U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND – ARMAMENTS CENTER

Augmented Intelligence for Competitively Bid Proposal Evaluation

Shane Esola[2], Hemant Yadav[1], George Herc[1]

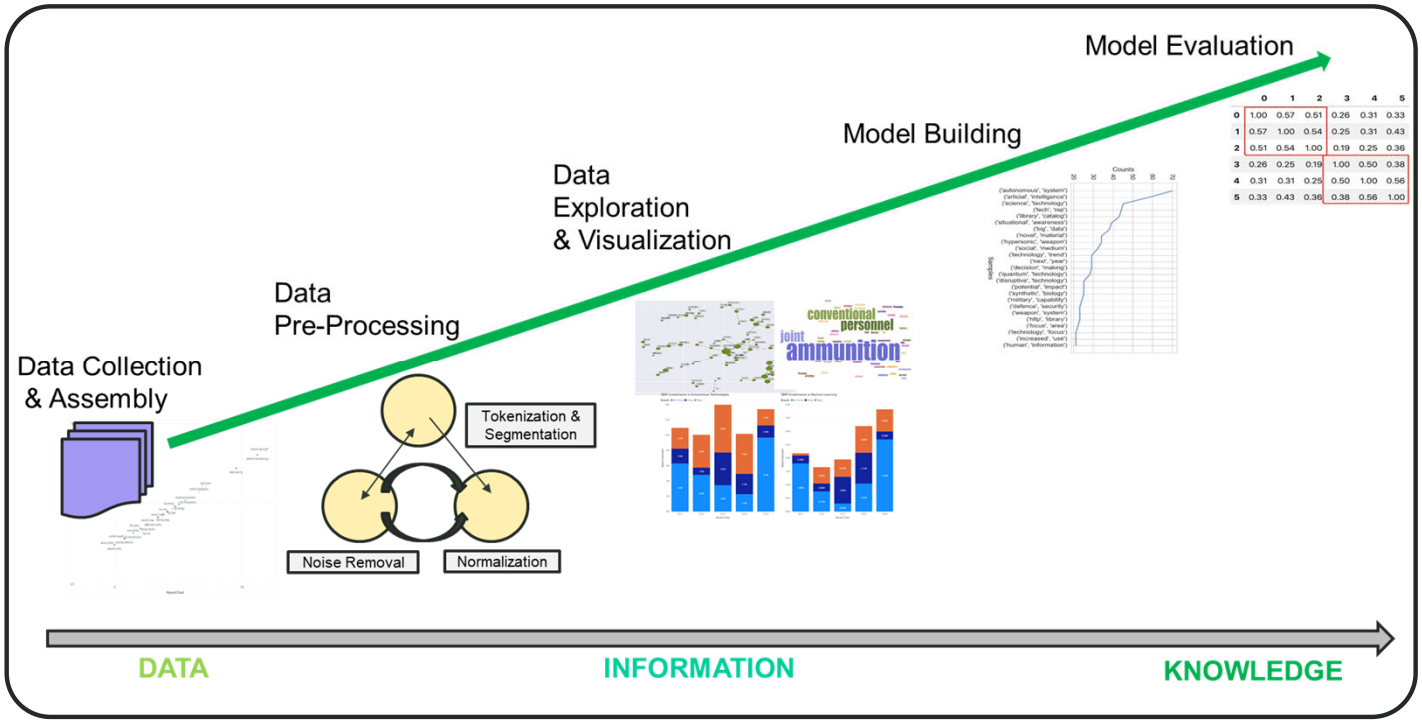
[1] U.S. Army/DEVCOM/Armaments Center/Business Interface Office. Picatinny Arsenal, NJ 07806

[2] U.S. Army/DEVCOM/Armaments Center/Energetics & Warheads Directorate. Picatinny Arsenal, NJ 07806

October 21, 2021

OUTLINE

1. Introduction
2. Method
3. Results & Discussion
4. Application Extension
5. Conclusion



INTRODUCTION

- In 2020, the U.S. Army's Development Command (DEVCOM AC) at Picatinny Arsenal, NJ began an emphasis on Data Analytics to support the U.S. Army Developmental Command (DEVCOM) Global Technology Office (GTO). This competency was initiated to analyze the data related to international grants, Small Business Independent Research (SBIR) efforts, Cooperative Research and Development Agreements (CRADAs) and emerging technology needs**.**

- This presentation outlines the applied method for text mining techniques and the development of Natural Language Processing (NLP) to collect, process and analyze data to better assist senior leadership make informed decisions.

- The research efforts outlined here enable the transformation of unstructured to structured data to identify meaningful patterns, discover hidden logical relationships, and unlock data-driven insight. The applications are many.

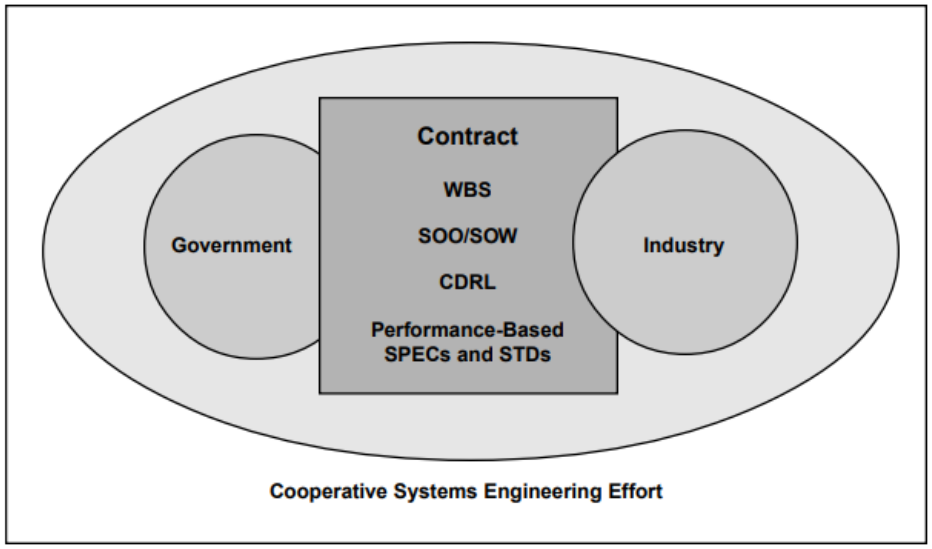
CONTRACTING DECISIONS PARAMOUNT TO SYSTEMS ENGINEERING SUCCESS

- ❑ DOD services and supplies contracts are $444.1 Billion of $9.1 Trillion total obligated FY21 budget
- ❑ 2.7 million competitively bid contracting actions were taken ($143.8B)
- ❑ 9,802 were RDT&E ($33.1B)

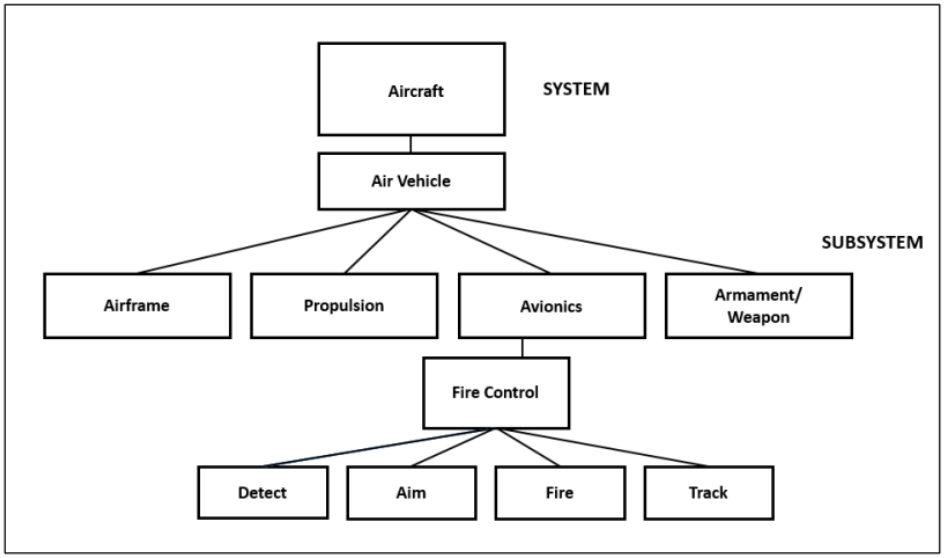
Data from usaspending.gov as of Aug 31, 2021

- Contracting is the link between gov systems planning and industry execution
- In complex DOD weapons systems development is competitively bid at multiple work breakdown structure levels

→ Improved contract decision making could have substantial impact on warfighter and taxpayer outcomes



SYSTEMS ENGINEERING FUNDAMENTALS, DAU, 2001



MIL-STD-881D, WORK BREAKDOWN STRUCTURES FOR DEFENSE MATERIEL ITEMS, 2018

SOURCE SELECTION POLICY (FEDERAL)

FEDERAL ACQUISITION REGULATION (FAR) Subpart 15.3 - Source Selection

FAR

A massive legal document

15.302 The objective of source selection is to *select the proposal that represents the best value.*

15.304 Evaluation factors and significant subfactors.

- ❑ *Mandated factors: price or cost; quality of the product or service; past performance; small business considerations*
- ❑ Other factors and relative importance are left to agency discretion
- ❑ All factors and significant subfactors that will affect contract award and their relative importance shall be stated clearly in the solicitation [*Decisions must be transparent and defensible*]

15.305 Proposal evaluation.

- ❑ Proposal evaluation is an assessment of the proposal and the offeror's ability to perform the prospective contract successfully.
- ❑ Evaluations *may be conducted using any rating method or combination of methods*, including color or adjectival ratings, numerical weights, and ordinal rankings
- ❑ *Cost or price evaluation*. Normally, competition establishes price reasonableness.
- ❑ *Past performance evaluation.* Currency and relevance of the information, source of the information, context of the data, and general trends in contractor's performance shall be considered. Take into account predecessor companies, key personnel who have relevant experience, or subcontractors that will perform major or critical aspects of the requirement
- ❑ *Technical evaluation.* Assessment of offeror's ability to accomplish technical requirements AND a *summary, matrix, or quantitative ranking*, along with appropriate supporting narrative, of each technical proposal using the evaluation factors.

SOURCE SELECTION POLICY (DOD)

DEFENSE FEDERAL ACQUISITION REGULATION SUPPLEMENT (DFARS) Subpart 215.3 - Source Selection

- ❑ Consider the purchase of capital assets (including machine tools) manufactured in the United States, in source selections for all major defense acquisition programs ["buy American"]
- ❑ Consider the *manufacturing readiness* and manufacturing-readiness processes of potential contractors and subcontractors as a part of the source selection process for major defense acquisition programs
- ❑ Include an evaluation factor regarding *supply chain risk* when acquiring information technology, whether as a service or as a supply, that is a covered system, is a part of a covered system, or is in support of a covered system
- ❑ Ensure source selections *emphasize sustainment* factors and objective *reliability* and *maintainability*

DFARS

Another massive legal document

DFARS Procedures, Guidance, and Information (PGI) 215.3--SOURCE SELECTION … more policy guidance

Department of Defense Source Selection Procedures Memo 1 APR 2016 … more policy guidance

Department of Defense Source Selection Procedures Memo

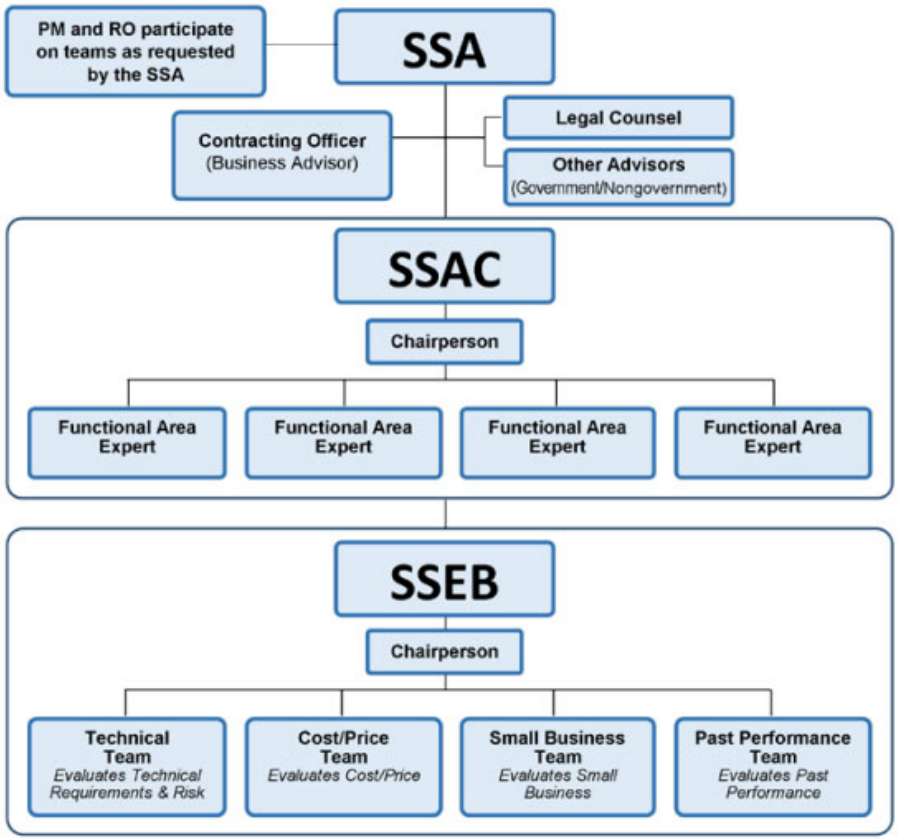
1 APR 2016

71 pages of instruction…

→ Lots of potential factors to consider for every selection and flexibility over how to apply them

→ We chose to focus on technical evaluation and considered approaches for past performance

SOURCE SELECTION PRACTICAL APPLICATION



- ❑ Source selection authority manages an ad hoc team that provides the **[overwhelming]** input laid out in policy
- ❑ Proposals are technically dense and 10s of pages long
- ❑ Data types are mixed [text, tables, charts, pictures, etc.]
- ❑ There are often underutilized proposal sections
- ❑ Proposal quality, depth and formatting can vary significantly
- ❑ Deadlines are tight with pressure to deliver "yesterday"
- ❑ Proposed solutions can vary widely across functional expertise
- ❑ Proposal evaluation is likely a tertiary duty for subject matter experts
- ❑ Non-cost factor evaluation is largely subjective and can be challenging to consistently apply qualitative rankings

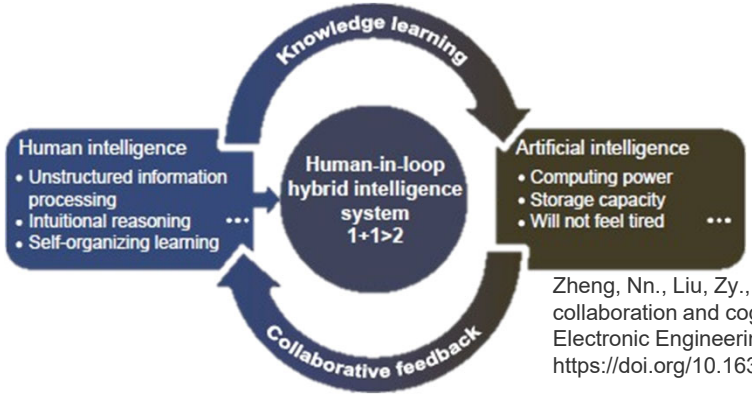
→ Source selection is cognitively taxing and resource intense

AUGMENTED INTELLIGENCE

Content adapted from: “What Is Augmented Intelligence?”, IEEE Digital Reality

- Augmented intelligence is a subsection of AI machine learning that enhances human intelligence by improving human decision-making
- Uses machine learning and deep learning to provide humans with actionable data
- Analyzes data and reports identified patterns to users, allowing human intelligence to take over
- Improves human decision-making both by handling large amounts of data that would overwhelm a human decision-maker, and by removing factors that can color or misinterpret data, including bias, fatigue, and distraction

IEEE Digital Reality



Zheng, Nn., Liu, Zy., Ren, Pj. *et al.* Hybrid-augmented intelligence: collaboration and cognition. Frontiers of Information Technology & Electronic Engineering **18,** 153–179 (2017). https://doi.org/10.1631/FITEE.1700053

Examples

- Viewing recommendations provided by a streaming video service
- Online stores using data analytics to predict customer preferences
- Medical analysis of case files to identify efficient treatment options
- Investment and financial applications monitoring and identifying stock market patterns

NATURAL LANGUAGE PROCESSING

- Natural language processing (NLP) is a branch of artificial intelligence that helps computers understand, interpret and manipulate human language.

- The goal of NLP is “to accomplish human-like language processing” and achieve “understanding” such as
  1. Paraphrase an input text
  2. Translate the text into another language
  3. Answer questions about the contents of the text
  4. Draw inferences from the text

From E.D. Liddy. Natural Language Processing. SURFACE. Syracuse University. 2001.

S. Gupta. Organizing Your First Text Analytics Project. towardsdatascience.com. Sep 4, 2018.

- Language is a convoluted, noisy and massive data set
- Consider the multi-level synchronic model of language

Phonology (sounds)

Morphology (word components)

Lexical (word meaning)

Syntactic (sentence structure)

Semantic (local word interactions)

Discourse (multi-sentence interactions)

Pragmatic (situational context)

→ NLP helps resolve language ambiguity and applies structure to highly unstructured data for reduction in applications

PROBLEM, HYPOTHESIS, & RESEARCH OBJECTIVES

Problem: Non-cost evaluation factors such as past performance, compliance with solicitation requirements, technical excellence, management capability, personnel qualifications, and prior experience are largely subjective and require significant cognitive resources to evaluate, but are essential to source selection. State of the Art (SOTA) is manual qualitative scoring of informationally dense proposals over a short time period with adjudication by a decision authority overwhelmed by inputs.

Hypothesis: An augmented intelligence approach using NLP to quantify evaluation metrics, create visual aids, and generate condensed summaries will reduce DOD evaluator cognitive load, lessen the resource burden, and improve contracting decision quality and consistency.

Research Objectives:

- ❑ Implement augmented intelligence data-to-decisions framework the can be broadly applied to text-rich tasks
- ❑ Transform the legacy proposal evaluation process by injecting automated objective data analytics

APPLIED TECHNICAL APPROACH

- ❑ Leverage existing, robust algorithms that have resulted from decades of theoretical NLP research
- ❑ Create integrated analytics framework that will populate a “dashboard”
- ❑ Verification & Validation: Run proposed approach in blind parallel to manual process for a research proposal source selection and have the source selection authority compared results.

Python (Free, Open Source)

- All scripts are written in Python for data analysis

Python libraries used:

- Natural Language Toolkit (NLP)
- Scikit Learn (Linear regression, topics modeling)
- Pandas (Data Manipulation)
- Numpy (Data Manipulation)
- Matplotlib (Graphing)
- Plotly (Graphing)
- Seaborn (Graphing)

Implemented tools: N-gram analysis, network topology maps with automated data clustering, named entity recognition, and computer-generated text summarization

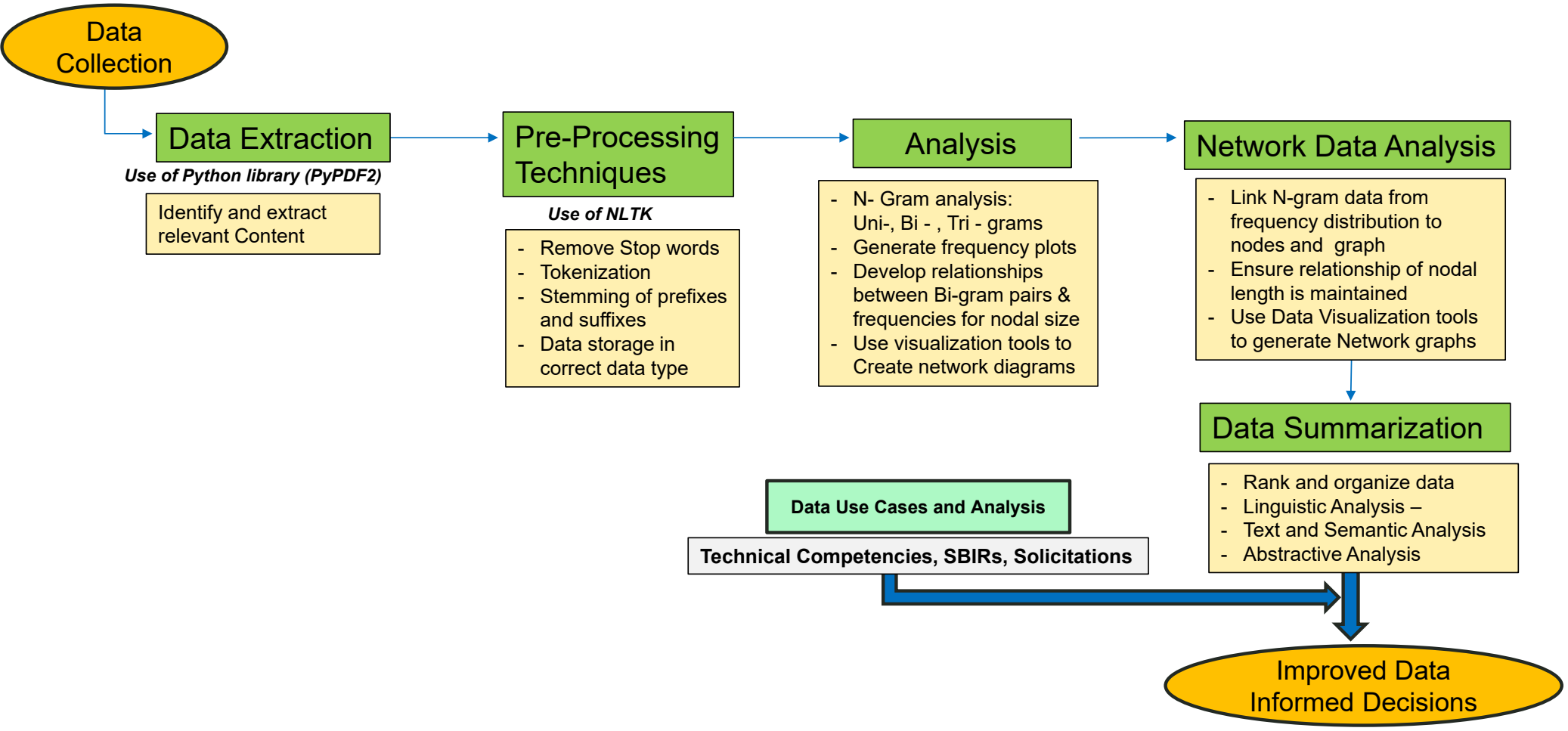
PROPOSAL DATA STRUCTURE

1. Structured Information (Company Name, Address, POC's, DUNS Number, etc)
2. Identification and Significance of the Problem or Opportunity
3. Technical Objectives
4. Work Plan Outline (Statement of Work)
5. Related Work
6. Relationship with Future Research or Research and Development
7. Commercialization Strategy
8. Key Personnel and the Team
9. Foreign Citizens
10. Facilities / Equipment
11. Consultants and Subcontractors
12. Prior, Current, or Pending
13. References
14. Financial Information (Total cost of Project)

Sections used for summary analysis

Sections used for Network Maps

TEXT ANALYSIS METHOD



METHOD – PRE PROCESSING TEXT

Pre-processing steps

1. Remove numbers from text
2. Remove punctuation from text
3. Convert all text to lower case letters
4. Remove stop words
5. Create tokens

Picatinny Arsenal is the Joint Center of Excellence for Guns and Ammunition, providing products and services to all branches of the U.S. military. Nestled in the northern New Jersey Highlands, our team of more than 6,000 personnel includes Soldiers, Sailors, Airmen, Marines, U.S. Federal employees and contractor personnel who lead in the research, development, acquisition and lifecycle management of advanced conventional weapon systems and ammunition. Picatinny's portfolio comprises nearly 90 percent of the Army's lethality and all conventional ammunition for joint warfighters.

picatinny	arsenal	joint	center	excellence	guns	ammunition

METHOD – PRE PROCESSING TEXT

- Tokens can and should be further reduced by stemming or lemmatization
- Stemming and Lemmatization both generate the root form of the inflected words. The difference is that stem might not be an actual word whereas, lemma is an actual language word.
- Lemmatiser require more processing time vs Stemming

Word	Porter	Lanecaster	Lemmatiser
apples	appl	appl	apple
pears	pear	pear	pear
tasks	task	task	task
children	children	childr	child
earrings	ear	ear	earring
dictionary	dictionari	dict	dictionary
marriage	marriag	marry	marriage
connections	connect	connect	connection
universe	univers	univers	universe
universities	univers	univers	university

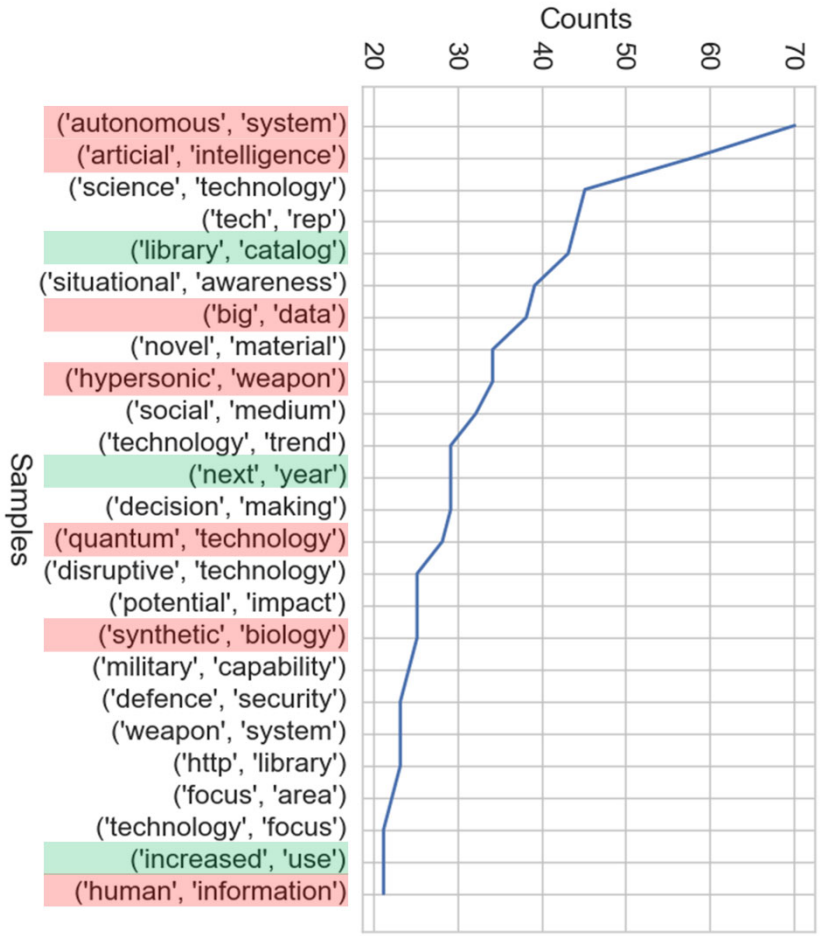
METHOD – BAG OF WORDS

Picatinny Arsenal is the Joint Center of Excellence for Guns and Ammunition						
Uni-gram	Picatinny	Arsenal	Is	the	Joint	Center
Bi-gram	Picatinny Arsenal	Arsenal is	is the	the Joint	Joint Center	
Tri-gram	Picatinny Arsenal is	Arsenal is the	is the Joint	the Joint Center		

- Uni-grams shown in word cloud convey minimal information
- Bi-grams can provide linkages between words as written in a body of text
- Tri-grams begin to over fit the body of text with repeated phrases

METHOD – FREQUENCY DISTRIBUTION

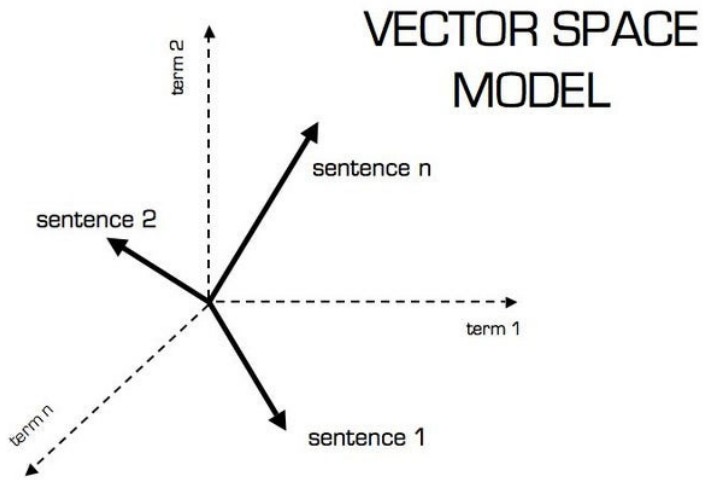
- Sample frequency distribution from NATO's Science & Technology Trends 2020-2040 Report
- Bi-grams frequency distribution highlights top repeating key phrases in text body
- Linkage between words is still lacking



METHOD – SENTENCES TO VECTORS

Sentence 1		Sentence 1 vector
Picatinny Arsenal Joint Center of Excellence	→	[1, 3, 1, 1, 0, 7, 3, 3, 2, 5, 3, 1, 6, 0, 0, 2, 0, 1, 4, 1]

Sentence 2		Sentence 2 vector
Nestled in the northern New Jersey Highlands	→	[0, 2, 0, 1, 1, 7, 2, 3, 1, 6, 1, 0, 6, 1, 2, 3, 4, 1, 0, 3]



Cosine Distance of Sentence 1 and Sentence 2

0.849281296908581

METHOD – SIMILARITY MATRIX

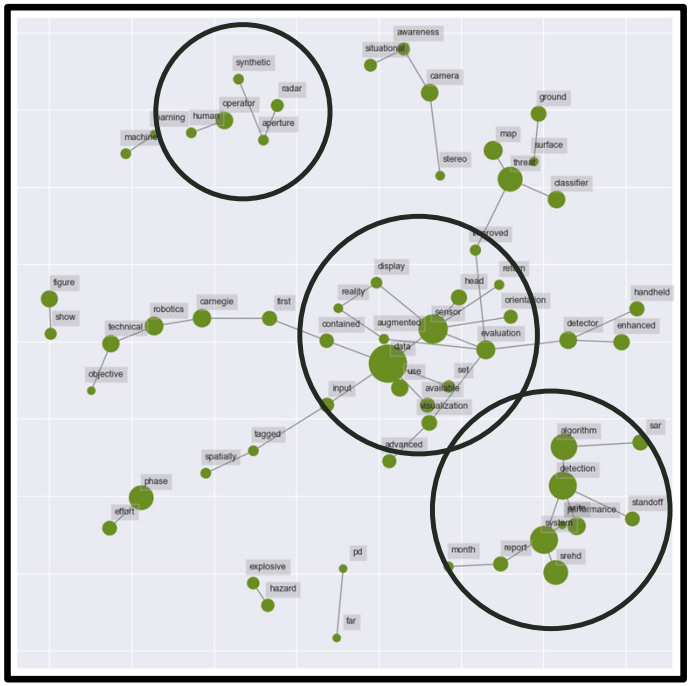
- Rank sentences most similar
- Select top N for summary

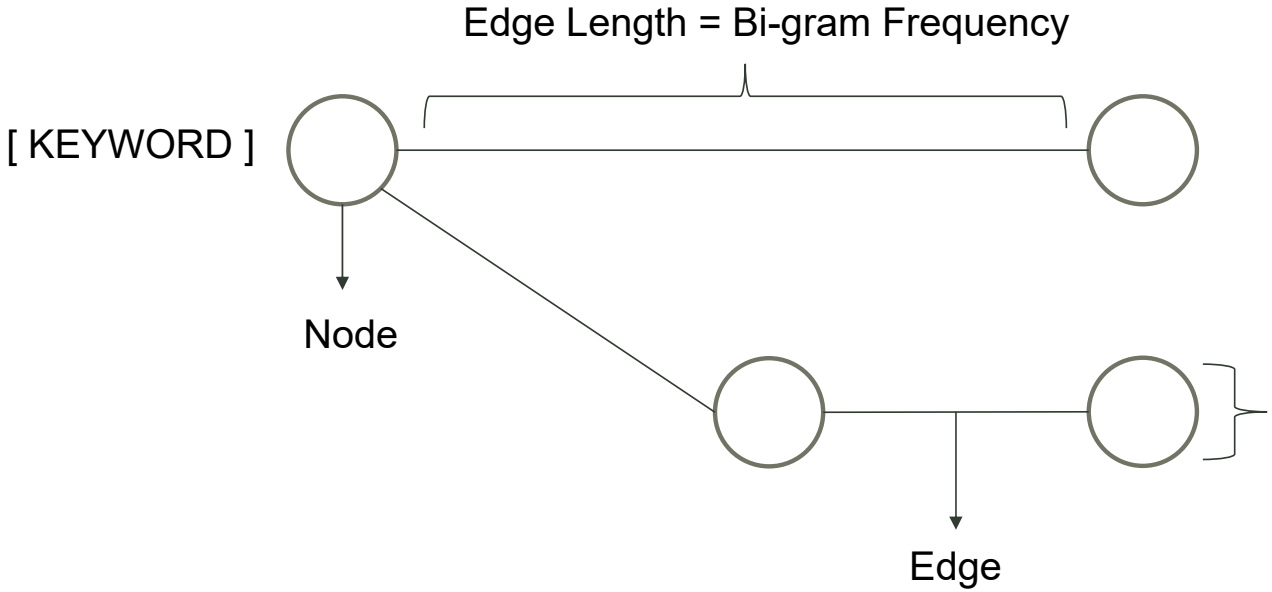
Cosine Similarity Matrix

Sentence	0	1	2	3	4	5
0	1.00	0.57	0.51	0.26	0.31	0.33
1	0.57	1.00	0.54	0.25	0.31	0.43
2	0.51	0.54	1.00	0.19	0.25	0.36
3	0.26	0.25	0.19	1.00	0.50	0.38
4	0.31	0.31	0.25	0.50	1.00	0.56
5	0.33	0.43	0.36	0.38	0.56	1.00

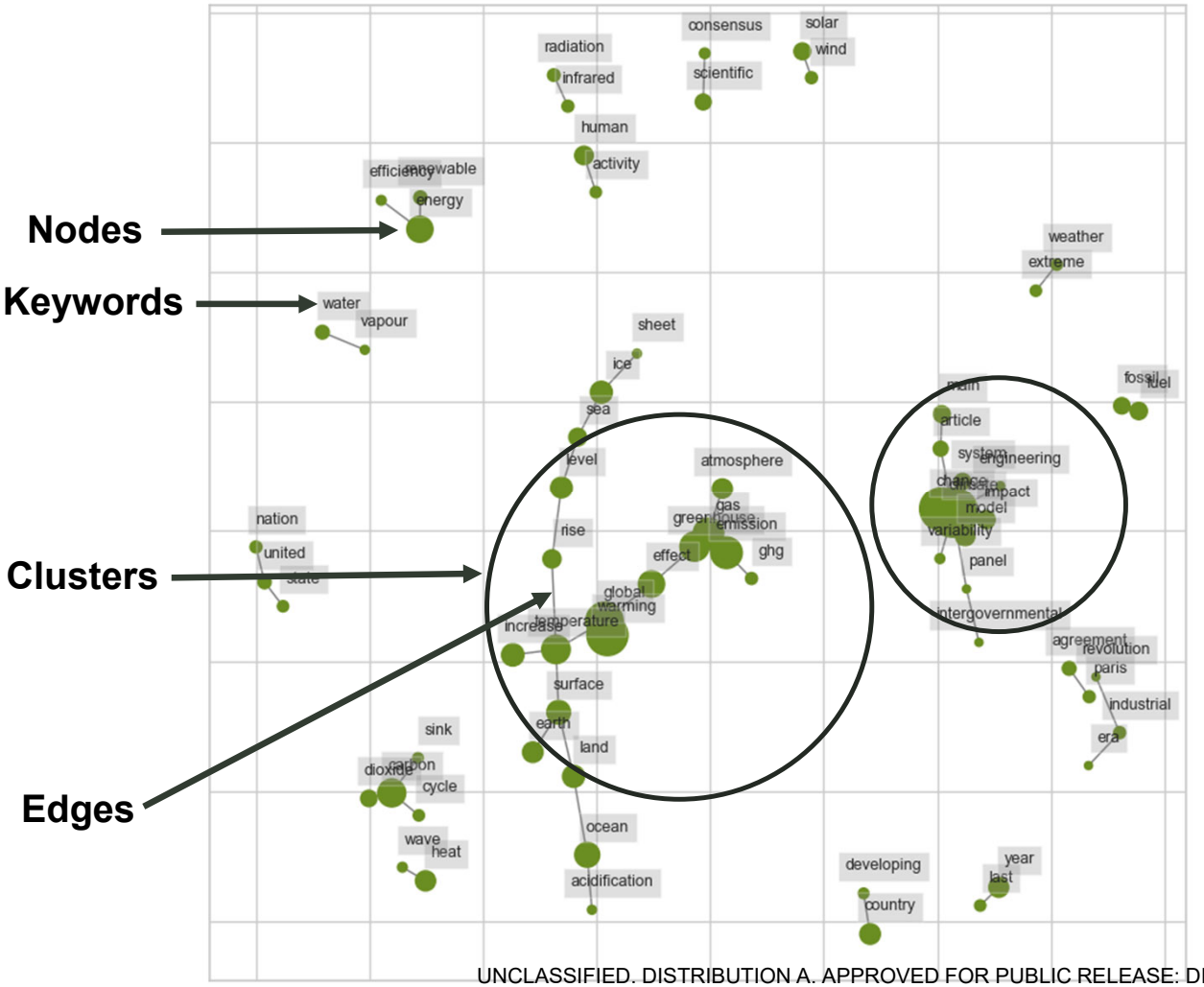
METHOD – NETWORK DIAGRAM

- Network diagrams combine uni-gram and bi-grams into insightful visualization
- Key features from a body of text easily identifiable
- Quickly dissect large amounts of information visually
- Determine relationship between clusters/topics





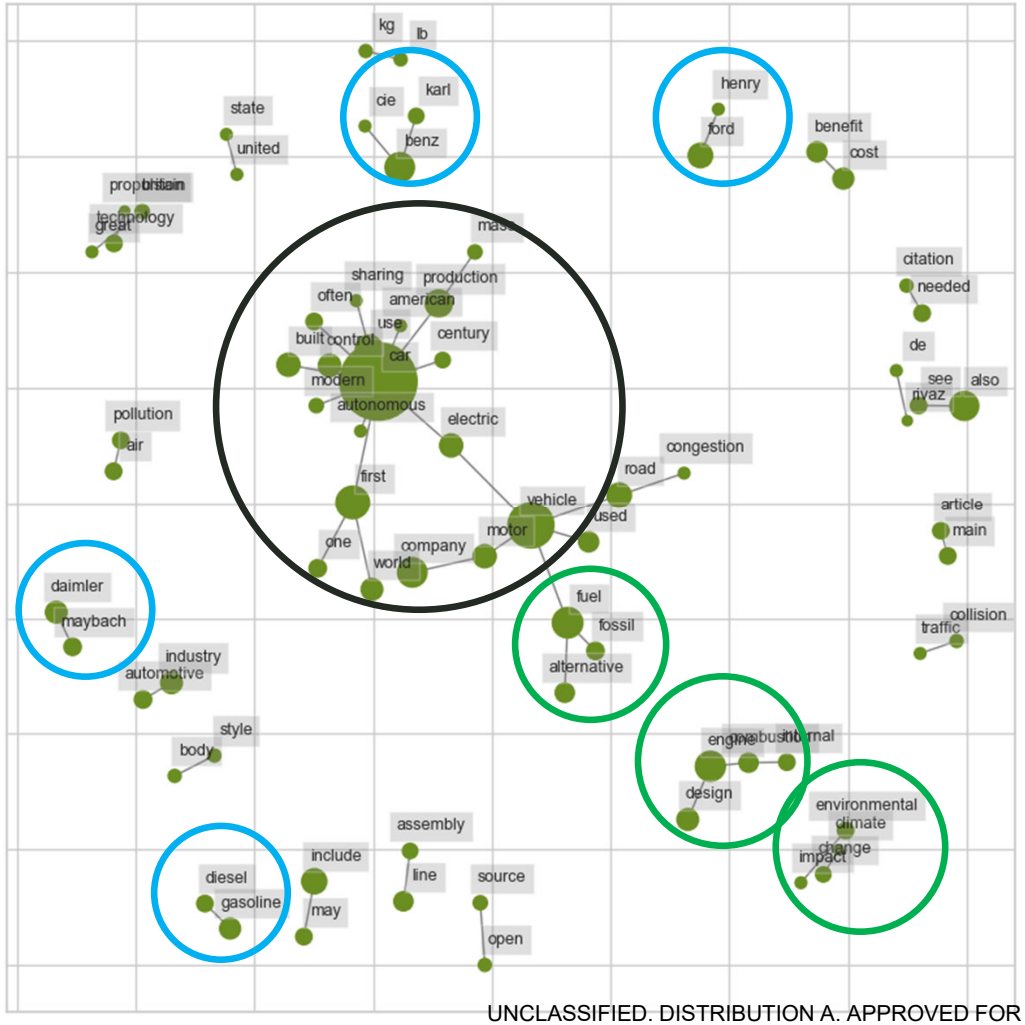
METHOD – NETWORK DIAGRAM



How to read a Network Diagram

- ❑ Node size is determined by how often a particular word repeats
- ❑ Edge length is determined by how often two pair of words repeat together
- ❑ Large clusters often show underlying core topic
- ❑ Smaller clusters often are about sub topic
- ❑ Outliers show related event, entity, relation to core topic
- ❑ Cluster coherence can give indication of proposal approach logical clarity

NETWORK DIAGRAM EXAMPLE



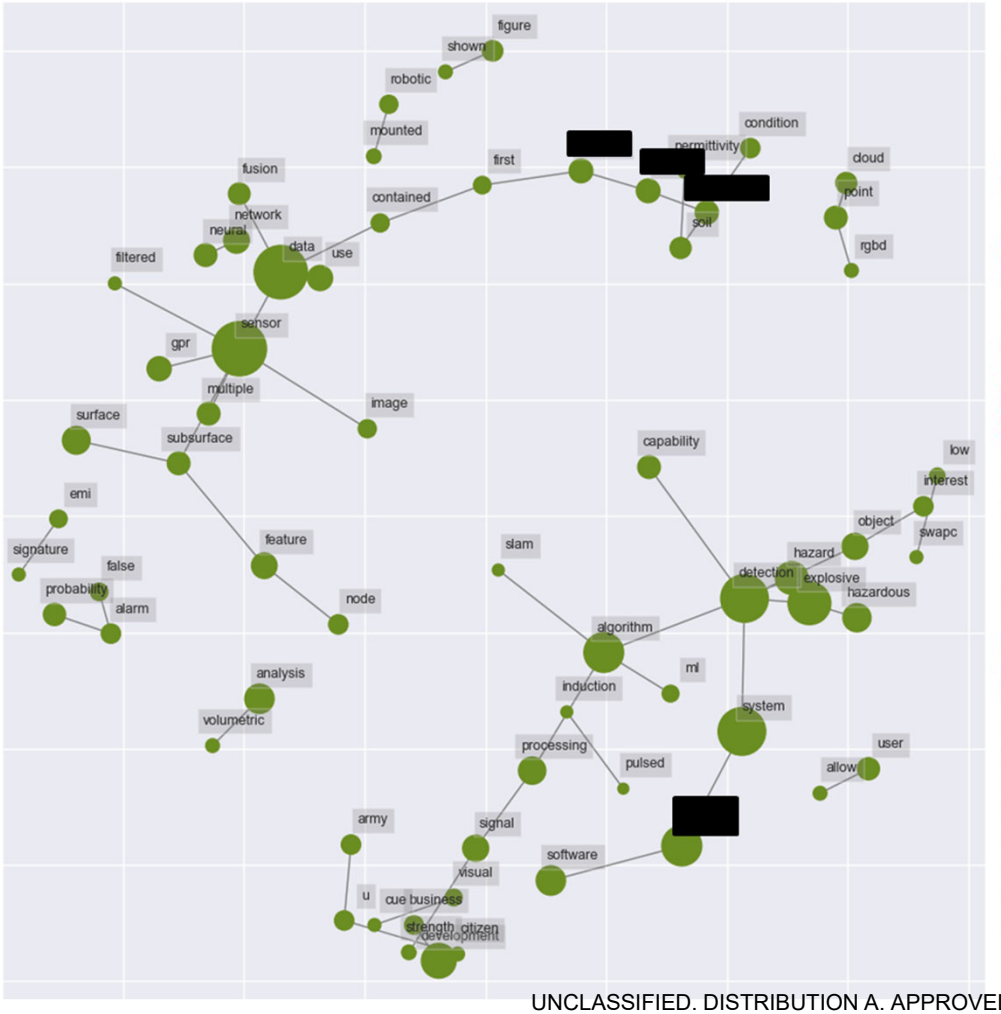
Source: Wikipedia Article on Cars

Core topic will always have the most nodes and associated keywords

Sub topics appear in smaller clusters

Entity, event, subject relation to core topic

ANALYSIS RESULTS



Proposal Summary

The XXXXXX product will be a software package with the following key components: (a) a hardware subsystem installed on a robotic platform component to perform data collection, data processing, data fusion, and data streaming, where the bulk of analysis needed for 3D visualization of XXXXXX will be done, as well as a display device where data can be visualized; and (b) a software subsystem that will include algorithms for processing data to detect and classify XXXXX and prepare the data for visualization. To address the need for intelligent multi-model sensor data fusion algorithms and visualization approaches for XXXXX detection, XXXXXXX proposes the development of a XXXXXX system. XXXXXX correlates data from the following sensors to provide comprehensive detection capabilities: Multifrequency GPR Sensor (XXXXXXX): Radar-based subsurface imaging sensor using multiple-frequency transmitters (XXXXXX) to **handle multiple soil conditions**. XXXXXX is designed to detect XXXXXX and XXXXXXX objects using surface and subsurface filtered sensor data and ML algorithms. XXXXX's experience includes data analysis and data fusion, specifically for point and area sensors collecting XXXXX data for early warning experience, as evidenced in the TRL-5 system developed for the XXXXXX, as shown in Figure 4-3. XXXXX fuses ground-penetrating radar (GPR), pulsed induction (PI), soil permittivity, light detection and ranging (LIDAR), red, green, blue (RGB) and infrared (IR) image sensor data with positioning data from global positioning system (GPS) and inertial measurement unit (IMU) sensors to provide standoff detection and three-dimensional (3D) visualization of XXXXXXXX. The XXXXXX architecture will be developed based upon the sensors identified in the previous section, with an emphasis on a low SWaP-C footprint for the signal processing and XXXXX detection neural network. Design and Develop Data Visualization Capability (Objective 2) A proof-of-concept XXXX prototype will be developed focusing on the GPR sensor filters and ML, which are the key algorithms for sensing and identifying XXXXXX. Develop the System Specification Based on Result of Phase I XXXXXX Phase II requirements will be developed for fully maturing the detection and visualization algorithms required to demonstrate the system in a simulated operational environment, for integration into the robotic demonstration platform, and for the demonstration event plan. 3.3.5 Phase I Product and Demonstration (Task 4) XXXXXX will demonstrate the Phase I XXXXX software in the laboratory using real-time simulated sensor inputs, a COTS laptop, and a visualization tablet communicating over a Wi-Fi network to test the ability to meet the requirements. Specifically, XXXX will provide technical guidance for the design and development of the sensor data fusion algorithms. XXXXXX provides this functionality by integrating multiple sensors on a robotic platform and including algorithms for object detection, classification, and data visualization. XXXX is uniquely positioned to successfully develop and commercialize the XXXXX technology due to the following capabilities: Availability of a rich combination of all the skills required for the research and development of XXXXX at XXXX, including experience with XXXXXXX defense systems, data fusion algorithms, data analysis, modeling and simulation, algorithm design/development, graphical user interface (GUI)/software/database design/development, and hardware design for unmanned ground vehicle (UGV) applications. As the outcome of the project, in Phase I, XXXX will conduct a laboratory demonstration of prototype algorithms using simulated XXXXX and representative clutter to test the detection and processing speed. The surface and subsurface sensor data collection process will generate a lot of data

ANALYSIS RESULTS

ORIGINAL DOCUMENTS (n=12)

- ❑ Unstructured data
- ❑ PDF Format
- ❑ Avg length 36 Pages, 2+ hours to read
- ❑ Requires 2 or more people to review multiple proposals in weeks

NETWORK MAP + SUMMARY

- ✓ Structured Data + Visual Aids
- ✓ Plain Text
- ✓ 1 Page Summary, *10 minute read*
- ✓ One person with aid of NLP can review multiple proposal in a day

- ❑ Average reading speed for non-technical material roughly 2 minutes per page.
- ❑ The human *brain processes images 60,000 times faster than text* [broadly cited, source to U. Minnesota]
- ❑ Source selection authority confirmed that the conclusions drawn from the augmented intelligence approach were in line with the source selection advisory committee functional expert opinions and manual qualitative evaluation. → Hypothesis supported!

NAME ENTITY RECOGNITION

Quickly Gauge Relevance of Principal Investigators, Subcontractors, & Associates

TYPE	DESCRIPTION
PERSON	People, including fictional.
NORP	Nationalities or religious or political groups.
FAC	Buildings, airports, highways, bridges, etc.
ORG	Companies, agencies, institutions, etc.
GPE	Countries, cities, states.
LOC	Non-GPE locations, mountain ranges, bodies of water.
PRODUCT	Objects, vehicles, foods, etc. (Not services.)
EVENT	Named hurricanes, battles, wars, sports events, etc.
WORK_OF_ART	Titles of books, songs, etc.
LAW	Named documents made into laws.
LANGUAGE	Any named language.
DATE	Absolute or relative dates or periods.
TIME	Times smaller than a day.
PERCENT	Percentage, including "%".
MONEY	Monetary values, including unit.
QUANTITY	Measurements, as of weight or distance.
ORDINAL	"first", "second", etc.
CARDINAL	Numerals that do not fall under another type.

multidisciplinary team to address the various scientific, engineering, administrative, and commercialization efforts required during this program. The [redacted] PERSON team offers all the expertise necessary to develop this technology to satisfy Army ORG 's needs. 7.1 CARDINAL . Dr. [redacted] PERSON , Ph.D. ORG , Senior Research Engineer Dr. [redacted] PERSON received Bachelor PERSON 's, Master's and Doctoral degrees from Virginia Tech ORG in Blacksburg GPE , VA GPE . His graduate (MS) research in acoustic modeling and active control evolved into Phase I, II SBIR programs with AFRL PERSON , and he was recognized as a NDSEG and VSGC Fellow for his doctoral research on the characterization and modeling of active material sensors and actuators. He worked as a research scientist with [redacted] ORG , Inc from [redacted] DATE leading SBIR ORG programs in active material systems, controls, and energy harvesting. Following this time, he joined [redacted] ORG [redacted] and worked to develop embedded wireless sensing hardware and power solutions for civil and energy infrastructure applications. He was recognized as a [redacted] Early Career Award recipient and focused on using hybrid radio frequency (RF ORG) based energy transmission and harvesting systems to supplement traditional energy harvesting. From [redacted] DATE [redacted] PERSON led multiple research projects on novel energy and embedded sensing applications. In [redacted] DATE , [redacted] PERSON joined [redacted] ORG as a Senior Research Engineer. In this capacity, he now leads [redacted] ORG team which is comprised of data scientists and

❑ Available models require more training to improve accuracy, but are useful right out of the box.

AUGMENT INTELLIGENCE DASHBOARD

Network Diagram

PI snapshot

Company has with deep learning for detection of objects in 3D LIDAR data and similar voxel domains. Existing approaches to detection - Using of 3D object detection - Data and models capture the of underground objects in GPR models that are purpose built for volumetric nature of the data in this scans rely on techniques use with GPR data. Under a Phase II project funded by XXXXX, Company has developed an architecture for biologically inspired 3D convolutional neural networks for exploitation of onboard 3D sensors and demonstrated its effectiveness for real-time detection of targets-of-interest in both sparse and dense 3D voxel data (Figure 9). Under multiple XXXX-funded projects, Company has also developed innovative deep learning systems, including deep learning models for target detection, recognition, and tracking in EO/IR imagery, 3D deep convolutional-neural networks for LIDAR sensors, sensor fusion, and perception systems for UGV systems. We will leverage significant experience and expertise using deep learning for 3D object detection in LIDAR imagery to build neural network architectures for standoff detection. Task 3: Development of Deep Learning Models for Localization and Classification of Buried Objects (Base Effort) A key part of the phase I effort will be to use the global density estimate to identify buried objects and hazards in the operational area. In contrast to standard machine learning approaches for the detection of buried objects using GPR B-scan imagery, the proposed model is capable of exploiting the volumetric nature of the scattering data. By taking full advantage of 3D structure of GPR data using novel deep learning architectures along with the proposed novel scheme of sparse sampling of the hazardous area, the proposed technologies significantly improve the state-of-the-art in standoff detection. Relationship with Future Research or Research and Development Upon successful completion of this project, Company will have demonstrated the feasibility of the proposed technologies for deep learning based standoff detection from mobile platform. Task 5: Generation of Global Hazard Map (Base and Option Effort) As part of the hazard visualization for this system, Company will combine the global scattering density estimate, the deep learning model output, and GPS / IMU navigational data to produce a global map of the possible hazards in the operational area. These include development of 3D deep-learning and visual attention models for efficient object detection and classification in 3D LIDAR data (funded by XXXXX); development Figure 14: (Top) Company's of short-term and long-term memory processes and their interplay to facilitate long- UGV platform with onboard term learning and contextual facilitation in deep neural networks for improved sensors and computing sensor localization in GPS-denied environments and target recognition (funded by infrastructure. In order to use GPR A-Scan data to perform standoff detection we must use off-nadir scattering as the basis for estimating the location of scattering densities. Mathematical analysis and software implementation for combining A-scan data with Product navigational location data to produce an estimate of underground scattering density. To perform this task, Company will leverage its experience and expertise in building deep convolutional neural networks for object detection and localization using 2D and 3D sensors. Product Deep learning model for hazard detection and classification from scattering densities

Metrics

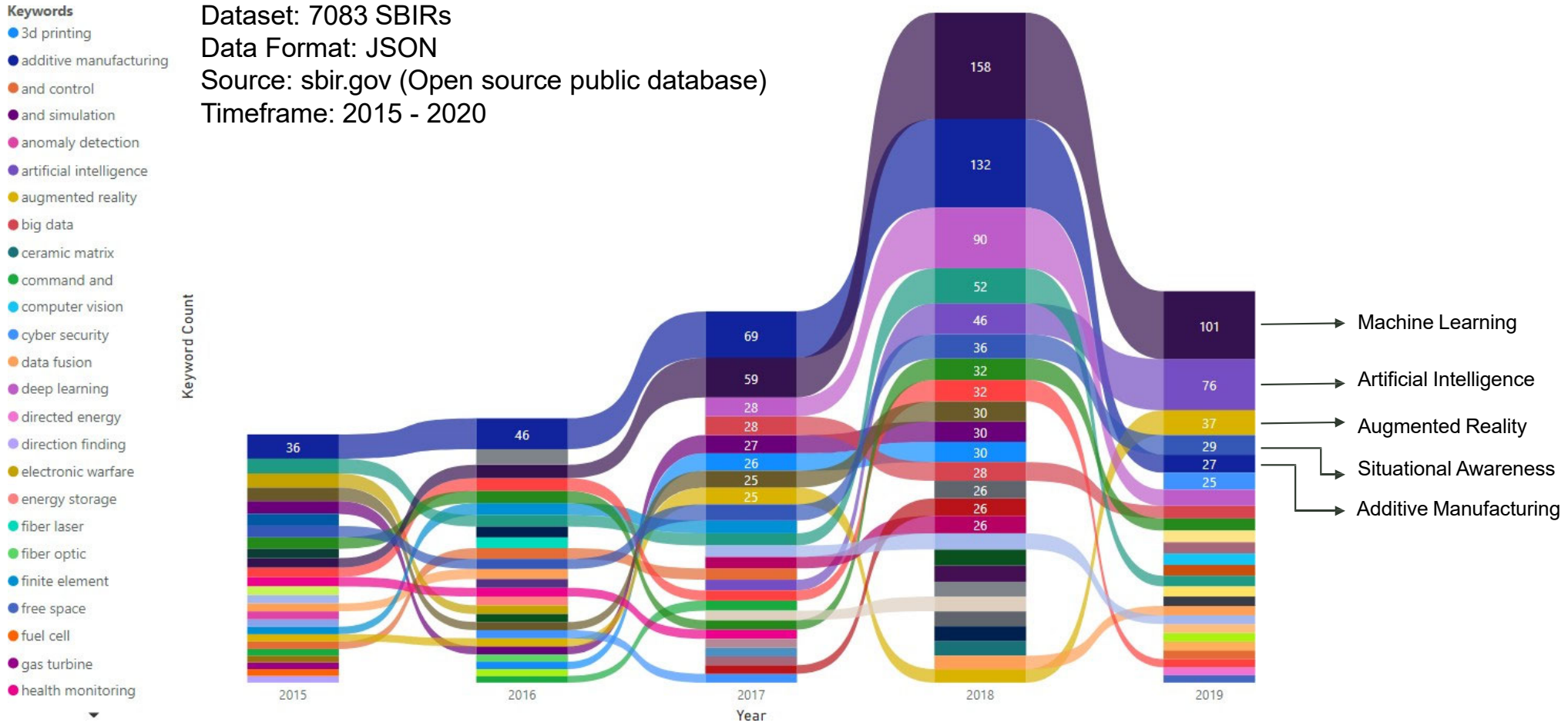
Color map to problem statement tokens

Relevance Index

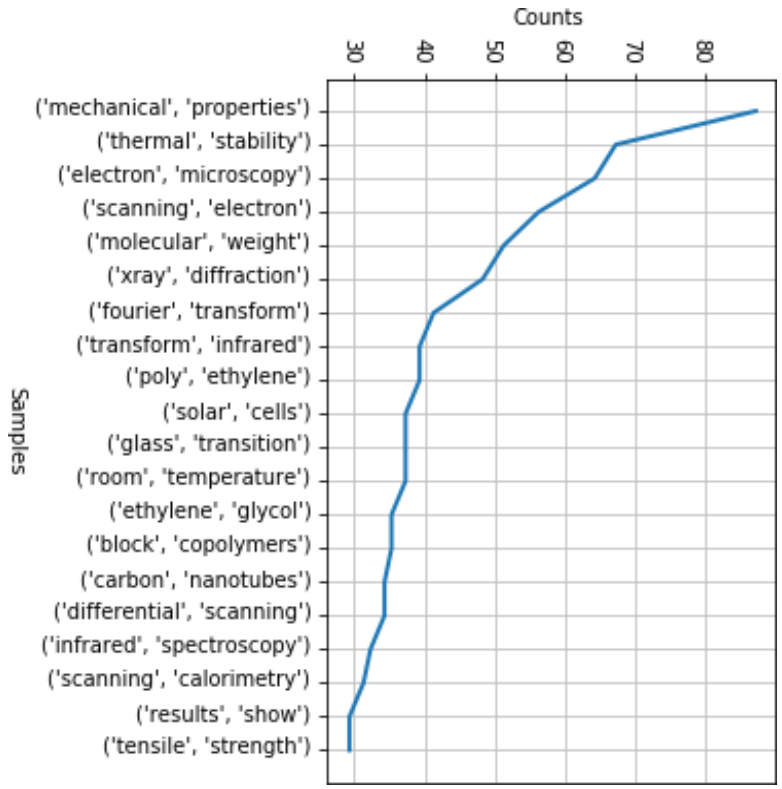
Proposal Cost

APPLICATION EXTENSION - DOD SBIR INVESTMENT

Dataset: 7083 SBIRs
Data Format: JSON
Source: sbir.gov (Open source public database)
Timeframe: 2015 - 2020



APPLICATION EXTENSION – PUBLICATION MINING



N-gram Analysis on publication abstracts for important keywords

Publication for future technology search in materials

CONCLUSION

- Contracting is central to systems engineering.
- Almost ½ *trillion* dollars in service and supplies contracts are cut by DOD annually over *millions* of contracting actions → there is a lot of opportunity to affect change by modernizing source selection with augmented intelligence.
- There is an expanding list of non-cost source selection evaluation criteria that are cognitively taxing, resource intense, and difficult to evaluate consistently. SOTA is [*hurried*] manual qualitative scoring with adjudication by a decision authority overwhelmed by inputs.
- The proposed augmented intelligence framework guides evaluations toward logical, defendable, consistent and explainable data-driven conclusions for optimized systems engineering management.
- The resulting method reduces DOD evaluator cognitive load, lessens the resource burden, and improves contracting decision quality and consistency. → V&V'd by SSA in blind assessment
- Ultimately, augmented intelligence will translate to higher quality contracting selections, faster and more in-depth competitive bid evaluation, and greater technology transition efficiency to the Warfighter.