Aurora ESP Projects

S D L

Anouar Benali (ANL)

Extending Moore's Law computing with Quantum Monte Carlo

Martin Berzins (U. Utah)

Design & evaluation of high-efficiency boilers for energy production using a hierarchical V/UQ approach

CS Chang (PPPL)

High fidelity simulation of fusion reactor boundary plasmas

Theresa Windus (Ames)

NWChemEx: Tackling Chemical, Materials & Biochemical Challenges in the Exascale Era

Katrin Heitmann (ANL)

Extreme-Scale Cosmological Hydrodynamics

Ken Jansen (U. Colorado)

Extreme Scale Unstructured Adaptive CFD: From Multiphase Flow to Aerodynamic Flow Control

Norman Christ (Columbia)

Lattice Quantum Chromodynamics Calculations for Particle and Nuclear Physics

Aiichiro Nakano (USC)

Metascalable Layered Materials Genome

Benoit Roux (U. Chicago)

Free Energy Landscapes of Membrane Transport Proteins

David Bross (ANL)

Exascale Computational Catalysis

Salman Habib (ANL)

Dark Sky Mining

Ken Jansen (U. Colorado)

Data Analytics and Machine Learning for Exascale CFD

Walter Hopkins(ANL)

Simulating and Learning in the ATLAS detector at the Exascale

Amanda Randles (Duke U.)

Extreme-scale In Situ Visualization and Analysis of Fluid-Structure-Interaction Simulations

Will Detmold (MIT)

Machine Learning for Lattice Quantum Chromodynamics

Nicola Ferrier (ANL)

Enabling Connectomics at Exascale to Facilitate Discoveries in Neuroscience

Noa Marom (CMU)

Many-Body Perturbation Theory Meets Machine Learning to Discover Singlet Fission Materials

Rick Stevens (ANL)

Virtual Drug Response Prediction

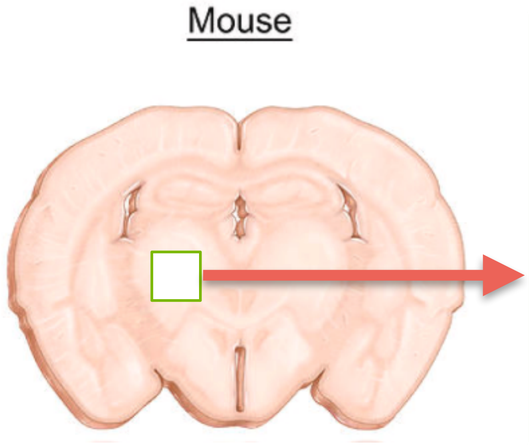
Bill Tang (Princeton)

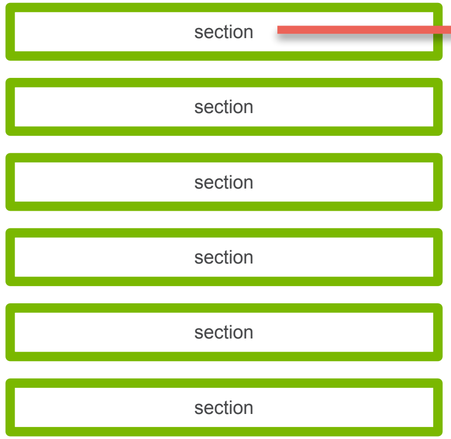
Accelerated Deep Learning Discovery in Fusion Energy Science

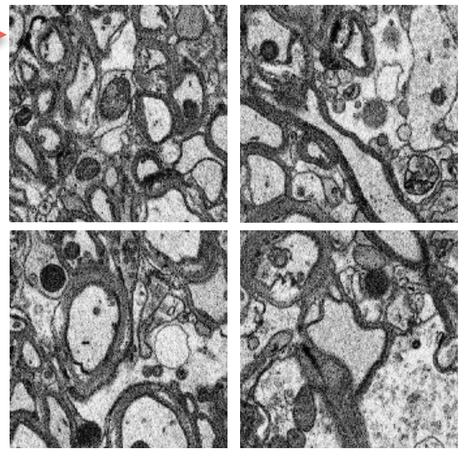
Argonne NATIONAL LABORATORY

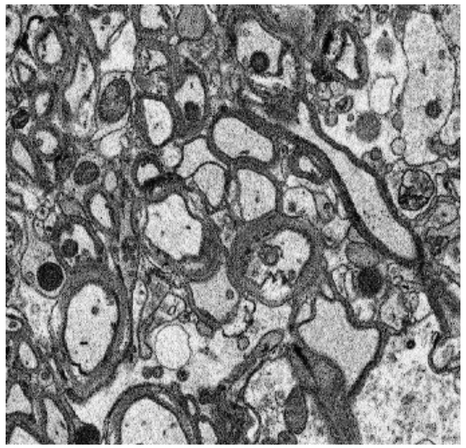
Data from Gregg Wildenberg, Kasthuri Lab, UChicago

Connectomics Data-Driven Models









~1cm^3

Mouse brain: 70M neurons

~1mm^3

25000
40nm sections
1mm x 1mm
(6nm resolution)

Each section
imaged with EM as
N tiles (8 bit)
80K x 40K pixels

Sections
stitched
together

How much image data is 1mm³ ? 1×10^{15} voxels --> ~1 PB