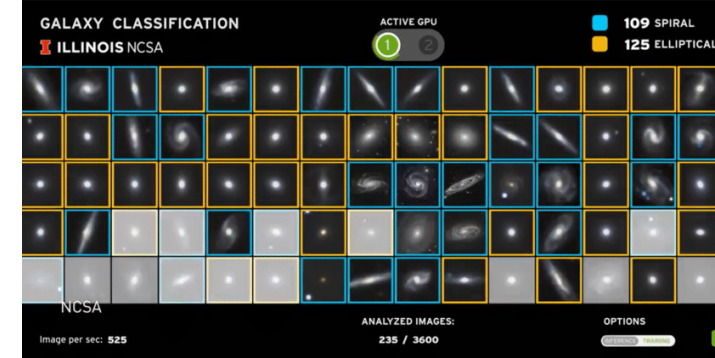
2

Scholarship
(Students)

3

Industry
(Companies)

- Bring together University resources for opportunities to collaborate
- Align research with academic and industry challenges
- Provide students opportunities in AI disciplines from top tier University
- Very active in proposal development, faculty research, opportunities for students, and industrial challenges
- <http://ai.ncsa.illinois.edu/>



Overview of Delta

COMPUTE



Furthering GPU adoption

DATA



Moving beyond POSIX

INTERFACE



Improving usability
and accessibility

Thank you!

Today's slides will be posted at <https://wiki.ncsa.illinois.edu/display/NRE/Presentations>

