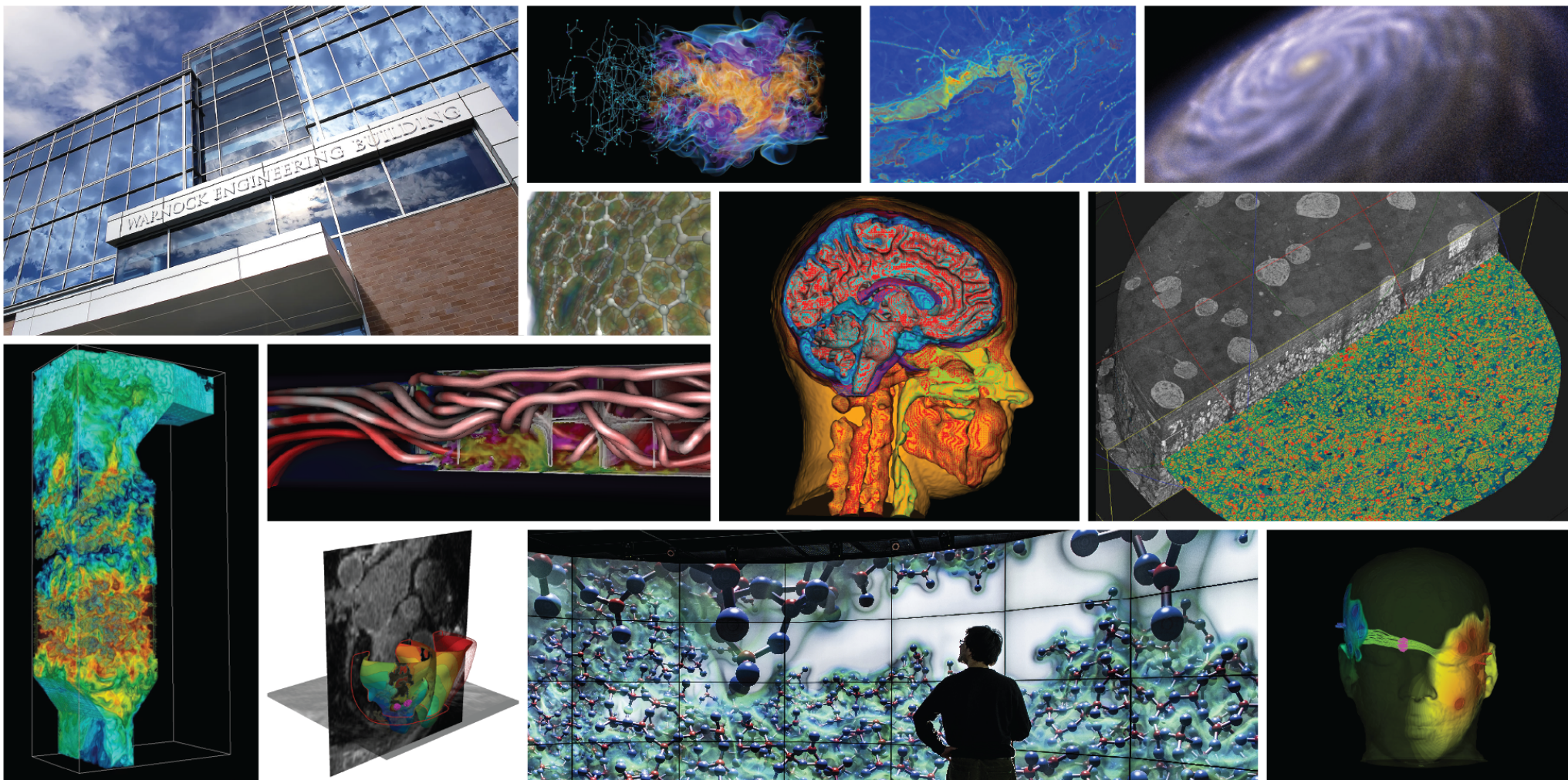
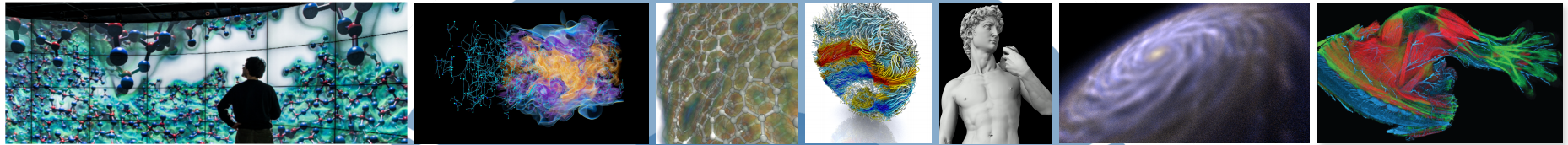


Visual Analysis in Material Design



SCI Institute Research Cores

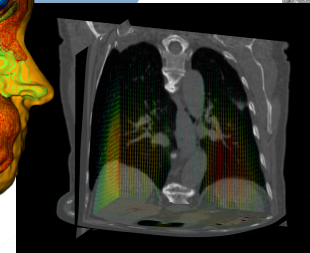
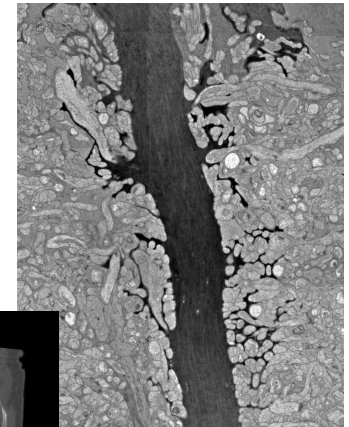
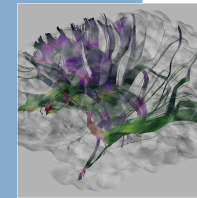
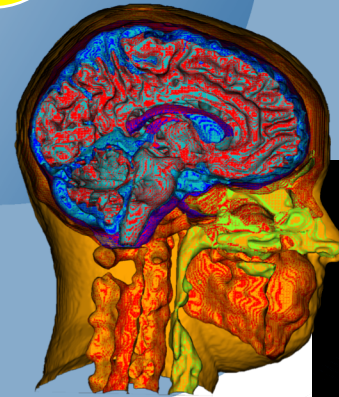
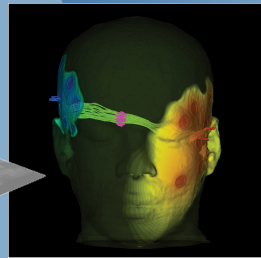
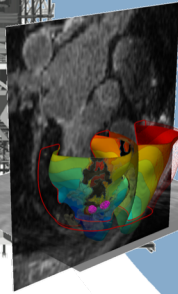
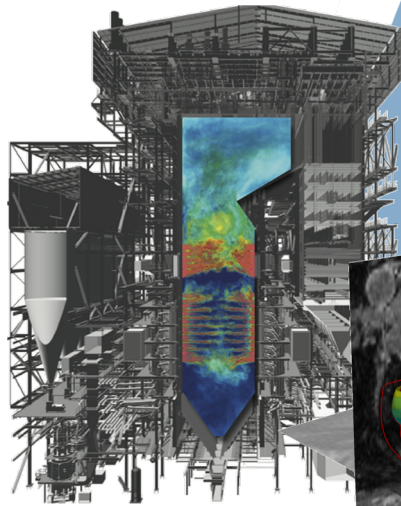


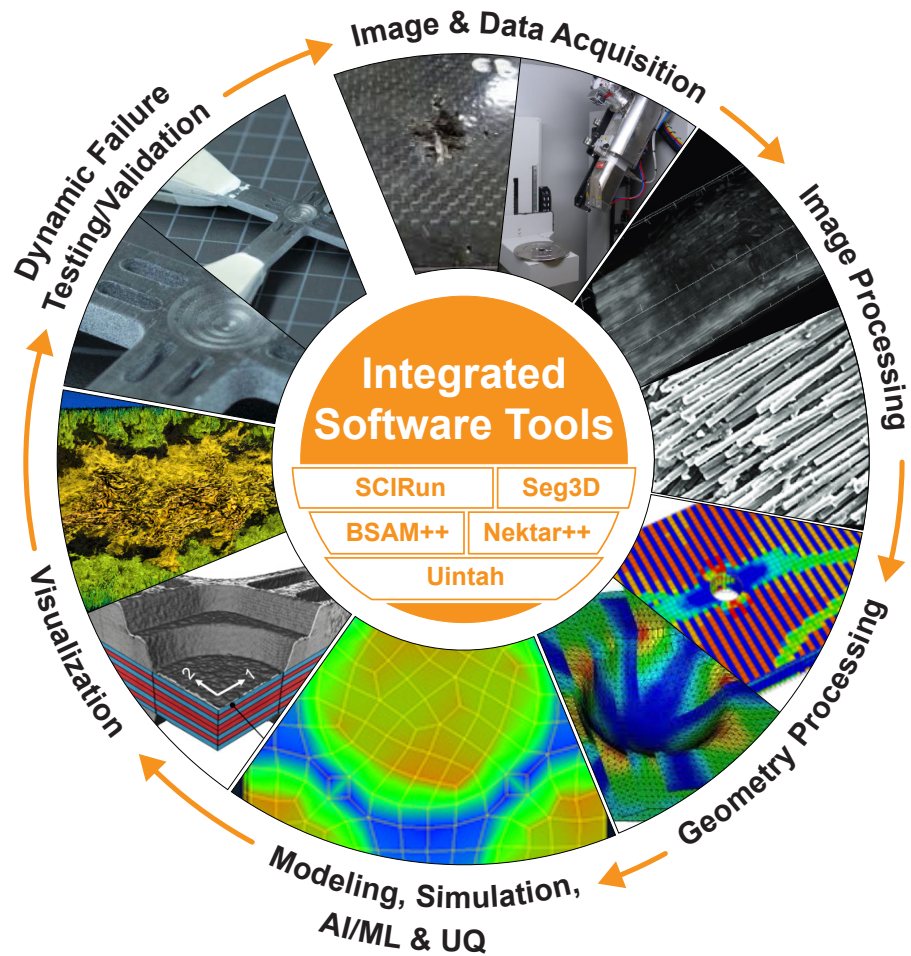
Visualization

Computing

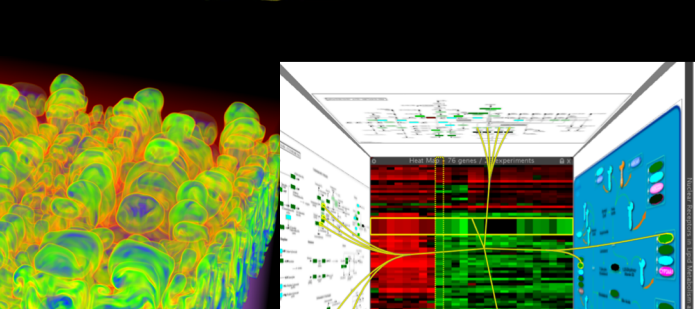
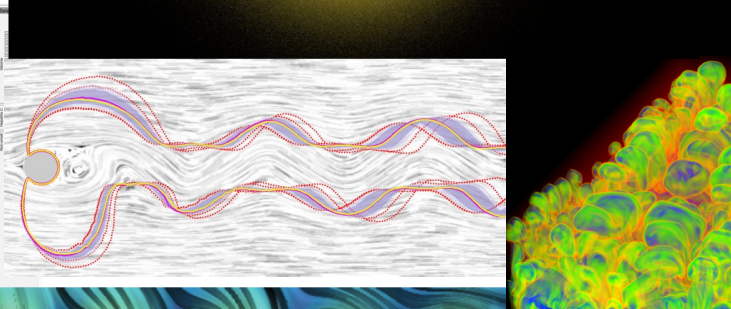
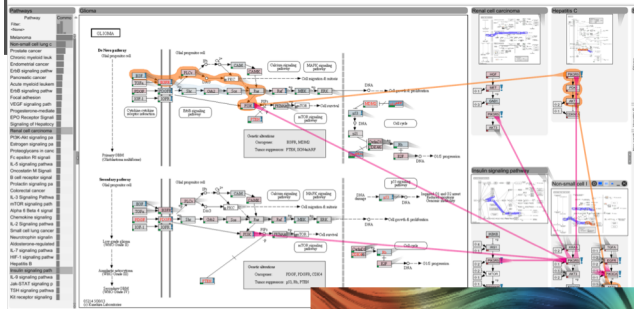
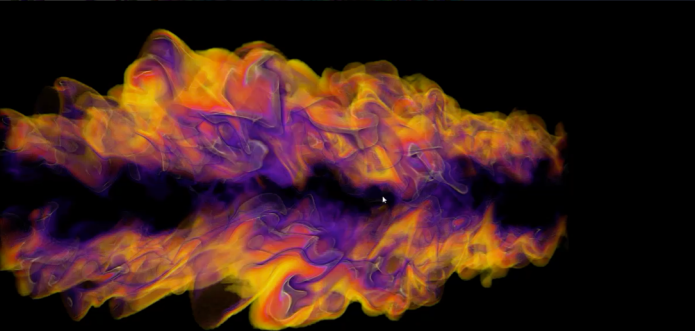
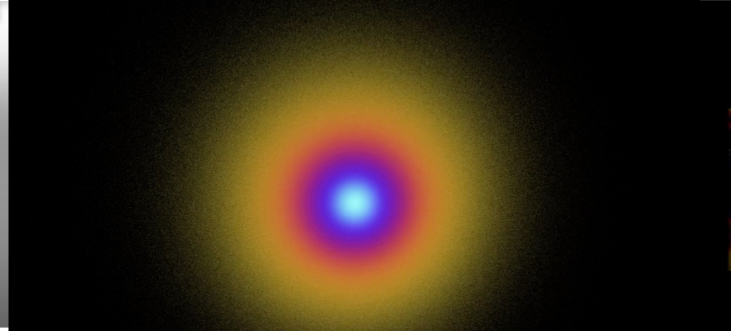
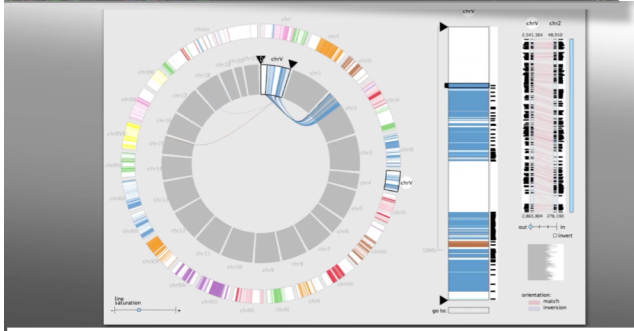
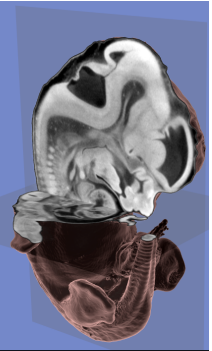
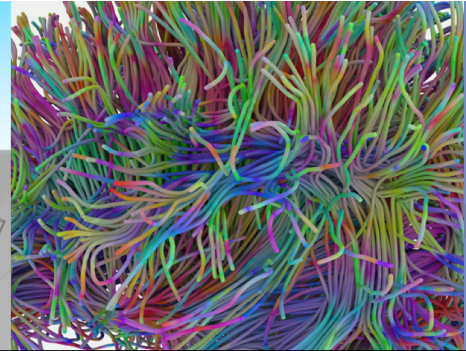
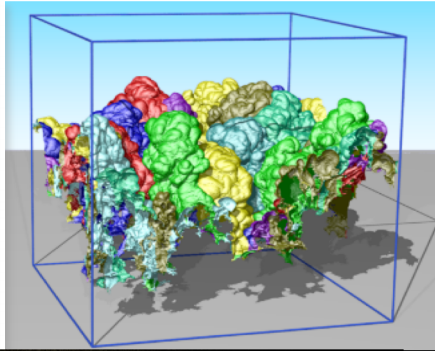
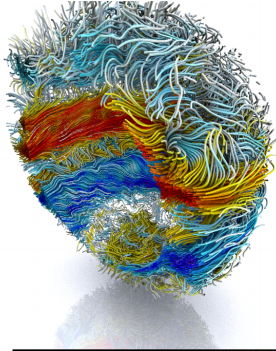
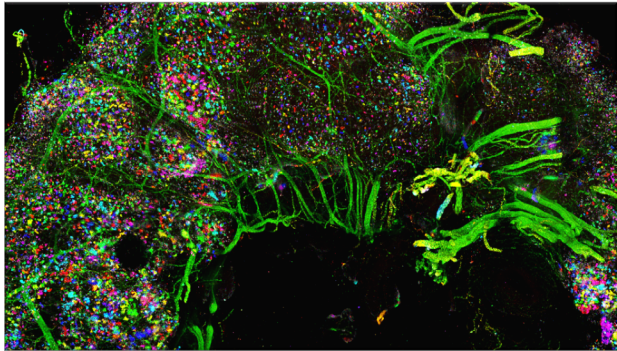
Scientific Data Management

Image Analysis

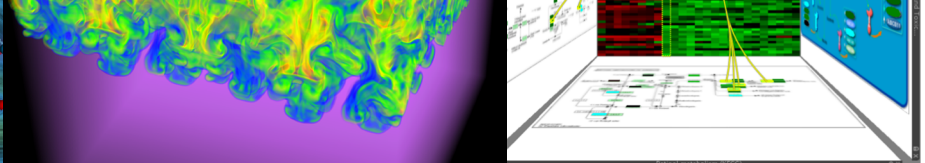
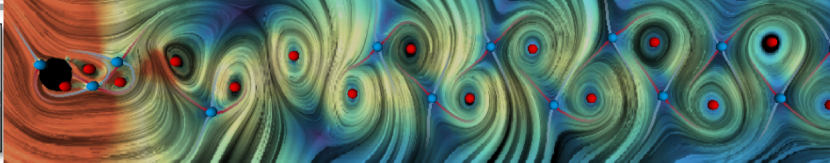




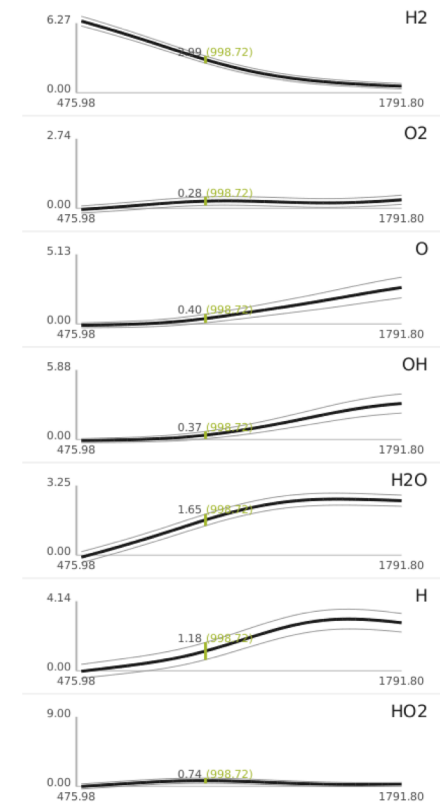
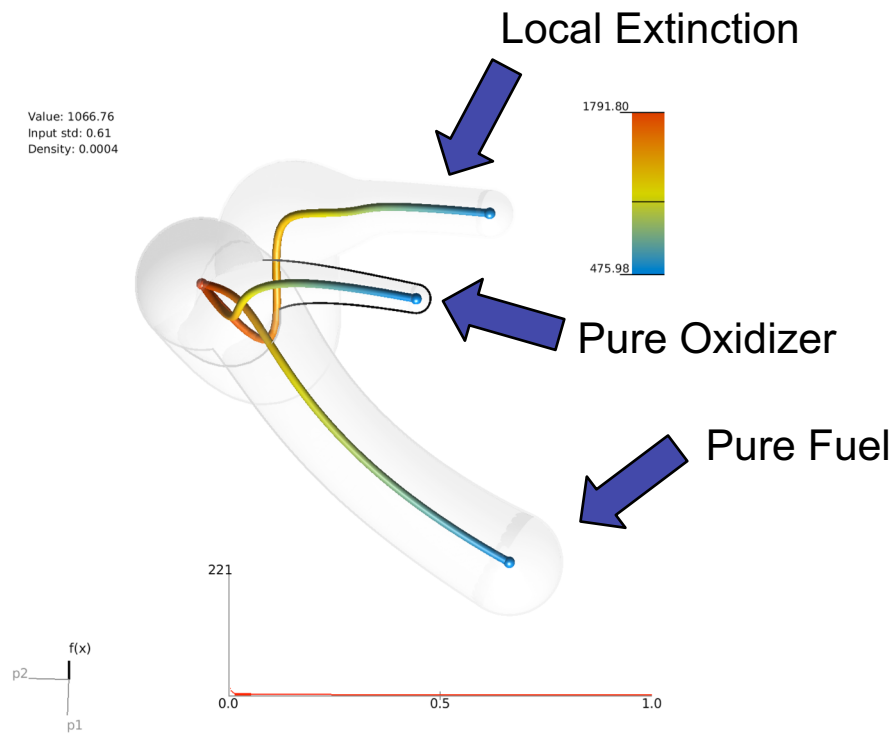
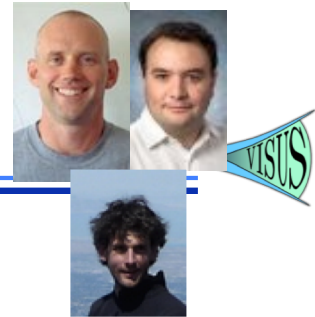
Computational Modeling System for Carbon Fiber Repair and Sustainment



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Visualization of 10D Combustion Simulation of Jet CO/H₂-Air Flames



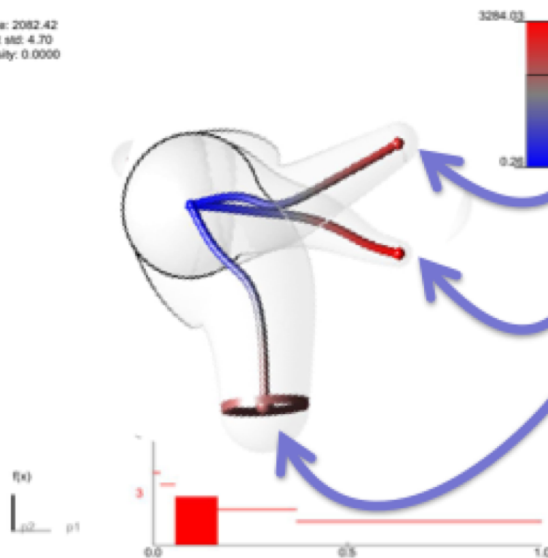
10 dimensional data set describing the heat release wrt. to various chemical species in a combustion simulation

Design of a New Composite Materials

- Features in experimental data show unexpected structures and are used to plan future experiments.

Stakeholder: A. Karim, PNNL.

Value: 2082.42
Input std: 4.70
Density: 0.0000

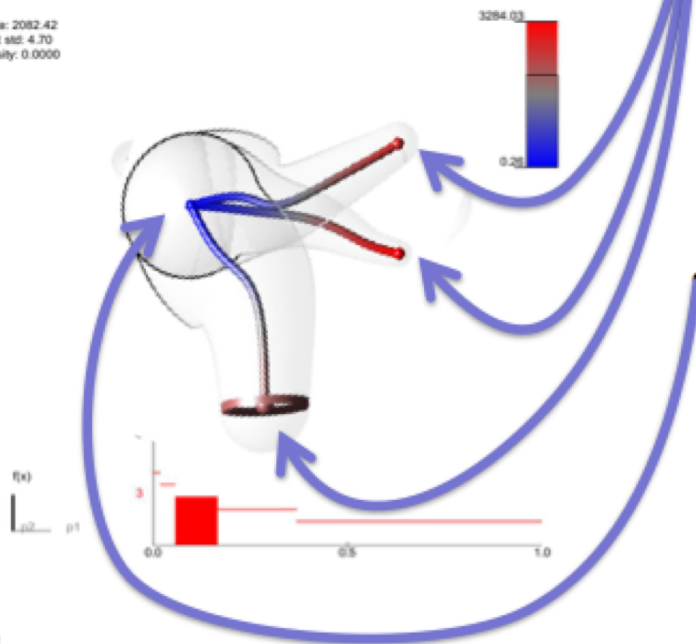


Analysis of a 7-dimensional space show three regions of high value corresponding of three “ways” of achieving a high quality material that are based on different composition of the possible materials.

Design of a New Composite Materials

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Analysis of a 7-dimensional space show three regions of high value corresponding of three “ways” of achieving a high quality material that are based on different composition of the possible materials.

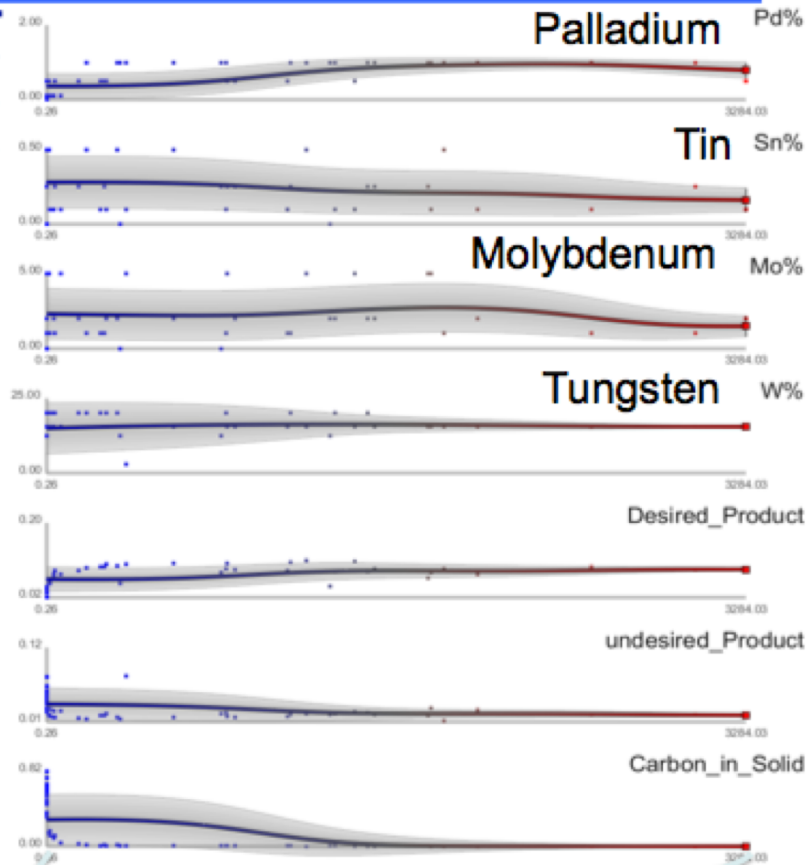
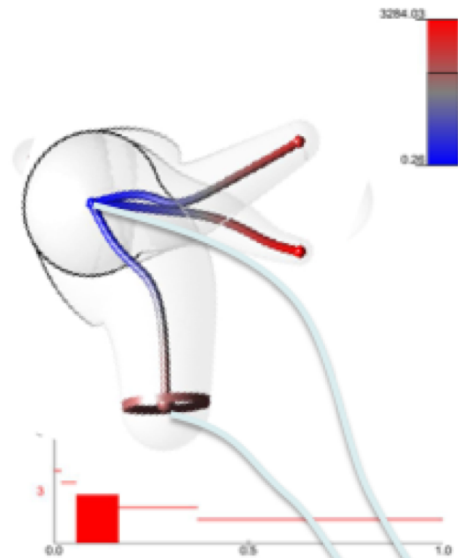
A low value region shows a large connected space describing low quality material that show NOT be manufactured

Design of a New Composite Materials

- Features in experimental data show unexpected structures and are used to plan future experiments.

Stakeholder: A. Karim, PNNL.

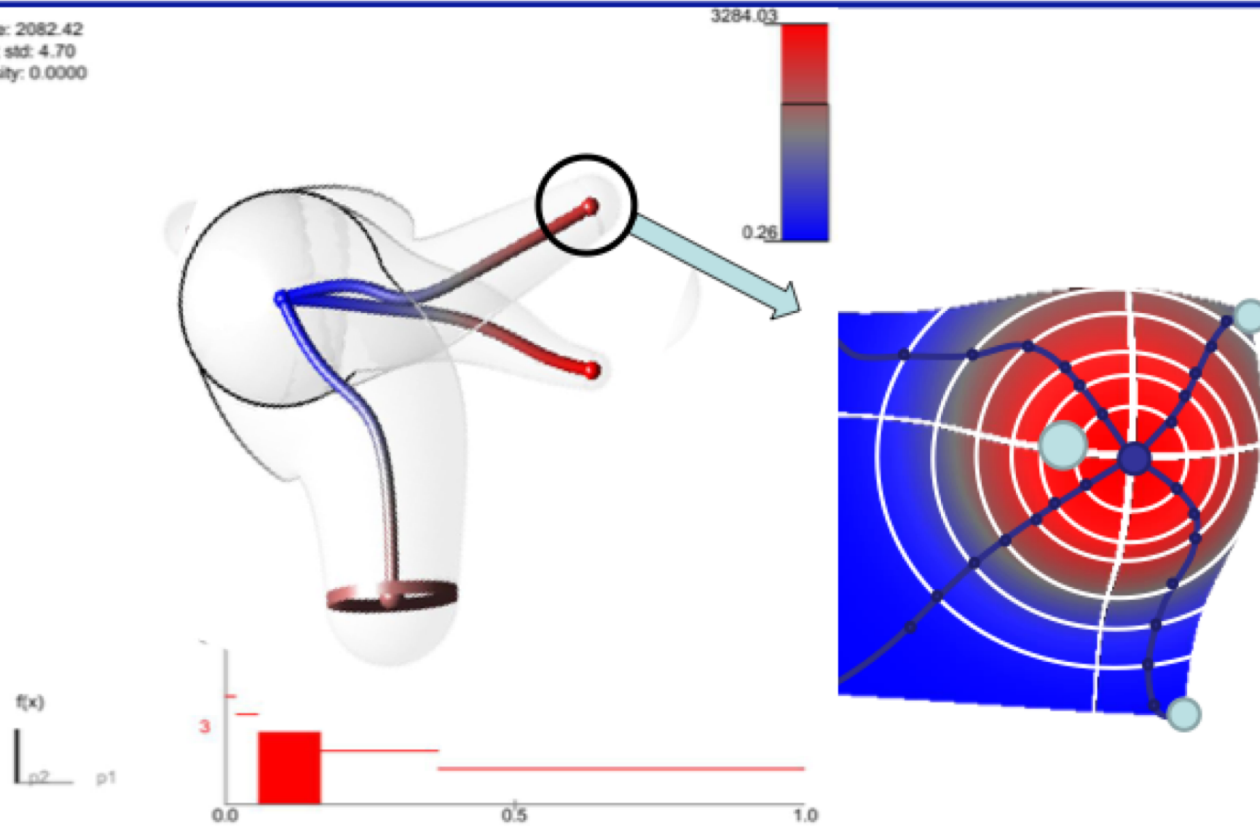
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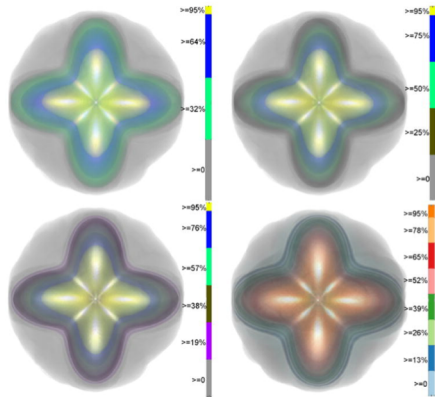
Pascucci-45

Design of a New Composite Materials by Further Sampling of Promising Regions

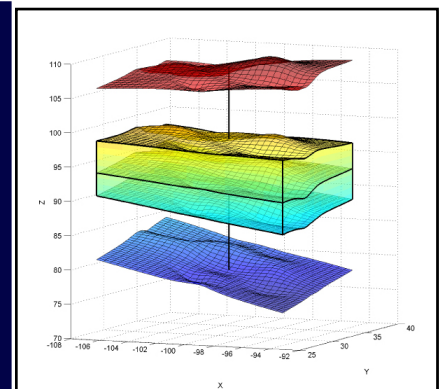
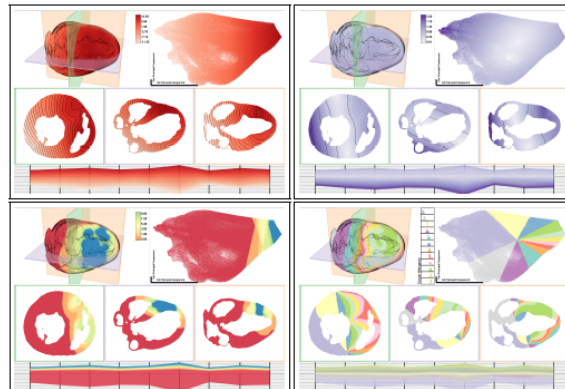
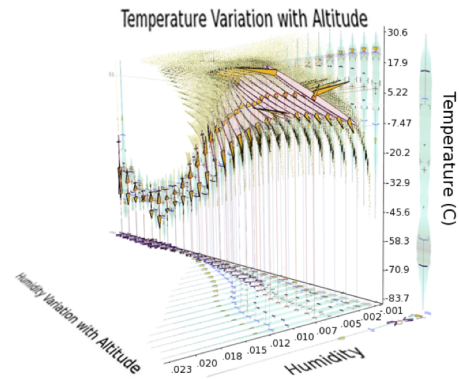
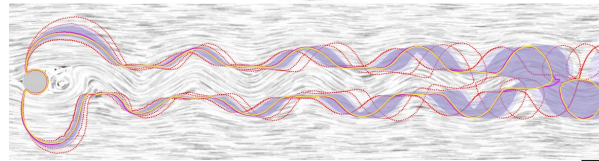
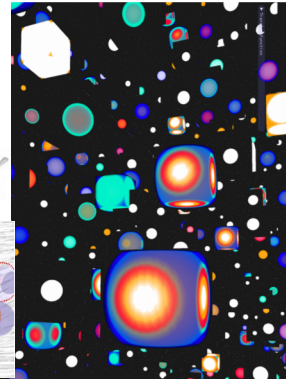
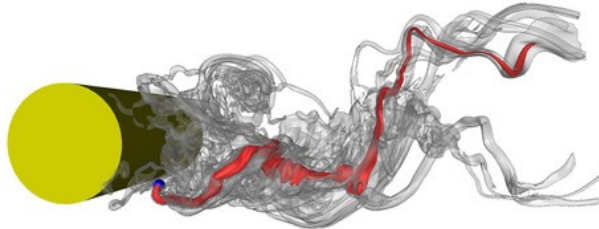
- **D** Value: 2082.42
Input std: 4.70
Density: 0.0000



Uncertainty Visualization



When is the last time you've seen an error bar on an isosurface?



G.P. Bonneau, H.C. Hege, C.R. Johnson, M.M. Oliveira, K. Potter, P. Rheingans, T. Schultz. "Overview and State-of-the-Art of Uncertainty Visualization," In *Scientific Visualization: Uncertainty, Multifield, Biomedical, and Scalable Visualization*, Edited by M. Chen and H. Hagen and C.D. Hansen and C.R. Johnson and A. Kauffman, Springer-Verlag, pp. 3-27. 2014.

M.G. Genton, C.R. Johnson, K. Potter, G. Stenchikov, Y. Sun. "Surface boxplots," In *Stat Journal*, Vol. 3, No. 1, pp. 1-11. 2014.

K. Potter, P. Rosen, C.R. Johnson. "From Quantification to Visualization: A Taxonomy of Uncertainty Visualization Approaches," In *Uncertainty Quantification in Scientific Computing*, IFIP Series, Vol. 377, Springer, pp. 226-249. 2012.

K. Potter, A. Wilson, P.-T. Bremer, D. Williams, C. Doutriaux, V. Pascucci, C.R. Johnson. "Ensemble-Vis: A Framework for the Statistical Visualization of Ensemble Data," In *Proceedings of the 2009 IEEE International Conference on Data Mining Workshops*, pp. 233-240. 2009.

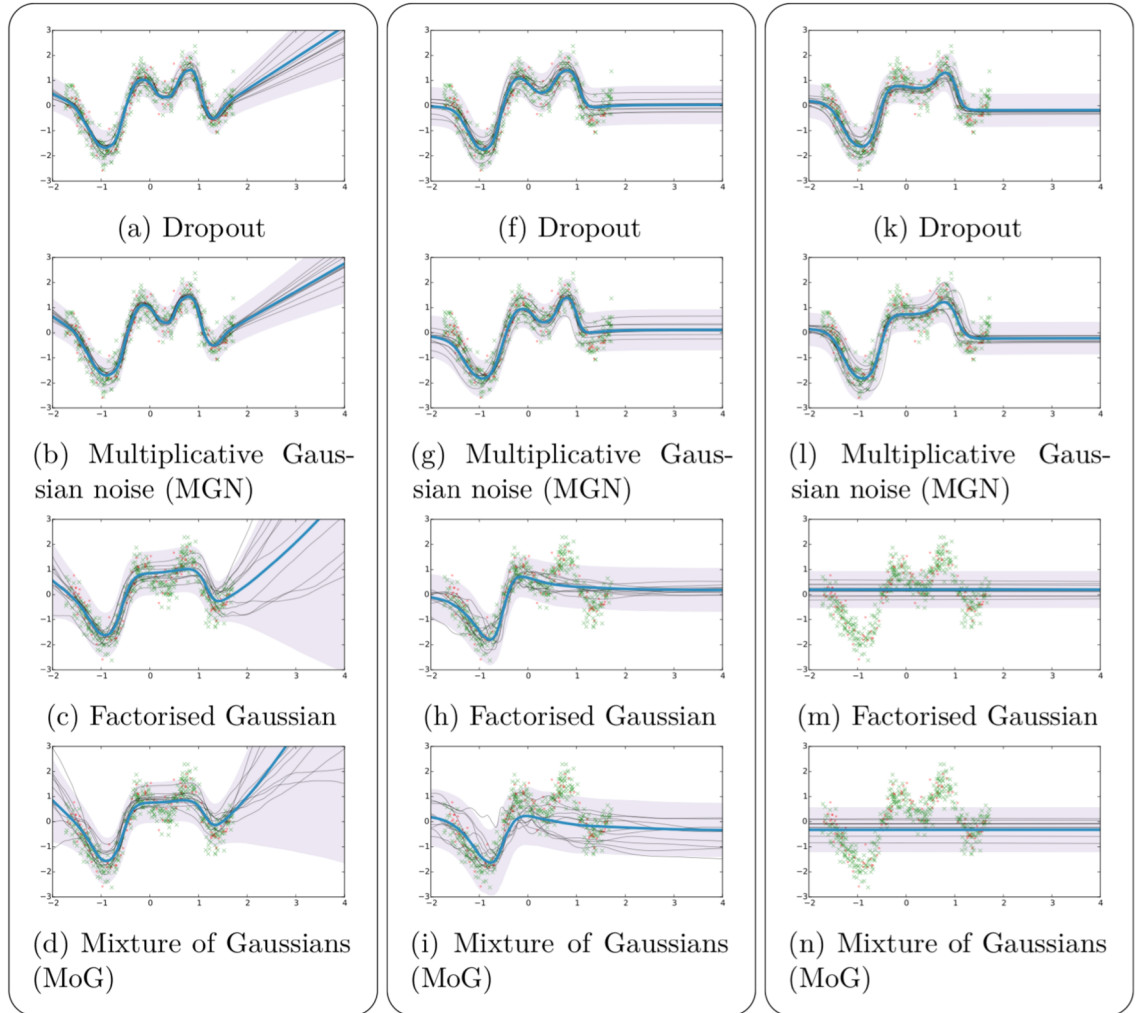
C.R. Johnson, A.R. Sanderson. "A Next Step: Visualizing Errors and Uncertainty," In *IEEE Computer Graphics and Applications*, Vol. 23, No. 5, pp. 6-10. September/October, 2003.

Uncertainty in Machine Learning

Draws from a Bayesian neural network posterior with various approximating distributions.

Shown are predictive mean (thick blue line), predictive uncertainty (shaded area, showing 2 standard deviations), and draws from the posterior (thin black lines).

Yarin Gal. **Uncertainty in Deep Learning**
https://www.cs.ox.ac.uk/people/yarin.gal/website/blog_2248.html



More Information

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