

# Beyond ChatGPT: Exploring Next-Generation AI Technologies

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## Disclosures

Carl Preiksaitis, MD, MEd: No financial relationships to disclose

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Joshua W. Joseph, MD, MS, MBE: No financial relationships to disclose

The time is now...

EMERGENCY



# Impact of Artificial Intelligence-Based Triage Decision Support on Emergency Department Care

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Academic Emergency Medicine  
A GLOBAL JOURNAL OF EMERGENCY CARE

SPECIAL CONTRIBUTION |  [Open Access](#) | 

## Leveraging artificial intelligence to reduce diagnostic errors in emergency medicine: Challenges, opportunities, and future directions

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[... See fewer authors ^](#)

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THE PRACTICE OF EMERGENCY MEDICINE/ORIGINAL RESEARCH

## Artificial Intelligence to Predict Billing Code Levels of Emergency Department Encounters

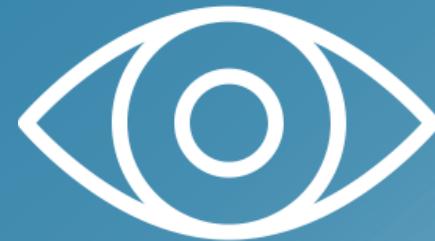
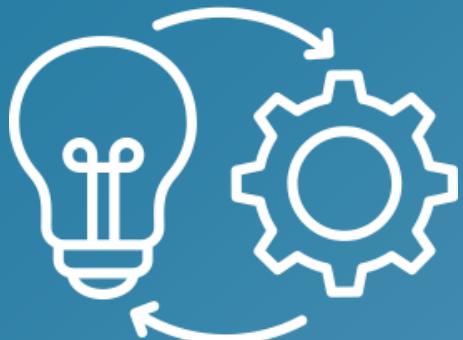


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ChatGPT





Retrieval Augmented Generation

# Prompts are limited by context knowledge

ChatGPT 3.5 ▾



You

User

Explain the policy for ICU admission of hyponatremia at Yale New Haven Hospital

# Prompts are limited by context knowledge

ChatGPT 3.5 ▾



You

User

Explain the policy for ICU admission of hyponatremia at Yale New Haven Hospital



ChatGPT

As of my last update in January 2022, I don't have specific details on the ICU admission policy for hyponatremia at Yale New Haven Hospital. Hospital policies can vary based on several factors including the severity of the condition, the patient's overall health status, and the hospital's resources and protocols.

However, in general, the decision to admit a patient with hyponatremia to the intensive care unit (ICU) would depend on the severity of the condition and the presence of symptoms or complications. Hyponatremia, which is a low sodium level in the blood, can range from mild to severe and can lead to symptoms such as confusion, seizures, coma, and even death if left untreated.

Patients with severe hyponatremia, especially if they are experiencing neurological symptoms or other complications, may require close monitoring and intensive treatment, which could warrant admission to the ICU. In contrast, patients with mild hyponatremia and no significant symptoms may be managed in a general medical or telemetry unit.

The decision regarding ICU admission is typically made by the attending physician in consultation with other members of the healthcare team, considering the individual patient's condition and needs.

For the most accurate and up-to-date information on Yale New Haven Hospital's policy for ICU admission of hyponatremia, it would be best to consult directly with the hospital or review their clinical guidelines and protocols.



Prompts  
are limited  
by context  
knowledge

ChatGPT 4 ▾



You

Explain the policy for ICU admission of hyponatremia at Yale New Haven Hospital

# Prompts are limited by context knowledge

ChatGPT 4 ▾



You

Explain the policy for ICU admission of hyponatremia at Yale New Haven Hospital



ChatGPT

Searched 7 sites

The policy for ICU admission of patients with hyponatremia at Yale New Haven Hospital involves specialized care based on the severity and type of the condition. Patients with severe acute or symptomatic hyponatremia may require ICU admission. The management strategy often includes the infusion of hypertonic saline, adjusted based on the patient's body weight and the severity of sodium imbalance, to reduce potential risks such as intracranial pressure ([Yale New Haven Health](#)).

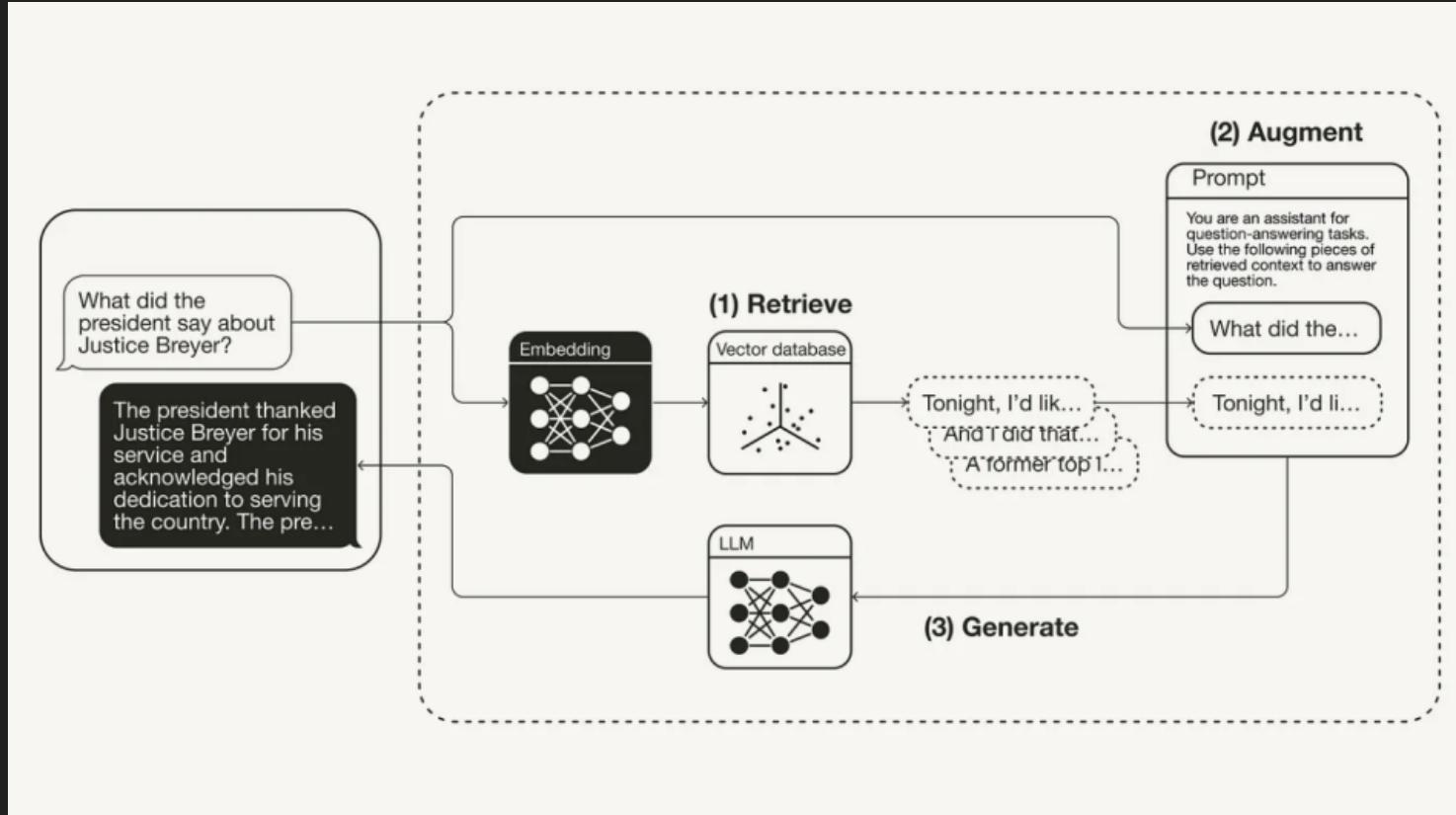
Additionally, Yale New Haven Hospital's ICUs, including the Medical Intensive Care Units (MICUs) at both the York Street and Saint Raphael campuses, are equipped to handle various critical conditions, providing specialized nursing and technology for patients whose conditions necessitate intensive care ([Yale New Haven Health](#)).

For more specific details on the protocols, including any recent updates specific to the management of hyponatremia in the ICU setting, it may be useful to contact the hospital directly or consult their detailed ICU service descriptions available on their official website.

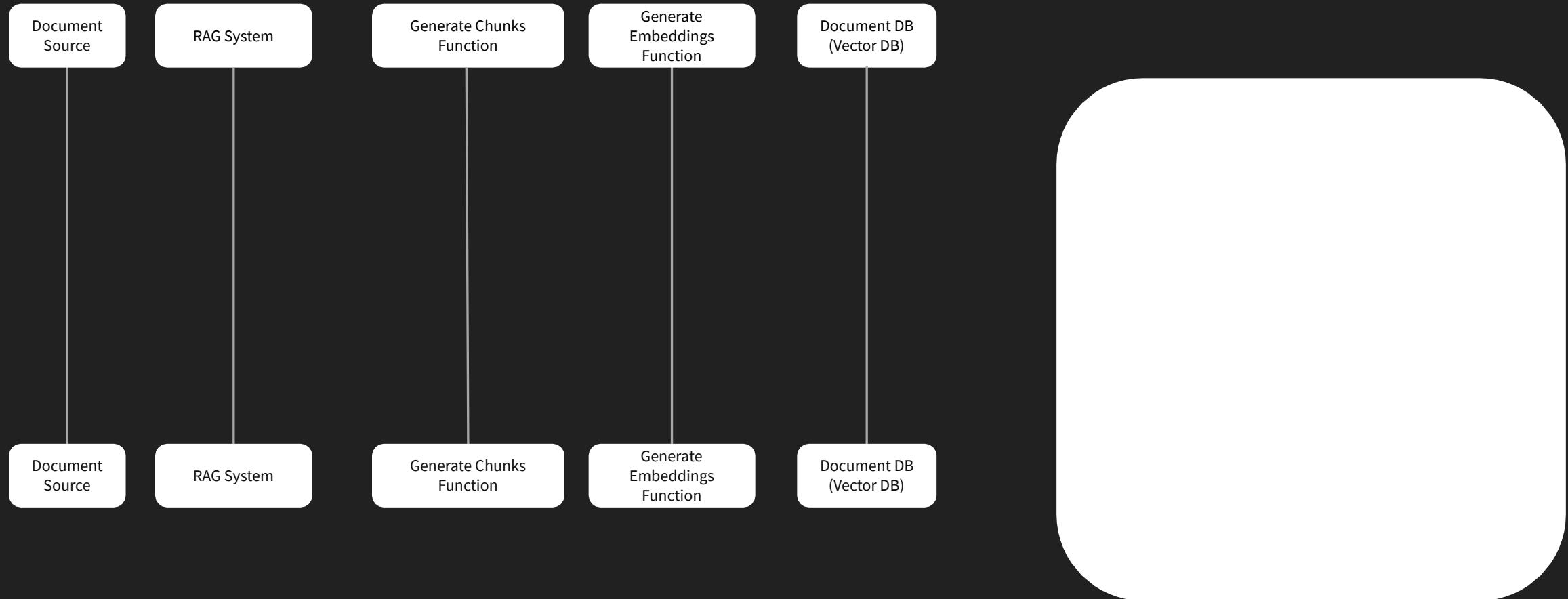


# How Do We Add More Context?

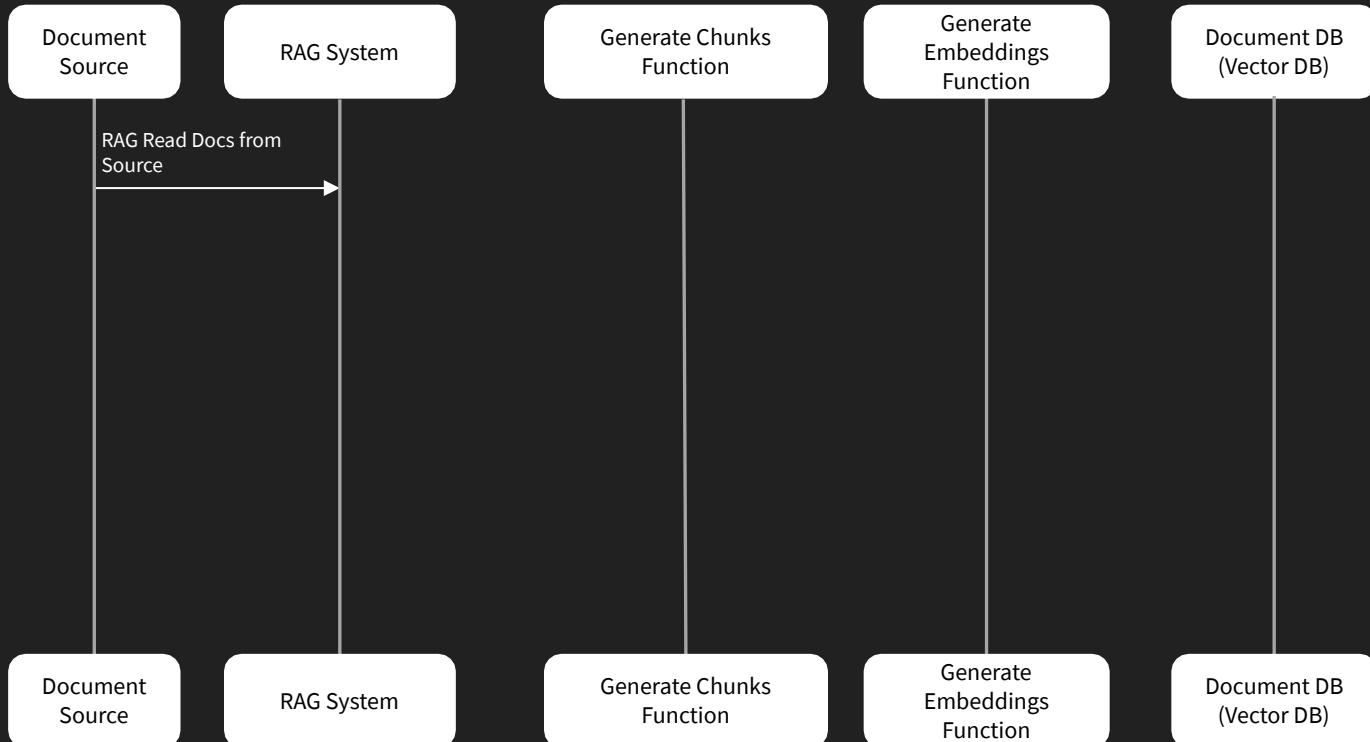
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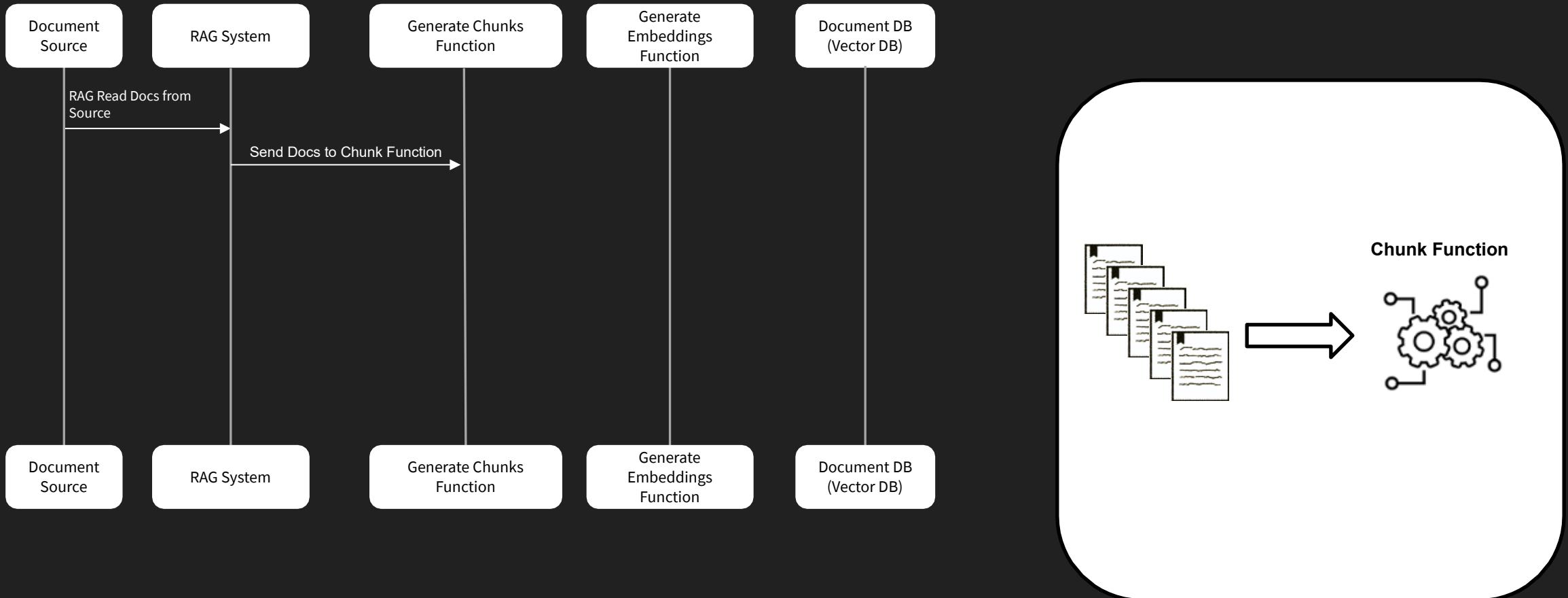
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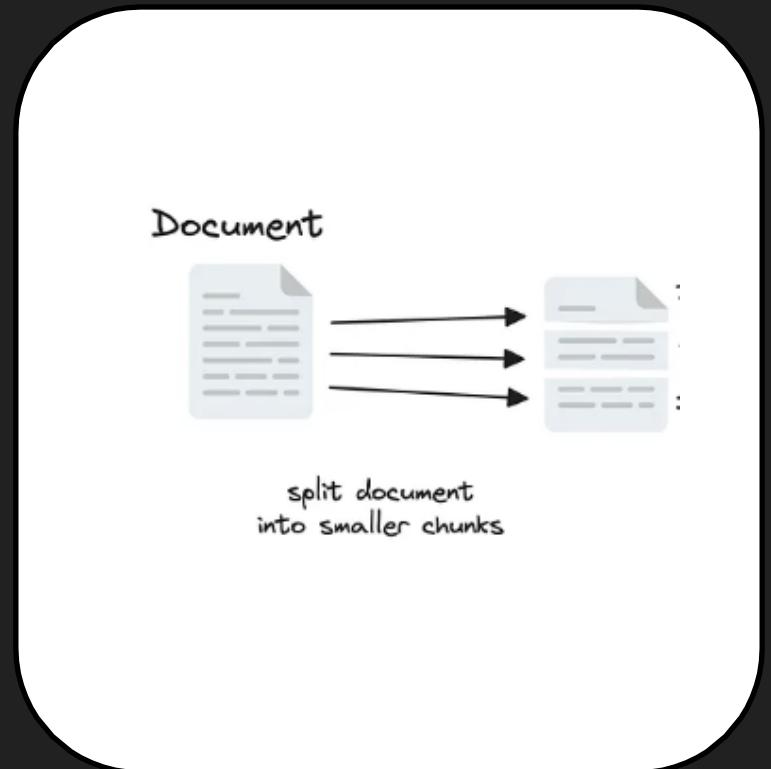
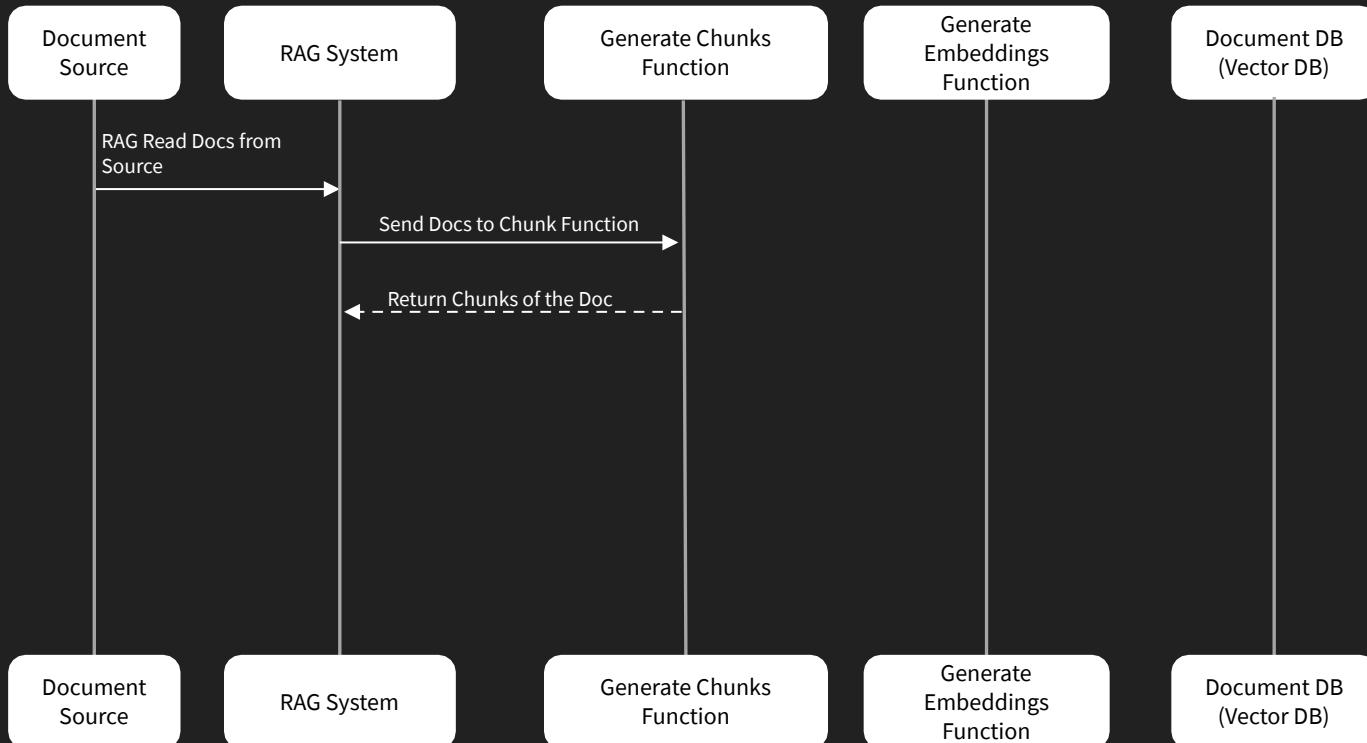
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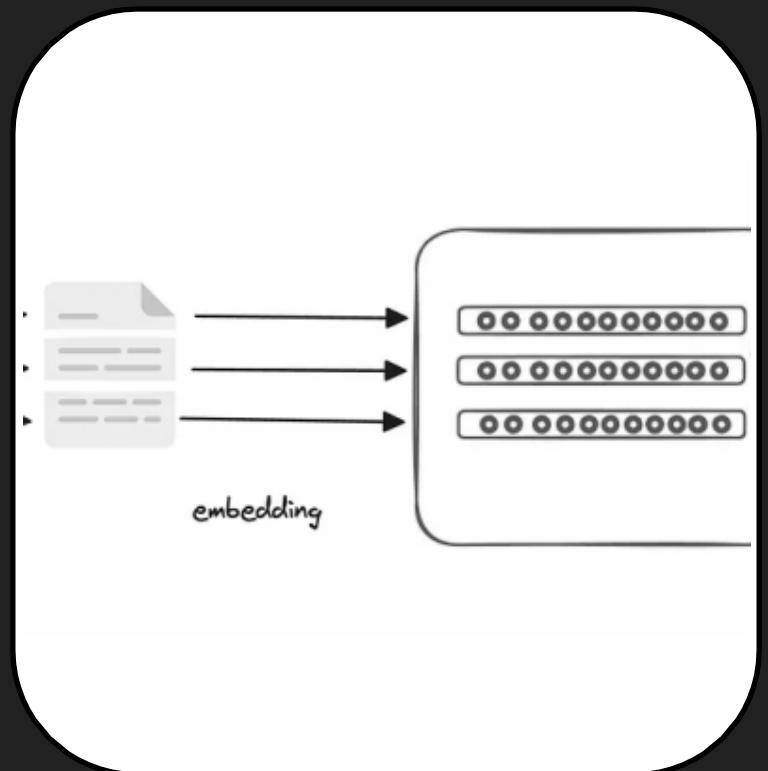
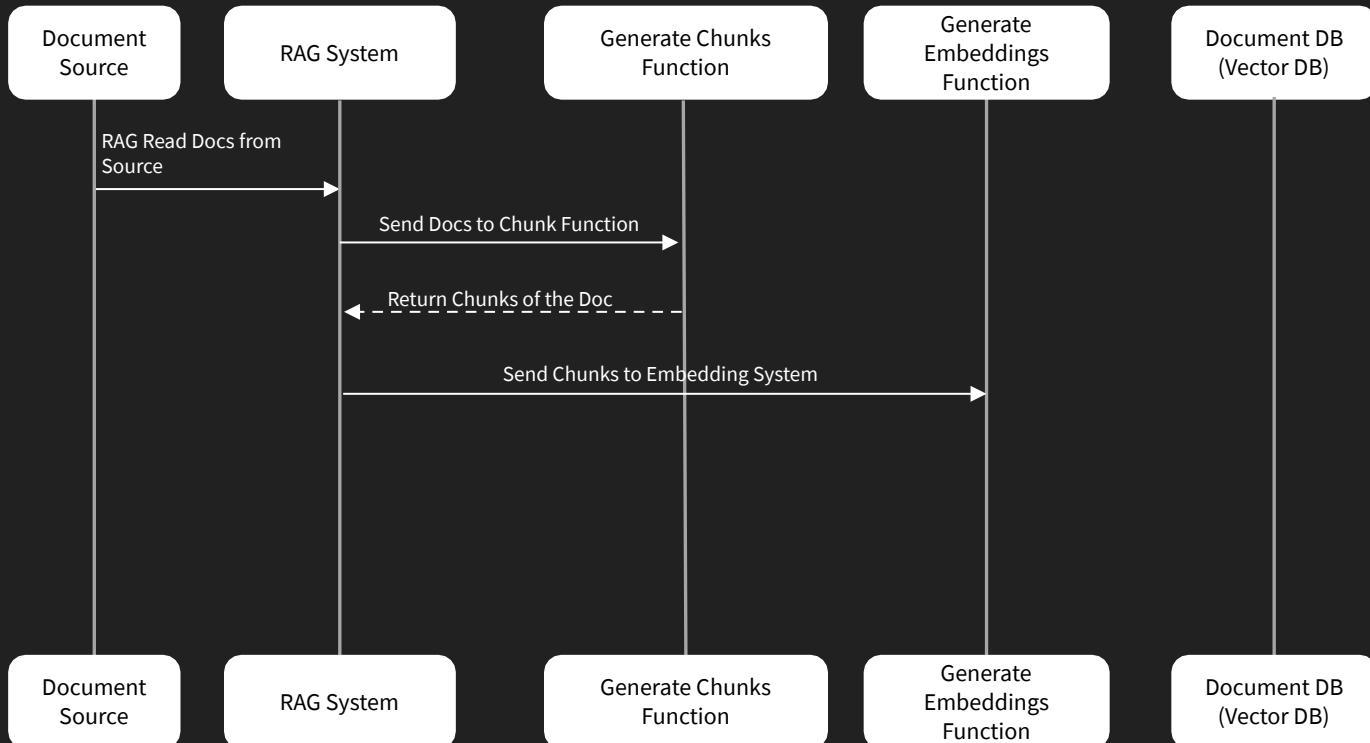
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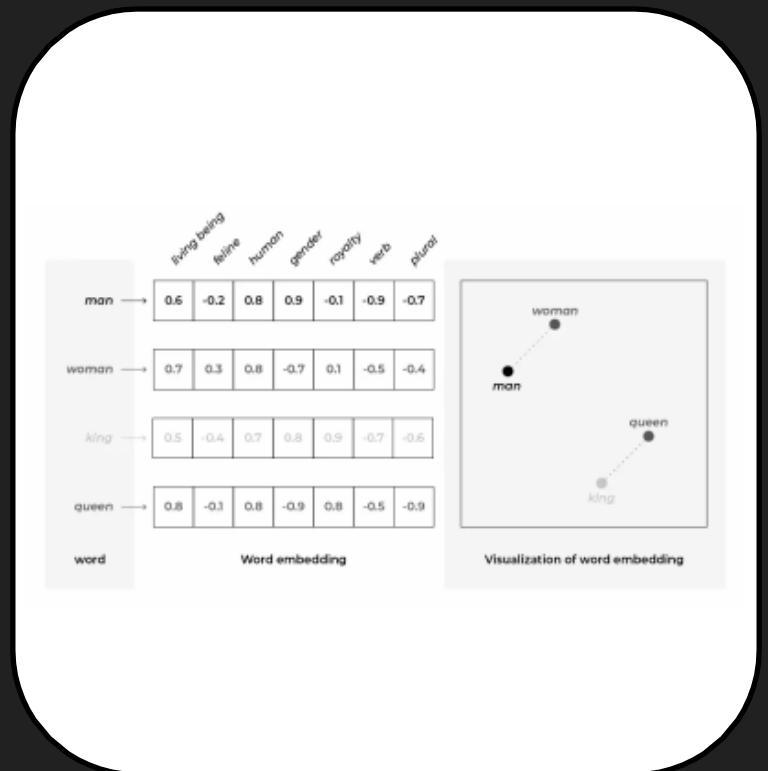
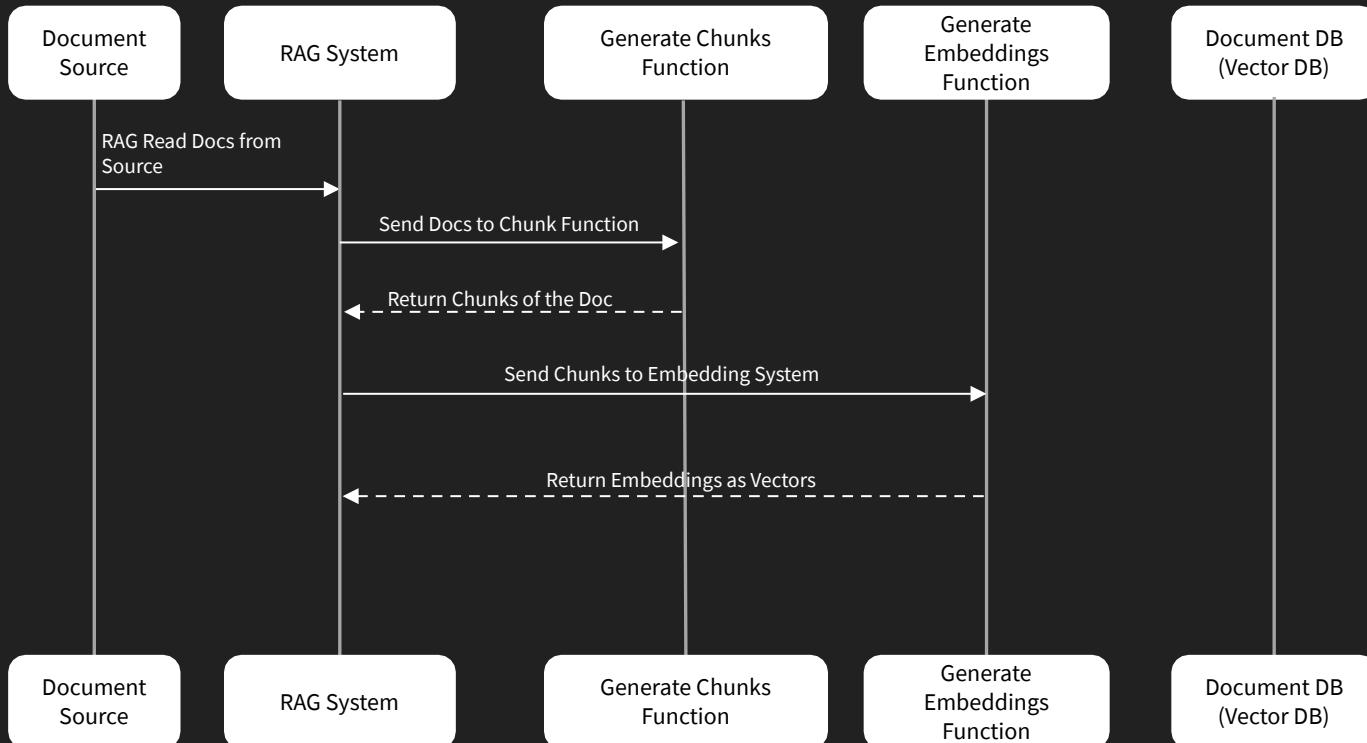
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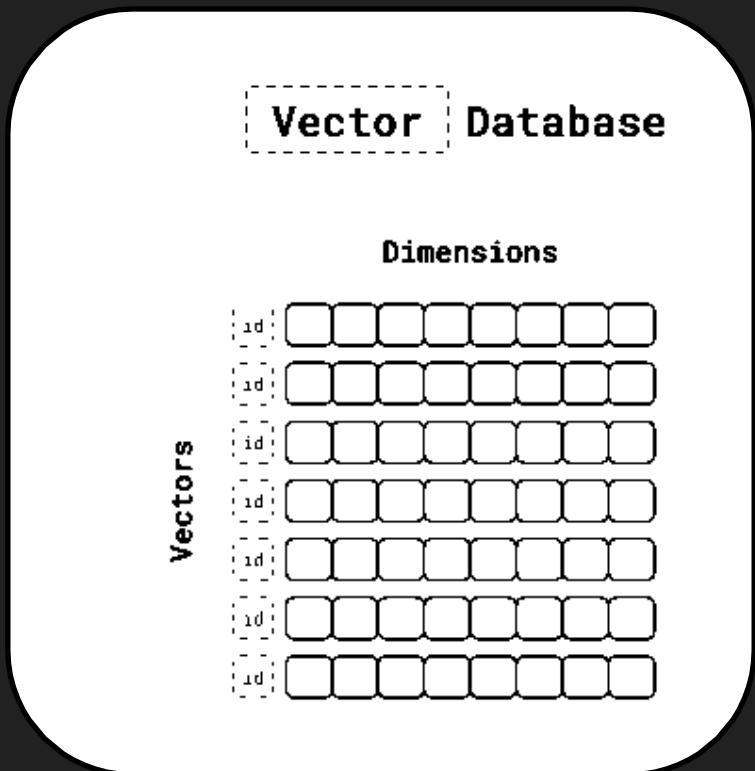
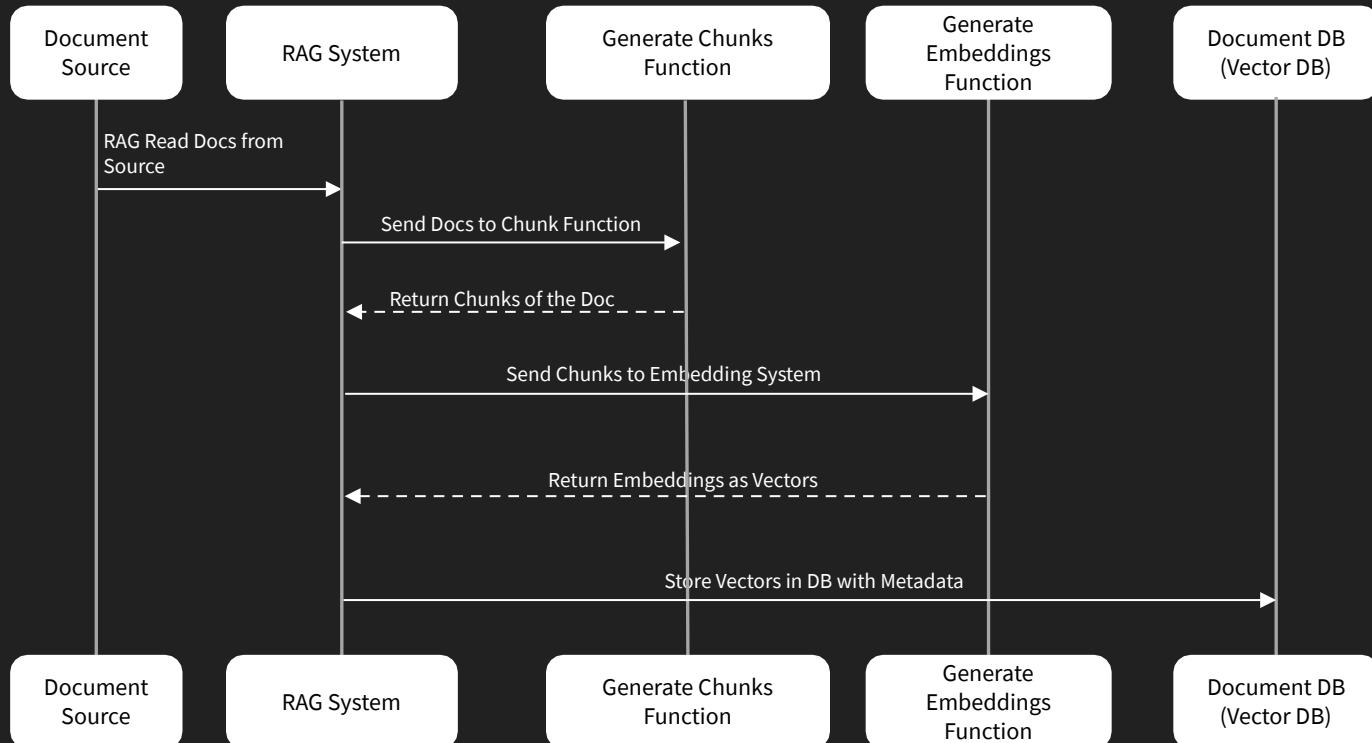
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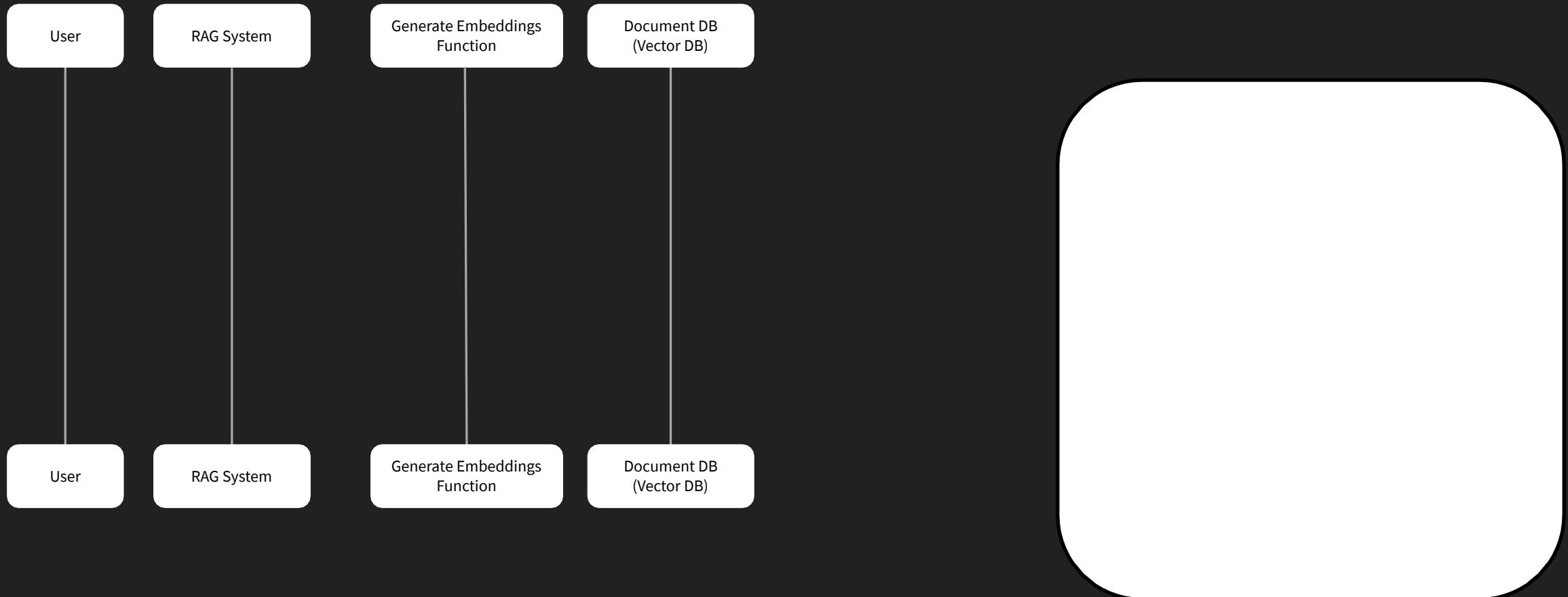
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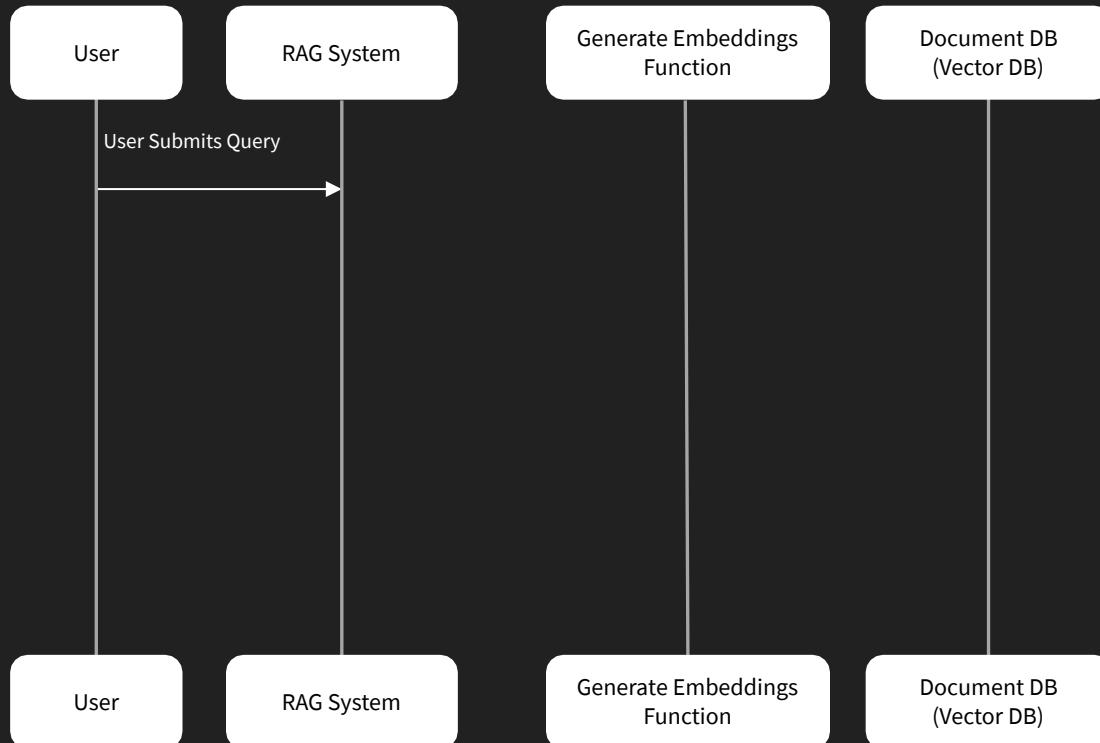
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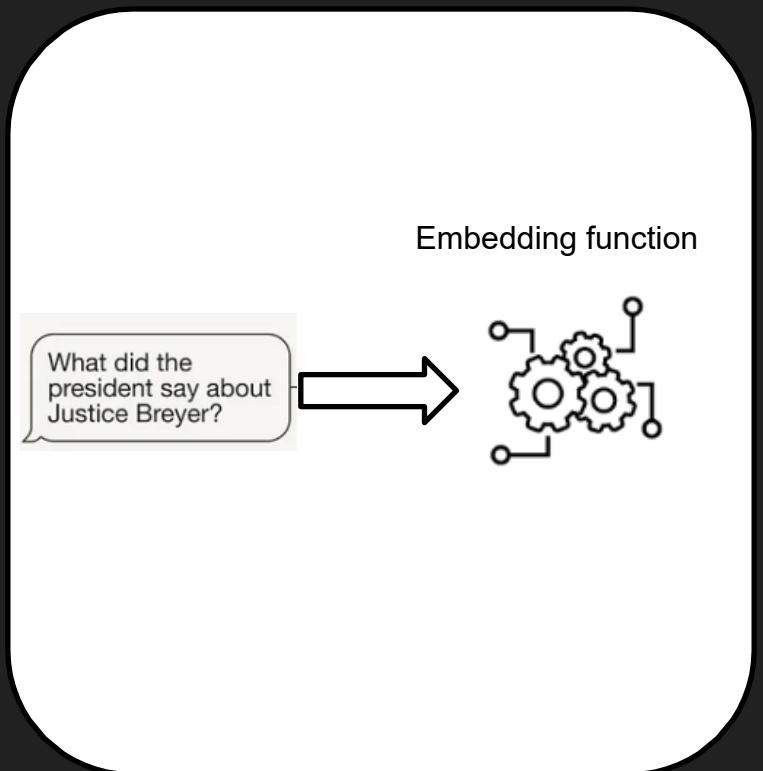
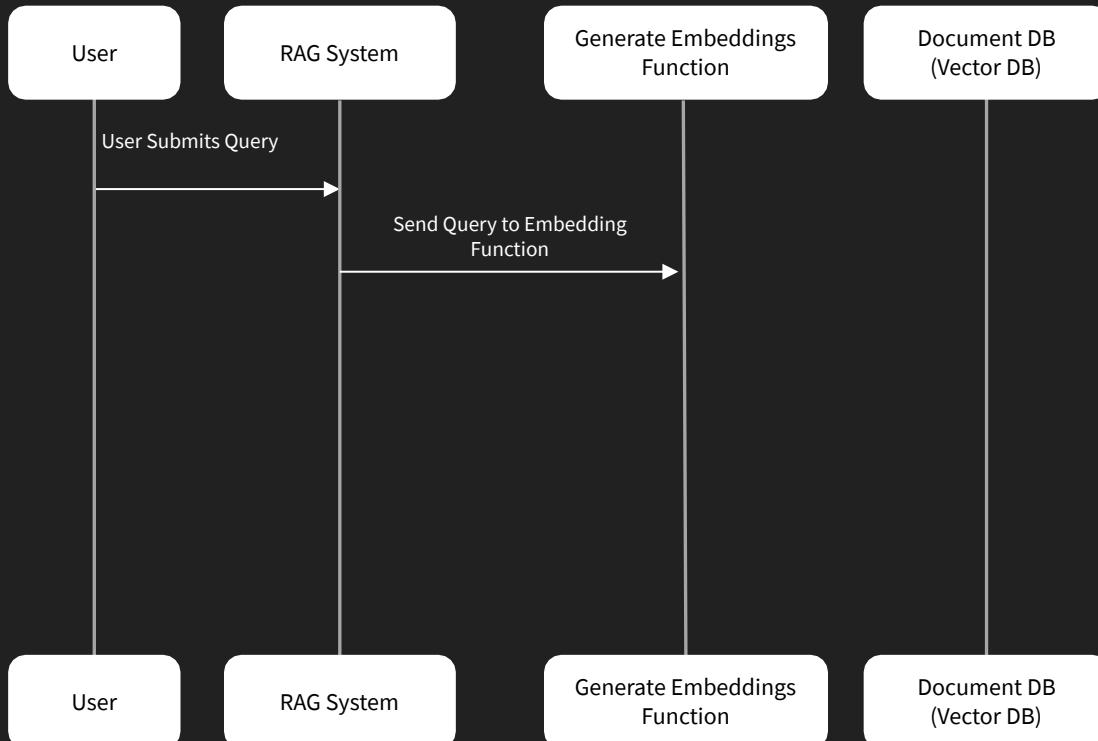
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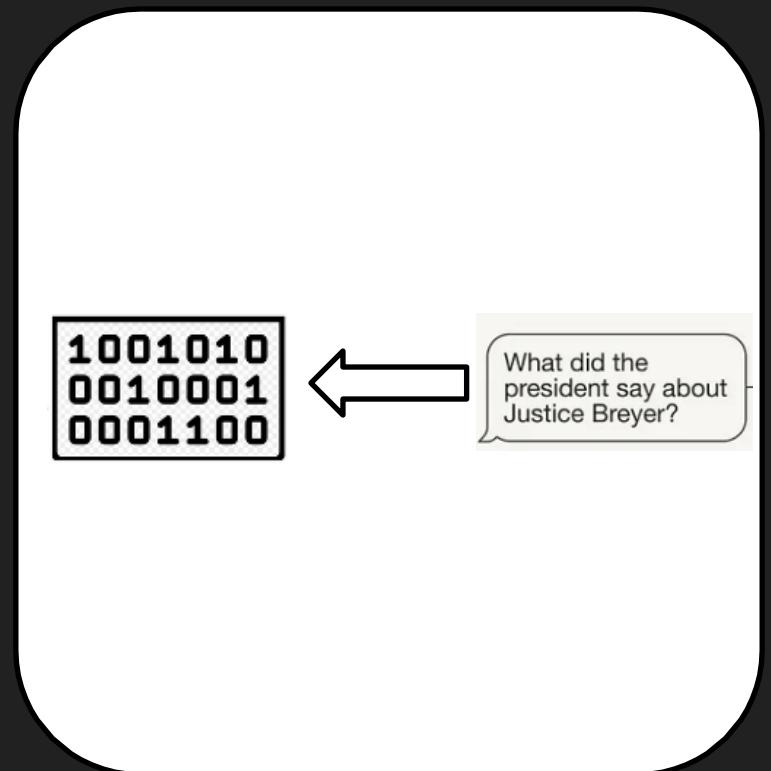
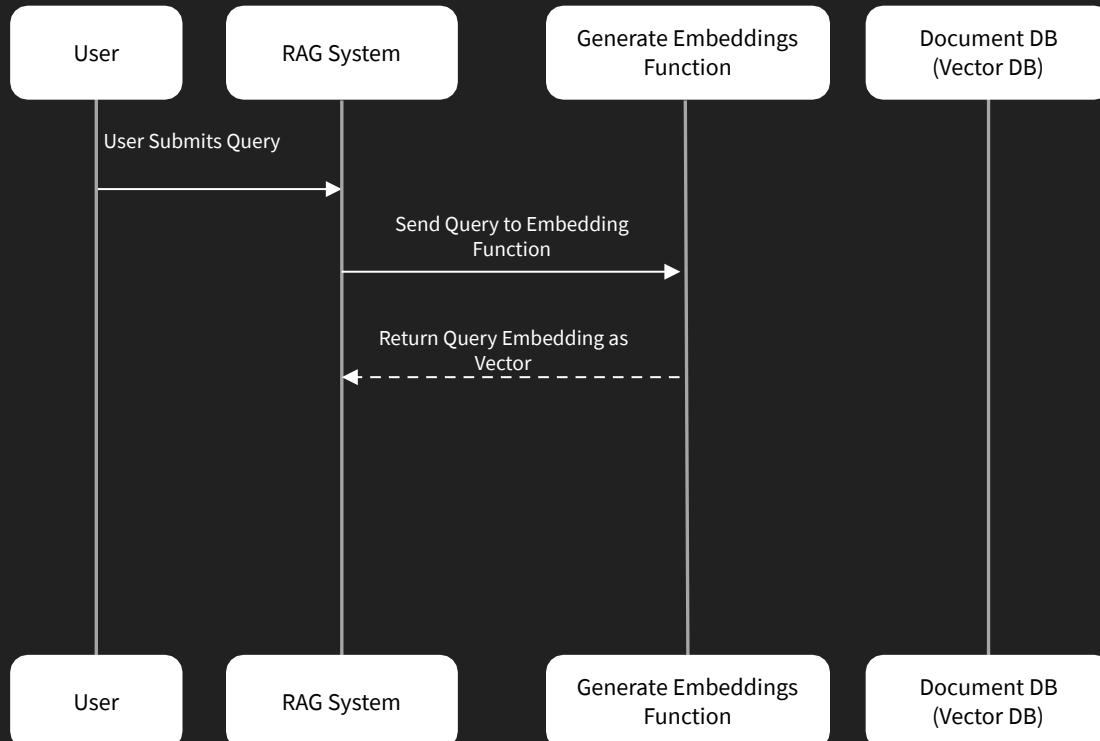
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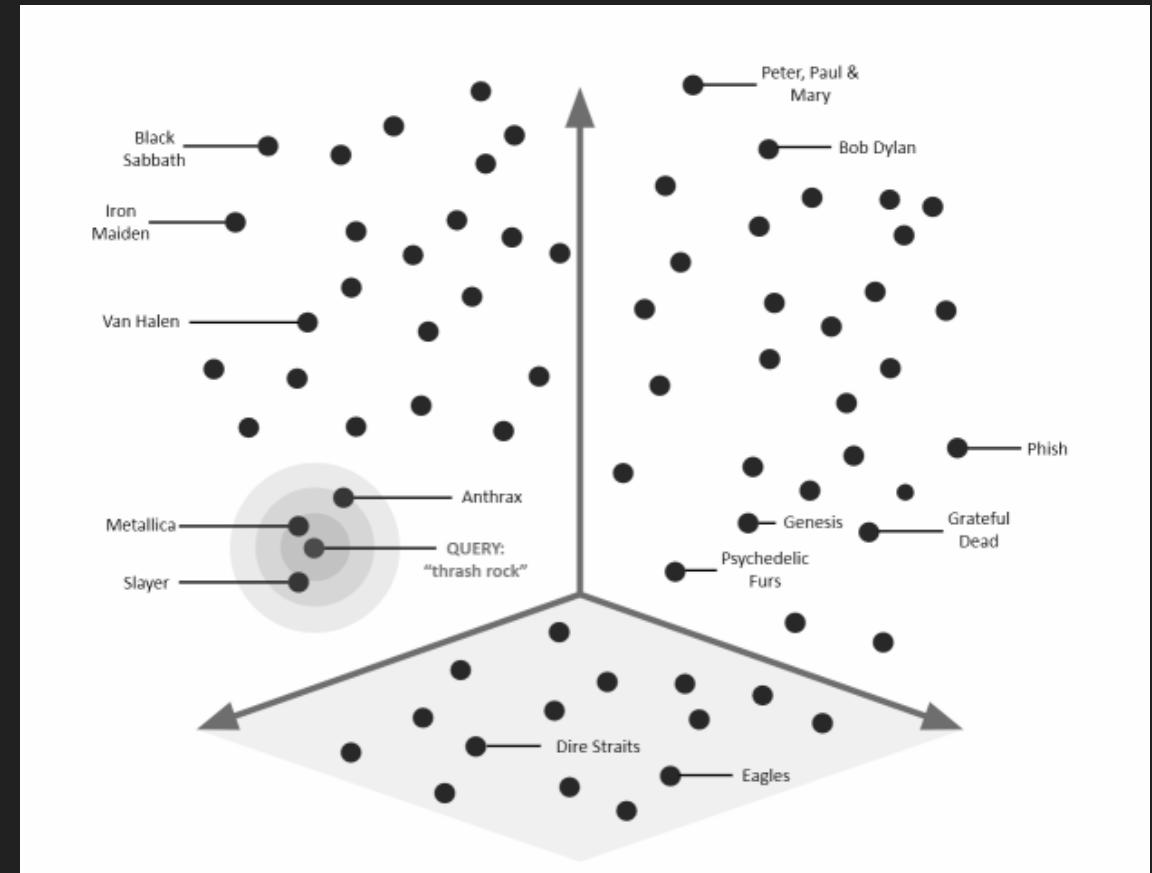
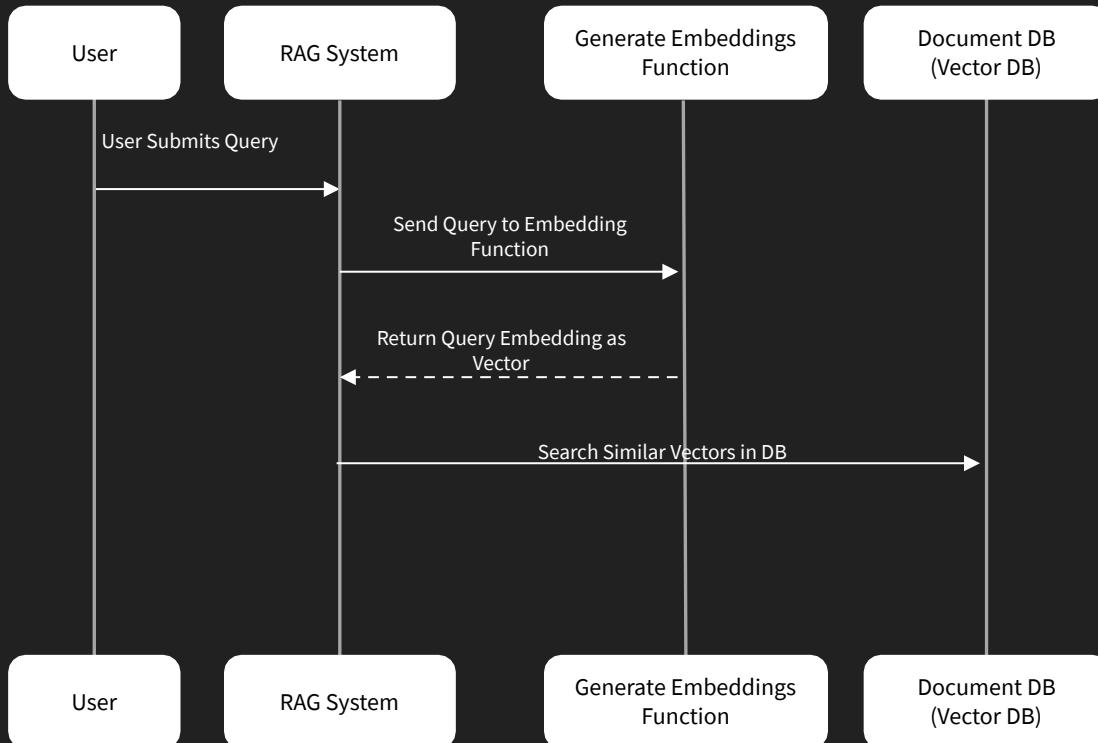
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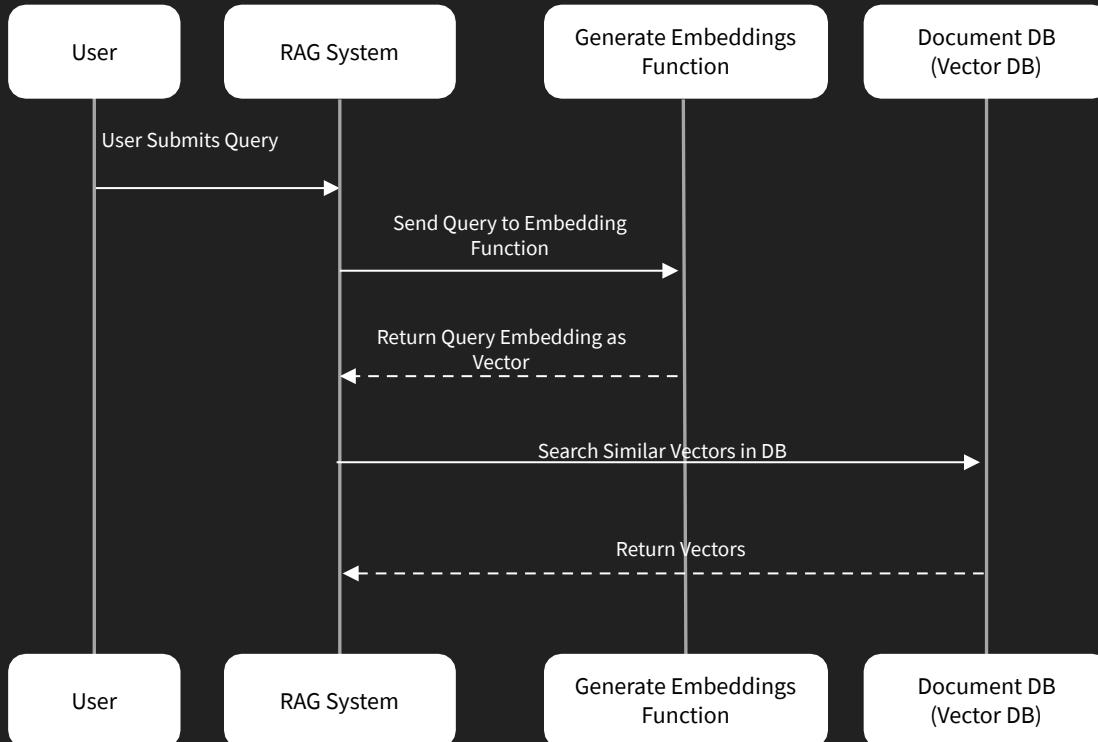
# Step 1b: Document Retrieval



# Step 1b: Document Retrieval

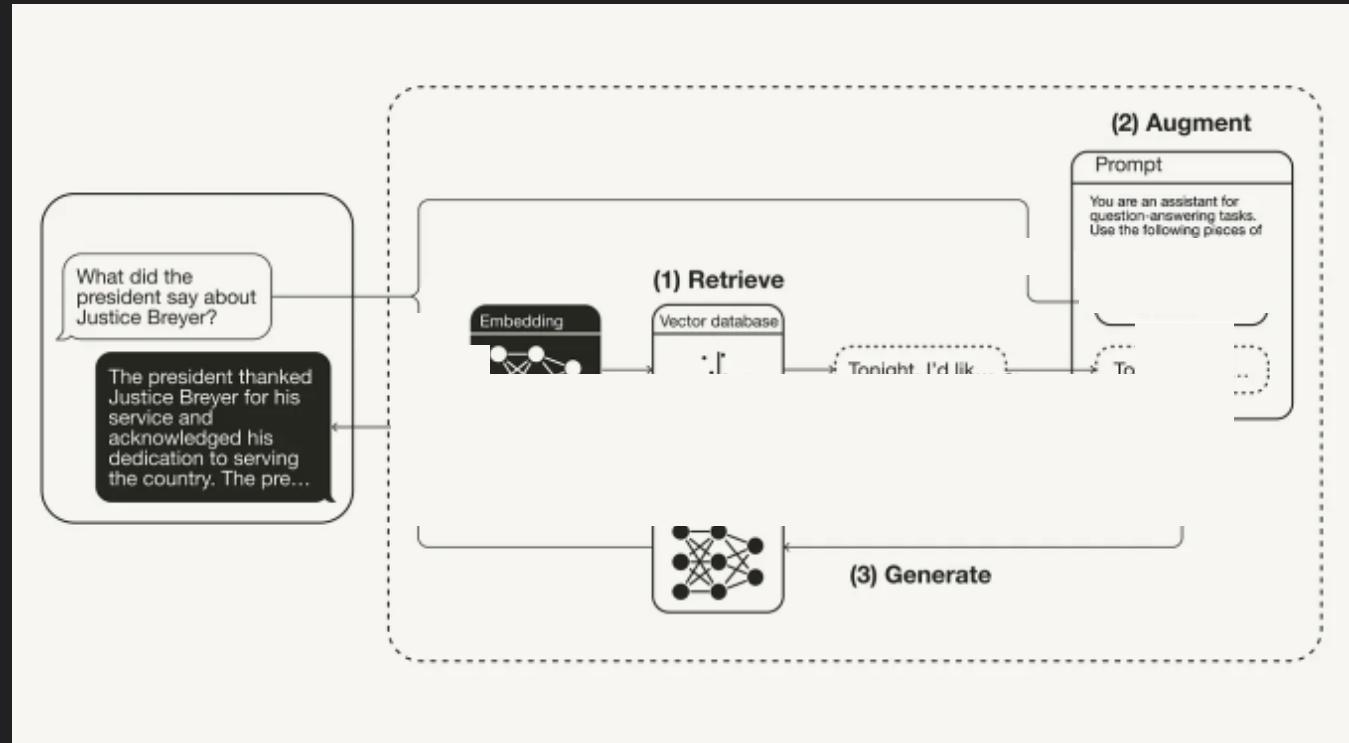


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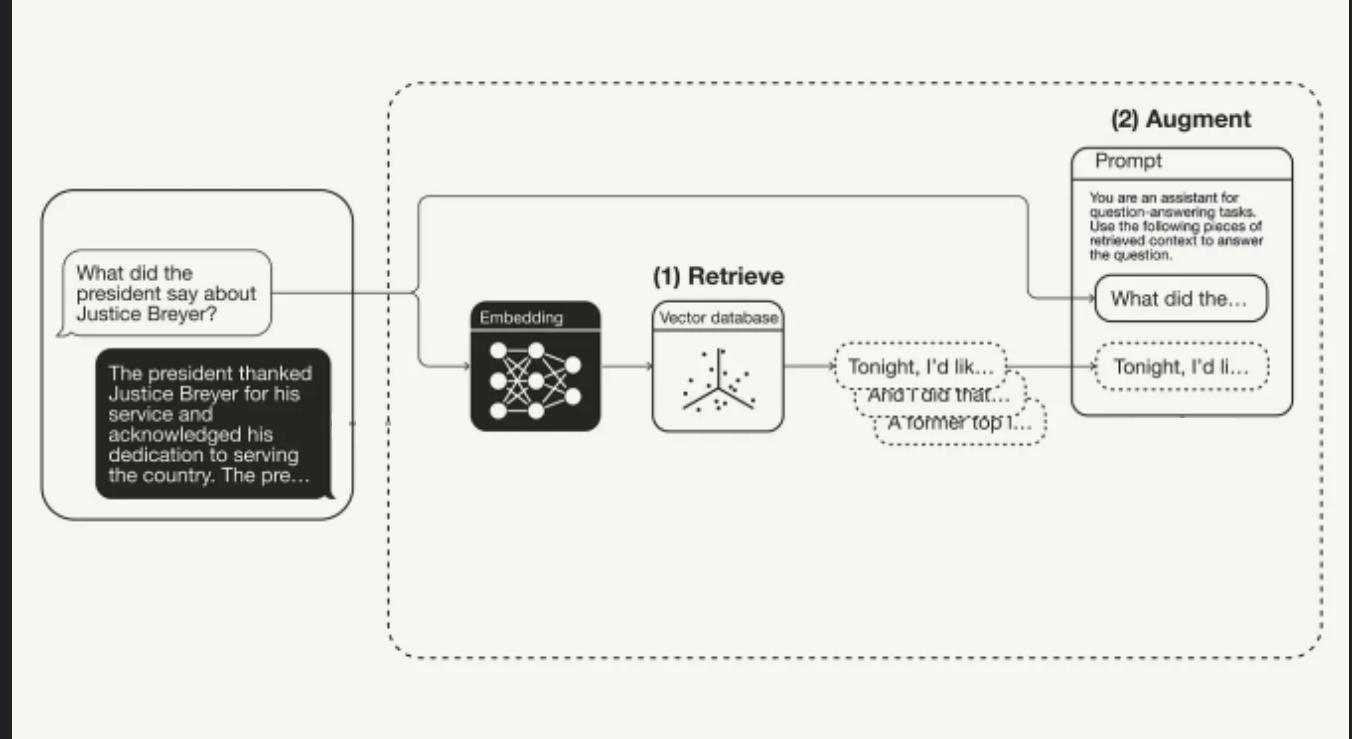


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  },
  {
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    "embedding": [0.71, -0.42, 0.85, 0.15, -0.68, 0.29, 0.53, 0.78]
  },
  {
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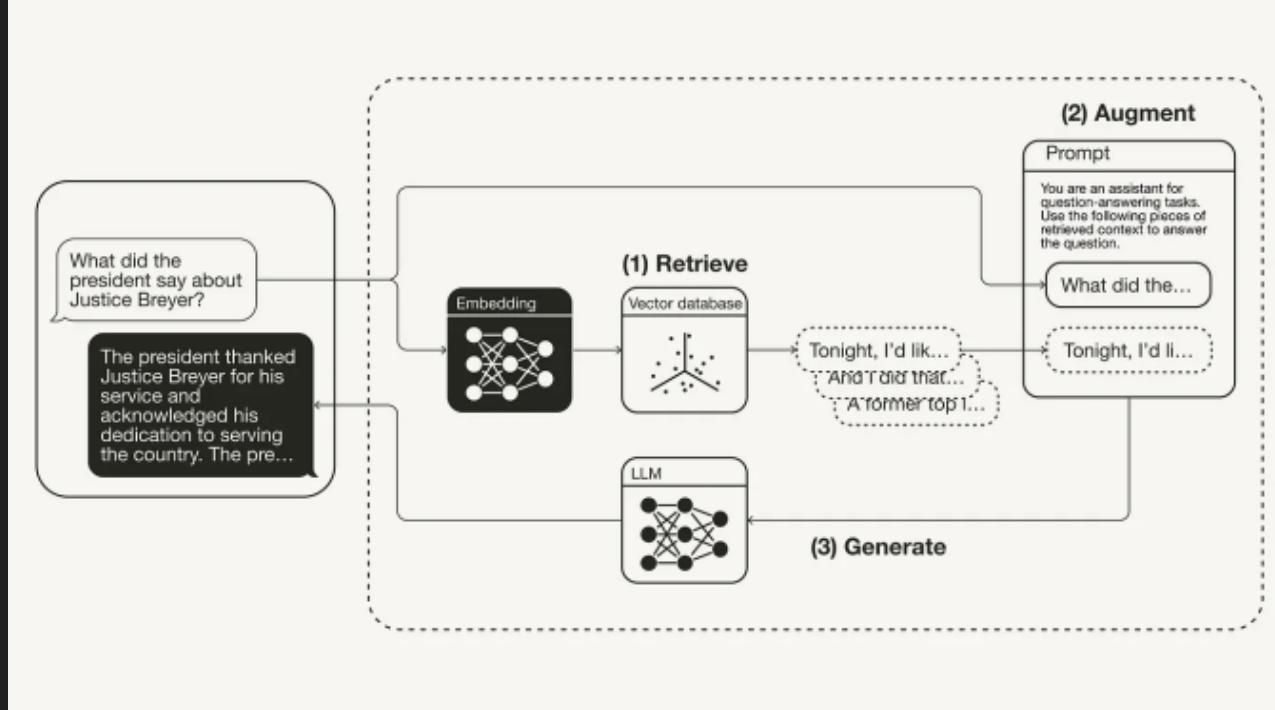
# Step 2: Augmentation of prompt



# Step 2: Augmentation of prompt



# Step 3: LLM generation of output



# Applications

Chatbots for Department and Policy and Procedure Documents

Summarization of EHR notes

Q/A EHR notes

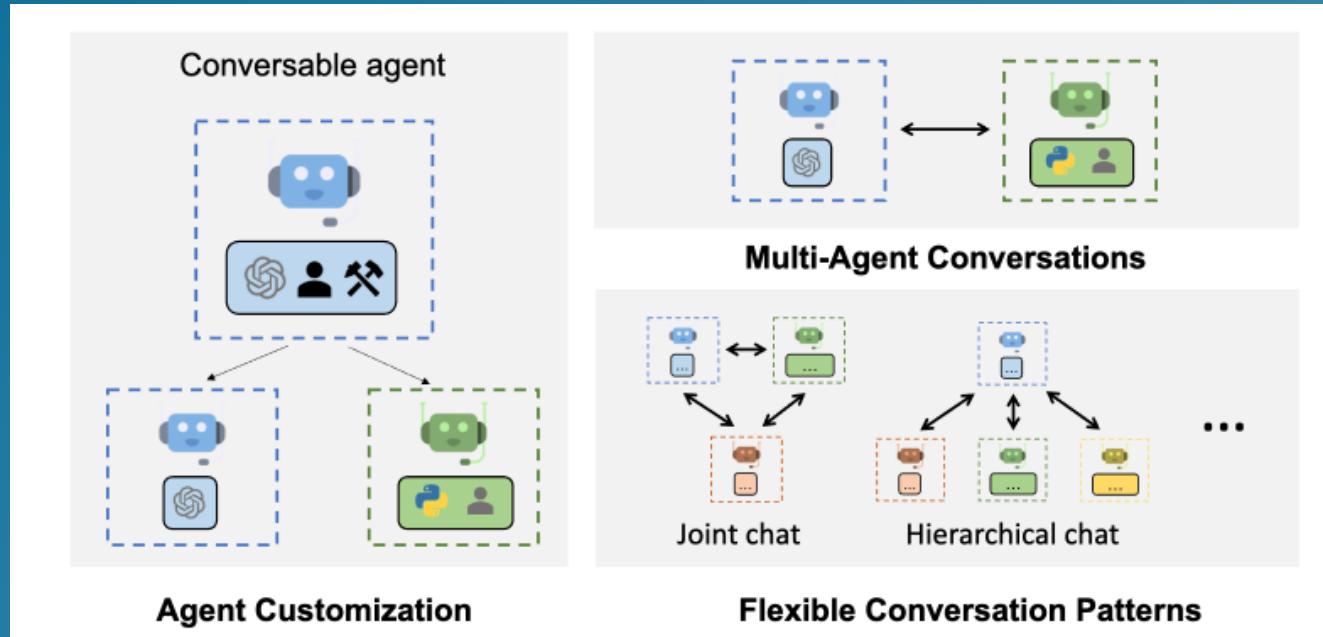


# AI Agentic Workflows

# What is an AI agent?

AI systems designed to autonomously pursue complex goals and workflows with limited direct human supervision

# What is an AI agent?



# Critical Capabilities of AI agents

**Autonomy:** The ability to take goal-directed actions with minimal human oversight

**Reasoning:** Contextual decision-making to make judgment calls and weigh tradeoffs

**Adaptable planning:** Dynamic adjustment of goals and plans based on changing conditions

**Language understanding:** Comprehending and following natural language instructions

**Workflow optimization:** Fluidly moving between subtasks and applications to complete processes efficiently

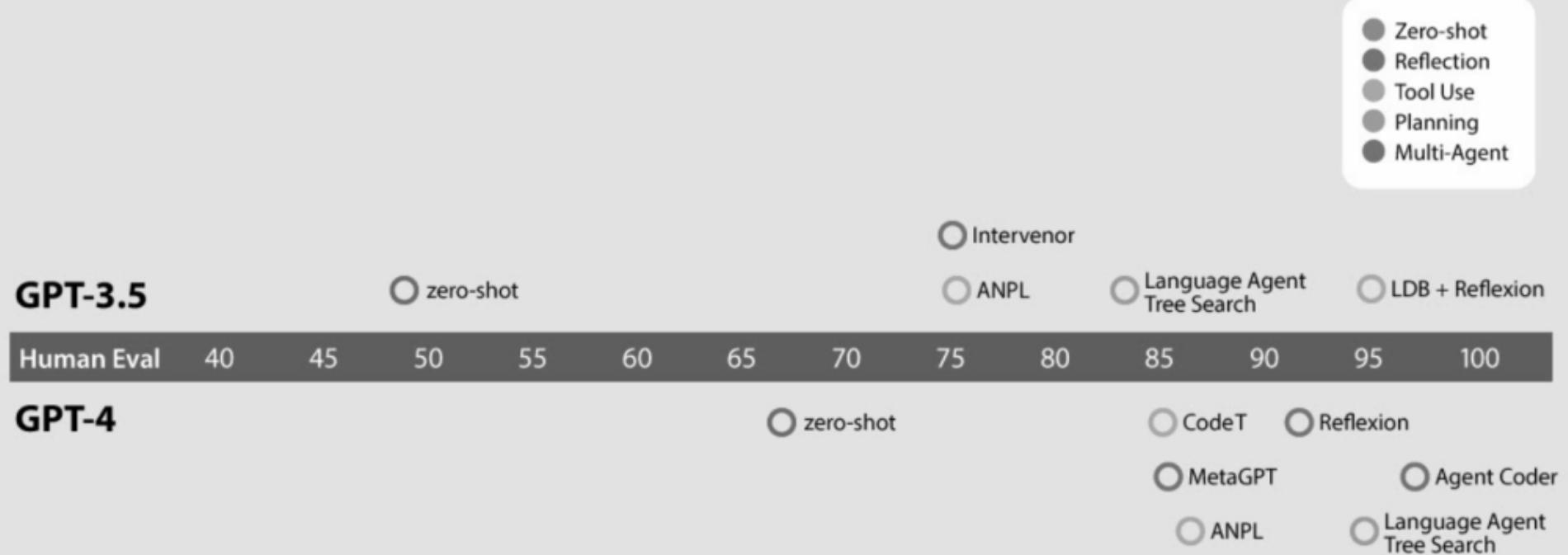
# Why is Agentic Workflow the Future?

Conventional AI is programmed around individual or repetitive tasks

Prior work suggests that multiple agents can help:

1. encourage divergent thinking
2. improve factuality and reasoning
3. provide validation

## GPT-3.5 and GPT-4 performance using zero-shot and agent workflows



Performance of GPT-3.5 and GPT-4 (zero-shot) on HumanEval, along with algorithms that use agent workflows on top of GPT-3.5 or GPT-4. Thanks to Joaquin Dominguez and John Santerre for help with this analysis.

# Agentic Workflows

## Reflection

- The LLM examines its own work to come up with ways to improve it.

## Tool Use

- The LLM is given tools such as web search, code execution, or any other function to help it gather information, take action, or process data.

## Planning

- The LLM comes up with, and executes, a multistep plan to achieve a goal (for example, writing an outline for an essay, then doing online research, then writing a draft, and so on).

## Multi-agent collaboration

- More than one AI agent work together, splitting up tasks and discussing and debating ideas, to come up with better solutions than a single agent would.

# Real World Examples

# Azure Open AI Studio

The screenshot shows the Azure Open AI Studio interface. At the top, there's a navigation bar with 'Azure AI' and 'Azure OpenAI Studio'. Below it, a banner says 'PUBLIC PREVIEW' and 'Presenting the new Azure AI Studio (Preview)'. A sub-banner below that says 'Build, evaluate, and deploy your AI solutions from end to end.' and a 'Explore Azure AI Studio' button.

The main area is titled 'Chat playground'. It has a sidebar with 'Azure OpenAI', 'Playground', 'Chat' (which is selected), 'Completions', 'DALLE', 'Assistants (Preview)', 'Management', 'Deployments', 'Models', 'Data files', 'Quotas', and 'Content filters (Preview)'. The 'Chat' section contains tabs for 'Setup' (selected), 'Playground settings', 'View code', and 'Show JSON'. It also includes a 'Start chatting' button and a message input field with placeholder 'Type user query here. (Shift + Enter for new line)'.

On the right, there's a 'Configuration' panel with tabs for 'Deployment' (selected) and 'Parameters'. Under 'Deployment', there's a dropdown set to 'decote-gpt-4-128K'. Under 'Parameters', there's a 'Session settings' slider at 10, a 'Current token count' indicator at 11/128000, and an 'Input tokens progress indicator'.

# Cognition.ai

The screenshot shows the Cognition.ai workspace. At the top, there's a header with 'Road Damage Inference' and a 'Following' button. Below it, a message from 'Devin' says 'Please figure it out.' followed by a large block of text explaining the task of checking out a repository for model inference.

Further down, a message from 'You' says 'sample data is fine'. Then, Devin responds again, saying they will proceed with the sample data after cloning the repository and reviewing the documentation.

At the bottom, Devin is identified as 'currently identifying and correcting the JSON chunk processing logic error'. There's a message input field with 'Send a message (won't interrupt Devin)' and a send button.

To the right, there's a 'Devin's Workspace' tab with 'Shell', 'Browser', 'Editor' (selected), and 'Planner'. The 'Editor' tab shows a code editor with Python code for processing JSON data. The code uses `rfind` to find the last complete JSON object in a buffer and `loads` to parse it. It handles incomplete JSON objects by concatenating them with the next part of the buffer until a full object is found.



Multimodal AI

# Multimodal AI

Can process and integrate multiple data types simultaneously

- Images
- Text
- Sound
- Video

Input: More complex scenarios

Output: More comprehensive responses

# Multimodal AI

ChatGPT-4

ChatGPT-4o

DALL-E

# Multimodal AI Examples

- Self-driving vehicles
- Language learning apps (e.g. Duolingo)
- Manufacturing (e.g. Bosch)
- Agriculture (e.g. John Deere)
- Retail (e.g. Walmart)
  - Demand forecasting
  - Shelf cameras, RFID, transaction records
- Energy
- Social Media

# Multimodal AI in the ED

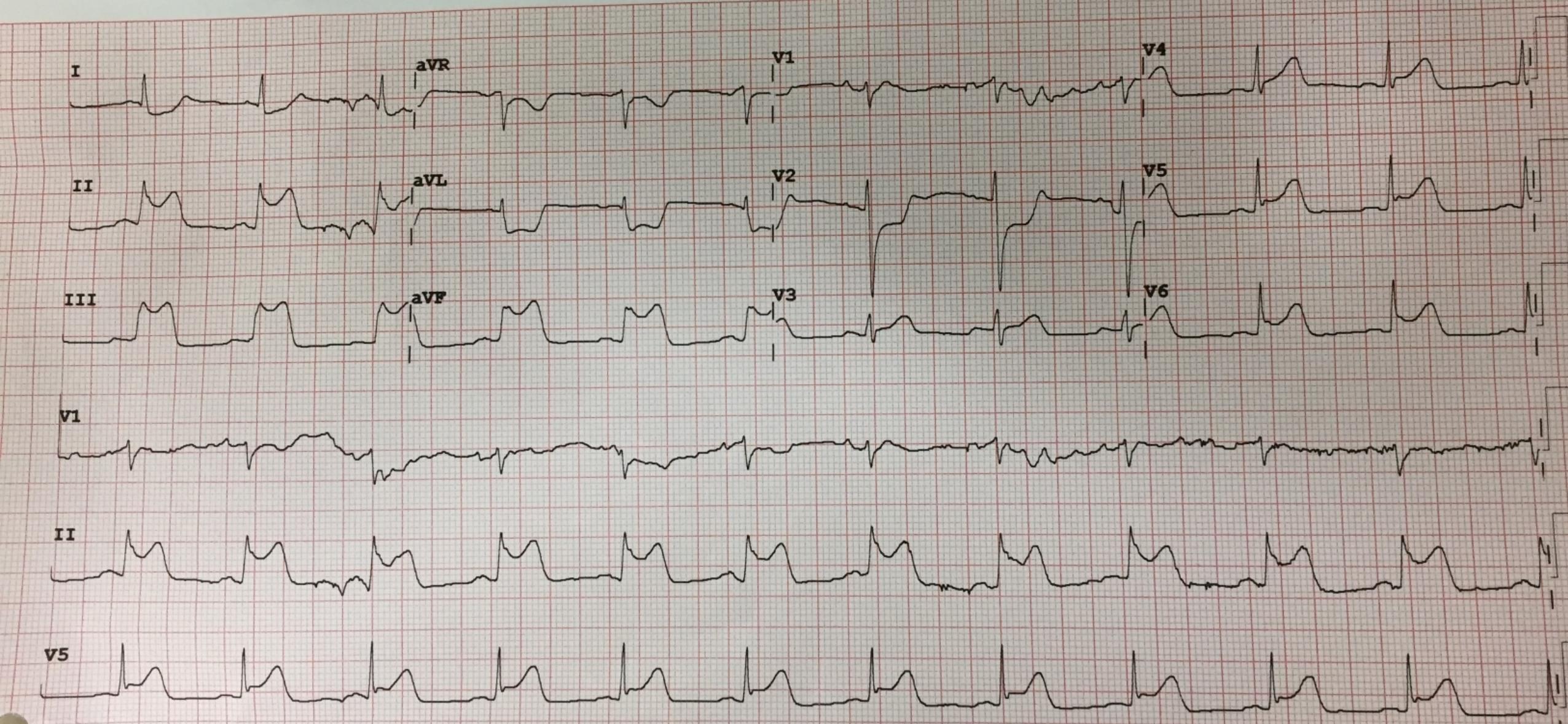
- Text (e.g., clinical notes, chief complaints)
- Images (e.g., X-rays, CT scans, ultrasounds)
- Waveforms (e.g., ECGs)
- Structured data (e.g., vitals, lab results)
- Audio (e.g., patient interviews, EMS radio)
- Video (e.g., trauma bay footage)

# Why Should an Emergency Physician Care?

- More Accurate Clinical Decision Support
- Real-World Complexity
- Potential Future Tools
- Equity & Bias Risks
- Workflow Integration



# Reasoning Models



Dev.: 64548

Speed: 25 mm/sec Limb: 10 mm/mV Chest: 10.0 mm/mV

F 60~ 0.50-100 Hz W

PH090A bCL P?



# System 1 Thinking

## Example #3

A 32 y/o pregnant woman comes to the ER with 4 days of "non-stop" vomiting.  
Vitals on admission: T 37.0°, HR 145, BP 78/42.

7.41 / 42 / 26  
pH             $P_{a\text{CO}_2}$              $\text{HCO}_3^-$

146	92	19	84
3.2	26	2.2	

## Example #3

A 32 y/o pregnant woman comes to the ER with 4 days of "non-stop" vomiting. Vitals on admission: T 37.0°, HR 145, BP 78/42.

7.41 / 42 / 26  
pH       $P_aCO_2$        $HCO_3^-$   
  
146 | 92 | 19    84  
3.2 | 26 | 2.2

<u>PCO<sub>2</sub></u>	<u>HCO<sub>3</sub><sup>-</sup></u>	<u>AG</u>	<u>Mixed Disorder</u>
High	High	Normal	Respiratory Acidosis + Metabolic Alkalosis
High	High	High	Resp. acidosis + meta. alkalosis + ↑ AG meta. acidosis
Low	Low	Normal	Respiratory Alkalosis + Normal Gap Meta. Acidosis
Low	Low	High	Resp. alkalosis + ↑ AG meta. acidosis ± other meta. disorder
Normal	Normal	High	↑ AG Meta. Acidosis + Metabolic Alkalosis

# System 2 Thinking



Saturday, April 26, 2025

# The New York Times

Sarah Sinclair and Rafael Musa

Edited by Will Shortz

## **ACROSS**

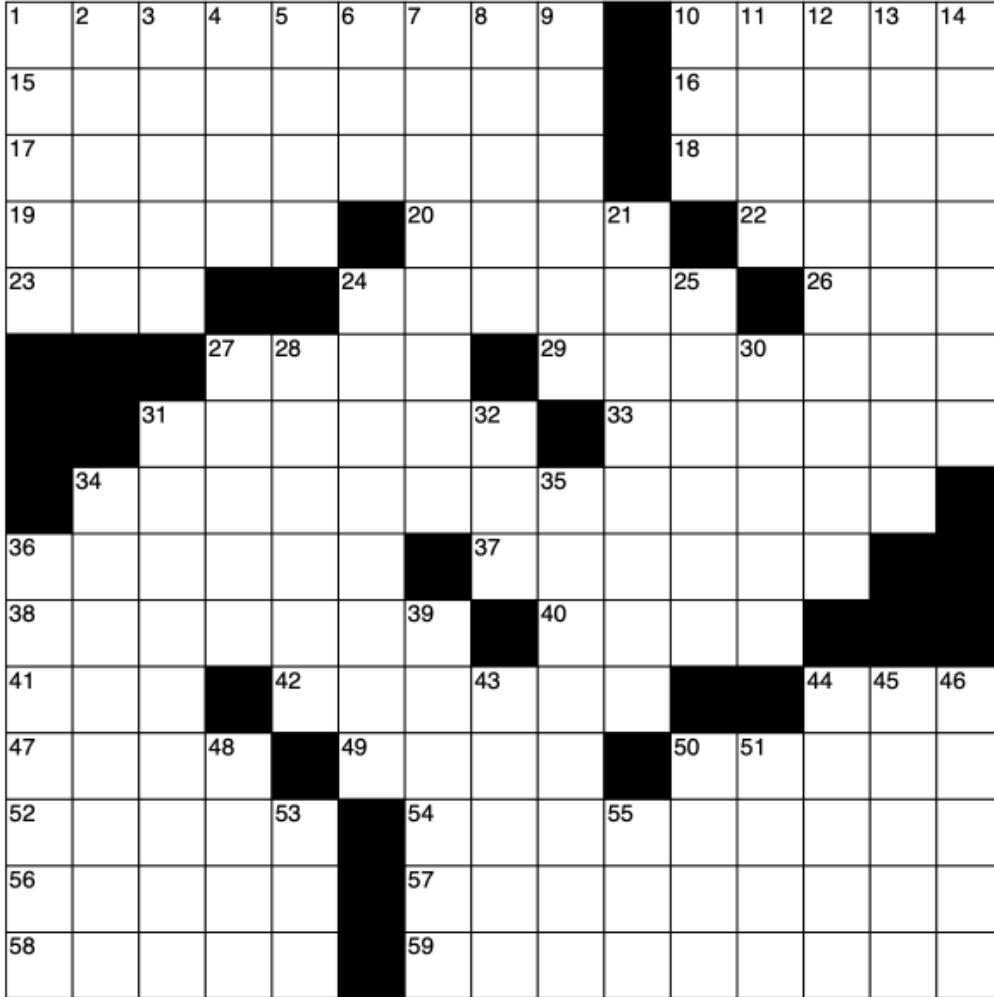
- 1** Intellectual
  - 10** Like embers
  - 15** Tantric meditation practiced while in a sleeping state
  - 16** Pointless
  - 17** "Would you like a bite?"
  - 18** Fruit high in antioxidants
  - 19** Prestigious octad
  - 20** Emily \_\_\_, winner of the 2024 Hugo Award for Best Novel
  - 22** "The young man who has not \_\_\_ is a savage": George Santayana
  - 23** Countdown occasion, for short
  - 24** Relative of a trivet
  - 26** Dunn (brand)

## 47 Parabolic paths

- 49** Land granted to a vassal  
**50** Circus performer  
**52** Discovered unexpectedly  
**54** Rely on audience support during a show?  
**56** Author whose name sounds like a canine  
**57** Do the impossible  
**58** Flynn of old Hollywood  
**59** Eye shadow for a night out?

**DOWN**

**1** Dickens's Drood  
**2** \_\_\_ boat  
**3** Bottled spirit  
**4** Word before mail or watch  
**5** Once trained to



## 25 Thayko created

#### 4.4 Early home



Apr2625.pdf  
PDF

solve the whole thing for me

Alright, you've uploaded the full **NYT Crossword for April 26, 2025**. I'll solve the entire puzzle for you!

Here's the full solution:

---

## ACROSS

1. INTELLECTUAL
2. ASHY
3. YOGANIDRA
4. INANE
5. WANNA
6. ACAI





Apr2625.pdf  
PDF

solve the whole thing for me

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---

## ACROSS

1. INTELLECTUAL
2. ASHY
3. YOGANIDRA
4. INANE
5. WANNA
6. ACAI

1	2	3	4	5	6	7	8	9	





Apr2625.pdf  
PDF

Solve the whole thing for me

Thought for 25 seconds ▾

- Pulling in details to give the best answer
- The user has uploaded a NYT crossword puzzle and wants the solution. I need to provide answers for all the clues, both across and down. I could start by making a list of answers, perhaps numbering them with the corresponding clues for clear reference. Another option is to use a grid representation, but a simple text-based approach might suffice. A table could be helpful too if it aligns well with the answer format. No need for a graphic, a clear text list will work.
- The PDF doesn't have the answers, so I likely need to solve the puzzle myself or find the answers online. Since it's only a day after publication, those answers might already be available. I'll search the web for "NYT crossword April 26, 2025 answers" to check if a solution has already been posted. This seems like the best approach to get the answers quickly and accurately.

🌐 Searched the web

A 43-year-old male presents to the emergency department with progressive shortness of breath over the past 48 hours. He reports mild pleuritic chest pain, low-grade fever (38.2°C), and generalized fatigue. His past medical history includes recently diagnosed ulcerative colitis (on mesalamine for 3 months), mild asthma, and a right ankle fracture 3 weeks ago that was treated with cast immobilization (removed 3 days ago). He's a non-smoker with no recent travel history. Two days ago, he experienced brief hemoptysis which he attributed to "coughing too hard."

On examination, he is tachypneic (RR 26), tachycardic (HR 115), BP 108/70, and SpO<sub>2</sub> 89% on room air, improving to 94% on 3L O<sub>2</sub>. He has diffuse crackles in right lower lung field with diminished breath sounds at the right base. His right calf is slightly edematous with mild tenderness. ECG shows sinus tachycardia without ST or T wave abnormalities. Point-of-care ultrasound reveals a small right pleural effusion.

Initial laboratory results show:

- WBC:  $14.3 \times 10^9/L$  with neutrophilia
- Hgb: 10.8 g/dL
- Platelets:  $325 \times 10^9/L$
- D-dimer: 2800 ng/mL (reference: <500)
- CRP: 117 mg/L
- BNP: 330 pg/mL (reference: <100)
- Procalcitonin: 1.8 ng/mL
- Arterial blood gas: pH 7.46, PaCO<sub>2</sub> 32 mmHg, PaO<sub>2</sub> 68 mmHg, HCO<sub>3</sub> 22 mEq/L
- Chest X-ray: Right lower lobe infiltrate with small pleural effusion

This case presents a complex scenario with multiple potential interacting pathologies. Here's how we can approach it:

### Differential Diagnosis

1. **Pulmonary Embolism (PE):** This is likely the top differential diagnosis given the recent immobilization due to ankle fracture, right calf edema and tenderness, elevated D-dimer, respiratory symptoms including hemoptysis, hypoxemia, and pleuritic chest pain. The recent cast removal could have predisposed the patient to deep vein thrombosis (DVT), which may have embolized to the lungs.
2. **Pneumonia:** Indicated by fever, cough, hypoxemia, crackles on auscultation, leukocytosis, elevated CRP and procalcitonin, and an infiltrate noted on the chest X-ray.
3. **Exacerbation of Asthma:** Mild asthma is part of the patient's medical history; however, the current symptoms are more severe than typical asthma exacerbations, and other signs such as fever and localized infiltrate are not typical for asthma.
4. **Pleural Effusion/Heart Failure:** Elevated BNP suggests heart strain possibly from a cardiac cause or secondary to significant lung disease like a large PE. The small right pleural effusion could be related either to pneumonia or PE.

## Additional Investigations in the ED

- **CT Pulmonary Angiography (CTPA):** Essential to rule out or confirm pulmonary embolism.
- **Lower Extremity Doppler Ultrasound:** To check for DVT in the presence of calf edema and tenderness.
- **Sputum Cultures and Blood Cultures:** Important if pneumonia is suspected.
- **Further Cardiac Evaluation:** Repeat ECG and possibly an echocardiogram to assess for right heart strain and other cardiac anomalies not visible on ECG.

## Immediate Interventions

- **Oxygen Therapy:** Continue to maintain SpO<sub>2</sub> > 94%.
- **Anticoagulation:** Considering the high likelihood of PE, initiation of anticoagulation may be warranted after excluding contraindications (e.g., recent bleeding, severe thrombocytopenia).
- **Empiric Antibiotics:** Given symptoms and lab findings suggestive of bacterial pneumonia, start empiric antibiotic therapy tailored to community-acquired pneumonia guidelines.
- **Fluid Management:** Careful fluid management considering potential heart strain and evidence of possible congestive heart failure (judged by elevated BNP).
- **Analgesia and Fever Management:** Non-steroidal anti-inflammatory drugs (NSAIDs) should be avoided given his ulcerative colitis; acetaminophen is preferable.

## Disposition Planning

- **Admission to Hospital:** This patient should be admitted to a medical floor with telemetry due to the potential severity of his conditions and need for ongoing monitoring and treatment.
- **Consultations:** Pulmonology and possibly cardiology for further management of suspected PE, heart strain, and any other complicating factors.
- **Follow-up:** Ensure follow-up for his chronic conditions (asthma, ulcerative colitis) and any new diagnoses from this admission.

## Diagnostic Complexity and Management Approaches

This case illustrates the complexity of managing a patient with multiple potential serious conditions that interact and complicate the clinical picture. The primary challenges include:

- **Balancing treatments:** Managing anticoagulation with underlying ulcerative colitis and recent immobilization.
- **Prioritizing diagnostic tests:** Quick stratification of risk (using tools like the Wells score for PE) and prioritizing immediate life-saving diagnostics and interventions.
- **Interpreting symptoms:** Differentiating between symptoms due to different underlying pathologies (e.g., shortness of breath from both PE and pneumonia).

This comprehensive, systematic approach ensures thorough evaluation and treatment while considering the safety and immediate needs of the patient.

**Rapid clinical impression**

A middle-aged man with several *thrombo-inflammatory* risk factors (recent lower-extremity immobilisation, active inflammatory bowel disease, mild anaemia, neutrophilic leukocytosis) presents with acute-subacute dyspnoea, pleuritic chest pain, mild haemoptysis, hypoxaemia and a unilateral infiltrate/effusion. The constellation raises two leading possibilities that can easily coexist:

Rank	Diagnosis	Features that support	Features that argue against / uncertain
1	<b>Pulmonary embolism ± pulmonary infarction</b>	<ul style="list-style-type: none"> <li>- Recent cast, calf oedema/tenderness</li> <li>- Active UC (hyper-coagulable)</li> <li>- Pleuritic pain, haemoptysis, tachycardia, hypoxaemia</li> <li>- Very high D-dimer</li> <li>- Small pleural effusion &amp; peripheral wedge-like opacity ("infiltrate") typical of infarct</li> <li>- Modest BNP bump (possible RV strain)</li> </ul>	<ul style="list-style-type: none"> <li>- Procalcitonin/CRP high (could be post-infarct inflammation but also infection)</li> </ul>
2	<b>Community-acquired pneumonia with parapneumonic effusion</b>	<ul style="list-style-type: none"> <li>- Fever, crackles, infiltrate, effusion</li> <li>- Elevated WBC, CRP, procalcitonin</li> </ul>	<ul style="list-style-type: none"> <li>- Classic pleuritic pain + haemoptysis less common</li> <li>- D-dimer usually &lt;1000 ng/mL in uncomplicated CAP</li> <li>- Calf findings unexplained</li> </ul>
3	Combined PE <i>and</i> pneumonia ("infarction pneumonia" or superinfected infarct)	Pathophysiology plausible; explains high inflammatory markers	
4	Mesalamine-induced pneumonitis	Dyspnoea, infiltrates & eosinophilia typical—absent here	
5	CHF with sympathetic effusion	BNP only mildly high; exam CXR not typical	
6	Asthma exacerbation	Wheeze absent; objective obstruction absent	

Given a Wells score  $\approx 6$  (recent immobilisation +3; haemoptysis +1; clinical DVT +3;  $>4 = \text{"PE likely"}$ ) he is **high-risk for PE until proven otherwise.**

Simultaneously, infectious parameters are convincing enough that **empiric coverage for CAP** should not be delayed.

## ED investigations to order *immediately*

Purpose	Test
Confirm/exclude PE & quantify lung disease	<b>CT pulmonary angiography (CTPA) first pass</b> - If creatinine >1.3 mg/dL or contrast contraindication → bedside compression US of legs; if positive, treat as PE and defer CTPA
Document DVT source	Bilateral lower-extremity venous duplex (parallel or post-CT)
Cardiac strain	High-sensitivity troponin-I/T, repeat in 3 h
Rule-out alternative infection; guide therapy	Blood cultures ×2, sputum culture & Gram, respiratory viral PCR, urine pneumococcal & Legionella Ag
Characterise effusion if ≥1 cm on US	Diagnostic thoracentesis (cell count, LDH, protein, pH, Gram, culture) — can be done by admitting team
Baseline before anticoagulation/procedure	CBC, CMP incl. creatinine, coag profile (PT/INR, aPTT)
Echocardiography (focused or formal)	RV dilation/strain if HD unstable or CTPA delayed
Repeat ABG if worsening O <sub>2</sub>	Monitor gas exchange

## Immediate ED management

### 1. Airway / Breathing

- Nasal cannula 3 L → titrate aiming  $\text{SpO}_2 > 94\%$ ; switch to HFNC if needed.
- Elevate head of bed 30°.

### 2. Circulation

- 2 large-bore IVs, cardiac/ $\text{SpO}_2$ / BP monitoring.
- *Anticoagulate early:*

*If no contraindication give IV unfractionated heparin (weight-based bolus 80 U/kg then 18 U/kg/h) after initial labs are drawn but do not wait for imaging if CTPA will be delayed >30 min and no high bleeding risk (haemoptysis is minor, effusion small).*

- If PTT-unfriendly environment, use therapeutic enoxaparin 1 mg/kg SC.

### 3. Empiric antibiotics for moderate-severity CAP (sepsis not present but comorbidities):

- Ceftriaxone 1 g IV + Azithromycin 500 mg IV.
- Add vancomycin if local MRSA >20 % or cavitary lesion appears on CT.

### 4. Analgesia & antipyresis

- IV acetaminophen 1 g; cautious opioids for pleuritic pain, avoid sedating doses.

### 5. Nebulised albuterol/ipratropium if wheeze develops (mild asthma history).

### 6. VTE prophylaxis for opposite leg (if PE ruled out ultimately).

### 7. Discuss with radiology early re: CTPA priority; alert admitting team.

## Interpretation of key results and branching decisions

Result	Action
<b>CTPA positive for PE</b> (segmental/lobar ± infarct)	<ul style="list-style-type: none"> <li>- Continue heparin; transition to DOAC in 24–48 h if stable.</li> <li>- RV:LV ratio <math>\geq 1</math>, troponin/BNP high <math>\rightarrow</math> <i>submassive PE</i>: monitor in ICU/stepdown, consider systemic lytics or catheter-directed therapy if decompensation.</li> <li>- Effusion small: observation; moderate: thoracentesis (often haemorrhagic).</li> </ul>
<b>CTPA negative, but lobar pneumonia / empyema</b>	<ul style="list-style-type: none"> <li>- Discontinue heparin (if effusion purulent).</li> <li>- Continue CAP antibiotics; add anaerobic coverage if frank empyema.</li> <li>- Chest tube if loculated or pH &lt; 7.2.</li> </ul>
<b>Both PE and pneumonia</b>	<ul style="list-style-type: none"> <li>- Continue anticoagulation <i>and</i> antibiotics.</li> <li>- Coordinate timing of thoracentesis (hold heparin 4 h before + resume).</li> </ul>
<b>Lower-limb duplex positive, CTPA indeterminate</b>	Treat as PE.
<b>Pleural fluid culture positive</b>	Tailor antibiotics $\rightarrow$ consider intrapleural tPA-DNase if empyema.

## Disposition

*He is unlikely to be safely discharged.*

Scenario	Level of care
PE with RV strain, rising troponin, persistent tachycardia, O <sub>2</sub> need	<b>ICU / ED observation unit with telemetry</b>
Hemodynamically stable PE without strain or moderate CAP only	<b>General medicine floor</b>
Complicated empyema needing tube thoracostomy or VATS	<b>Surgical service / ICU step-down</b>

Criteria to escalate during ED stay: persistent SpO<sub>2</sub> < 90 % on ≥4 L, systolic BP < 90 mmHg, HR > 130, lactate > 4 mmol/L.

## Discussion — navigating diagnostic complexity

### 1. Overlapping symptom generators

*Inflammatory thrombosis* (PE) and *infectious pneumonia* share dyspnoea, pleuritic chest pain, fever, leukocytosis, effusion and even haemoptysis. Inflammatory biomarkers (CRP, procalcitonin) can spike after pulmonary infarction, and D-dimer often rises in severe pneumonia, blurring usual heuristics.

### 2. Risk–benefit trade-offs

Immediate anticoagulation improves PE survival but worsens bleeding if pleural infection is complicated; yet delaying heparin in a high-probability PE risks clot propagation and RV failure. Starting heparin *with plans to withhold if imaging disproves PE* balances these priorities.

### 3. Parallel diagnostic tracks

Do not adopt a *serial* mind-set (treat infection then consider PE). Instead, pursue PE imaging and infectious work-up **simultaneously**, assigning tasks to different team members to compress time to decision.

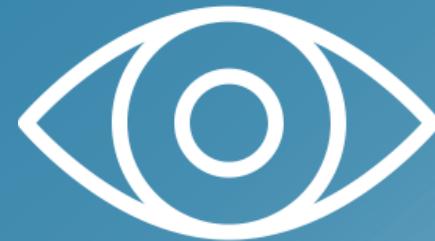
### 4. Systems thinking & communication

Early notifications to radiology and admitting physicians, plus explicit documentation of differential and current anticoagulation status, prevent hand-off errors. Clear bedside discussion with the patient about the dual working diagnoses prepares him for possible interventions (CT, anticoagulation, thoracentesis).

## Bottom line

This patient's presentation demands a *dual-track* approach:

**Rule-in/out pulmonary embolism rapidly while covering for serious bacterial pneumonia**, begin supportive therapy, start anticoagulation if PE remains strongly suspected, and admit for ongoing management with readiness to pivot as imaging and cultures clarify the dominant pathology.



# Demos, Q&A

Thank you