

Building a Community of Practice in Computational Pathology

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Professor, Principal Data Scientist

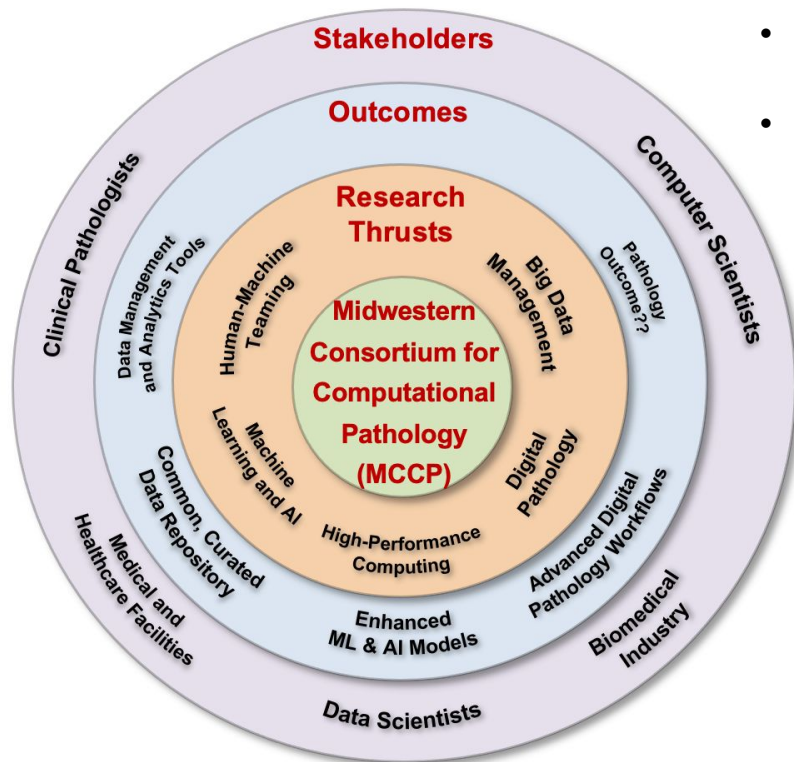
Presenting on Behalf of



Prof. D. K. Panda,
Computer Science and Engineering
The Ohio State University


Midwestern Consortium for Computational Pathology (MCCP)

<http://nowlab.cse.ohio-state.edu/mccp/>



- Established through the Midwest Big Data Hub (MBDH)
- To foster a community of practice around **computational pathology in the Midwest** and beyond:
 - Scarcity of well-trained pathologists in the US negatively impacts patient care
 - Practice of pathology is rapidly undergoing a transformation
 - Enormous opportunity for the application of innovative human-machine teaming using AI technologies
 - MCCP brings together experts from:
 - pathology, data science, and computer science
 - academia, government laboratories and industry

Aim to position the Midwest at the cutting edge of this new age of digital pathology

A man in a white lab coat and glasses is seated at a desk, looking at two computer monitors. The left monitor displays a software interface with a small inset image of a red, fleshy, lobulated specimen on a green background. The right monitor shows a large histological slide with pink and purple staining. A black computer tower and keyboard are on the desk.

Dr. Anil Parwani, Ohio State

Goals and Objectives of the Consortium

- **Primary goals:** To collaborate on technology applications and resource development, best practices and knowledge sharing, and proposals for funding.
- **Specific objectives:**
 - Organize information exchanges to create closely coordinated working groups
 - workshops, hackathons, etc.
 - Define agenda and goals of the community to establish working groups with specific team-science, convergent research, educational and outreach purposes
 - interdisciplinary thrusts, short courses and programs, community engagement
 - Create data and computing assets for the consortium and larger MBDH community
 - Data and model commons and collections, computational tools, educational offerings
 - Outline clear and tangible value propositions and outputs to stakeholders in academia, industry, and healthcare organizations
 - Form engagements through a formal consortia involving academic institutions, companies dedicated to pathology and biotechnology, and medical and health facilities, including those in resource-poor areas

Consortium Members

253 registered attendees and 70 organizations across Industry, Academia, Government, National Labs from 17 Countries!

- Affiliated Pathologists Medical Group
- American University of Beirut Medical Center, Lebanon
- ARUP Laboratories
- AQUYRE Biosciences, France
- Augmentiqs, Israel
- Bogazici University, Turkey
- Barretos Cancer Hospital, Brazil
- Bristol Myers Squibb
- Case Western Reserve University
- Caterpillar
- Cincinnati Children's Hospital Medical Center
- COMSATS University, Pakistan
- Columbia University
- Deciphex
- Duke Health
- Duke University
- Ege University, Turkey
- Emory University
- Foundation University Islamabad, Pakistan
- French Medical Institute for Mothers and Children, Afghanistan
- Hospital de Amor, Brazil
- Hospital Italiano de Buenos Aires, Argentina
- H. Lee Moffitt Cancer Center and Research Institute
- Ibex Medical Analytics, Israel
- Imam Abdulrahman bin Faisal University, Saudi Arabia
- Imperial College London, United Kingdom
- International Medical Center, Saudi Arabia
- Kameda Medical Center, Japan
- King Faisal Specialist Hospital and Research Centre, Saudi Arabia
- Kitware
- Leaderzest, United Kingdom
- Mass General Hospital
- Mayo Clinic
- MD Anderson Cancer Center
- Mechanomind
- Medical College of Wisconsin
- Memorial Sloan Kettering
- Minia University, Egypt
- Nagasaki University, Japan
- National Institutes of Health
- Nference
- Northwestern University
- National University of Computer and Emerging Sciences, Pakistan
- NUST, Pakistan
- Ontario Institute for Cancer Research, Canada
- Ospital ng Makati, Philippines
- Philips
- Queen's University, Canada
- Roswell Park Cancer Center
- Siro Clinpharm
- Splintellx
- Strand Life Sciences, India
- The Ohio State University
- The University Of Oklahoma Health Sciences Center
- The University of Texas Medical Branch
- UMass Medical School-Baystate
- University of California
- University of Cincinnati
- University of Florida
- University of Management and Technology, Pakistan
- University of Maryland
- University of Michigan
- University of Mississippi Medical Center
- University of New Mexico
- University of Pennsylvania
- University of Pittsburgh
- University of South Alabama
- University of Utah
- University of Waterloo, Canada
- University Hospital Cologne, Germany
- Upstate Medical University
- UT Southwestern Medical Center
- Walchand College of Engineering, India
- Washington University in St. Louis

Objectives of MCCP workshop series

Workshop #1

Bring **computation scientists** and **pathologists** together

- Computational scientists are introduced to pathology data sets and state-of-the-art tools and workflows
- Pathologists are introduced to cutting edge trends in data science and data management
- Breakout groups to **identify gaps in state-of-the-art computational pathology workflows**

Workshop #2

Discuss solutions to **bridge the gap** in state-of-the-art computational pathology workflows

- Arrange hackathons to use ML, DL, and data science techniques for digital pathology data sets with the **goal of creating new tools to enable optimized workflows**
- Learn latest techniques being developed in the industry from industry partners
- Exploration of collaborative funding opportunities

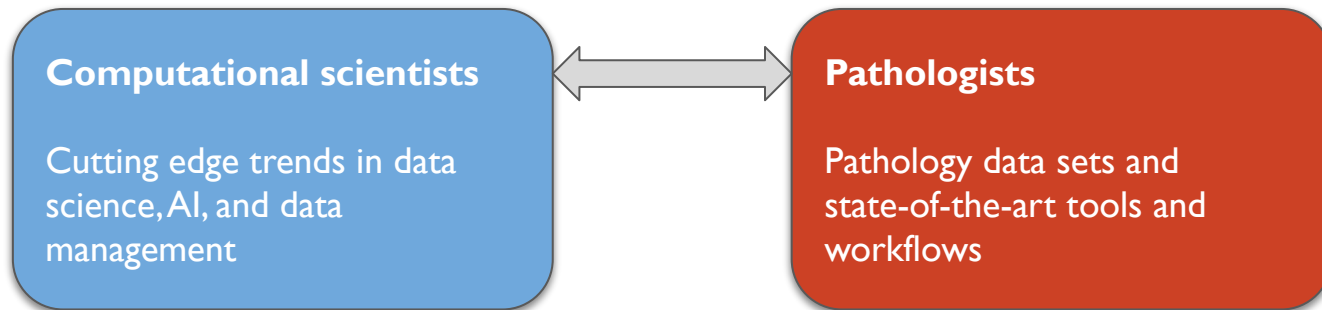
Workshop #3

Identify future directions

- Discuss opportunities and challenges of **developing these tools into future products** with industry partners
- Discuss educational materials to **train next-generation of digital pathologists**
- Share experiences in pursuing collaborative funding opportunities and aim for large scale collaboration

The First MCCP workshop

- Theme: “**Building Convergence**”
- Specific objectives:



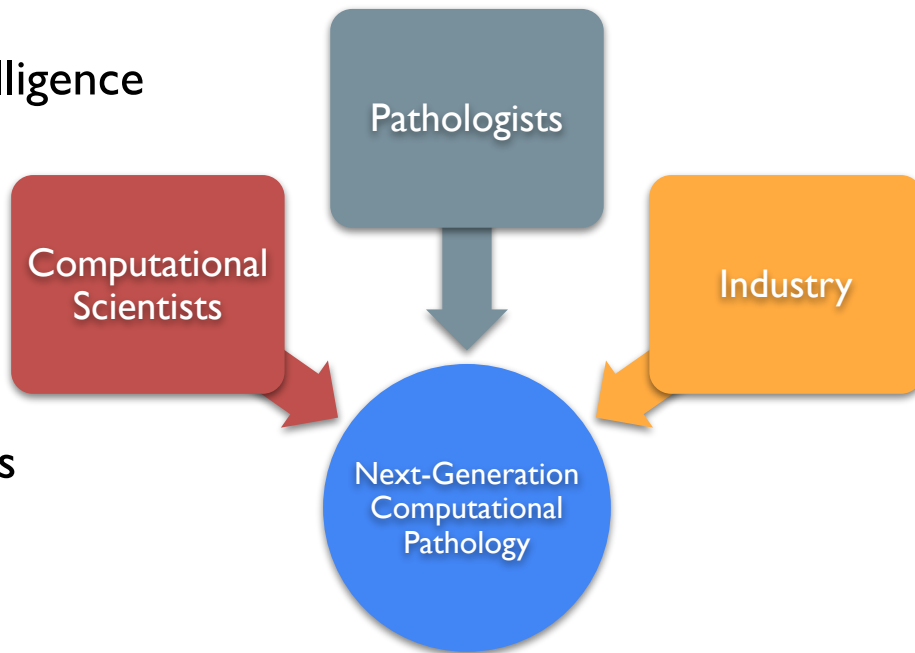
- Breakout groups to identify gaps in computational pathology workflows, datasets, and tools
- Discuss plans for outreach in both academia and industry
- Identify interdisciplinary research thrusts

Workshop website: http://nowlab.cse.ohio-state.edu/mccp_prog/

All talks and their videos are available on the workshop website

Focus areas of first MCCP workshop

- Digital Pathology and Imaging
- Machine Learning and Artificial Intelligence
- Human-Machine Teaming
- Big Data Management
- High-Performance Computing
- Outreach and Industry Connections



First Day - Jan 26

12:00 - 12:15	Welcome and Opening Anil Parwani and DK Panda, The Ohio State University, USA
12:15 - 1:00	Keynote Talk: Supporting the NIDDK Kidney Precision Medicine Project (KPMP): Standing up the U-M Pathology AI / Data Visualization Center and Core Lab - Five years in retrospect <i>Ulysses Balis, University of Michigan, USA</i>
1:00 - 1:30	How Computational Pathology is Improving Predictive Analytics? <i>Michael Becich, University of Pittsburgh, USA</i>
1:30 - 2:00	Digital Pathomics - An Alternative to Deep Learning to Prognosticating Disease Outcome <i>Anant Madabhushi, Case Western Reserve University, USA</i>
2:00 - 2:30	How Digital Pathology will Transform Drug Development and Cancer Diagnosis? <i>Jason Hipp and Khan Baykaner, AstraZeneca</i>
2:30 - 3:00	Machine learning for placental pathology: Why, How, and What Now? <i>Jeffrey Goldstein, Northwestern, USA</i>
3:00 - 3:45	Breakouts and Discussion Breakout #1 Digital Pathology and Imaging <i>Breakout leaders: Jennifer Picarsic (Cincinnati Children) and Jeffrey Goldstein (Northwestern)</i> Breakout #2 Machine Learning and Artificial Intelligence <i>Breakout leaders: Michael Becich (Pittsburgh) and Anant Madabhushi (CWRU)</i>
3:45 - 4:05	Reporting from two breakout sessions (10 mins each)
4:05 - 4:15	Closing for Day 1 and Plans for Day2 and Day 3 <i>Anil Parwani and DK Panda, The Ohio State University, USA</i>

Second Day - Jan 27

12:00 - 12:15	Updates from Day 1 and Day 2 Overview Anil Parwani and DK Panda, The Ohio State University, USA
12:15 - 1:00	Keynote Talk: Highlighting Challenges for Machine Learning in the Pathology Clinic through Specific Use Cases Raghu Machiraju, The Ohio State University, USA
1:00 - 1:30	Understanding how to Understand Teammates Eric Fossler-Lussier, The Ohio State University, USA
1:30 - 2:00	Stochastic Flow Clustering: Consolidation, Renewed Bearing and Applications to Image Segmentation Srinivasan Parthasarathy, The Ohio State University, USA
2:00 - 2:30	Providing molecular insight for resource-strained patients with machine learning-based workflows Jose Otero, The Ohio State University, USA
2:30 - 3:00	BERT - Transformers, NLP, and Pathology Reports Hamid Tizhoosh, University of Waterloo, Canada
3:00 - 3:45	Breakouts and Discussion
	Breakout #3 Human-Machine Teaming Breakout leaders: Eric Fossler-Lussier (OSU) and Jose Otero (OSU)
3:45 - 4:05	Breakout #4 Big Data Management Breakout leaders: Srinivasan Parthasarathy (OSU) and Hamid Tizhoosh (Waterloo)
	Reporting from two breakout sessions (10 mins each)
4:05 - 4:15	Closing for Day 2 and Plans for Day 3 Anil Parwani and DK Panda, The Ohio State University, USA

Third Day - Jan 28

12:00 - 12:15	Updates from Day 2 and Day 3 Overview Anil Parwani and DK Panda, The Ohio State University, USA
12:15 - 1:00	Keynote Talk: Charting a Future Course for Computational Pathology <i>Lee Cooper, Northwestern, USA</i>
1:00 - 1:30	Explainable AI (xAI) for Anatomic Pathology <i>Chakra Chennubhotla, University of Pittsburgh, USA</i>
1:30 - 2:00	AI-Based Pathology in Clinical Stage Biopharmaceutical Drug Development <i>Mike Montalto, PathAI, USA</i>
2:00 - 2:30	AI Promise to the Practice of Hematopathology <i>Mohammad Salama, Mayo Clinic, USA</i>
2:30 - 3:00	High-Performance Deep Learning with Large Pathology WSI Images <i>Hari Subramoni, The Ohio State University, USA</i>
3:00 - 3:45	Breakouts and Discussion
	Breakout #5 High-Performance Computing <i>Breakout leaders: Mike Montalto (PathAI) and Hari Subramoni (OSU)</i>
	Breakout #6 Outreach and Industry Connections <i>Breakout leaders: Mohammad Salama (Mayo Clinic) and Chakra Chennubhotla (Pittsburgh)</i>
3:45 - 4:05	<i>Reporting from two breakout sessions (10 mins each)</i>
4:05 - 4:15	Closing for Day 3 and Plans for Workshop #2 Anil Parwani and DK Panda, The Ohio State University, USA

Plans Ahead

Early Spring 2022

Late Summer 2022

Workshop #1

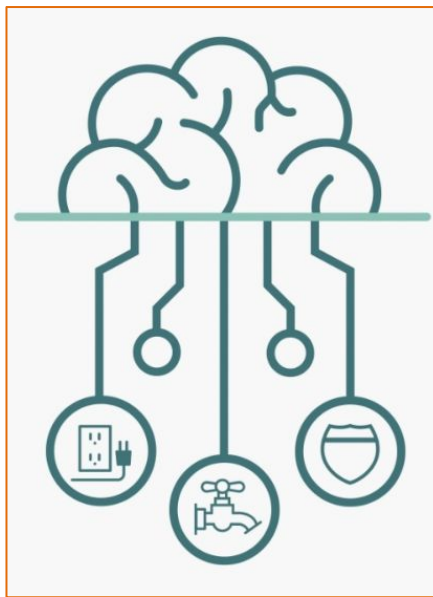
Bring **computation scientists**
and **pathologists** together

Workshop #2

Discuss solutions to **bridge the gap** in state-of-the-art
computational pathology workflows

Workshop #3

Identify future directions



ICICLE

Intelligent CyberInfrastructure with
Computational Learning in the Environment

<http://icicle.ai>

NSF-Funded AI Institute



Dhabaleswar K. Panda
The Ohio State University



Raghu Machiraju
The Ohio State University



Eric Fosler-Lussier
The Ohio State University



Beth Plale
Indiana University



Vipin Chaudhary
Case Western

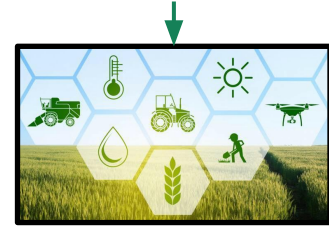
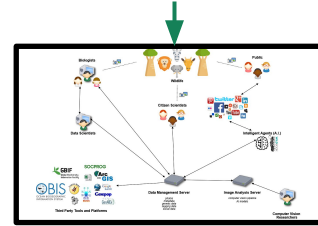
An Overview of ICICLE

- *Plug-and-play characteristics exists in current generation electricity and power grid*
- *No such plug-and-play AI exists for modern scenarios*

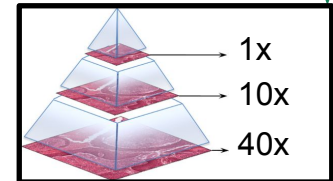
Can we democratize AI for current societal needs ?

- Democratizing AI will require **new Cyberinfrastructure** that enables:
 - *Plug-and-play AI* capabilities that are accessible to diverse stakeholders
 - Intelligent Cyberinfrastructure – CI4AI & AI for CI4AI
 - Use-inspired research for co-design in select target domains
- Inclusive growth of next generation of AI-capable workforce trained in transdisciplinary settings

Driving Use Cases from Smart Foodsheds, Animal Ecology, Digital Agriculture, etc.



- Systems provide a continuum of field-to-edge-to-cloud/HPC centers
- Provide very large, complex, heterogeneous data for a plethora of scientific and operational questions
- ICICLE will augment current cloud-based AI models by:
 - Facilitating decision-making in the field plagued by low network bandwidth
 - Allowing data to be private but facilitating collaborative intelligence
 - Provisioning models to use and plan computation and data movement
- Adding more verticals, including Computational Pathology



Thanks to our Sponsors!



Joining the Consortium

All interested are welcome to join the MCCP consortium by visiting our website (<http://nowlab.cse.ohio-state.edu/mccp/>) and filling an application form