



## Computer Vision

Object detection and classification, visual similarity, defect detection



## Natural Language Processing

Knowledge Assistant, Information Retrieval, Semantic Similarity



## Data analytics

Anomaly detection , classification, predictions,...

**REBATCH.INDUSTRIES**

PETER MEES

**EFFICIENCY**

**INFORMATION**

**FORECASTS**

**MULTI LINGUAL**



**GATEWAY/  
ASSISTANT**

**LIVE DATA**

**WARNINGS**

**OBJECTIVE**

**SPEECH SUPPORT**

**FACTORY OF THE FUTURE**



**NOVEMBER 30, 2022**





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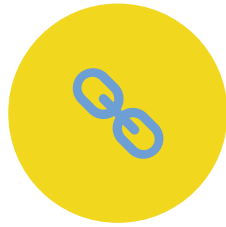


**THE POWER OF LLMs**  
**NOT JUST ANOTHER HYPE**



# THE POWER OF LLMs

NOT JUST ANOTHER HYPE



**ACCESSIBILITY**

**FAST INFORMATION  
RETRIEVAL FROM  
DIFFERENT SOURCES**

**INSIGHTS**

**REASONING**

**KNOWLEDGE  
RETENTION AND  
TRANSFER**

**MULTILINGUAL  
SUPPORT**

**SUMMARIZATION**



# **IMPORTANT CONSIDERATIONS**

## **WHEN USING AN LLM IN A BUSINESS/INDUSTRIAL CONTEXT**



# Why not use ChatGPT directly in the enterprise?

Direct usage of [ChatGPT in an enterprise presents risks and challenges](#) (link resides outside ibm.com). These include security and data leakage, confidentiality and liability concerns, intellectual property complexities, compliance with open-source licenses, limitations on AI development, and uncertain privacy and compliance with international laws. Here, I explore these risks and share examples that illustrate how these risks could manifest in your everyday enterprise activities.

## WHAT ARE THE RISKS OF CHATGPT?

ChatGPT comes with risks. Before entering a prompt, ChatGPT lists several limitations. These include occasionally generating incorrect information, producing harmful instructions or biased content, and having a limited knowledge of the world and events after 2021. Other risks are also present.

Privacy concerns arise because ChatGPT may collect and store whatever information a user inputs. So, for example, entering customer names and contact information risks exposing your customer's private information. Similarly, disclosing confidential information to ChatGPT could result in your company's trade secrets or other confidential information being shared with other users or losing legal protection.



# IMPORTANT CONSIDERATIONS

## WHEN USING AN LLM IN A BUSINESS/INDUSTRIAL CONTEXT



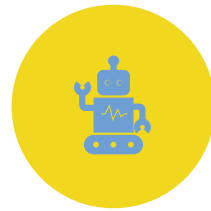
HOW TO KEEP  
SENSITIVE **DATA**  
**SECURE?**



HOW TO AVOID  
**VENDOR LOCK-IN?**



HOW CAN WE  
CONTROL **COSTS?**



HOW NOT TO FALL  
BEHIND IN TERMS OF  
**INNOVATION/TECHN**  
**OLOGY?**



HOW CAN WE KEEP  
KNOWLEDGE UP TO DATE,  
AND CAN IT BE **IMPROVED**  
THROUGH USAGE?



**BIAS/HALLUCINATIONS**  
**HUMAN IN THE LOOP**



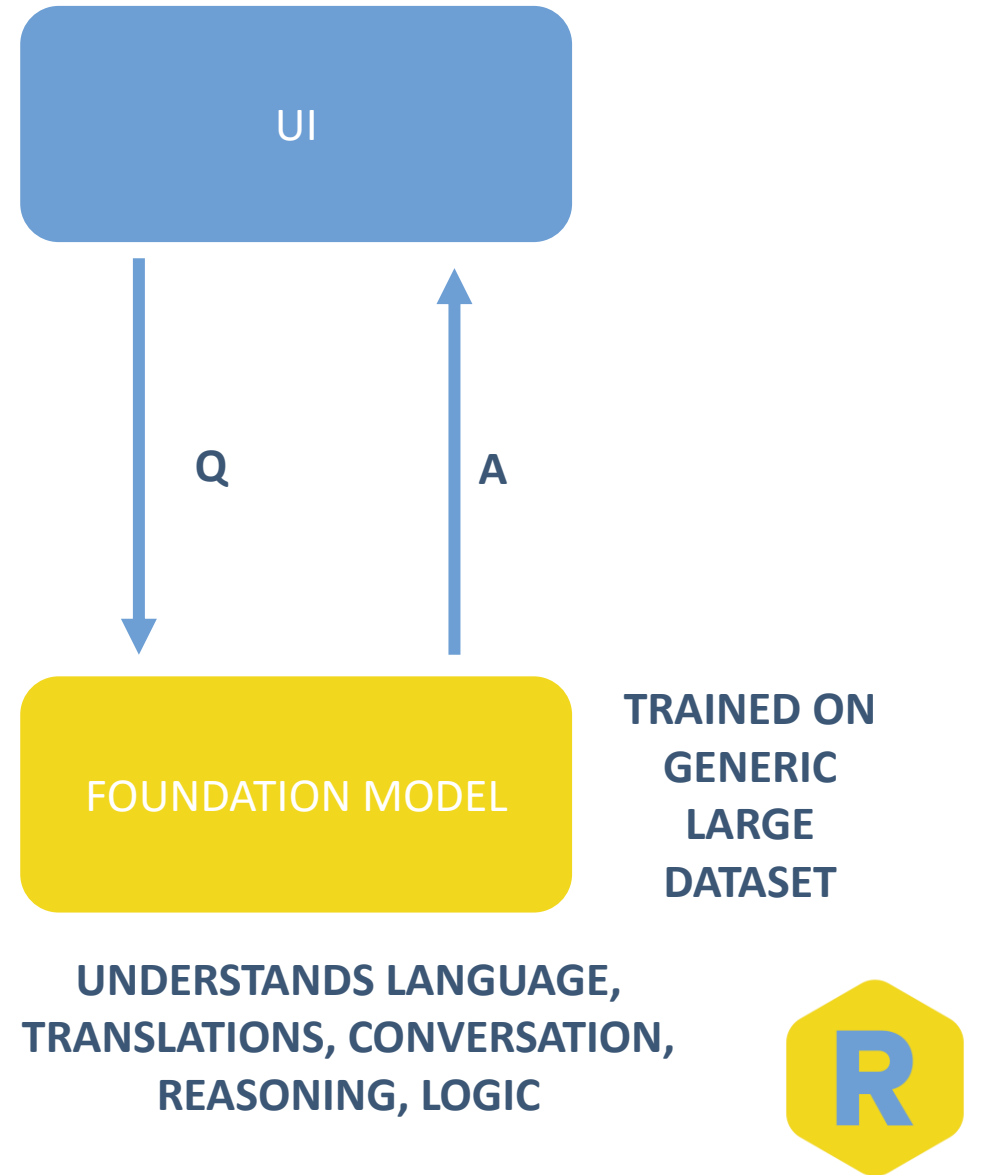
# THE FOUNDATION OF AN ASSISTANT

WHERE TO START?



# LLMs

## ARCHITECTURE



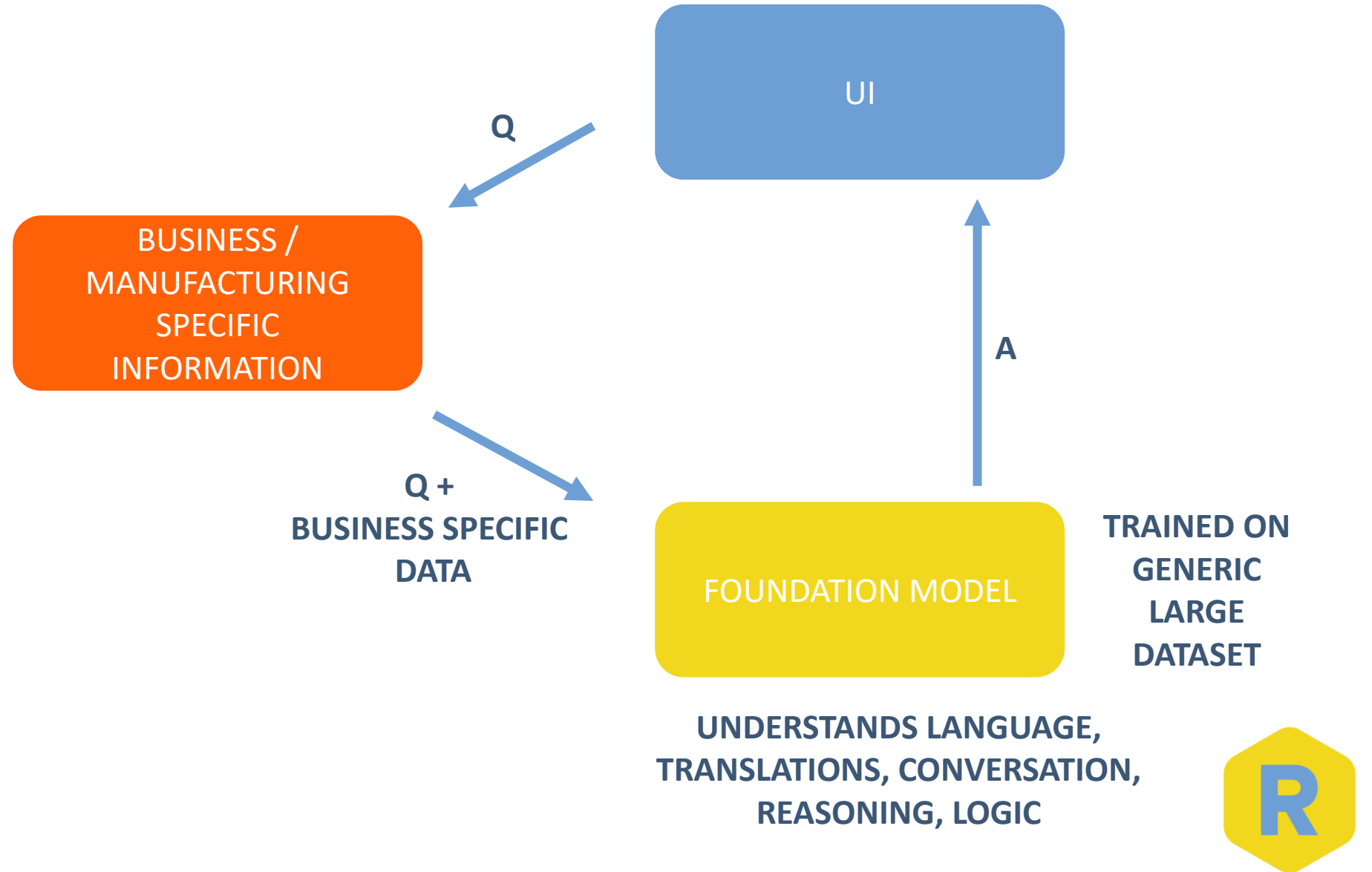
# THE INFORMED ASSISTANT

A CONNECTION TO YOUR DATA SOURCES



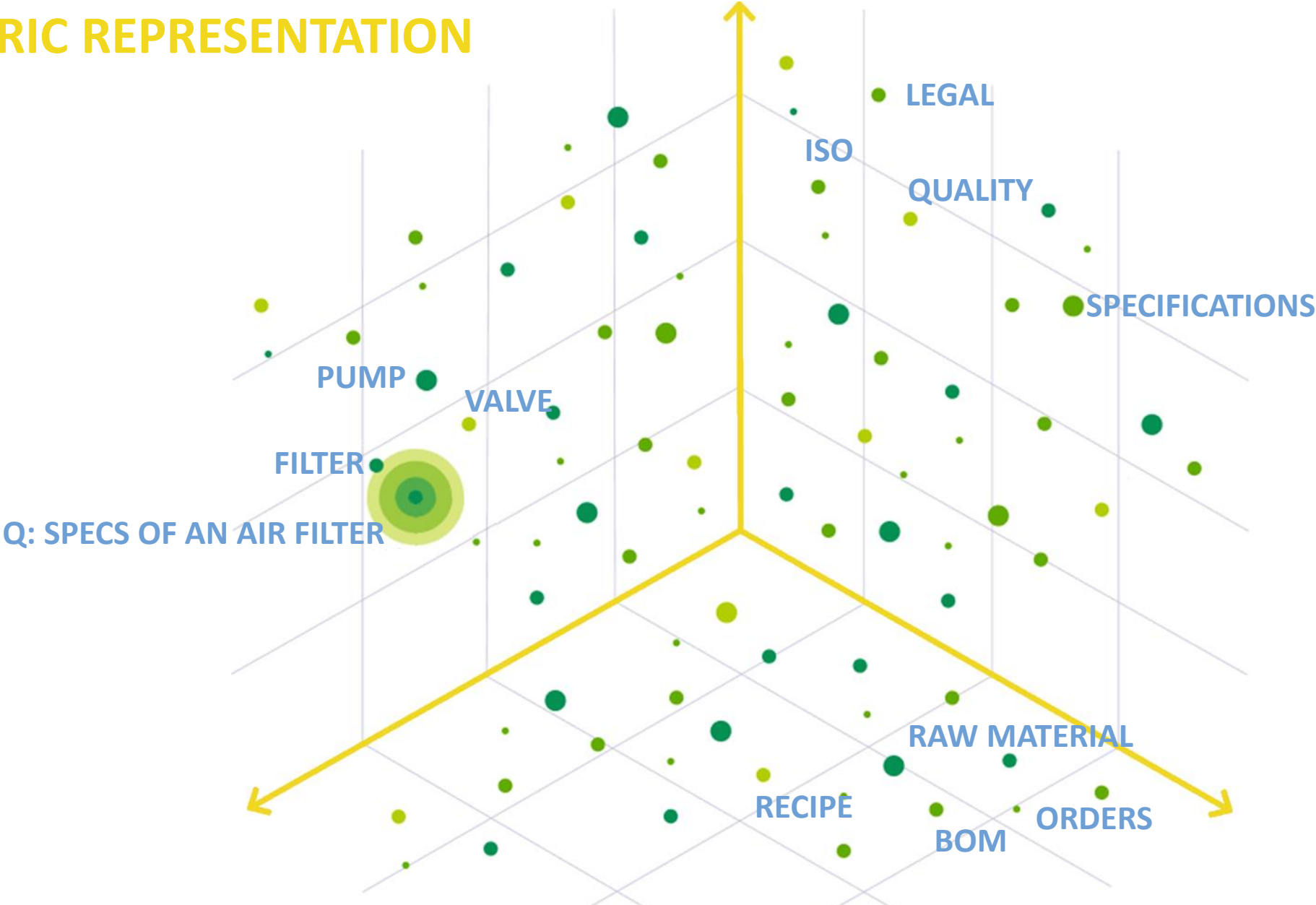
# LLMs

## ARCHITECTURE



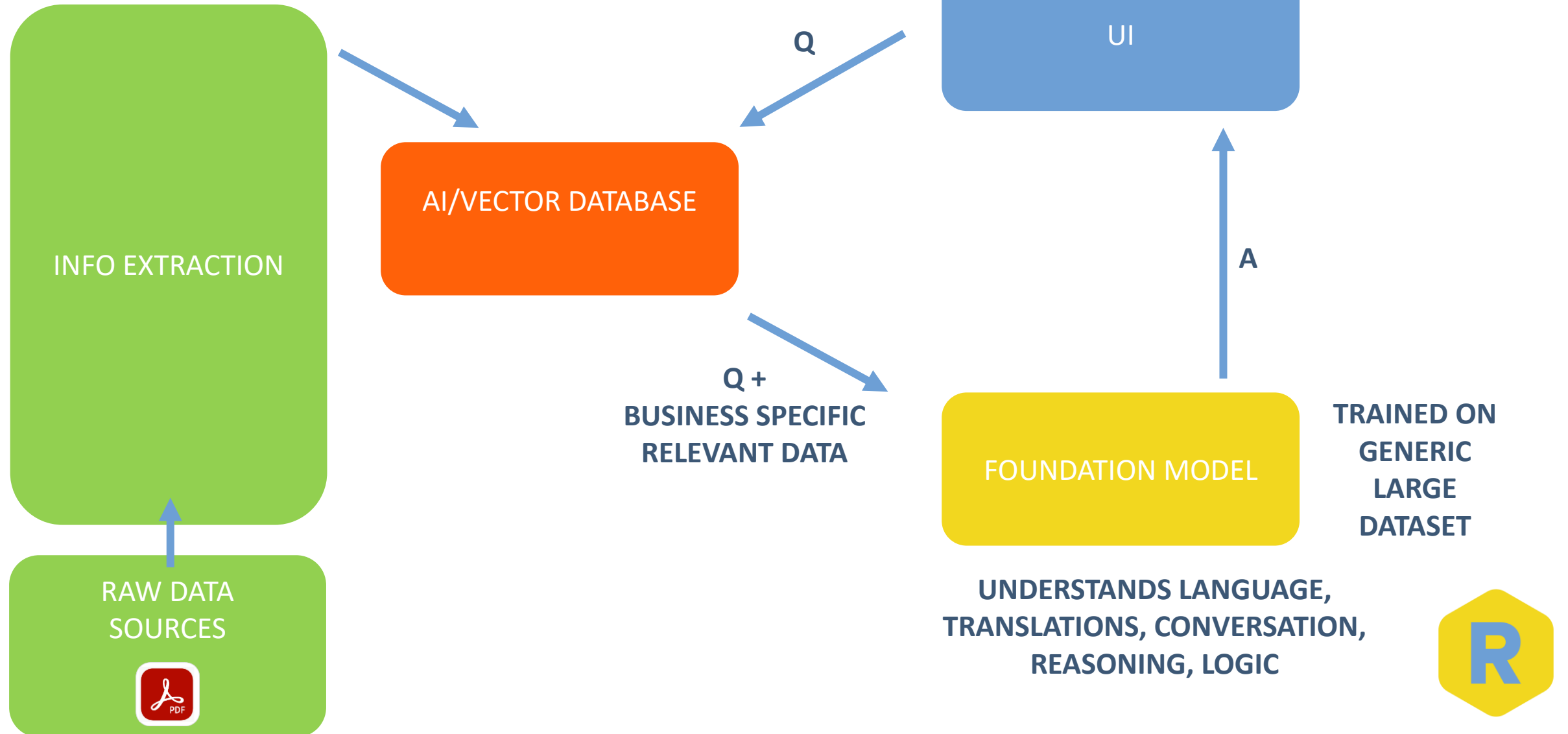
# VECTOR DATABASE

## A NUMERIC REPRESENTATION



# LLMs

## RAG (Retrieval Augmented Generation)



# iriSearch

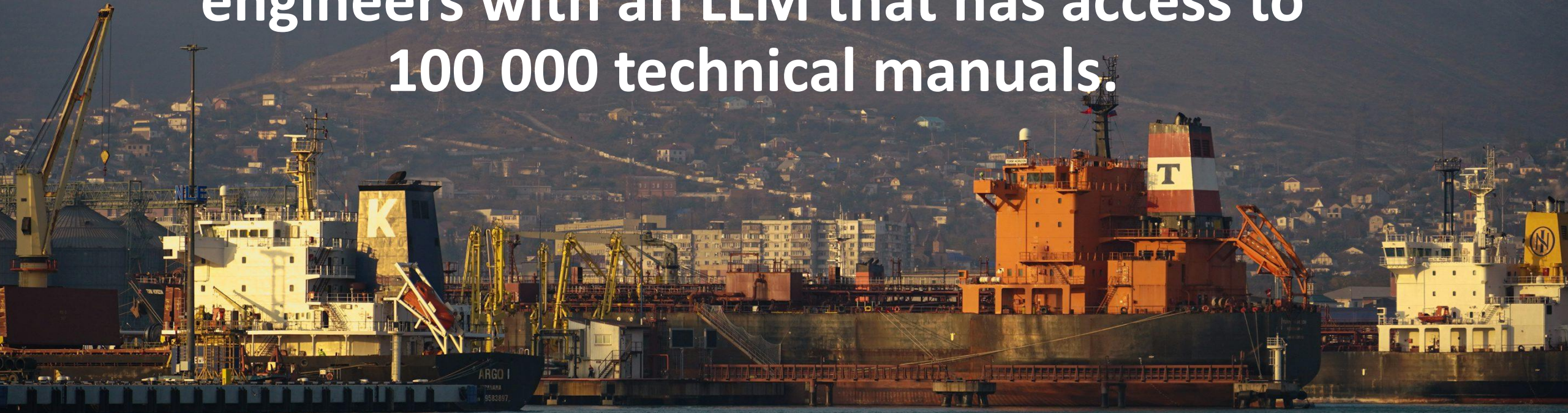
An enterprise-grade **assistant**, comparable with 'ChatGPT' **tailored specifically for your company**, equipped with a comprehensive understanding of your **documents**, and capable of accurately **answering any company-related inquiries**. It's designed to provide precise, reference-based responses, ensuring that the **human user remains in control**.

[www.irisearch.ai](http://www.irisearch.ai)





**Supporting offshore maintenance  
engineers with an LLM that has access to  
100 000 technical manuals.**







Pump A735 has a low flow rate at 1500 rpm, back pressure is 0.95MPa.  
What is a possible cause and how can we fix it?



MM Wed 10 Jul 2024 - 14:56

Pump A735 has a low flow rate at 1500 rpm, back pressure is 0.95MPa. What is a possible cause and how can we fix it?

Sources

Centrifugal pump PE series 2023.pdf

1 Pump A735 is a pump of type GEH406M2ME0.75 PE(2), specifications can be consulted here. (page 3)

InstallationOperationMaintenance\_3393.pdf

2 If the flow rate of a PE2 pump is too low, several factors could be causing the issue. Investigating the following areas can help identify and resolve the problem: check flow, pressure and motor speed. (page 26)

Centrifugal pump PE series 2023.pdf

3 According to the spec, the max back pressure is 0.77 MPa at 0.75kW at 1500 RPM. (page 3)

InstallationOperationMaintenance\_3393.pdf

4 3 options: Open discharge valve further. Reduce resistance discharge pipe, clean filter. Use a larger impeller. (page 6)

Show more results >

Answer

⚠ Use with caution. This answer is not validated by a human. [Learn more](#)

Pump A735 is a pump of type GEH406M2ME0.75 PE(2).  
 If the flow rate of a PE2 pump is too low, several factors could be causing the issue. Investigating the following areas can help identify and resolve the problem: check flow, pressure and motor speed.  
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 3 options: 1. Open discharge valve further. 2. Reduce resistance discharge pipe, clean filter. 3. Use a larger impeller.

Type your question....

Centrifugal pump PE series 2023.pdf

Specification table

50Hz

Suction bore mm	Discharge bore mm	Ref.	Model	Motor LW	Standard specifications				Maximum back pressure MPa	GE-C/S/502 E	
					Capacity m <sup>3</sup> /min	Total head m	Capacity m <sup>3</sup> /min	Total head m		Vibration isolator application table	
40	32	1	GEI405CE0.75	0.75	0.05	19.8	0.2	14.5	0.77	PBKV-46-404-01	PX-60Z
		2	GEI405CE1.5	1.5	0.05	31	0.2	24	0.62	PBKV-46-404-02	PX-60Z
		3	GEI405CE2.2	2.2	0.05	40	0.2	33.5	0.58	PBKV-46-404-02	PX-60Z
50	40	4	GEH505CE0.75	0.75	0.1	15.8	0.32	10.5	0.81	PBKV-46-404-01	PX-60Z
		5	GEI505CE1.5	1.5	0.1	22.5	0.32	17	0.75	PBKV-46-404-01	PX-60Z
		6	GEI505CE2.2	2.2	0.1	34.5	0.32	24	0.63	PBKV-46-404-02	PX-60Z
		7	GEI505CE3.7	3.7	0.1	45.5	0.32	36.5	0.53	QRE-01A	PX-60Z
		8	GEK505CE5.5	5.5	0.1	58	0.32	51	0.39	QRE-01A	PX-60Z
65	50	9	GEH655CE1.5	1.5	0.2	15.8	0.63	10.5	0.81	PBKV-46-404-01	PX-60Z
		10	GEI655CE2.2	2.2	0.2	22.8	0.63	15.2	0.75	PBKV-46-404-02	PX-60Z
		11	GEI655CE3.7	3.7	0.2	32.5	0.63	21	0.65	QRE-01A	PX-60Z
		12	GEK655CE5.5	5.5	0.2	45	0.63	34	0.52	QRE-01A	PX-85Z
80	65	13	GEK655CE7.5	7.5	0.2	54.5	0.63	43.5	0.42	QRE-01A	PX-85Z
		14	GEI805CE3.7	3.7	0.4	23	1.25	12	0.74	QRE-01A	PX-60Z
		15	GEI805CE5.5	5.5	0.4	30.5	1.25	20	0.64	QRE-01A	PX-85Z
		16	GEI805CE7.5	7.5	0.4	38.5	1.25	27.5	0.58	QRE-01A	PX-85Z

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7 Troubleshooting

## 7 Troubleshooting

### 7.1 Alignment troubleshooting

Symptom	Cause	Remedy
Horizontal (side-to-side) alignment cannot be obtained (angular or parallel).	The driver feet are bolt-bound.	Loosen the pump's hold-down bolts, and slide the pump and driver until you achieve horizontal alignment.
	The baseplate is not leveled properly and is probably twisted.	<ol style="list-style-type: none"> <li>Determine which corners of the baseplate are high or low.</li> <li>Remove or add shims at the appropriate corners.</li> <li>Realign the pump and driver.</li> </ol>

### 7.2 Operation troubleshooting

Symptom	Cause	Remedy
The flow rate is too low.	The back pressure is too high.	Open the discharge valve a little further. <a href="#">Reduce the resistance in the discharge pipe. Clean the filter if necessary.</a> <a href="#">Use a larger impeller. Make sure to take note of the available motor power.</a>
	The speed is too low.	Increase the speed. Check the available motor power. Compare the speed of the motor with the specified pump speed. See the rating plate. When you adjust the speed (frequency transformer), check the reference value settings.
The impeller diameter is too small.		Use a larger impeller. Check the available motor power.
The pump and/or pipes are not completely filled with liquid.		Fill the pump and/or pipes with liquid. Vent the pump and/or pipes.
The pump or suction/intake pipe is blocked.		Clean the pipes.

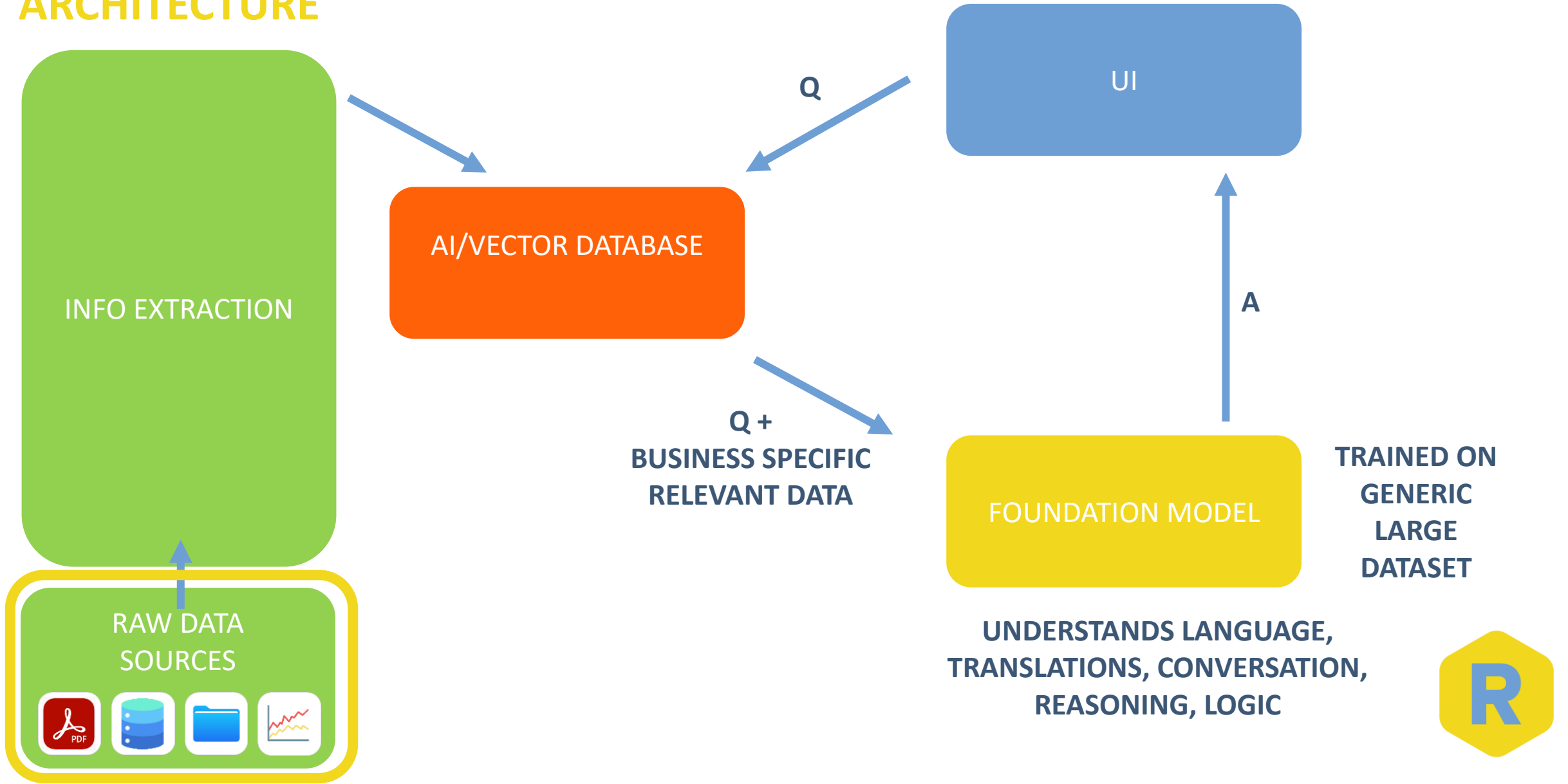
# THE INFORMED ASSISTANT

A CONNECTION TO MULTIPLE DATA SOURCES



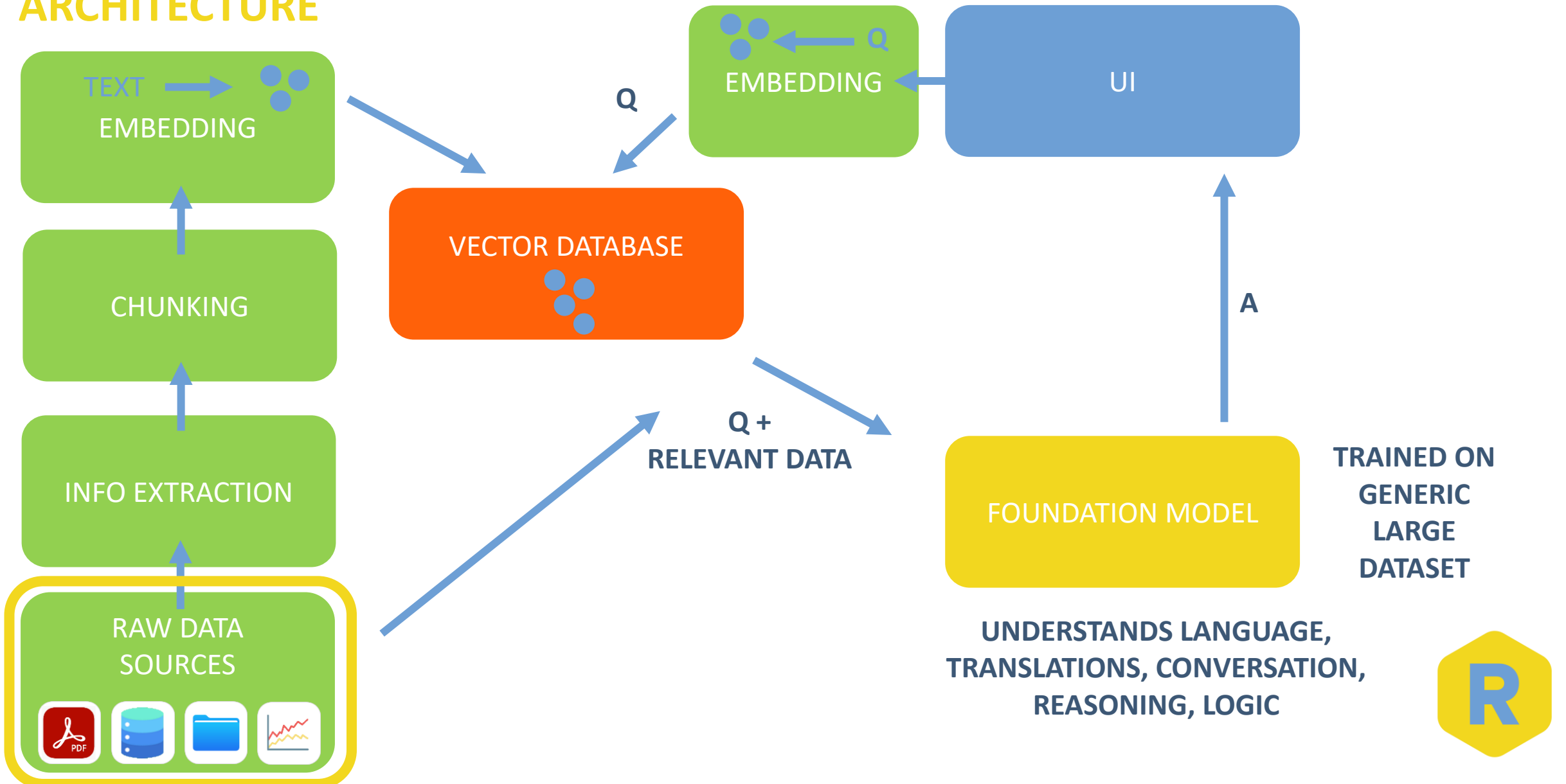
# LLMs

## ARCHITECTURE



# LLMs

## ARCHITECTURE





MM Wed 10 Jul 2024 - 14:56

Pump A735 has a low flow rate. Please check live conditions and advice.

Sources



Pump A735 has a low flow rate. Please check live conditions and advice.







Provide me the query you used to retrieve the data of the pressure.

Sources

Centrifugal pump PE series 2023.pdf

1 Pump A735 is a pump of type GEH406M2ME0.75 PE(2), specifications can be consulted here. (page 3)



SQL Servername: ProductionSQL\_A; Database: RawTagData

2 Pump A735 has a mean back pressure of 0.95 MPa at 1500 rpm. According to the specification, back pressure should be below 0.77 MPa.



Provide me the query you used to retrieve the data of the pressure.





MM Wed 10 Jul 2024 - 14:56

Show a trend of the pressure tag of the first 3 months in 2023.

Sources

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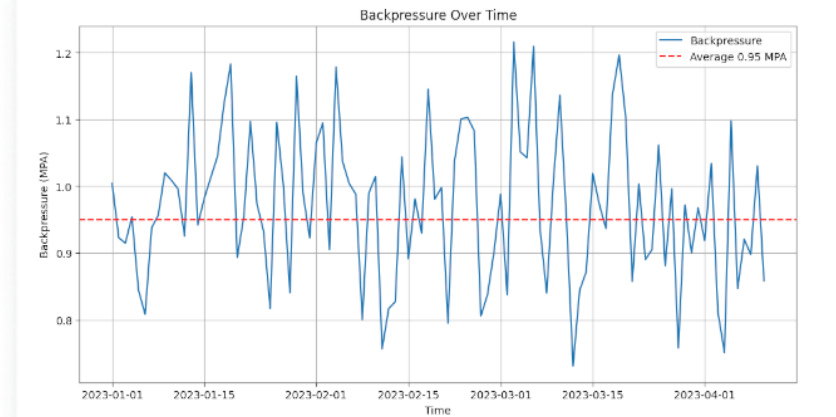


Servername: ProductionSQL\_A; Database: RawTagData

3 `SELECT AVG(rd.Data) AS Backpressure FROM rawData rd  
JOIN equipment e ON rd.EquipmentId = e.ID  
WHERE e.Name = 'pumpA735' AND rd.Tag = 'bpress'  
AND rd.Timestamp >= DATEADD(day, -X, GETDATE());`



Show a trend of the pressure tag of the first 3 months in 2023.



# THE SMART ASSISTANT

GENERATING INSIGHTS ON YOUR DATA



# TYPES OF DATA

## IN MANUFACTURING

### TEXT & NUMERIC DATA

Language Foundation Models

Trained primarily on text data to understand and generate human language.

Example : Llama

### TIMESERIES DATA

Timeseries Foundation Models

Trained on time-series data to handle tasks such as imputation, anomaly detection, classification, and forecasting.

Example : Moment

### VISUAL DATA

Vision Foundation Models

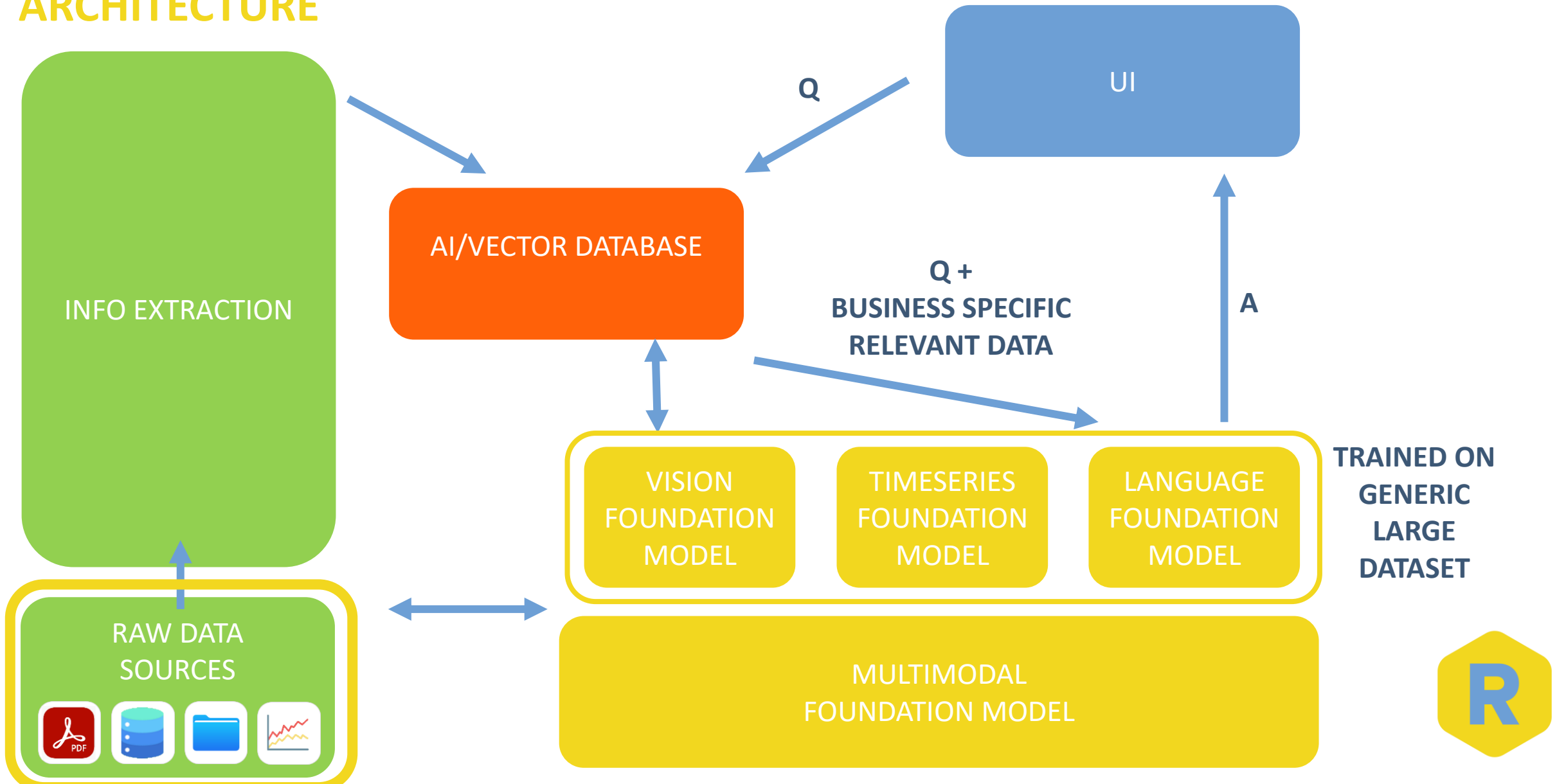
Classify, detect, segment, generate, describe images, answer visual questions, and integrate visual and textual data for comprehensive analysis.

Example : Pixtral



# LLMs

## ARCHITECTURE



# CONCLUSION

(OPEN SOURCE) MODELS WITH FEEDBACK LOOP & RAG, A GOOD FIT?



HOW TO KEEP SENSITIVE DATA SECURE?

TRANSPARENCY  
(PRIVATE) CLOUD  
/ON PREM



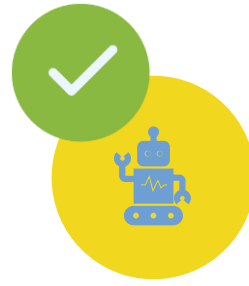
HOW TO AVOID VENDOR LOCK-IN?

OPEN STANDARDS



HOW CAN WE CONTROL COSTS?

COST EFFECTIVE



HOW NOT TO FALL BEHIND IN TERMS OF INNOVATION/TECHNOLOGY?

COMMUNITY



HOW CAN WE KEEP KNOWLEDGE UP TO DATE, AND CAN IT BE IMPROVED THROUGH USAGE?

RETRIEVAL AUGMENTED GENERATION (RAG)  
FEEDBACK LOOP



BIAS/HALLUCINATIONS

HUMAN IN THE LOOP



# ENVISION

## A MANUFACTURING ENVIRONMENT WHERE

An employee saves **10 minutes** per day.

Time saved per person per year : **1 week**

Unlocked budget ... in a company with 1000 people: **20 new hires!**



**Thanks!**  
**Any questions?**



**You can find me at:**

[peter.mees@rebatch.be](mailto:peter.mees@rebatch.be)

+32 494 41 97 25