WELCOME TO TACC

TACC AT A GLANCE

- Research center located at UT Austin
- ~160 Staff (~70 PhD scientists, ~20 students)
- Funded by UT System, NSF (85% external grants)

- **Users:** >10,000 on 2,300 active projects across all fields
- **Partnerships:** UT Research Cyberinfrastructure (UTRC), Extreme Science and Engineering Discovery Environment (XSEDE), Industry, International

Mission: "To enable discoveries that advance science and society through the application of advanced computing technologies."

TACC AT A GLANCE

- **Capacity and Infrastructure:**
  - A billion compute hours per year
  - 5 billion files, 50 petabytes of data
  - Hundreds of public datasets
  - 10 MW data center

- **Systems and Services:**
  - High performance computing (HPC), high throughput computing (HTC), large scale data storage, cloud computing, visualization
  - Portals and gateways, web service APIs, rich software stacks
  - Consulting, curation and analysis, code optimization, training and outreach

TACC SYSTEMS AT A GLANCE

STAMPEDE

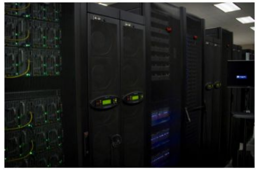
HPC, Visualization, Data Analysis, Data Intensive Computing

LONESTAR 5

HPC, Remote Visualization

MAVERICK

Interactive Visualization, Data Analytics



WRANGLER

Data Analysis, Data Management

CHAMELEON

Cloud Computing Testbed

HIKARI

Sustainable Supercomputing

VISLAB

Advanced Visualization Resources and Consulting

STALLION

Tiled-Display System

LASSO

Multi-Touch Display

JETSTREAM

Self-Service Cloud System

FABRIC

Alternate Computer Architectures

DISCOVERY

Testbed Cluster

RODEO

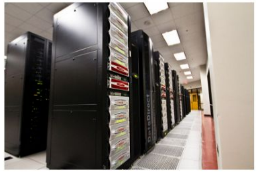
Cloud Computing, Storage

CORRAL

Storage, Data Management

RANCH

Mass Archival Storage



STOCKYARD

Global File System

CATAPULT

A Reconfigurable Architecture for Large Scale Machine Learning

RUSTLER

Data Intensive Computing

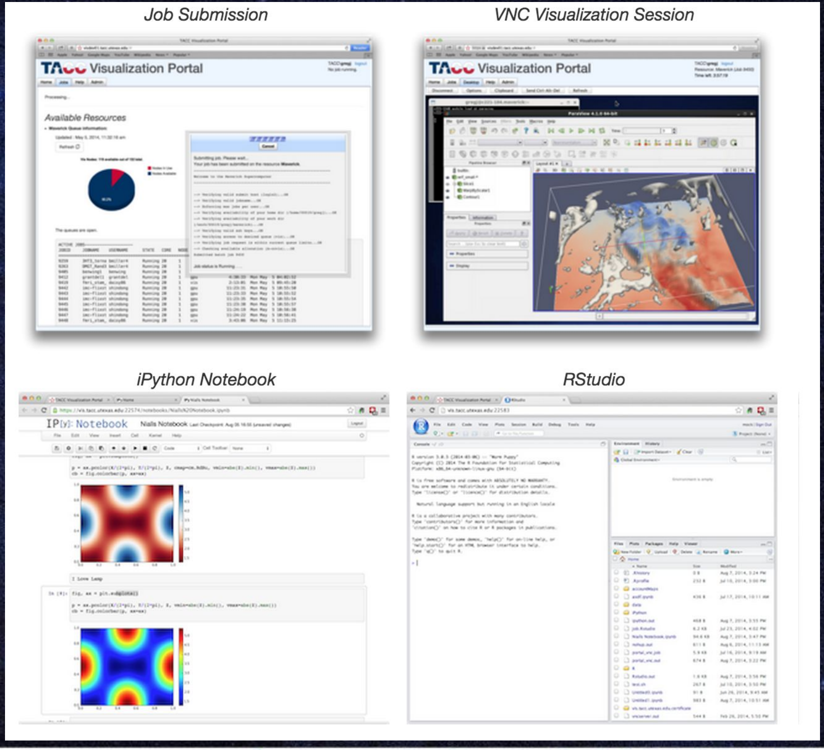
HIGH PERFORMANCE COMPUTE CLUSTERS

- **Stampede2**
  - 4200 KNL nodes, 1736 Intel Xeon nodes; ~18 PF peak performance
  - >600 TB RAM; 21 PB lustre filesystem
  - XSEDE / UT System

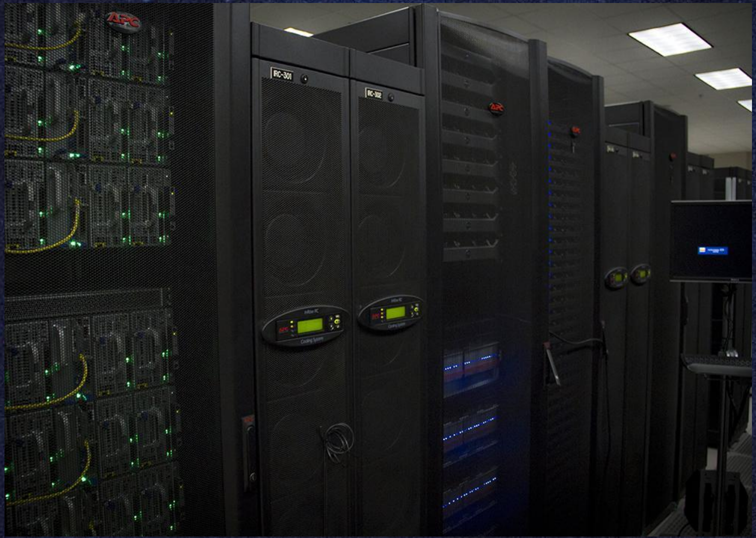
- **Lonestar5**
  - 1,282 nodes; 30K compute cores; ~1.2 PF peak performance
  - Large mem, GPU, hyperthreading
  - **UT System only**

VISUALIZATION AND GPGPU

- **Maverick**
  - 132 NVIDIA Tesla K40s
  - Remote visualization via VNC
  - GPGPU calculations
  - Machine learning / deep learning



DATA INTENSIVE COMPUTING



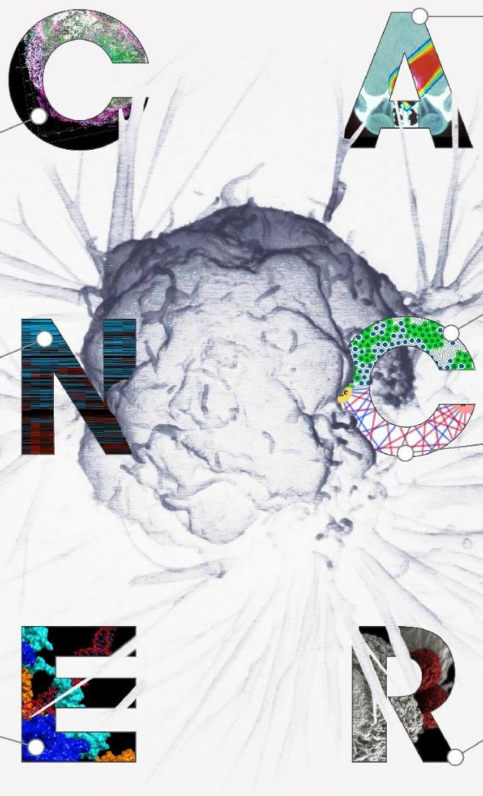
- **Wrangler**
  - >3,000 processor cores for analytics
  - 10 PB storage system; 600 TB DSSD flash storage
  - Aggregate bandwidth >1 TB/s
  - **Only allocable through XSEDE at this time**

DATA AND COLLECTIONS REPOSITORY

- **Corral**
  - 11 PB geo-replicated storage (Austin / Arlington)
  - 5 TB free to all UT System principal investigators
  - $118 per TB per year after the first 5 TB
  - Project data sharing / collection hosting

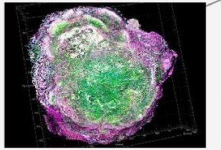
The Texas Advanced Computing Center accelerates basic and applied cancer research to help save lives.

fighting



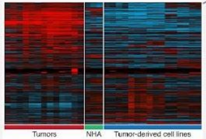
with supercomputers

Computer Modeling



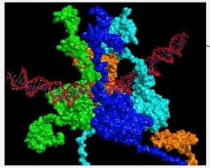
Researchers use advanced computing to model tissues, cells and drug interactions, and to design patient-specific treatments and identify new medicines.

Big Data Analysis



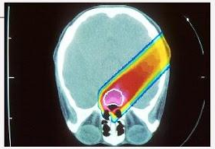
Supercomputers allow researchers to find patterns in genomes and among patient outcomes to pinpoint risks and target treatments.

Molecular Dynamics Simulations



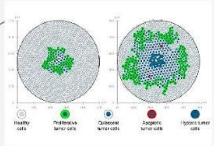
Simulating protein and drug interactions at the atomic level enables scientists to understand cancer and design more effective therapies.

Quantum Calculations



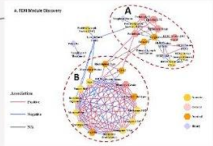
Exploring how proton and x-ray beams interact with DNA on the quantum level helps explain why radiation treatments work and how they can be optimized.

Trial Design



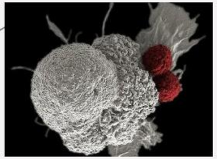
Researchers use TACC's advanced computers to design clinical trials that can determine the combination of dosages that will be most effective.

Clinical Planning



Supercomputers can test thousands of potential treatments in advance to help decide which one will work best.

Artificial Intelligence



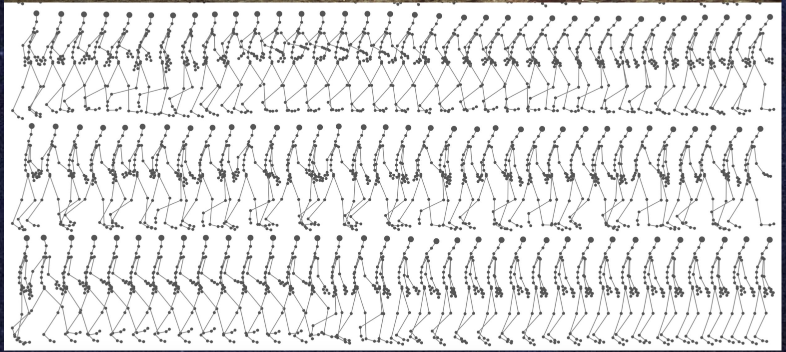
AI on high-performance computers can uncover relationships among complex cellular networks and reverse-engineer interventions.

TACC
TEXAS ADVANCED COMPUTING CENTER

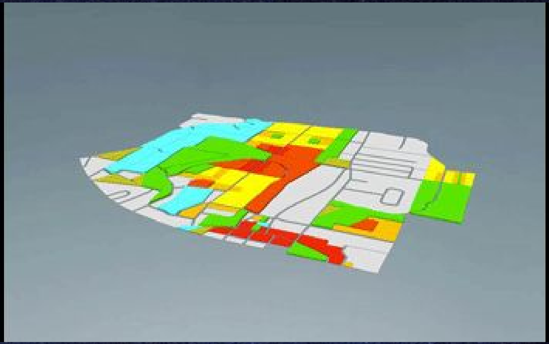
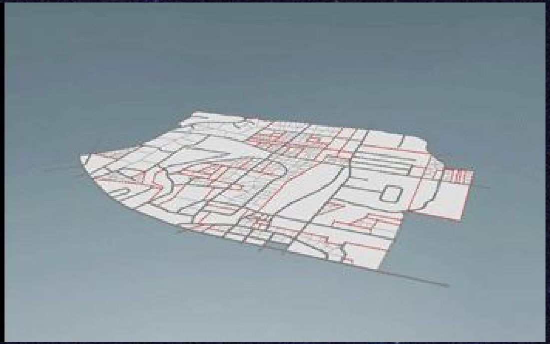
ADVANCED COMPUTING FOR SOCIAL CHANGE

- Use visualization and data analytics to increase awareness
- Engage students in a social change challenge
- Increase the participation of students historically underserved in STEM

A DANCE WITH ALGORITHMS



- XSEDE resources help researchers merge art and science to create systems that can understand and produce human-quality movement
- Uses deep learning techniques and relies on the collaboration of graduate students with artists to create new algorithms
- *On a single computer, running our algorithms would take years, on medium-sized resources months, but using XSEDE, we can train some of most complex models within 24 hours.* - Philippe Pasquier, professor and researcher, Simon Fraser University

- How will the Central Texas region evolve over the next 20 years?
- Newly developed suite of analytics tools developed by TACC for understanding of the impacts of various development patterns, such as:
  - What types of housing and business development should be planned?
  - How concentrating growth can maximize a community's infrastructure?
  - Where natural resources should be preserved?
  - How can communities promote better health?
  - How the region can ensure all segments of the community have access to education and jobs?

CITY AND REGIONAL PLANNING IN 3D

TAXATION AT THE TOP

- Economist use Stampede supercomputer to assess consequences of increasing tax rate on top earners
- "We need (TACC) to efficiently compute optimal individual decision rules about working, learning and saving, and then simulate the behavior of millions of model households, using these rules, in order to determine economic aggregates and equilibrium behavior,"
- Badel and Huggett found that a spike in the tax rate would have adverse affects on potential high earners.

USING SUPERCOMPUTERS TO ILLUMINATE THE RENAISSANCE

- Who knew whom in Renaissance Britain?
- Analyze writers work using machine learning, graph inferences, and web development to reconstruct and communicate social networks of Britain from about 1500 to 1700.
- *Once you employ computational techniques you can start to assemble relationships at a much greater scale. This is something no human could ever have in their head. By putting this together and making it available for the scholarly community we hope that we're facilitating a new way of doing scholarship that allows for a full appreciation of these historical networks.* - Christopher Warren, Associate Professor of English, Carnegie Mellon University