Analysis in Motion Initiative

Pacific Northwest NATIONAL LABORATORY
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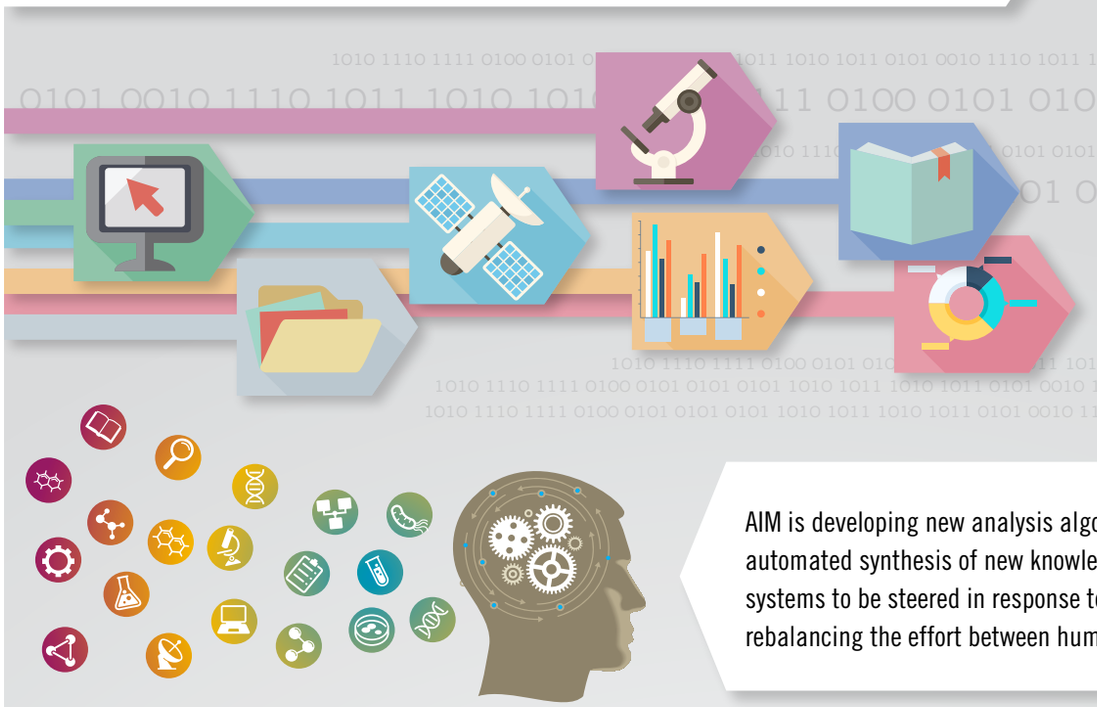
U.S. DEPARTMENT OF ENERGY

In a world where data are continually streaming from distributed and diverse sources—from scientific instruments, to web traffic, to live imagery—making timely discoveries requires computing capabilities that can keep pace with rapidly evolving phenomena.



AIM is developing new analysis algorithms to provide continuous, automated synthesis of new knowledge and to enable measurement systems to be steered in response to emerging knowledge, rebalancing the effort between humans and machines.

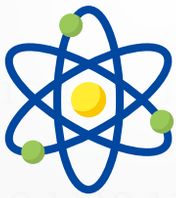
APPROACH

Human-Machine Feedback	Hypothesis Generation & Testing	Streaming Data Characterization & Processing	Work Environments
Interaction with human interfaces to implicitly weight, tune, and modify underlying models	Scalable symbolic deduction and incremental machine learning to track a stream	Foundational streaming algorithms, methods for extracting features from streams	Integration framework and testing range
Visual strategies for bidirectional communication of and interaction with multiple hypotheses	Generate, update, and validate human-understandable hypotheses from streaming classifiers	Data reduction techniques for higher effective throughput	Instrumentation to measure overall accuracy, utility, and throughput

USE CASES

Co-design Application Domains

AIM will use a co-design methodology of collaborative development across computing and science domains to aid transferability of AIM concepts to mission areas. The co-design process will create ongoing engagement between science and technology teams throughout AIM's lifecycle.



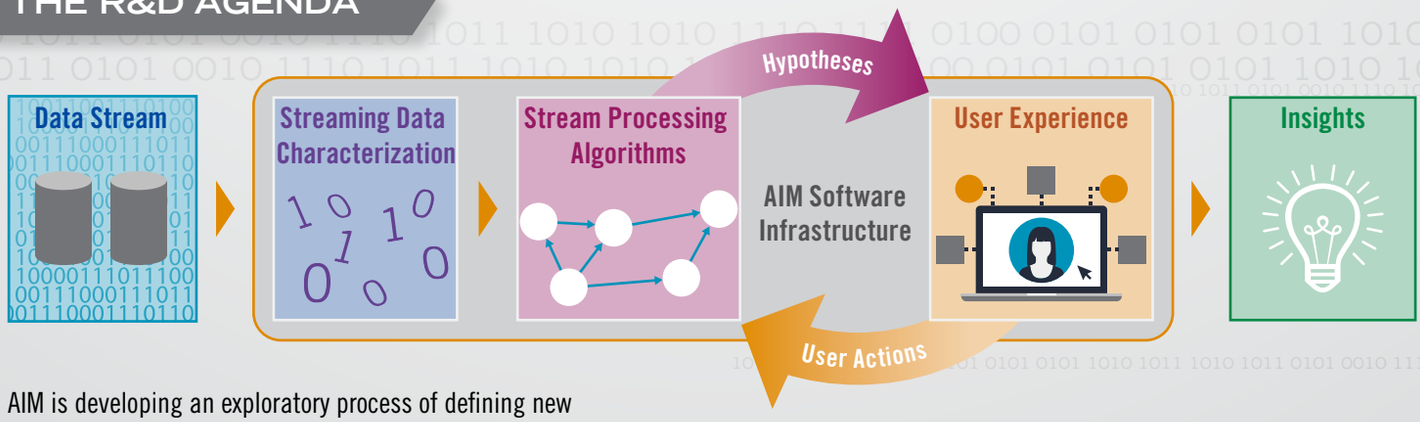
Strategic Surprise

AIM will demonstrate its computing advances through application to the nuclear trafficking domain. Initially AIM will target hypothesis generation from export records.

Evolution of Nuclear Magnetic Resonance (NMR)

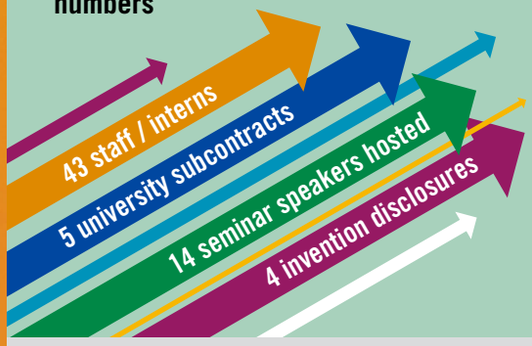
Increased rate and volume of data are limiting the ability to analyze all the data in a reasonable amount of time; AIM hopes to enable faster, more accurate NMR metabolomics by explicitly incorporating scientist judgment in NMR stream processing.

THE R&D AGENDA



AIM is developing an exploratory process of defining new knowledge in a streaming environment; we seek to construct machines that can help tell stories from data by constructing and evolving candidate hypotheses in parallel with the stream. Research and development is being conducted in four main thrust areas.

AIM by the numbers



How AIM is sharing its research

11 abstracts

28 presentations

13 conference papers

4 journal articles

Collaborate with us

We're interested in partnering with individuals and organizations. If you have expertise in the areas of machine learning or human-computer interaction, and are interested in partnership opportunities, then we'd like to talk with you.

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