

Join our milSuite community; participate in our challenges.

Help us discover new and better ways to leverage technology to improve the DoD patient and provider experience.

Current Challenge - Spring/Summer 2015 

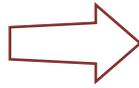
How can machine learning help improve processes across the Military Health System?

Get Involved in Three Steps...



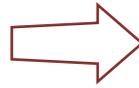
1. Create your milSuite account.

Anyone with a CAC can participate



2. Join the conversation.

Search for "Health IT Ideation Portal"



3. Have your voice heard.

Ask questions, comment and vote

With this challenge, we need your help to **pinpoint how we can implement machine learning to improve processes and patient outcomes.**



Machine learning uses mathematical algorithms to gain new insights into datasets to support answering complex questions. This makes it easier to apply statistical techniques to study, understand complex data faster and become information dominant.



Using machine learning and predictive analytics to:

- Automate clinical decision support
- Use speech recognition tools
- Recommend products based on online shopping habits
- Forecast hospital readmission rates
- Analyze patient profiles to detect high suicide risk
- Highlight patients with a higher risk of heart failure via Natural Language Processing

www.health.mil/ITideaChallenge

Military Health System Department of Defense

Defense Health Agency - Health IT Directorate - Innovation and Advanced Technology Development Division



Defining MACHINE LEARNING

and how the MHS is evaluating its statistical techniques to help understand complex data, faster

Today, the Defense Health Agency (DHA) is evaluating machine learning and its potential applications for Health IT. From predicting emergency room wait times to advanced medical diagnostics, the underlying techniques of machine learning have huge potential to improve how we provide healthcare in an impactful and meaningful way.

What is Machine Learning

Machine learning uses mathematical algorithms to gain new insights into datasets to support answering complex questions. By utilizing complex math which mimics human intelligence, machine learning can analyze text, numbers and images to identify patterns and facilitate process automation. This makes it easier to apply statistical techniques to study and understand complex data faster.

Potential Applications

Powerful analytics and machine learning are empowering breakthrough discoveries across all industries and are present in our everyday lives. From email spam detection to speech recognition tools and online shopping's product recommendations, all are examples of how we interact with machine learning algorithms on a daily basis.



...machine learning can analyze text, numbers and images to identify patterns and facilitate process automation...

The rising popularity of new machine learning algorithms comes in part from the availability of software to utilize massive amounts of data being collected across multiple industries. This rapid increase of usable data make it easier to apply statistical techniques to study and understand complex systems faster.

Future Impact

So why hasn't machine learning made greater advances in the medical field? Such technology does not replace a doctor's experience and expertise. Technology works best as an assistant to the medical practitioner.

Machine learning can help take care of relatively straightforward time-consuming diagnosis tasks, freeing up the doctor for more clinically demanding procedures. The challenge in machine learning is to develop intelligent decision support systems that facilitate, not eliminate, the doctor-patient relationship.

Potential Health IT Applications of Machine Learning



Prevent Heart Attacks

Pacemakers can take real-time metrics in patients and flag a patient if they show symptoms to have a heart attack.

A physician can see this alert and notify the patient to go to the hospital for care to prevent this life-threatening event.

**Enhance Comprehensive Primary Care*



Diagnose Heart Failure from Physician Notes

Industry is researching ways for a machine learning algorithm to analyze free-text physician notes.

Through natural language processing, machine learning would call attention to patients with higher risk of impending heart failure.

**Expand Boundaries of Healthcare*



Detect Patients Risk of Suicide

Analyze soldiers, who were hospitalized for mental health problems, and identify the most prevalent factors that lead to suicide.

Clinicians can then identify and monitor high-risk individuals.

**Improve Clinical Outcomes*



Predict Hospital Readmissions

Hospitals could generate analytical models to better predict emergency room admissions before they happen to improve care and reduce costs.

**Optimize Care Support Processes*



*Indicates support of the MHS Strategy Map 2015

Selecting MACHINE LEARNING

and how the MHS used analytics to select the technology for its first campaign challenge topic

When it came to picking our first health IT campaign challenge topic for 2015, the Defense Health Agency knew (DHA) needed a way to comb through more than 4 million technologies and their potential impact to military health IT. With that in mind, the agency leveraged its Semantic Open Source Software Tool (SEMOSS) and its powerful analytics engine to evaluate technologies over the next ten years.

Narrowing Down a Technology Topic



Selecting Machine Learning

Using the newly developed Natural Language Processing (NLP) capability of SEMOSS, the DHA analyzed more than four million technologies and their benefit ratings from a leading IT research and advisory company. Based on this approach, the agency identified four high-priority technologies (complex-even processing, machine learning, cloud computing, and open data).

Next, the team mapped these technologies to the DHA's Health IT Research Catalog to understand which technologies were already addressed by current or past research initiatives.

Machine learning is currently not well covered by existing projects and thus was selected as the first campaign topic.

What is Machine Learning

Machine learning uses mathematical algorithms to gain new insights into datasets to support answering complex questions. By utilizing complex math that mimics human intelligence, machine learning can analyze text, numbers and images to identify patterns and facilitate process automation. This makes it easier to apply statistical techniques to study and understand complex data faster, allowing us to enhance our information dominance.

Examples of how machine learning and predictive analytics can be used include automating clinical decision support, supporting speech recognition tools, recommending products based on online shopping habits, analyzing patient profiles to detect risk of suicide, and highlighting patients with a higher risk of heart failure through NLP.

The underlying techniques of machine learning also have the ability to help predict emergency room wait times to advanced medical diagnostics, each of these with the possibility to help improve how we provide healthcare in an impactful and meaningful way. Such technology does not replace a doctor's experience and expertise. Technology works best as an assistant to the medical practitioner.

Conversation Checklist

- Does this technology show strong promise for the MHS as measured by its Technology Benefit Rating?
- No internal MHS groups researching this technology?
- Can sharing of confidential or otherwise sensitive information be avoided when hosting this challenge?
- Not a politically sensitive topic?
- Could IATDD benefit from an open discussion on this technology?

- Link connections between different databases/sources
- Refine and customize queries to address specific needs
- Visualize complex data and relationships
- Collaborate and leverage open-data made available by peers



SEMOSS is a revolutionary, open-source enterprise context aware analytics platform that allows users to analyze and display data from more than one database in a customizable, interactive format. SEMOSS allows users to:

[learn more at SEMOSS.org](http://www.health.mil/SEMOSS.org)