



About COLSA

COLSA is a proven leader in innovative technologies that maintains our commitment to customer service above all else. Established in 1980, COLSA has remained steadfast in our commitment to one goal: to serve the company's clients with dedication and excellence.

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Scientific Machine Learning

Data Driven Discovery in Complex Systems

Complex systems from biological to physical present some of the more challenging opportunities for researchers and analysts and some of the most exciting areas for data scientists. In some cases systems are well defined within the science and can be represented by mechanistic models while in other cases this may not be true. Leveraging machine learning while taking advantage of the science is a pathway to improving and building upon mechanistic models.

Scientific Machine Learning, SciML, brings together machine learning methodologies and technologies with more traditional scientific modeling. It can improve system understanding and predictability beyond what might be obtained through simulation alone or where realistic simulation is not possible. In many instances understanding and estimating the performance dynamics of systems can be challenging due to the high dimensionality and limited amounts of data from systems which are not easy to measure. Leveraging the power of machine learning in combination with numerical methods is enabling scientists, researchers and engineers to uncover the dynamics governing complex systems and represents a rapidly evolving and exciting area of research and application combining applied mathematical methods, science and AI/ML to support systems analysis.

Capabilities

COLSA is working across a broad range of complex systems analytical challenges for customers in the Department of Defense and Intelligence Community. Areas in which we are currently supporting include:

- Data-driven physical systems analysis
- Model enhancement
- Physics Informed Neural Networks (PINNS)
- Advanced and automated signals analysis
- Augmenting and supporting simulation



Data Science

From direct support on critical missions to leading-edge Research and Capability Development, Data Science at COLSA is driving solutions development to address the DoD and Intelligence Community's toughest challenges.

Data Analysis and computational sciences (Dacs) Lab ◆

Enterprise-wide Strategies for Data Science ◆

Data Engineering and Machine Learning Operations (Mlops) ◆

Knowledge Management Solutions ◆

Enhanced Signals Analysis ◆

Scientific Machine Learning ◆

Services & Approach

With Scientific Machine Learning we can discover mechanics governing physical systems and augment the predictive abilities of models using known equations.

Our Data Scientists utilize sparse regression to narrow down a massive list of features and relationships to only those with strong predictive power. Using PINNs, they can leverage automatic differentiation to calculate complex gradient spaces enabling the use of partial differential equations to train models and discover properties of systems.

