

Building a customizable chatbot using Large Language Models

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Generative AI as a subset of AI



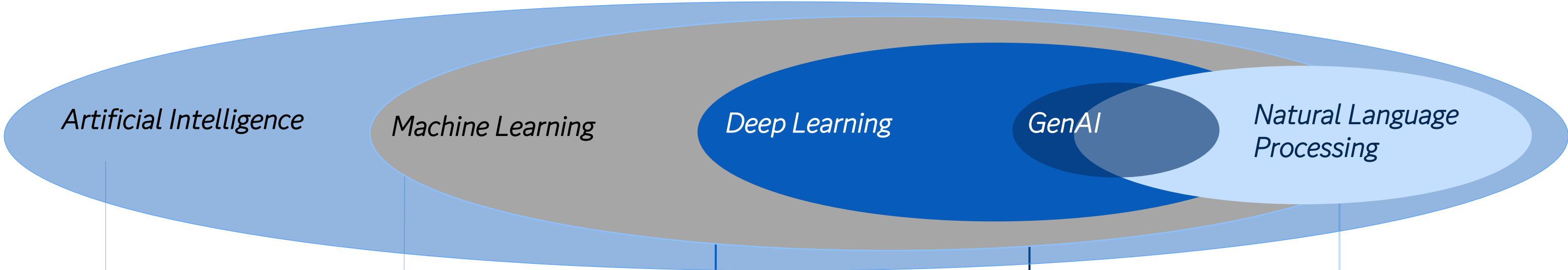
Artificial Intelligence (AI) is the science of designing systems to support and accelerate human decisions and actions.



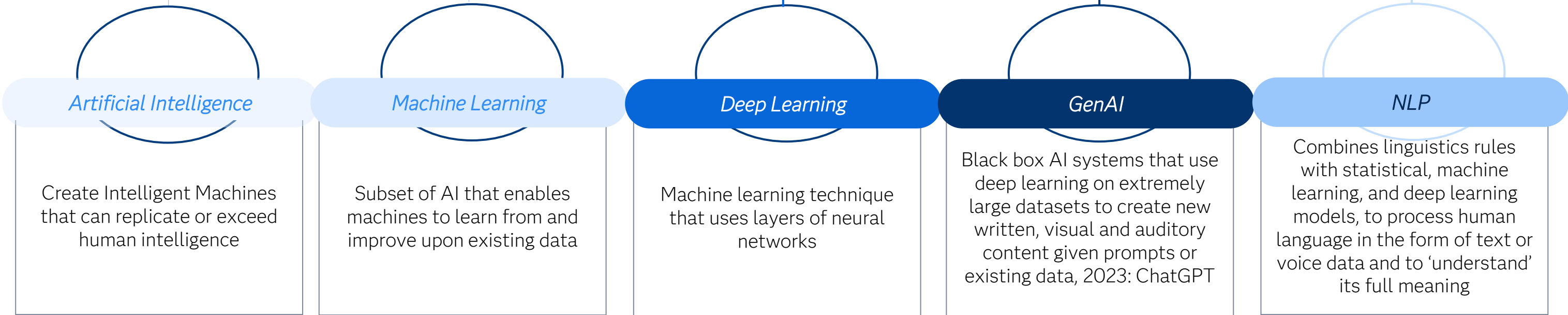
Generative AI (GAI) is a specific subset of AI algorithms designed to generate new content that closely resembles the data on which it's trained.

Disciplines

Computer
Science

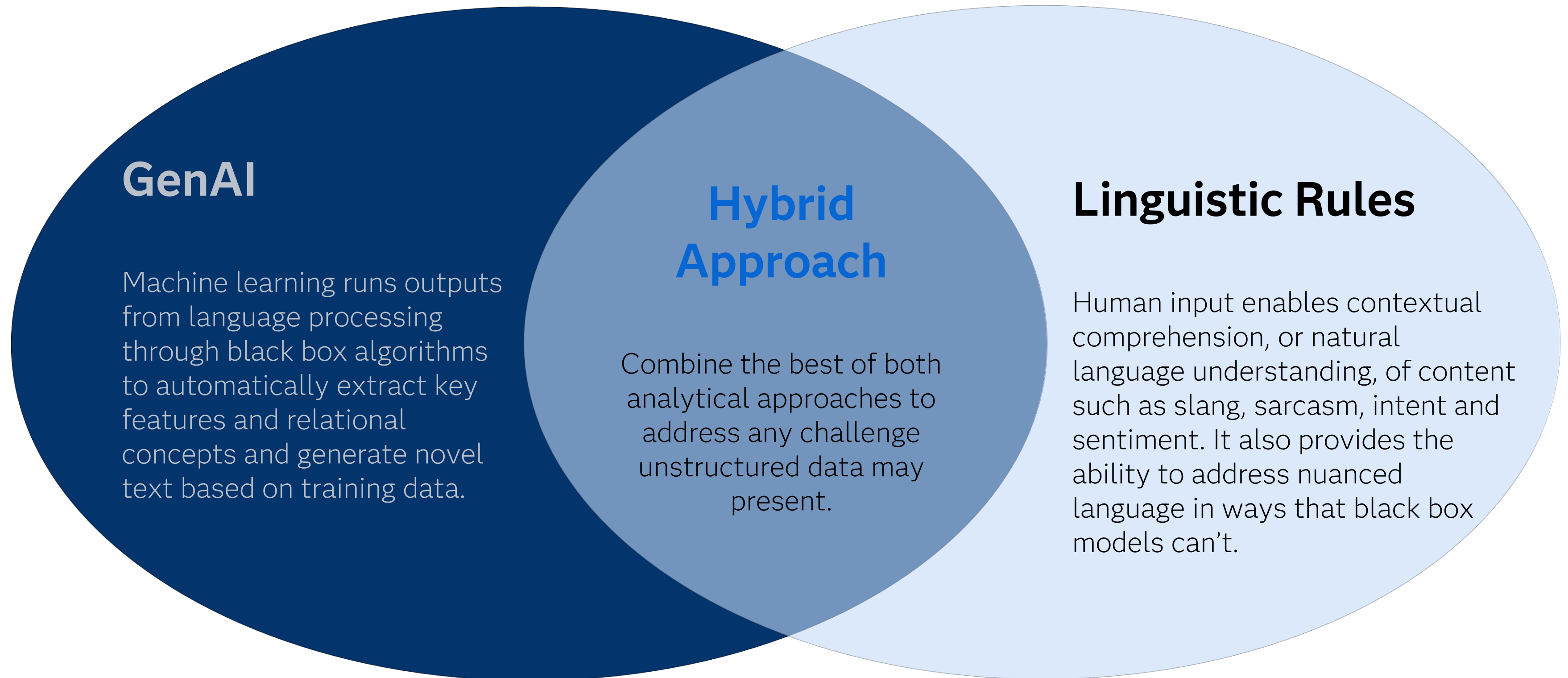


Evolution



Leverage both machine learning and rules-based methods

Improve accuracy with a hybrid approach



Summary

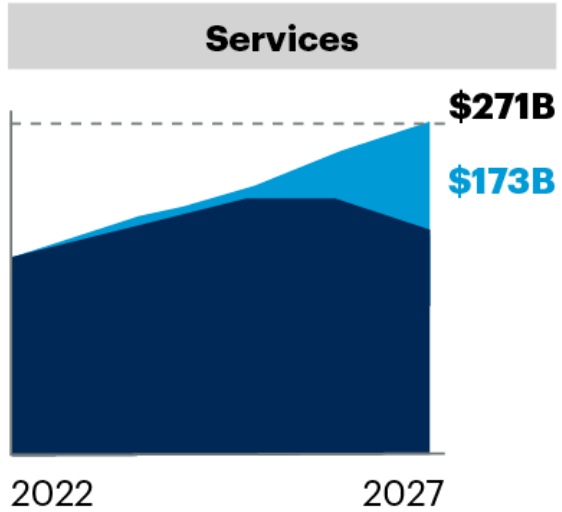
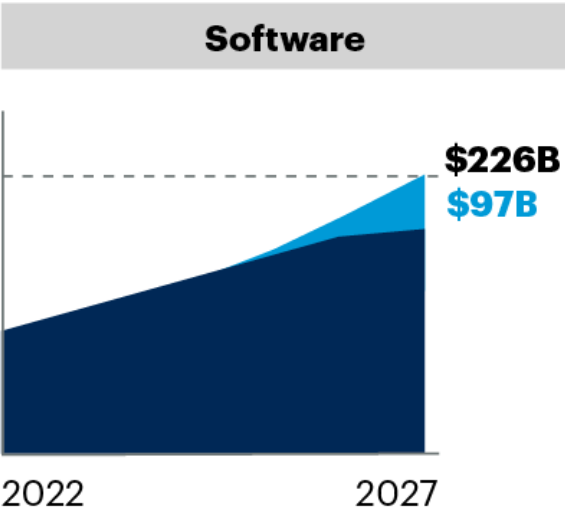
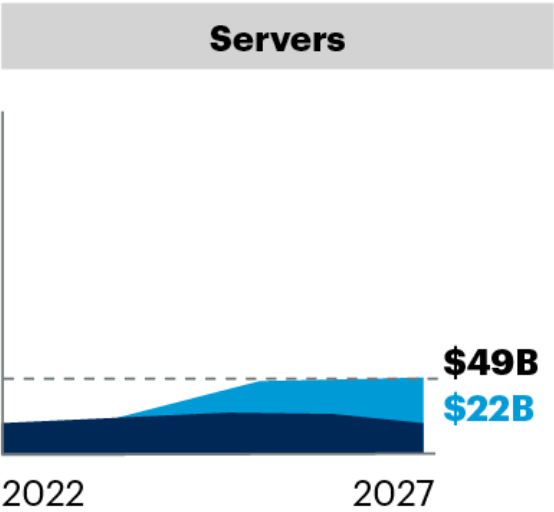
Enterprise Spend: What do numbers reveal?

Why this is important for SAS

Gartner

Global GenAI IT Spending, From 2022 to 2027

--- Overall Total AI IT Spending ■ GenAI ■ All Other AI



Source: 2023 Gartner Forecast Q3
791364_C

Gartner

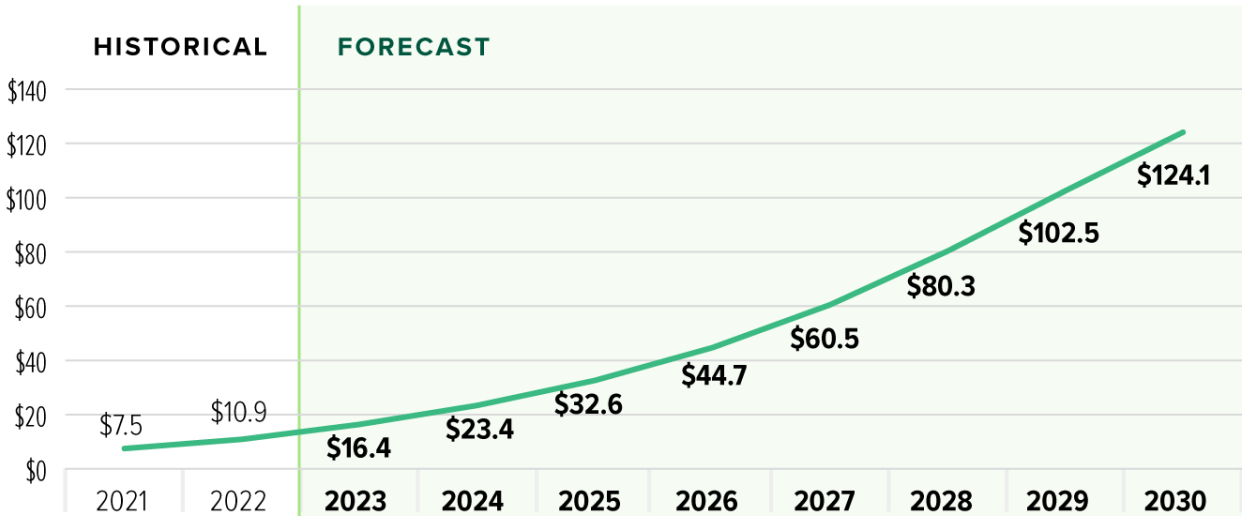
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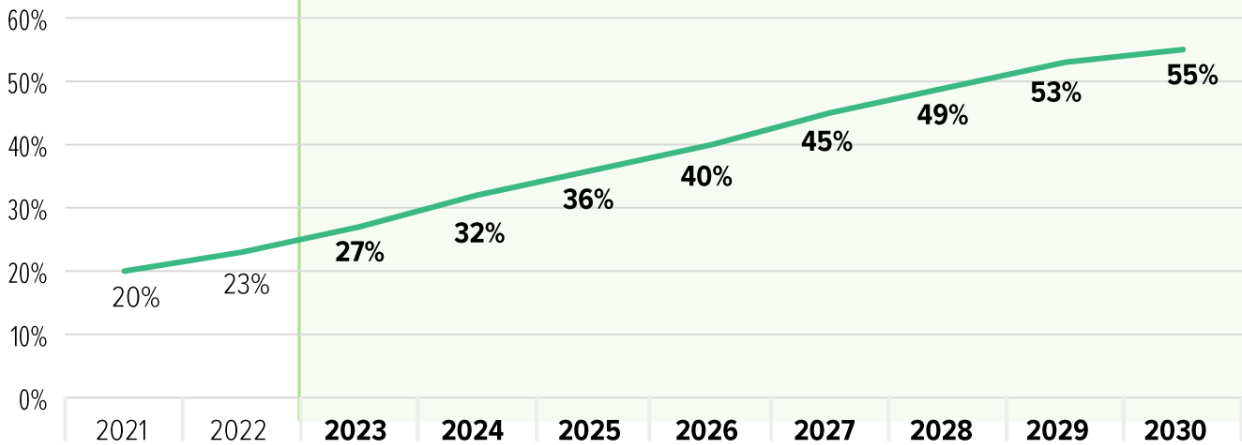
FIGURE 1

Generative AI Will Have 36% CAGR To 2030 And Capture 55% Of AI Software Spend

Generative AI software spend, billions of US dollars



Share of AI software spend from generative AI



Forrester Forecast

Source: Forrester's Global AI Software Forecast, 2023 To 2030

However...

66%

of leaders are ambivalent or dissatisfied
with their progress on GenAI and AI

[BCG Survey, 2024](#)

SAS' Generative AI Product Strategy



- **SAS Viya Copilot** to help you use SAS Viya tools
- Conversationally query SAS Viya to increase user productivity, further democratizing analytics



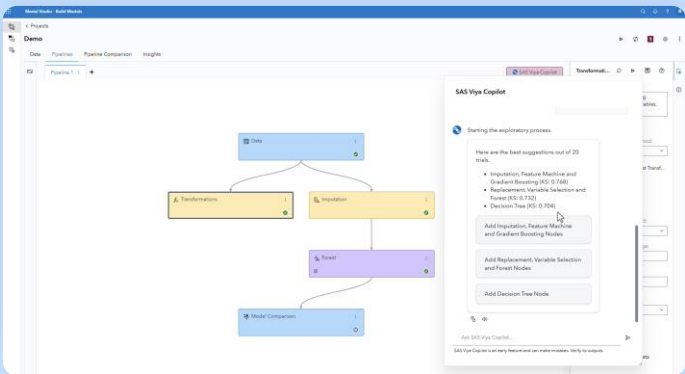
- **Specialized SAS Viya Copilots** to accelerate industry workflows and processes
- GenAI driven assistants to accelerate domain-specific workflows



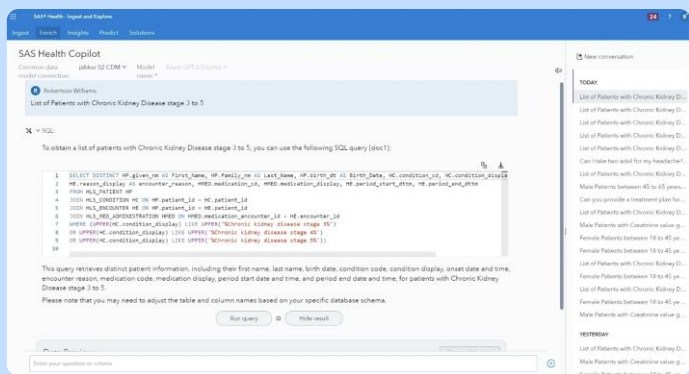
- **SAS Viya** to help build your LLM application stack to unlock value in your proprietary business assets
- Flexible SAS Viya GenAI building blocks to help with development and orchestration of your LLM application stack



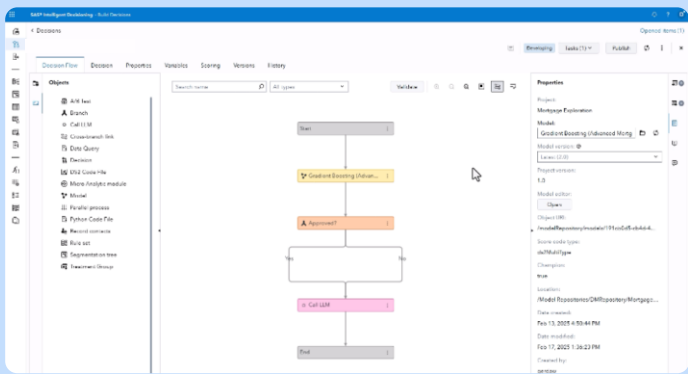
- **Standalone GenAI services** to enable your toolchains, like a **synthetic data generation service**
- API-first low-code/no-code synthetic data generation and validation experience



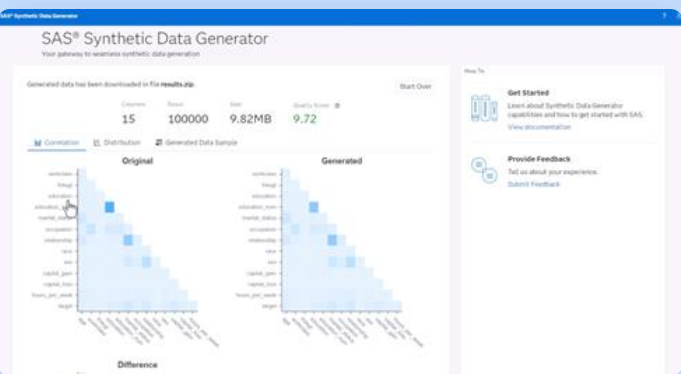
example: Model Pipeline Development



example. SAS Health – Clinical Data Discovery



example. Orchestrate an agent using SAS Intelligent Decisioning

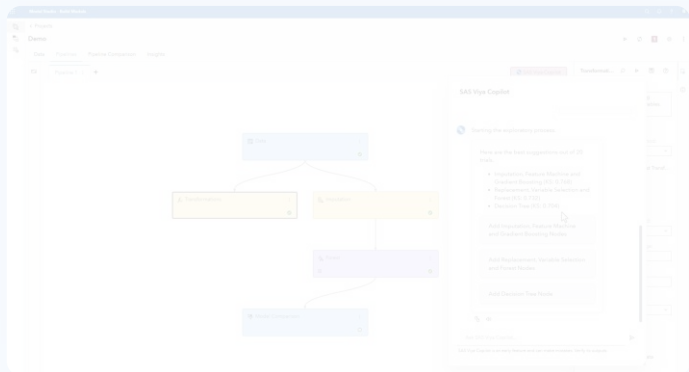


example. SAS Data Maker

SAS' Generative AI Product Strategy



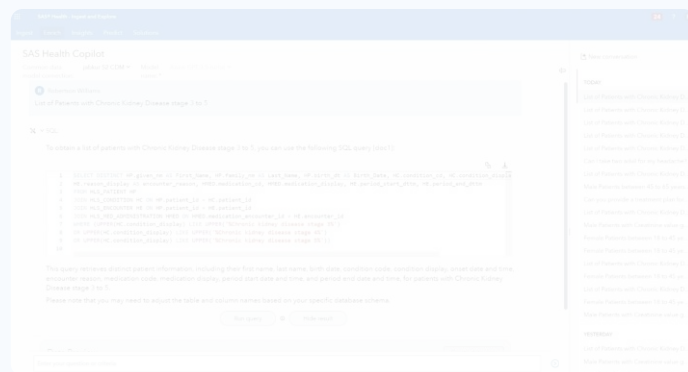
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example: Model Pipeline Development



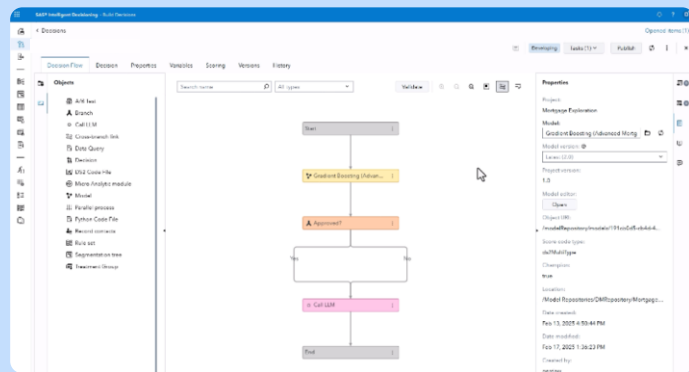
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example. SAS Health - Clinical Data Discovery



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example. Orchestrate an agent using SAS Intelligent Decisioning

SAS and Large Language Models



Georgia-Pacific

SAS combines **Generative AI** with corrective action models to **optimize** production.

Generative AI Learning Series

HIGHLY RECOMMENDED TRAINING

At Company Kickoff, CEO Jim Goodnight talked about the market for AI software growing at a rate of 19.1% over the next three years and his desire to see SAS own a piece of that market. Global consulting firm McKinsey predicts that almost a third of that will be driven by generative AI.

To take advantage, we'll need to move fast. Market opportunity doesn't wait. But we also need to commit to learning everything we can about the technology that is driving the future.

There are lots of great resources to read and consume, many of which can be found on the InsideSAS [Generative AI Guidance Hub](#) internally, or the [Generative AI page](#) available externally on sas.com.

But to make sure you learn everything you can about SAS' commitment to generative AI, you'll also want to register and participate in a new SAS and Generative AI global training series.

The first module, [SAS and Generative AI: Understanding the Trend and Our Response](#), is now available in SABA and provides an overview of what generative AI is and how we are currently using the technology internally at SAS. In this 55-minute course, you'll also gain a better understanding of the larger AI market and the challenges our customers are faced with as they integrate this new technology. Finally, you'll hear more about SAS' generative AI strategy and pick up a few ideas for how you can begin to use generative AI for productivity gains and more.

Additional offerings will be available later in Q1 and throughout the year. Registering for the courses ensures completion will be documented in your SABA learning system.

Jumpstart your efforts to learn all you can about the biggest technology opportunity of the generation by registering for [SAS and Generative AI: Understanding the Trend and Our Response](#) and be part of successfully positioning SAS as a leader in this new space.



Tags: AI and Generative AI

[Link: Generative AI Learning Series](#)

Workshop

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< Projects

ASAS_Inspections_TWS

Data

Pipelines

Pipeline 1

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Run pipeline

Animal_Feed_Detection

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Description:

☐ Include predefined concepts

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- Add child node >
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- Open
- Download score code
- Register model
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- Save as...
- Run
- Results
- Create PDF report...
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FlowGenerated CodeSubmitted Code and Results

LLM - Azure OpenAI RAG

Guidance_Response

LLM - Azure OpenAI RAG

ParametersConfigurationAboutNodeNotes

> System Prompt

LLM - Azure OpenAI RAG

ParametersConfigurationAboutNodeNotes

> System Prompt

<div>Question</div><div>Type your question below: *</div><div>What practical steps can poultry facility managers take to ensure adequate nourishment?</div><div>Output specification</div><div>By default, answers from the LLM are written to standard output. You n output table to this step to write results to a table.</div><div>Provide temperature governing LLM response: *</div><div>0</div></div>

Start PageASAS_Workshop_Nutrition.flw x

RunCancel

Add

View

FlowGenerated CodeSubmitted Code and Results

CodeLogResultsOutput Data (1)

Jun 23, 2025, 12:32:14 PM

Question: What practical steps can poultry facility managers take to ensure adequate nourishment?

1. **Regular Feed and Water Checks**: Ensure that feed and water checks are conducted at least twice daily to monitor availability and quality. This includes checking for any contamination or spoilage. 2. **Maintain Detailed Records**: Keep clear, detailed records of daily observations, feed and water checks, and any changes in the birds' behavior or appearance. This will help in early detection of potential issues. 3. **Nutritional Assessments**: Regularly assess the nutritional content of the feed to ensure it meets the specific dietary requirements of the poultry at different stages of their growth. 4. **Hydration Monitoring**: Implement systems to monitor water intake for each bird or group of birds. Dehydration can be a significant risk, especially in warmer climates or seasons. 5. **Feed Formulation and Quality Control**: Use high-quality feed ingredients and ensure the feed is stored properly to prevent degradation or contamination. Regularly review and adjust feed formulations based on the latest poultry nutrition research. 6. **Training Staff**: Train all facility staff on the importance of proper feed and water management and how to recognize signs of malnutrition and dehydration. 7. **Environmental Control**: Maintain appropriate environmental conditions, including temperature and humidity levels, to reduce stress on the birds and promote optimal feed and water intake. 8. **Regular Health Checks**: Schedule regular veterinary health checks to assess the health status of the birds and identify any issues related to nutrition or hydration early. 9. **Use of Technology**: Implement technology solutions like automated feeders and waterers that can provide consistent and measured amounts of feed and water to avoid underfeeding or overfeeding. 10. **Emergency Protocols**: Develop and implement emergency response protocols for addressing sudden issues related to feed and water supply. 11. **Feedback Mechanisms**: Establish a system for staff to report any irregularities in bird behavior or feed and water systems immediately to management. 12. **Review and Audit**: Regularly review and audit feeding practices, environmental conditions, and bird health to ensure ongoing compliance with best practices and to identify areas for improvement. By implementing these practical steps, poultry facility managers can ensure adequate nourishment and hydration, thereby promoting the health and productivity of the birds under their care.

Model Studio

https://myviya4.sas-fed-civ-05.unx.sas.com/SASModelStudio/

Model Studio - Build Models

ASAS_Inspections_TWS > Animal_Feed_Distress

Animal_Feed_Distress

Concepts

Custom Concepts (8)

C_Cattle

C_Death_Injury_Distress

C_Deer

C_Mice

C_Pig

C_Poultry

C_Water_Feed

F_WaterFeed_DeathDistress

Textual Elements (1358)

Filter

<input type="checkbox"/>	String	↑ 2	Role	↓ 1	Frequen
<input type="checkbox"/>	inspection		PN		
<input type="checkbox"/>	▶ animal		N		
<input type="checkbox"/>	animal		A		
<input type="checkbox"/>	veterinary		A		
<input type="checkbox"/>	▶ facility		N		
<input type="checkbox"/>	care		N		
<input type="checkbox"/>	date		PN		
<input type="checkbox"/>	medical		A		

Edit ConceptSandbox

C_Water_Feed

1 `CONCEPT_RULE:(OR,"_c{water}","_c{food}","_c{dehydration}","_c{feed}","_c{feeding}","_c{fed}","_c{intake}","_c{receptacles}","_c{potable}")`

Code is valid

DocumentsTest Sample Text

All (240)Matched (22 of 240)Unmatched

Search

sentences	Fact Matches	Critical_NCIs
**The defective water line in addition to the inadequate drain, did not protect the birds from injury resulting in a negative impact to the health of the animals.	0	2
The facility attributed the death of the birds to the defective water line and inadequate drainage.	0	2
The floor pen did have a drain; however, the plug in the drain had small holes which did not allow the water to drain quickly enough to adequately remove water from the pen.	0	2
The water line to the pen was found to have disconnected from the pressure reducing valve allowing water to flow freely.	0	2
A staff member at the facility acknowledged that feed from the mill was being delivered with insectcontamination.	0	.
Ag Guide: Chapter 3 & 11, page 21, 143Insects that appeared to be weeviles were observed in the bulk feed receptacle for the pigs and in one bulk foodreceptacle for the chickens.	0	.

Document 1 of 22

Highlight: Concept matchesSearch matches

RAG-non-creative prompt (Workshop main)

1. Implement Clear Documentation Practices: Ensure that daily observations of the birds, including their feeding and drinking behaviors, are clearly documented. This should include the amount of feed and water consumed by the birds each day.
2. Regularly Review Feed and Water Access: Conduct regular checks to ensure that all birds have easy access to fresh water and feed. This includes checking for any blockages or malfunctions in feeding and watering equipment.
3. Monitor Bird Health and Behavior: Train staff to recognize signs of dehydration, malnourishment, and illness among the birds. Early detection can prevent more severe health issues.
4. Nutritional Assessments: Work with a poultry nutritionist to assess the current feed formula to ensure it meets all the nutritional needs of the birds, including adequate levels of essential minerals like magnesium and manganese.
5. Adjust Humidity and Temperature Levels: Maintain appropriate environmental conditions in the facility as extreme temperatures and high humidity can affect the birds' ability to consume and digest food properly.
6. Regular Veterinary Check-ups: Schedule regular veterinary visits to monitor the health of the birds and to receive professional advice on improving their care and diet.
7. Educate Staff: Provide ongoing training for all facility staff on the best practices for poultry care, including the importance of nutrition and hydration and how to properly document their observations.
8. Quality Control of Feed: Regularly test feed quality to ensure it is free from contaminants and has not degraded, which could affect its nutritional value.
9. Implement a Feeding Schedule: Establish and adhere to a consistent feeding schedule to ensure regular intake of food, which can help prevent inanition.
10. Use Technology for Monitoring: Consider implementing technology solutions like sensors or CCTV to continuously monitor feed and water systems and the behavior of the birds.
11. Feedback Mechanism: Create a system where staff can report any issues related to feed, water, or bird health immediately, ensuring swift action can be taken.
12. Review and Adapt: Regularly review the health outcomes and growth performance of the birds and adapt feeding strategies as necessary to improve health and productivity.

By taking these practical steps, poultry facility managers can ensure that the birds receive adequate nourishment and care, thereby preventing issues like inanition and dehydration.

Non-RAG prompt (Optional “a”)

Ensuring adequate nourishment in a poultry facility is critical for bird health, productivity, and overall farm profitability. Here are practical steps facility managers can take:

1. Develop a balanced feeding program. Use scientifically formulated feed that meets the specific nutritional needs for the bird type (broilers, layers, breeders) and stage (starter, grower, finisher). Adjust feed formulations regularly based on age, health status, seasonal temperature, and performance goals.
2. Ensure feed quality. Source high-quality ingredients from reputable suppliers. Test feed ingredients for contaminants (e.g., mycotoxins, mold) and nutritional content. Store feed properly by keeping it in cool, dry, and well-ventilated conditions, and use FIFO (first in, first out) inventory management.
3. Optimize feeding systems. Regularly inspect and clean feeders to avoid moldy or spoiled feed. Ensure proper feeder height and spacing to allow all birds access without overcrowding. Calibrate feed delivery systems to ensure consistent and even distribution.
4. Monitor water quality and availability. Water is as critical as feed. Ensure clean, fresh water is always available. Drinkers should be the right height and number. Flush lines regularly to prevent biofilm buildup.
5. Track feed conversion ratios (FCR). Monitor how efficiently birds convert feed into body mass or eggs. Identify abnormalities quickly to adjust nutrition or health interventions.
6. Implement health and biosecurity protocols. Nutritional deficiencies can be masked by disease. Regularly vaccinate and monitor health, reducing nutrient loss to illness. Limit stress, which can reduce feed intake.
7. Engage a poultry nutritionist. Work with professionals to fine-tune rations and address specific challenges like heat stress, poor feed intake, eggshell quality, or growth rate issues.
8. Data logging and management. Keep records of feed intake, weight gain, mortality, and environmental conditions. Use software or spreadsheets to analyze trends and make evidence-based decisions.
9. Train staff. Educate workers on proper feeding practices and spotting signs of malnutrition. Encourage proactive communication when issues arise.
10. Use nutritional supplements if needed. Additives like vitamins, minerals, amino acids, enzymes, or probiotics can correct imbalances or support digestion and immunity.

Non-RAG, but detailed prompt (Optional “b”)

Drawing on APHIS inspection findings and USDA–FSIS analyses revealing common issues with feed and water—like microbial contamination, chemical residues, inadequate monitoring, and sanitation lapses—here are practical, evidence-based steps managers at ARS (and similar) poultry facilities can implement to ensure proper nourishment:

1. Source and use microbiologically safe feed. Ensure feed is sourced from reputable mills with rigorous hygiene protocols—this helps prevent Salmonella and other pathogens entering the flock via contaminated feed.
2. Heat-treat pelleted feed. Use pelleted feed that’s been heat-treated ($\geq 180^{\circ}\text{F}$) to reduce microbial load—FSIS notes this reduces Salmonella contamination risk.
3. Implement routine feed testing. Conduct regular microbial testing of feed (e.g., Salmonella, total/fecal coliforms) and chemical screening (e.g., mycotoxins, pesticide residues) to identify hazards early.
4. Prevent cross-contamination in mills. Ensure feed mills have effective cleaning protocols to prevent drug or toxin carryover (e.g., coccidiostats, antibiotics) and thoroughly flush equipment when switching formulations.
5. Maintain safe water supply. Provide clean, potable water at all times. APHIS–FSIS research shows reuse or recycled water systems must contain 1–5 ppm free chlorine, be free of solids, and be microbiologically monitored to prevent pathogen buildup.
6. Install continuous water monitoring. Regularly test water for chlorine residuals, turbidity, coliforms, Salmonella, etc. Weekly or more frequently until consistent safety is demonstrated.
7. Sanitize feeders and drinkers routinely. Clean and disinfect feeders/drinkers frequently to eliminate biofilm, mold, or microbial buildup—critical for maintaining feed/water hygiene.
8. Use reliable feed storage practices. Store feed in cool, dry, rodent- and pest-proof conditions; implement FIFO inventory management to prevent spoilage and mycotoxin or pathogen growth.
9. Calibrate feed deliveries accurately. Keep feeders at bird-appropriate heights and ensure uniform feed distribution; miscalibration can lead to uneven intake and wastage.
10. Document feed and water quality. Maintain records of feed sourcing, testing results, water treatment levels, equipment maintenance, feed conversion ratios (FCR), and bird health—this enables trend analysis and root-cause investigation.
11. Train staff on risk mitigation. Educate personnel to spot signs of inadequate nourishment (e.g., lethargy, poor growth), poor sanitation, water discoloration, or feeder/drinker malfunction and empower them to report issues immediately.
12. Collaborate with nutritionists and veterinarians. Work closely with poultry nutritionists and veterinarians to tailor diets (e.g., add vitamins, minerals, amino acids, enzymes, probiotics) during stress periods, early growth phases, or disease risk times.

By incorporating these steps—grounded in documented APHIS/FSIS observations—you can proactively safeguard feed and water quality, maintain optimal nutritional intake, and support flock health and productivity.

RAG-creative (Temp 0.875) prompt (Optional “c”)

1. To ensure adequate nourishment and overall welfare of poultry in research facilities, managers can take the following practical steps: 1. Enhanced Record-Keeping: Maintain clear, comprehensive, and up-to-date records of daily observations of each bird, including their food and water intake, behavior, and any signs of distress or illness.
2. Regular Veterinary Checks: Schedule routine veterinary inspections to assess the health of the birds and diagnose any nutritional deficiencies early. The attending veterinarian should regularly review and adjust feeding plans as necessary.
3. Proper Staff Training: Ensure that all staff members are adequately trained in poultry care, including understanding the importance of nutrition, signs of malnutrition or dehydration, and the procedures for reporting and addressing potential issues.
4. Quality Feed: Procure high-quality, nutrient-rich poultry feed that meets all the dietary requirements of the birds. Regularly evaluate the feed quality and make adjustments based on the specific needs of different poultry types and their life stages.
5. Consistent Water Supply: Guarantee a consistent and clean water supply that is easily accessible to all birds. Monitor water lines daily for cleanliness and proper function to prevent dehydration.
6. Environmental Monitoring: Frequently check and control the barn environment to maintain appropriate temperature and humidity levels, which can affect food intake and overall health.
7. Portion Control and Feeding Times: Implement precise portion control and regular feeding times to prevent overfeeding or underfeeding. Adjust the feeding schedule based on the age, health, and productivity of the birds.
8. Health Interventions: Promptly address any signs of illness or poor nutrition, such as lethargy, feather problems, or reduced feed intake, with appropriate veterinary interventions.
9. Nutritional Supplements: Depending on veterinary advice, consider the use of nutritional supplements to address any specific deficiencies noted during health checks.
10. Feedback Mechanism: Develop a feedback mechanism where staff can report any anomalies in bird behavior or health, including signs of inanition or dehydration, without repercussions. This encourages proactive health management.
11. Audit and Feedback: Regularly audit the feeding and care processes, and use the insights gained to improve the protocols and training continuously.
12. Collaborate with Experts: Work closely with poultry nutritionists, veterinarians, and other experts to keep updating the knowledge base about the best practices in poultry nutrition and care.

By implementing these steps diligently, poultry facility managers can significantly enhance the nourishment and overall well-being of their birds, ensuring that they meet both the ethical standards and scientific needs of the research facilities.

Context-ignored prompt (Optional “d”)

1. Regular Inspection of Food Supplies: Facility managers should establish a routine schedule for inspecting all food supplies to ensure they are free from contaminants, spoilage, and are of high nutritional quality. This includes checking for mold, pests, and proper storage conditions.
2. Maintain Clean and Functional Feeding Equipment: Regularly clean and maintain feeders and other feeding equipment to prevent contamination and ensure even distribution of food among the poultry.
3. Proper Storage of Feed: Store poultry feed in a cool, dry place to prevent spoilage and contamination. Use sealed containers that are rodent-proof and regularly check for any signs of infestation or moisture.
4. Nutritional Analysis: Work with a poultry nutritionist to analyze the nutritional content of the feed. Ensure that the feed meets the specific dietary requirements of the poultry at different stages of their growth.
5. Water Quality and Availability: Ensure that fresh, clean water is available at all times. Regularly clean water containers and check the water supply for any contamination to prevent waterborne diseases.
6. Monitor Poultry Health: Keep a close eye on the health of the poultry. Changes in eating habits or a drop in consumption can indicate health issues or deficiencies in the feed. Regular health checks can help catch and address any issues early.
7. Training for Staff: Provide training for all staff handling feed on proper handling, storage, and distribution techniques. This helps in maintaining consistency and ensures all safety measures are followed.
8. Record Keeping: Maintain detailed records of feed types, batches, nutritional information, and consumption rates. This data can help track the effectiveness of the feeding program and make necessary adjustments.
9. Pest Control: Implement an effective pest control program to prevent animals and insects from contaminating the feed or spreading disease to the poultry.
10. Compliance with Regulations: Stay updated with local and national regulations regarding poultry feed and care. Ensure compliance to avoid legal issues and to maintain high standards of poultry nourishment and welfare.
11. Feedback Mechanism: Establish a feedback mechanism to get insights from staff and external inspectors on the feeding process and implement suggestions for improvements.
12. Emergency Preparedness: Have a contingency plan in place for emergency situations such as feed supply disruptions. Keep an emergency stock of feed and have alternative suppliers ready.

By implementing these practical steps, poultry facility managers can ensure that their birds receive adequate and safe nourishment, leading to healthier poultry and potentially better productivity.

What to notice about the RAG vs non-RAG

Examples from this workshop

RAG pros:

- Based on known issues, not just “textbook” studies
- Highly tailored to USDA ARS-type environments.
- Clear segmentation of recommendations
- More action-oriented for daily facility management use.

RAG cons

- Some broad recommendations “Monitor bird health,” reflecting tone of input.
- Over-biases input data. no mention of FSIS know-how, like Salmonella risk, or chlorine residuals in water
- Responses seem complete either way.

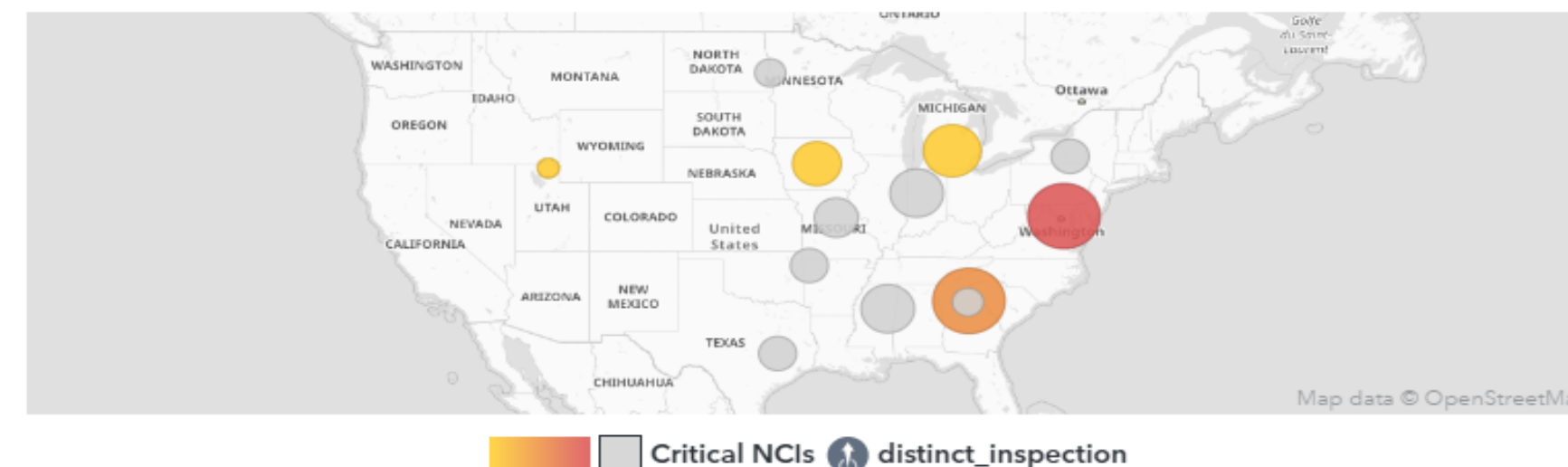


USDA
APHIS

- Result/Benefit: Prioritize next inspection on a facility-risk basis. Automate follow-up inspection decisions. Ensure follow-ups with facilities are crisp and fact-based. Improve efficiency of interventions by another 10*

Legal Name	Inspection Date	US ZIP	State	Critical N... ▼	Non-Critical NCIs	Direct NCIs	Concept Name ▲	Frequency
Northeast Area Beltsville Location	May 17, 2022	20705	Maryland	2	1	1	c_all_bird_and_ai_related	63
US National Poultry Research Center	December 17, 2024	30605	Georgia	2	.	.	c_bird_issue	21
US National Poultry Research Center	May 25, 2022	30605	Georgia	1	1	.	c_correct_issue	23
Poisonous Plant Research Laboratory	July 26, 2017	84341	Utah	1	1	.	C_Water_Feed	34
Avian Disease and Oncology Laboratory	May 18, 2017	48823	Michigan	1	.	.		
National Animal Disease Center	September 19, 2017	50010	Iowa	1	.	.		
National Animal Disease Center	February 11, 2025	50010	Iowa	1	1	.		
Avian Disease and Oncology Laboratory	April 2, 2024	48823	Michigan	.	.	.		
Avian Disease and Oncology Laboratory	August 30, 2023	48823	Michigan	.	.	.		
Avian Disease and Oncology Laboratory	June 4, 2019	48823	Michigan	.	.	.		
Livestock Behavior Research Unit	February 27, 2024	47907	Indiana	.	.	.		

Critical NCIs by US ZIP sized by distinct_inspection

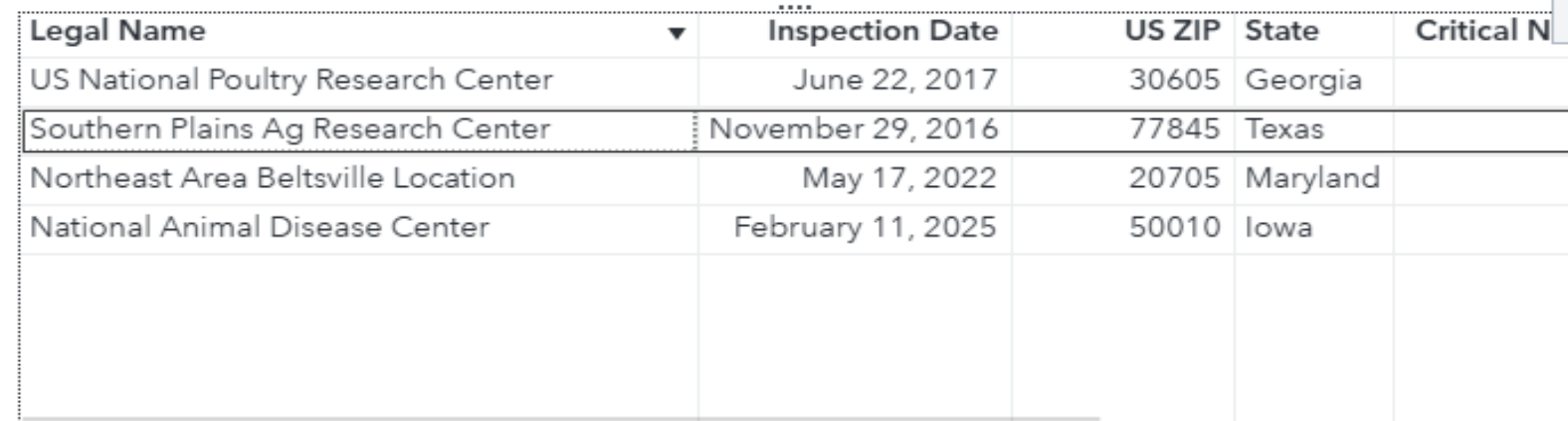


05

 $\nabla \cdot \mathbf{u} = 0$

Age Group	Percentage
18-24	15%
25-34	25%
35-44	35%
45-54	45%
55-64	55%
65-74	65%
75+	75%

ans



to be weeviles were observed in the bulk feed receptacle for the pigs and in one bulk foodreceptacle for the c

