TOGETHER

we are transforming healthcare

MAYO CLINIC & ILLINOIS ALLIANCE
For Technology-Based Healthcare

A program of the Interdisciplinary Health Sciences Institute

MAYO CLINIC

Mayo Clinic's mission is to inspire hope and contribute to health and well-being by providing the best care to every patient through integrated clinical practice, education, and research. A top-ranked medical center, Mayo Clinic's primary value is "the needs of the patient come first." Mayo Clinic values the creative ideas and unique talents of each employee to infuse and energize the organization through innovation, enhancing the lives of those served.

The **Center for Individualized Medicine (CIM)** at Mayo Clinic aims to solve the clinical challenges of today and tomorrow by bringing the latest discoveries from the research laboratory to the doctor's fingertips in the form of new genomics-based tests and treatments. CIM builds on Mayo Clinic's philosophy of putting patients at the center of the care experience and ensuring their needs come first. The center links clinical practice, education, and research resources to deliver a more individualized patient care experience.

Two Midwest institutions with world-class expertise

The **University of Illinois** has a unique history and breadth of research expertise. Many of the technologies that enabled the modern electronic era were developed at Illinois. That innovative commitment continues today, by addressing society's most pressing problems through interdisciplinary research that drives positive change in our communities, our state, our nation, and the world.

As the uniting hub for health sciences at Illinois, the **Interdisciplinary Health Sciences Institute (IHSI)** helps to advance clinical and translational research through infrastructure support, partnering, and strategic visioning:

- Bringing together experts in areas like engineering and computer science
- Partnering with campus powerhouses like the National Center for Supercomputing Applications, the Carl R. Woese Institute for Genomic Biology, and Coordinated Science Laboratory
- Connecting with Mayo Clinic to imagine and mobilize healthcare innovation

A powerful collaboration working to solve today's health challenges

Together, with over 300 years of combined excellence, Mayo Clinic and the University of Illinois are collaborating to unite science and technology, bringing innovative solutions to individualized healthcare.

A program of the Interdisciplinary Health Sciences Institute, the **Mayo Clinic and University of Illinois Alliance for Technology-Based Healthcare** blends the technical engineering expertise of Illinois with the clinical practice expertise of Mayo Clinic to develop new capabilities and technologies that will transform healthcare.

MAYO CLINIC & ILLINOIS ALLIANCE
For Technology-Based Healthcare

Organized in 2010, the Mayo Clinic and Illinois Alliance brings our two world-class institutions together to change lives through shared passion and values and a synergistic framework:

- **Innovative educational programs to train next-generation clinicians and biomedical scientists**
- **Focused research collaborations to advance computational medicine, genomics, and point-of-care diagnostics**
- **Unmatched abilities to translate education and research outcomes into improved patient care**

Groundbreaking educational opportunities inspire future clinicians and scientists

The foundational educational opportunities offered by the Mayo Clinic and Illinois Alliance allow undergraduates, graduates, and professionals to gain hands-on experience in healthcare innovation.

Summer Undergraduate Research Fellowship (SURF) Program – *Undergraduate Students*
This 10-week program hosted by Mayo Clinic promotes development of technical skills, hands-on lab experience, and enthusiasm for biomedical research. Students have the opportunity to work alongside Mayo Clinic mentors to conduct their own research or be part of an ongoing project.

IT and Bioinformatics Summer Internship at Mayo Clinic – *Undergraduate and Graduate Students*
This summer internship at Mayo Clinic awards students interested in information technology a unique opportunity to work within the Bioinformatics Systems Unit. Projects focus on translating and applying genomic data to clinical care solutions.

Fellowships for Technology-Based Healthcare – *Graduate Students*
This unique fellowship program supports the advancement of individualized medicine and creates a pathway for Illinois students to explore post-graduation employment opportunities at Mayo Clinic. The two-year fellowship includes a 12-month, on-site mentored research opportunity at Mayo Clinic; a stipend; and coverage of tuition, select fees, and travel expenses.

Computational Genomics Course – *Graduate Students and Professionals*
This week-long intensive course challenges participants to look at genomics data in a new way, integrating biology, computation, and genetics alongside the latest technologies and computational methodologies. University of Illinois faculty teach lectures and lead hands-on laboratory exercises in genome sequencing and assembly, polymorphism and variant analysis, epigenomics, and visualization.

Other Opportunities
Please visit **mayoillinois.org** for complete details about educational opportunities.

Computational Genomics Course participants

New technology using light-emitting quantum dots could improve prostate cancer outcomes

A perfect partnership: combining best-in-class medicine with best-in-class technology

Mayo Clinic's approach to individualized medicine embraces technology for research and data gathering for clinical purposes across the entire spectrum of medicine. To provide individualized care for each patient, Mayo Clinic physicians are looking to Illinois' engineering expertise and interdisciplinary research teams to solve complex health challenges.

More than 50 research collaborations have developed through the alliance in the areas of bioinformatics, cancer, imaging, microbiome, data visualization, biomarker discovery, epigenomics, pharmacogenomics, and neuroscience. These projects advance abilities to:

- **Create new and better diagnostic tests**
- **Develop therapies for preventing and treating a wide range of diseases**
- **Predict and avoid potential complications**
- **Improve monitoring of patients and delivery of treatment through new devices**
- **Individualize patient care with real-time clinical data and knowledge sources**

The need for high-performance computing and technology-driven solutions in medicine continues to grow as new possibilities are realized. Visit **mayoillinois.org** to learn about and join our effort to make life-changing medical research happen.

Breast cancer cells (purple) in non-perturbed tissue, visualized by SLAM microscopy

Using team science to transform healthcare

At Mayo Clinic, teams of specialists work together to provide optimal patient care. At Illinois, teams of researchers work together to solve health challenges. Together, we move beyond our individual abilities to change the way we deliver and experience healthcare.

The Mayo Clinic and Illinois Alliance brings the latest discoveries from the research laboratory to the doctor's fingertips. Just a few examples of exciting clinical advances include:

- **A new artificial intelligence-based approach** identifies seizure-generation brain regions. One potential benefit is decreased time to remove the part of the brain causing seizures from days or weeks to just a couple of hours.
- **Use of data-driven analytics and machine learning research** has helped reveal the connection between metformin and reduced breast cancer growth. Use of game theory may help predict whether a patient with triple-negative breast cancer will respond to this type of drug treatment.
- **A new computational tool** combines multiple types of genomic information to make stronger predictions about individual drug responses. Because treatment responses vary dramatically among individuals, this could serve an important role in selecting the right treatment at the right dose.

New projects and developments are happening all the time. Visit **mayoillinois.org** to be a part of this progressive collaboration.

A grand challenge: using high-performance computing for rapid genome sequence analysis

The Mayo Clinic and Illinois Alliance facilitates development of technology and capacity to meet the big data challenge in healthcare. A major "grand challenge" project toward this goal aims to use the computational expertise at Illinois to analyze and interpret a complete human genome sequence within a day. Eventually, we hope whole genome sequencing can be done for all Mayo Clinic patients, a major breakthrough towards individualized healthcare.

The two primary goals of the project include:

- **Reducing time required for analysis of whole genome sequencing.** It can take several days to weeks to analyze DNA sequences to help inform new treatment options. The prediction is that this will be reduced to hours.

- **Extracting more information from whole genome sequencing (WGS).** Accurately interpreting this amount of genetic data has immense potential to better prevent, diagnose, and treat a variety of health conditions and diseases.

Development and testing of new genomic computational models is underway using genomic data from approximately 300 people from families affected with hypoplastic left heart syndrome, a complex and rare heart defect present at birth in which the left side of a child's heart is severely underdeveloped. With new sequencing and computational models, there is potential for new targeted treatments not only for this serious heart condition, but a variety of health challenges.

High-performance computing helps address the big data challenge in healthcare

Connect with us

Mayoillinois.org, the website of the Mayo Clinic and Illinois Alliance, offers education program information and application details, the latest news in technology-based healthcare, and resources for research collaboration. The site will continue to improve, and we welcome your feedback on what you'd like to see made available in the future.

Connect with us by subscribing to our e-newsletter or email us at **info-mayo@mayoillinois.org**.

Join us

Be a part of this shared vision to transform healthcare. Find out how you can support the objectives of the Mayo Clinic and Illinois Alliance with your gift by contacting the University of Illinois' Director of Advancement for Research Initiatives at **(217) 333-1477** or **healthinstitute@illinois.edu**.

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