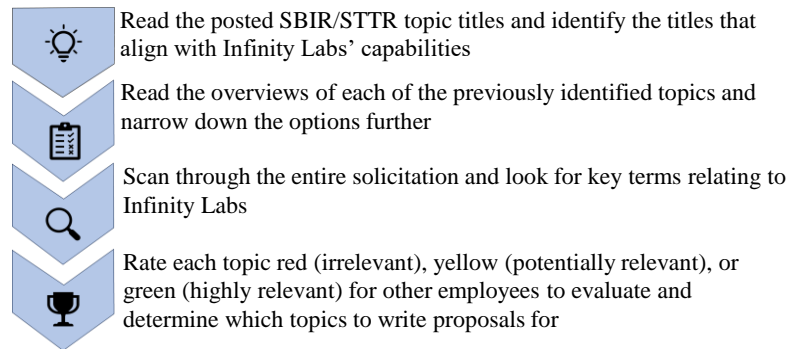# Streamlining the SBIR/STTR Topic Selection Process

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Industry Partners: Dr. David Hillstrom, Principal Investigator
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UNIVERSITY OF ARKANSAS
College of Engineering
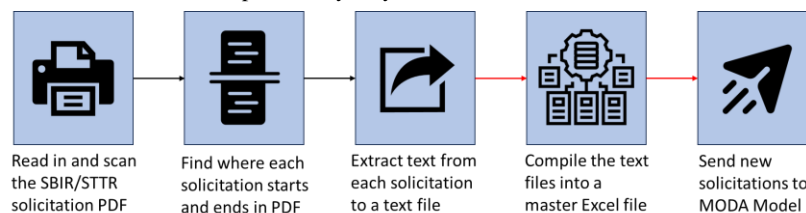Industrial Engineering

infinity LABS

Infinity Labs Topic Selection Process

Infinity Labs is a small business specializing in creating technical solutions for complex problems, primarily in the defense sector, leveraging their expertise in modeling, simulation, cyber, and advanced research and development. Funded largely by government grants, our focus is on their current Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) topic selection process. The current process is done by their Chief Scientist, Josh Kogot.

- Read the posted SBIR/STTR topic titles and identify the titles that align with Infinity Labs' capabilities
- Read the overviews of each of the previously identified topics and narrow down the options further
- Scan through the entire solicitation and look for key terms relating to Infinity Labs
- Rate each topic red (irrelevant), yellow (potentially relevant), or green (highly relevant) for other employees to evaluate and determine which topics to write proposals for

Technology Areas and Keywords Analysis

The technology areas found from the text extractor code contained many instances of similar technology areas (such as artificial intelligence and AI or weapon and weapons), so we went through these and wrote code to combine these terms to reduce the number of unique terms from 139 to 60. The keywords are more specific than technology areas. The text extractor code found 9065 unique terms. To transform these terms into a format that can be analyzed and ranked by Infinity Labs, we gave the 9065 terms to ChatGPT and had it categorize each term into one of the 34 categories that were also determined by ChatGPT. We used this categorization to create a word bank on the Excel to fuzzy match future terms with while keeping it easily modifiable for future use.

Technology Areas: 139 — Code — 60
Keywords: 9065 — Code — 45

Phi-3 Model

We used Microsoft's Phi-3 Medium using GPU-optimized inference to analyze solicitations. Our code manages the 4096-token context window for efficient processing. We engineered a structured prompt with Infinity Labs' expertise taxonomy to evaluate alignment, solution fit, and feasibility. The system processes data locally for security and prioritizes key information in lengthy solicitations. Regex parsers extract structured data, generating CSVs with recommendations and risk assessments. The system uses confidence-rating that outputs 'High/Medium/Low' certainty indicators with each decision, providing transparency about the model's decision certainty. The code includes error handling for batch processing and integrates with our text extraction code, transforming PDFs into actionable intelligence within minutes.

Load Phi-3 Model → Process Text & Token → Generate Response → Parse to CSV Format
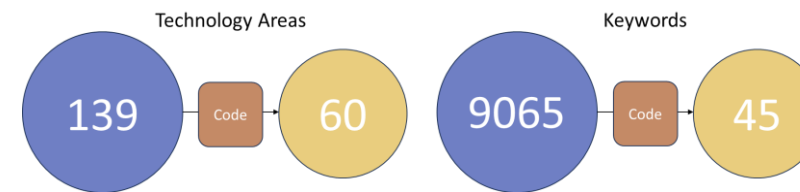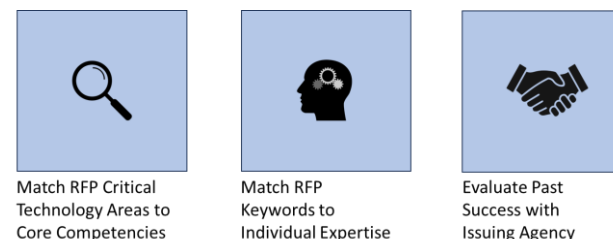
PDF Text Extractor Code

The topic solicitations are batch-released on PDFs. These PDFs contain hundreds of pages, however, most of the pages do not pertain to the topic solicitations. So, we created text extraction code to allow us to work with only the topic solicitation text. The code was written in Python to extract the solicitation text from the PDFs and put them into text files for the Phi-3 Model and a master Microsoft Excel file for the MODA model. The code worked correctly for 85-90% of the 2200 solicitations since 2020. The inconsistent formatting of the topic solicitations caused the errors to occur, which we had to manually fix. To prevent an error from ruining the final output of the code, we created breakpoints to allow the user to correct the errors at the points they may occur.

Read in and scan the SBIR/STTR solicitation PDF → Find where each solicitation starts and ends in PDF → Extract text from each solicitation to a text file → Compile the text files into a master Excel file → Send new solicitations to MODA Model
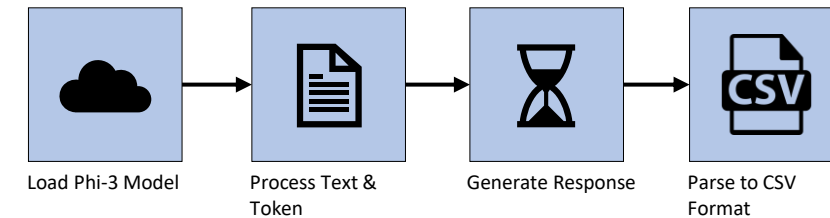
MODA Model

We created a Multi-Objective Decision Analysis (MODA) model to give each topic a value score to rank the opportunities. The value measures are technology areas, keywords, and issuing agencies. The technology areas and keywords are sections in each solicitation, and we measure these values on the percentage of terms in these sections that match with Infinity Labs' capabilities. The agency score is determined by a 5-star rating each agency was given by Infinity Labs. The MODA model was created in Excel and is set up so that once the Python code is ran, it automatically adds in the newest set of solicitations and calculates the value scores for each solicitation, ranking them in order of value.

Match RFP Critical Technology Areas to Core Competencies | Match RFP Keywords to Individual Expertise | Evaluate Past Success with Issuing Agency

Results and Future Recommendations

Both models provide quicker processing times, however, they lack accuracy (how well it ranks topics) and connection (how well it recognizes topics aligning with Infinity Labs' capabilities). Our solutions were created to be easily modified, allowing Infinity Labs to adjust the models to get better results with further analysis.

Time

30 min	Best Case	90 min	Most Likely Case	120 min	Worst Case	Original
7.5 min	Best Case	15 min	Most Likely Case	30 min	Worst Case	MODA Model
5 min	Set-up time	30 sec	Per solicitation	30 min	Average runtime	Phi-3 Model

Accuracy

26%	Same Post Ranking	0%	Type I Error	2.3%	Type II Error	Original
37%	Accuracy	67%	Type I Error	64%	Type II Error	MODA Model
50%	Accuracy	35%	Type I Error	13%	Type II Error	Phi-3 Model

Connection

97%	Correctly Connected	Original
35%	Correctly Connected	MODA Model
50%	Correctly Connected	Phi-3 Model