



DOCUGAMI

The Document Engineering Company

LangChain Webinar: Lessons from Deploying LLMs with LangSmith

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Topics

1. Intros

2. Real-World Challenges using LLMs with Documents

- i. Real documents are more than flat Text
- ii. Documents are Knowledge Graphs
- iii. Building Complex Chains with the LangChain Expression Language
- iv. Debugging Complex Chain Failures in Production

3. Summary: End to end LLM Ops

... deploy / run / trace / correct / finetune / repeat

Who we are...

- Generative AI for Business Documents. Founded 2018.
- Leverage open source and our own LLMs trained on millions of business documents to create a full XML data representation of complex documents in their entirety, delivering immediate value to frontline business users.
- Document as data can be used to generate insights and reports, create new documents, or drive line-of-business applications. Free trial at www.docugami.com/trial
- Customers in many sectors, including insurance, real estate, health, professional services.



Jean Paoli
Co-founder, CEO

Pioneer in document engineering;
co-creator of XML, .docx, .xlsx, .pptx;
started four \$1B+ businesses at Microsoft



Taqi Jaffri
Co-founder, Head of Product

Principal Product Manager at
Microsoft; co-created the AI driving
Microsoft presence in physical stores.



Mike Palmer
Co-founder, Head of Technologies

Senior engineering manager at
Microsoft; co-created Microsoft
InfoPath.



Zubin Wadia
Product Manager

Making documents matter to people and
systems – 100+ products over 20 years. MIT,
ImageWork, CiviGuard.

Challenge 1: Real documents are more than flat text

Real Documents are Structurally Complex: Headings, Lists, Tables, Headers/Footers, Complex Reading Orders, Figures, etc.

DOCUCAMI

NAME: Non-Compliant Docs | DOCSET: Services Agreement | STATUS: Designing | DOCS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 | NEXT DOC | Document View

DILIGENCE REPORT DESIGNER

Master Services Agreement - Zilliox

REPORT ITEMS

- Effective Date: June 1, 2021
- Liability Cap Exclusions: THE FOREGOING EXCLUSIONS AND...
- Itemized Fees Table: Itemized Fees Table
- Begin Date: 07/01/2021
- End Date: 12/31/2021

SUGGESTED ITEMS

- Liability
- Employers Liability Insurance
- Limit
- Commercial General Liability Insurance
- Technology Professional Liability Errors Omissions Policy
- Excess Liability Umbrella Coverage
- Services Agreement Date

B. INITIAL STATEMENT OF WORK (SOW)

The purpose of this SOW is to describe the Software and Services that Company will initially provide to Zilliox, Inc. ("Client") under the terms and conditions of the Services Agreement entered into between the parties on June 1, 2021 (the "Agreement"). Additional terms and conditions may be set forth in this SOW, and additional SOWs that may be subsequently signed.

To the extent the terms and conditions of this SOW are inconsistent with those of the Agreement, the terms of this SOW will control with respect to the Services described herein. Capitalized terms used herein shall have the same meaning as those used in the Agreement.

This SOW is an attachment to, and is incorporated by this reference into the Agreement as if fully set forth therein and make a part thereof. This SOW, together with the Agreement, represents the complete and total understanding of the parties regarding the Services to be provided by Company hereunder.

1. **Services Period.** Unless otherwise terminated earlier in accordance with the terms of the Agreement, the Services will end upon the completion of the Services by Company, which in no event shall be later than June 1, 2022, and payment by Client.

2. **Fees.** The Services outlined in this SOW reflect the initial understanding of Client's desired Deliverable and Company reserves the right to alter the manner in which Services are provided if Company determines different services are necessary to complete the Deliverable. Company shall provide the following Services to the Client:

Itemized Fees	Fee
Software: MagicSoft Desktop v. 3.0 (60 days)	\$100,000
Software: MagicSoft Connect v. 5.0 (60 days)	\$50,000

3. **Fees and Terms.**

Itemized Fees	Fee
Initial Setup	\$20,000
Profile Customizations	\$20,000
Conversion Environment	\$10,000
Total	\$230,000

Fixed Price: \$230,000
Start Date: 07/01/2021
End Date: 10/31/2021

4. **Hours of Operation**

- Engineering

Mitigations:

1. Structurally chunk the document to find structural elements.
2. Stitch together reading order flow with language models.
3. Sub-chunk for RAG using document structural elements rather than simple tiling or text splitting.

Challenge 2: Documents are Knowledge Graphs

Document structures and spatial relationships contain semantics that are often lost in simple text-based retrieval

Mitigations:

1. XML hierarchical Knowledge Graph representation for inherent per-document semantics added to vector store for RAG
2. Schema normalization across sets of similar documents

The screenshot displays the DocuGami Excel Report Designer interface. The top header bar is green with the DocuGami logo and navigation icons. Below the header, the document is titled "Leases Summary" with a "DOC SET: Lease" and "STATUS: Designing". A "NEXT DOC" button is visible. The main workspace is titled "EXCEL REPORT DESIGNER" and shows a document titled "TruTone Lane 2.docx". The document content is an "OFFICE LEASE AGREEMENT" with a highlighted section: "This OFFICE LEASE AGREEMENT (this 'Lease') is made and entered into by and between BUBBA CENTER PARTNERSHIP ('Landlord'), and TruTone Lane LLC, a Delaware limited liability company ('Tenant')." Below this is "ARTICLE I BASIC LEASE TERMS" with fields for Commencement Date, Landlord Address, Tenant Address, Address of Premises, Building, and Building Rentable Area. On the right, the "REPORT ITEMS" panel lists: "Landlord" (BUBBA CENTER PARTNERSHIP), "Tenant" (TruTone Lane LLC), and "Lease Parties" (This OFFICE LEASE AGREEMENT [this 'Lease'] is...). The "SUGGESTED ITEMS" panel lists: "Annual Base Rent Shall Increase", "Limits of Liability", and "Taken". Arrows indicate the mapping from the document content to the report items.

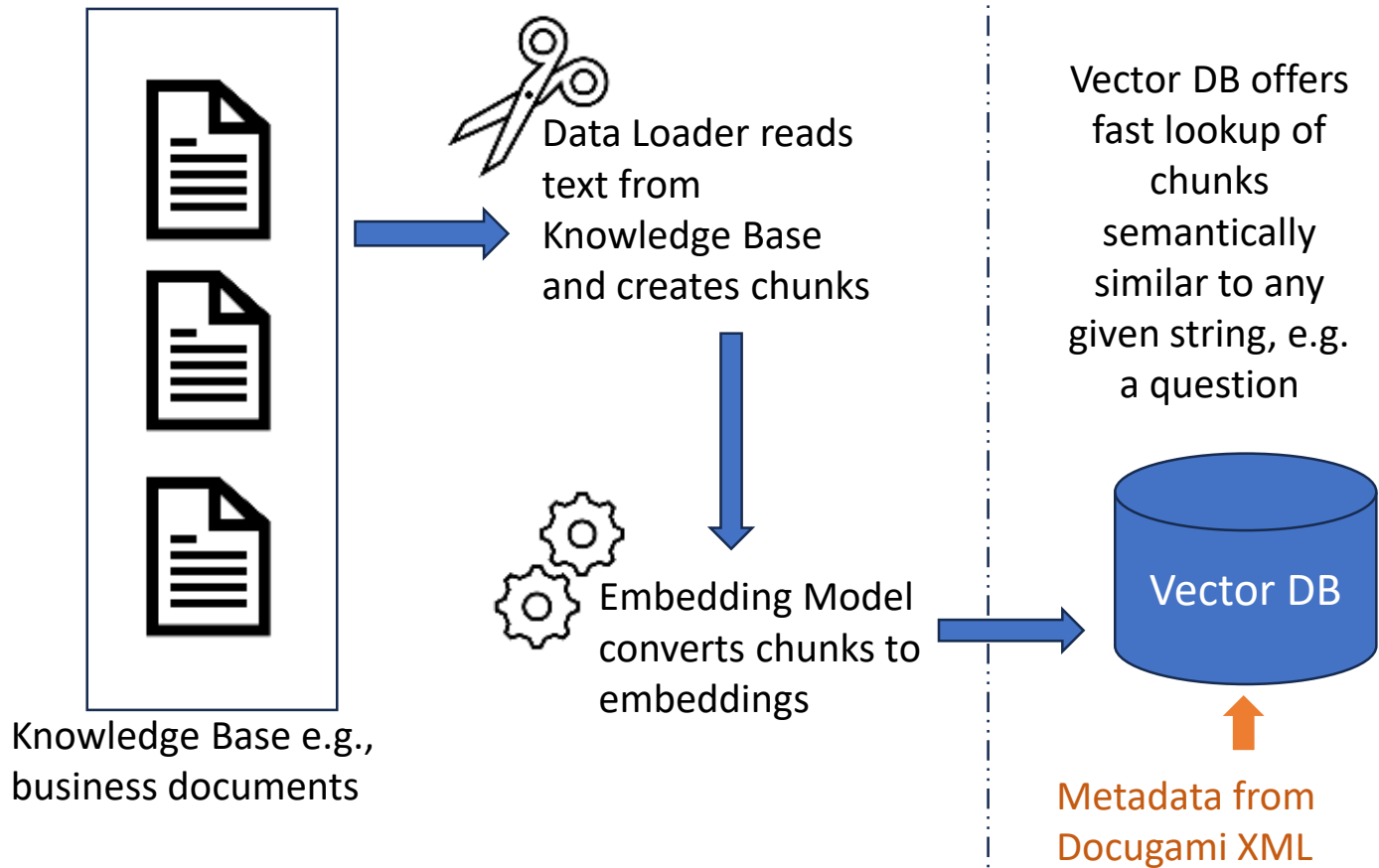
Example XML hierarchical Knowledge Graph

Represents structural relationships as well as per-chunk semantic labels

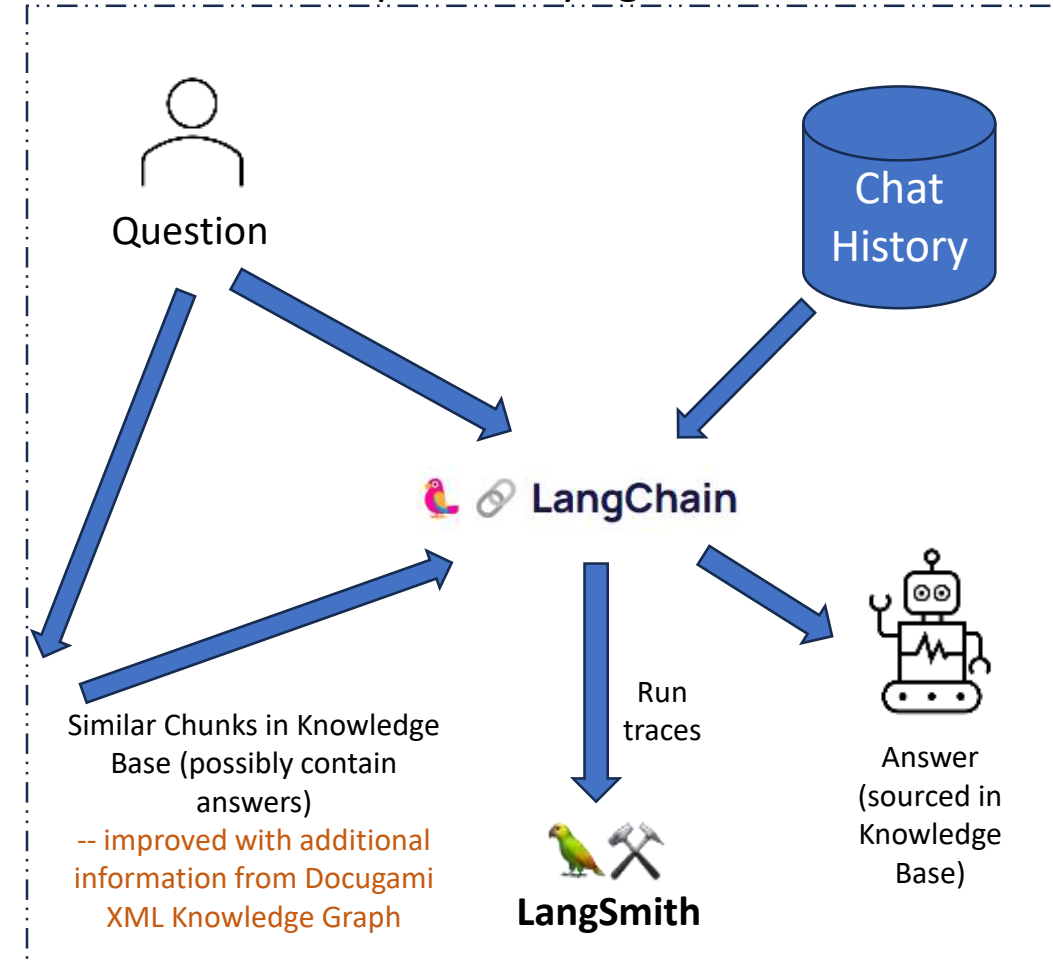
```
<?xml version="1.0" encoding="utf-8"?>
<docset:MUTUALNON-DISCLOSUREAGREEMENT-section xmlns:docset="http://www.docugami.com/2021/dgml/PublishTest/NDA" xmlns:addedChunks="http://www.docugami.com/2021/dgml/PublishTest/NDA/addedChunks" xmlns:dg="http://www.docugami.com/2021/dgml"
  <docset:MutualNon-disclosure structure="h1">
    <dg:chunk:MUTUAL NON-DISCLOSURE AGREEMENT </dg:chunk>
  </docset:MutualNon-disclosure>
  <docset:MUTUALNON-DISCLOSUREAGREEMENT structure="div">
    <docset:ThisMutualNon-disclosureAgreement>
      <docset:Preamble structure="p">
        This
        <dg:chunk:Mutual Non-Disclosure Agreement </dg:chunk>(this "
        <dg:chunk:Agreement</dg:chunk>" is entered into and made effective as of
        <docset:EffectiveDate xsi:type="date">2/4/2018 </docset:EffectiveDate>between
        <dg:Org>Docugami Inc.</dg:Org>, a
        <dg:USState>Delaware </dg:USState>corporation, whose address is 150 Lake Street South, Suite 221, Kirkland,
        <dg:USState>Washington </dg:USState>
        <dg:chunk>Delaware corporation</dg:chunk>, whose address is
        <docset:CompanyAddress>
          <dg:Street>
            <dg:chunk>
              <dg:Number>150 </dg:Number>
              <dg:StreetName>Lake Street South</dg:StreetName>
            </dg:chunk>,
            <dg:Apt>
              <dg:chunk>Suite </dg:chunk>
              <docset:Suite>221</docset:Suite>
            </dg:Apt>
          </dg:Street>,
          <dg:City>Kirkland</dg:City>,
          <dg:State>Washington </dg:State>
          <dg:Number>98033</dg:Number>
        </docset:CompanyAddress>, and
        <docset:Signatory>Leonarda Hosier</docset:Signatory>, an individual, whose address is
        <dg:Address>
          <dg:Street>
            <dg:Number>374 </dg:Number>
            <dg:StreetName>William S Canning Blvd</dg:StreetName>
          </dg:Street>,
          <dg:chunk>
            <dg:City>Fall River </dg:City>
            <dg:State>MA </dg:State>
          </dg:chunk>
        </dg:Address>
        <dg:Number>2721</dg:Number>
        <docset:SignatoryAddress>374 William S Canning Blvd, Fall River MA 2721</docset:SignatoryAddress>.
      </docset:Preamble>
      <docset:Discussions structure="p">
        The above named parties desire to engage in discussions regarding a potential agreement or other transaction between the parties (the "Purpose"). In connection with such discussions, it may be necessary for the parties to d
      </docset:Discussions>
    </docset:ThisMutualNon-disclosureAgreement>
  </docset:MUTUALNON-DISCLOSUREAGREEMENT-section>
</docset:MUTUALNON-DISCLOSUREAGREEMENT-section>
```

Retrieval Augmented Generation (RAG) w/ Semantic Chunk Metadata from Docugami XML

Step 1: Indexing / Ingestion



Step 2: Querying



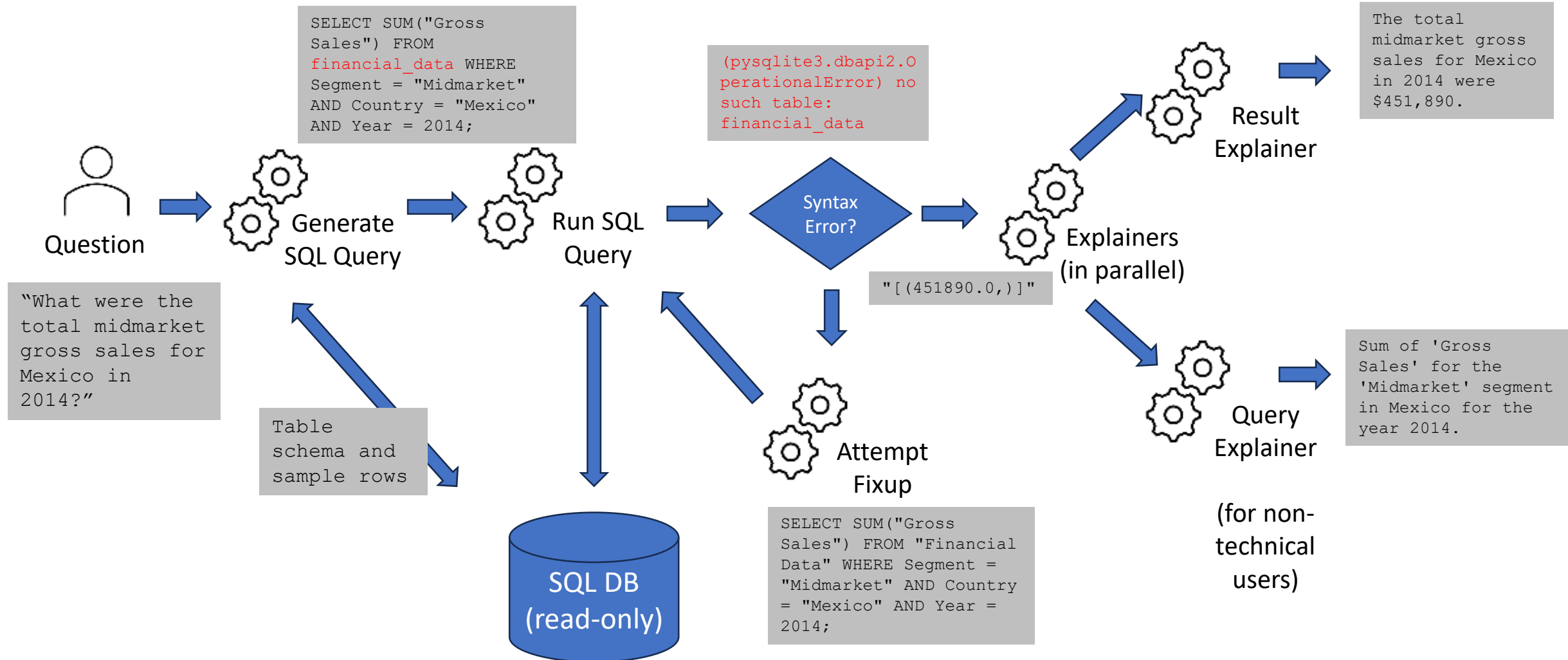
Challenges 1 & 2

CODE WALK-THROUGH

https://rebrand.ly/docugami_semantic_rag

Challenge 3: Building Complex Chains with the LangChain Expression Language

Real-world chains can get complicated with parallel branches, output parsers, few shot examples, conditional sub-chains, etc.



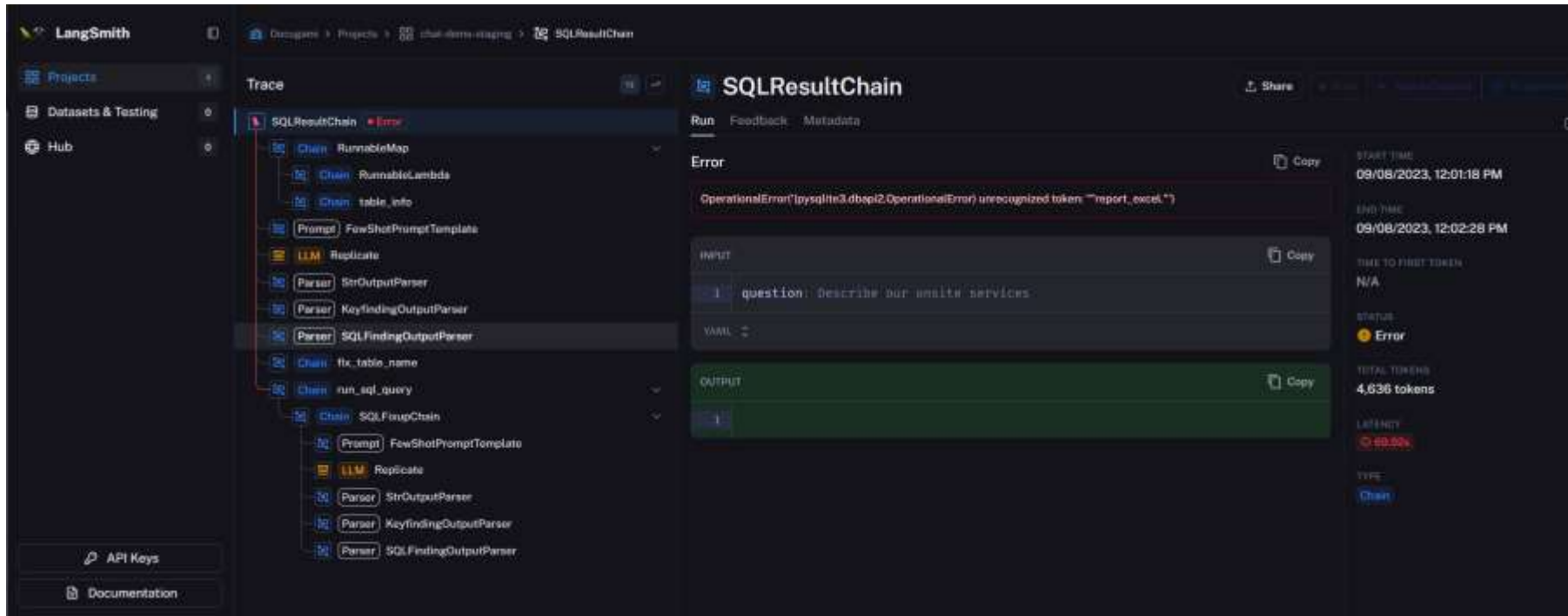
Challenge 3

LANGSMITH WALK-THROUGH

<https://smith.langchain.com/public/ab8ef1ec-46d1-4d1f-980a-6dcc8f1943e0/r>

Challenge 4: Debugging Complex Chain Failures in Production

Identifying what went wrong, where...



Common Failures:

1. [Invalid SQL that could not be automatically fixed, leading to chain failure](#)
2. [Token overflow \(table schema too large\)](#)
3. LLM rate limit reached
4. LLM call failed with GPU OOM (for self-hosted models)
5. Exception in custom python RunnableLambda
6. Exception in custom output parser

TIP: Name all runnable lambdas and pass config to conditionally-invoked runnables to correctly link and name. Reference: [cookbook](#) | [example](#)

TIP: If you have a link to a detailed call stack for an exception, you can add it to the failed run as metadata for later investigation. You can also add other information useful to investigate the failure later.

Summary: Docugami's End to end LLM Ops with LangChain + LangSmith

1. Deploy Model (we self-host a custom LLM)
2. Regularly look at failed and user-disliked runs
3. Add some problematic runs to dataset
 - a) Failed runs e.g. with syntax errors
 - b) Runs with negative user feedback
4. Fix runs in dataset
 - a) Tip: use larger LLM to propose fixes
 - b) Tip: validate that fixes are syntactically correct e.g. by checking SQL syntax
5. Add some examples to few shot set for in-context learning
6. Fine tune model on updated dataset
7. Redeploy (go back to #1)

Q&A



DOCUGAMI

The Document Engineering Company

Docugami API

1. Docs: <https://help.docugami.com/home/docugami-api>
2. Things to try:
 - a) Upload docs (DOCX, DOC, digital or scanned PDF)
 - b) Download processed XML (with semantic metadata tags)
 - c) Build reports to identify key chunks
 - d) Use the [LlamaHub Docugami loader](#) to load docs for RAG, with report metadata
3. Free trials available!

Example: Extracting Custom Data from a Document Set

Improved significantly via structural chunking and key metadata associated with all chunks

DOCUGAMI					
NAME: Non-Compliant Docs DOC SET: Services Agreement STATUS: Designing					
Grid View					
DILIGENCE REPORT DESIGNER					
SHOW: Select filter					
HUMAN MACHINE WORKING...					
DOCUMENT	Effective Date	Liability Cap Exclusions	Itemized Fees Table	Begin Date	End Date
1. Master Services Agreement - Zillilee 2Col.docx	June 1, 2021	THE FOREGOING EXCLUSIONS AND LIMITATIONS OF LIABILITY SET FORTH IN...	Itemized Fees Software MagicSoft Mobile x 2 MagicSoft Connect seats	07/01/2021	10/01/2021
2. Master Services Agreement - Flowpoint 2C Color.pdf	June 15, 2021	Company's liability under this agreement will not exceed \$900,000 under this agreement during th...	Itemized Fees Software MagicSoft Mobile x 2 MagicSoft Connect seats	06/15/2021	09/30/2021
3. Master Services Agreement - Hottechi Color LQ300.pdf	May 1, 2021	The foregoing exclusions and limitations of liability set forth in section	Itemized Fees Software MagicSoft Mobile x 2 MagicSoft Connect seats	05/15/2021	09/01/2021
4. Master Services Agreement - Vector Color LQ200.pdf	July 1, 2021	Company's liability under this agreement will not exceed \$2,000,000 under this agreement during...	Itemized Fees Software MagicSoft Mobile x 2 MagicSoft Connect seats	07/15/2021	10/30/2021
5. Master Services Agreement - Echo Formatted.pdf	June 1, 2021	THE FOREGOING EXCLUSIONS AND LIMITATIONS OF LIABILITY SET FORTH IN...	Itemized Fees Software MagicSoft Mobile seats MagicSoft Connect seats	06/15/2021	09/30/2021
6. Master Services Agreement - Blackzim Color.pdf	January 15, 2022	Company's liability under this agreement will not exceed \$2,500,000 under this agreement during...	Itemized Fees Software MagicSoft Mobile x 2 MagicSoft Connect seats	01/15/2022	03/31/2022
7. Master Services Agreement - Bioplex Formatted LQ200.pdf	January 15, 2021	THE FOREGOING EXCLUSIONS AND LIMITATIONS OF LIABILITY SET FORTH IN...	Itemized Fees Software MagicSoft Mobile x 2 MagicSoft Connect seats	03/03/2021	06/01/2021
8. Master Services Agreement - Finesse 2C Color.docx	June 15, 2021	Company's liability under this agreement will not exceed \$1,000,000 under this agreement during...	Itemized Fees Software MagicSoft Mobile x 2 MagicSoft Connect seats	06/30/2021	09/30/2021
	June 1, 2021	THE	Itemized Fees MagicSoft Mobile	06/15/2021	09/30/2021

Example: Authoring Assistance Based on Your Documents

Improved significantly via structural chunking and key metadata associated with all chunks

The screenshot displays a Microsoft Word document titled "My new Services Agreement.docx". The document content is as follows:

MASTER SERVICES AGREEMENT

This Services Agreement (the "**Agreement**") sets forth terms under which MagicSoft, Inc., a Washington Corporation ("**Company**") located at 600 4th Ave, Seattle, WA 98104 shall provide services to Daltech, Inc., a Washington Corporation (the "**Client**") located at 701 1st St, Kirkland, WA 98033. This Agreement is effective as of February 15, 2021 ("**Effective Date**").

A. STANDARD SOFTWARE AND SERVICES AGREEMENT

1. Deliverables. Company shall provide Client with software, technical support, product management, development, and testing services ("**Services**") to the Client as described on one or more Statements of Work signed by Company and Client that reference this Agreement ("**SOW**" or "**Statement of Work**"). Company shall perform Services in a prompt manner and have the final product or service ("**Deliverable**") ready for Client no later than the due date specified in the applicable SOW ("**Completion Date**"). This due date is subject to change in accordance with the Change Order process defined in the applicable SOW. Client shall assist Company by promptly providing all information requests known or available and relevant to the Services in a timely manner.

2. Onsite Services.

2.1 Onsite visits will be charged on a daily basis (minimum 8 hours).

2.2 Time and expenses will be charged based on actuals unless otherwise described in an Order Form or accompanying SOW.

2.3 All work will be executed during regular working hours Monday-Friday 0800-1900. For work outside of these hours on weekdays, Company will charge one hundred percent (100%) of the regular hourly rate and two hundred percent (200%) for Saturdays, Sundays and public holidays applicable to Company.

The Docugami sidebar on the right provides a structured view of the document's content, categorized by importance:

- VERY IMPORTANT**
 - This Agreement**

This agreement shall continue to form and effect until:
+FIELD1+ and shall be automatically renewed for +FIELD2+
+FIELD3+ thereafter until notice of non-renewal is given by
+FIELD4+ or +FIELD5+ before the end of the term. +FIELD6+
shall have the right to modify, repair, or terminate +FIELD7+.
- IMPORTANT**
 - Contract Price**

+FIELD1_1+ For performance of +FIELD1_1+ and rendering
+FIELD2_1+ +FIELD3_1+ shall pay to +FIELD4_1+ all fees due
under +FIELD5_1+.
 - Limitation**

Limitation of liability. COMPANY WILL NOT BE LIABLE FOR
ANY LOSS OF USE, INTERRUPTION OF BUSINESS, LOST PROFITS,
OR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL
DAMAGES OF ANY KIND REGARDLESS OF THE FORM OF ACTION
WHETHER IN CONTRACT, TORT...
 - Company**

COMPANY WILL NOT BE LIABLE FOR ANY LOSS OF USE,
INTERRUPTION OF BUSINESS, LOST PROFITS, OR ANY
INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL
DAMAGES OF ANY KIND REGARDLESS OF THE FORM OF
ACTION WHETHER IN CONTRACT, TORT INCLUDING...
 - Deposit**

+FIELD1_1+ +FIELD2_1+ is entered in their entirety.
 - Termination**

Termination This agreement shall continue to form and effect
until +FIELD1_1+ and shall be automatically renewed for
+FIELD2_1+.
 - Commercial General Liability Insurance**

+FIELD1_1+ including +FIELD2_1+ Coverage, with coverage for
+FIELD3_1+ completed operations, property...

Page 1 of 7 2553 words Text Predictions: On Accessibility: Investigate

Example: Workflows Triggered by Auto-Extracted Data

Improved significantly via structural chunking and key metadata associated with all chunks

