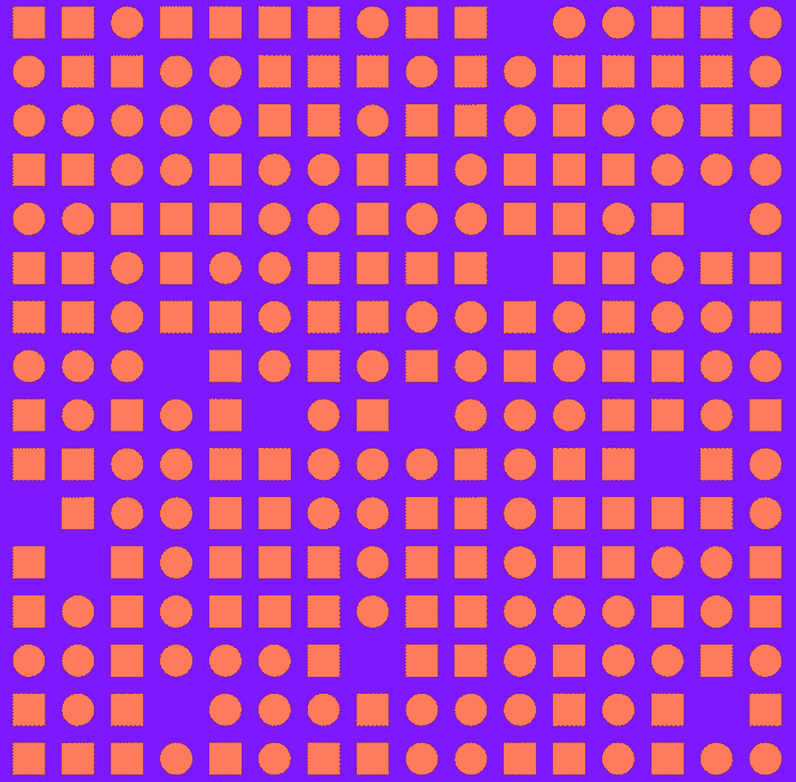
TypeFox

Langium + AI

Building AI Applications for Langium DSLs



LangDev CON 2024

Overview

1. Introduction
2. Background
3. Problem
4. Solution
5. Implementation
6. Demo
7. Wrap-up

Introduction

Introduction

Myself

- Benjamin Friedman Wilson
- Language Engineer @ TypeFox s. 2022
- Working on DSLs (Langium)
- Full Stack Applications

Introduction

And TypeFox

- Benjamin Friedman Wilson
- Language Engineer @ TypeFox s. 2022
- Working on DSLs (Langium)
- Full Stack Applications

- Topics at TypeFox
  - Language Engineering services
  - Cloud & Desktop IDEs
  - Modeling & Diagramming

Background

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Motivation for Digging into this

- Langium has been doing *great*
- AI Assistants have been doing *great*
  - CoPilot, Tab9, Anthropic, ChatGPT,…

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How can I get AI to work with my DSL?

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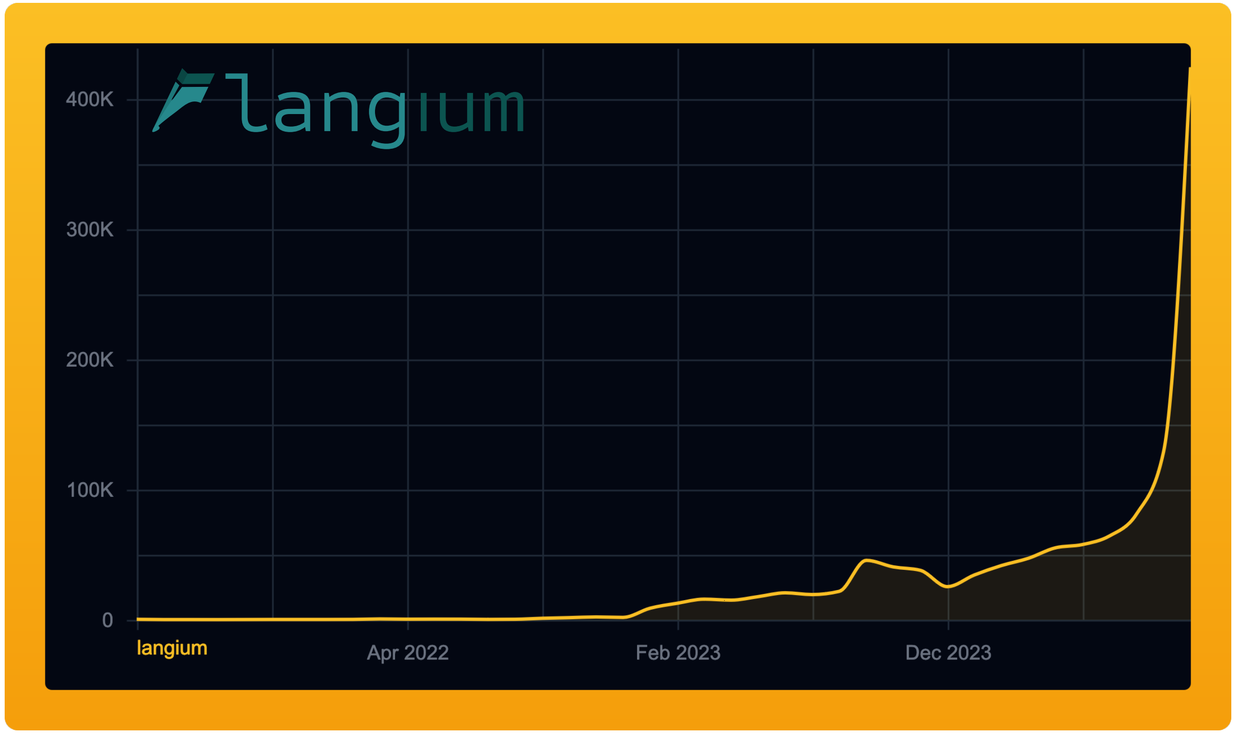
Which leads to the following:

How can I get AI to work with my DSL?

- But for *novel* DSLs:
  - Not much training data
  - Not many examples

Background

And a Quick Aside on Eclipse Langium



- Langium is an LE Framework written in TS
- Based on Chevrotain (parser-builder)
- Runs on Server & Browser

- LSP support out of the box for your DSLs
- Highly customizable w/ suitable defaults
- Now an *Eclipse Foundation* project

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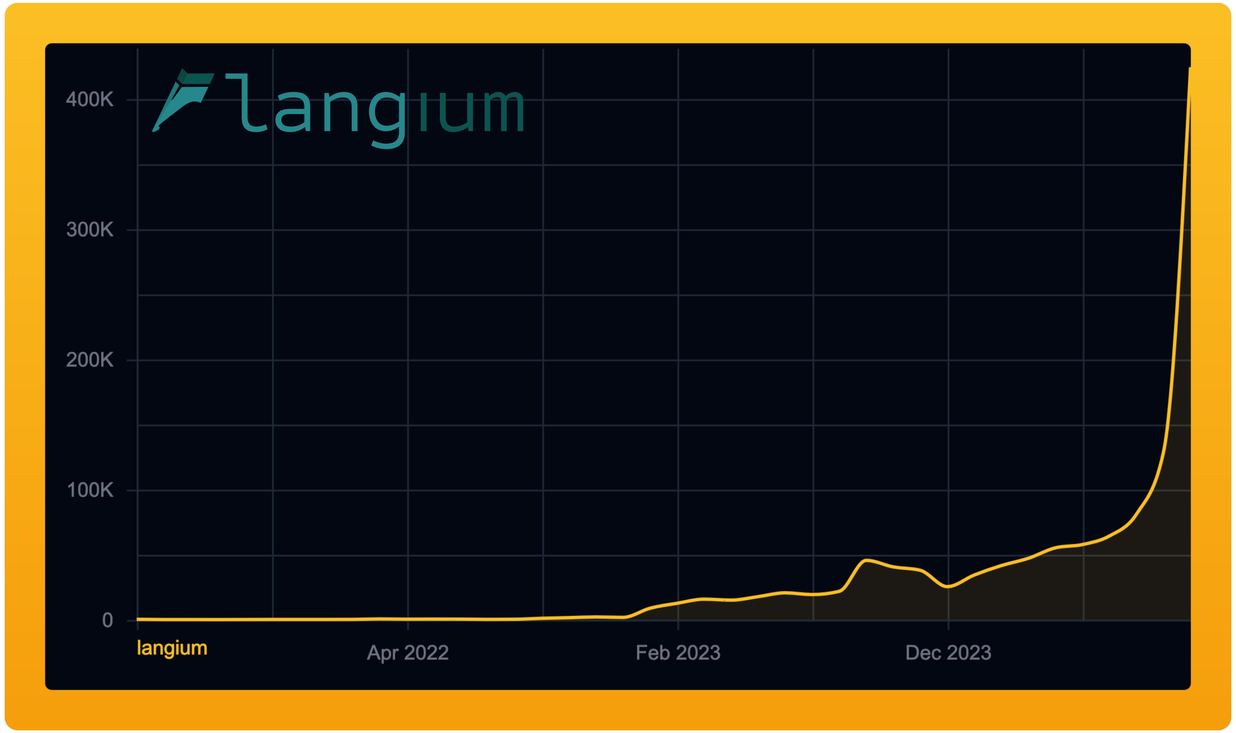

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- If you haven't heard of it, it's akin to *Xtext*

Problem

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Can we get AI to support language XYZ?

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Yes, but why?

Problem

Can we get AI to support language XYZ?

Yes, but why?
No, and why?

Problem

Can we get AI to support language XYZ?

- Generally speaking
  - Yes.

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- With a Langium DSL?
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Can we get AI to support language XYZ?

- Generally speaking
  - Yes.
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  - *Kinda.*
- Are the results good?
  - No.
- Are they getting better?
  - Yes, but it depends…

Problem

Can we get AI to support Langium DSLs?

- Langium itself will get support passively
  - Present in data for GPT, Claude, etc.
- But *not* so much for Langium-based DSLS

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  - Present in data for GPT, Claude, etc.
- But *not* so much for Langium-based DSLS

- **Crux of the problem**
  - *How to get AI support for novel Langium DSLs?*

Problem

Issues with Supporting Langium DSLs

- No pre-existing training data
  - i.e. it’s not in the model

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- Often few or limited examples
- Documentation is often limited

- Language is often *evolving*
  - Creates a moving target

Problem

Overview

- We need:
  - a quick way to build AI agents w/ DSL knowledge
  - to be able to iterate on the agent and the DSL
  - to be able to reasonably trust the agent’s results

Solution

Solution

Langium AI

- Langium AI
  - Taps into an existing Langium DSL
  - Leverages existing DSL services
  - Provides:
    - DSL Doc splitting
    - AI App evaluation
- Naturally, also written in TypeScript

Solution

Langium AI

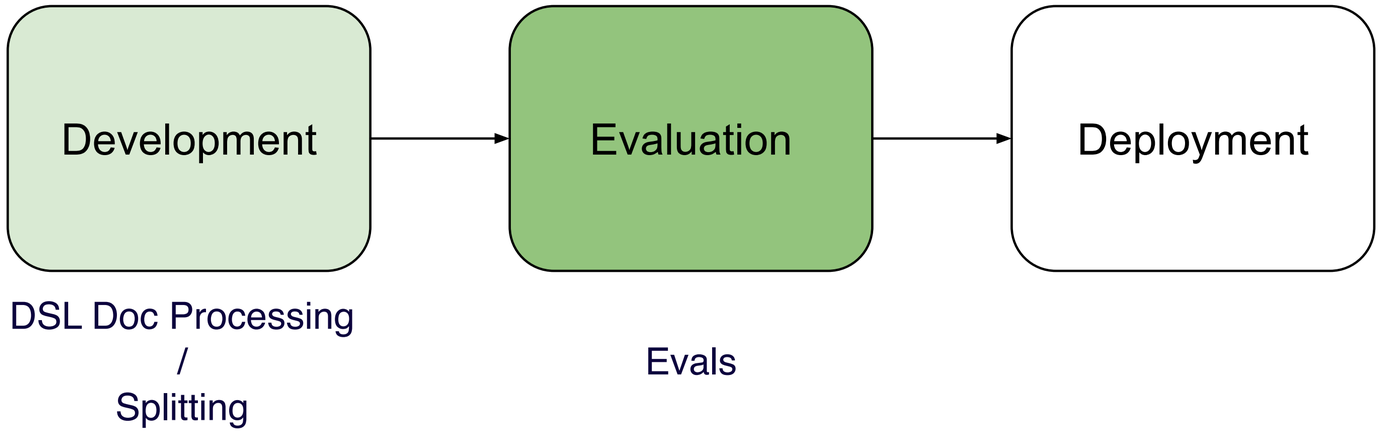
- Langium AI is for:
  - Langium developers
  - Those who need an agent for an LDSL
  - Not *necessarily* ML experts
- But it's *not* for:
  - Replacing existing models & stacks
  - Fine-tuning models
  - Training models
- *This complements existing AI apps that work with or support Langium DSLs*

Solution

Where does Langium AI Fit in?

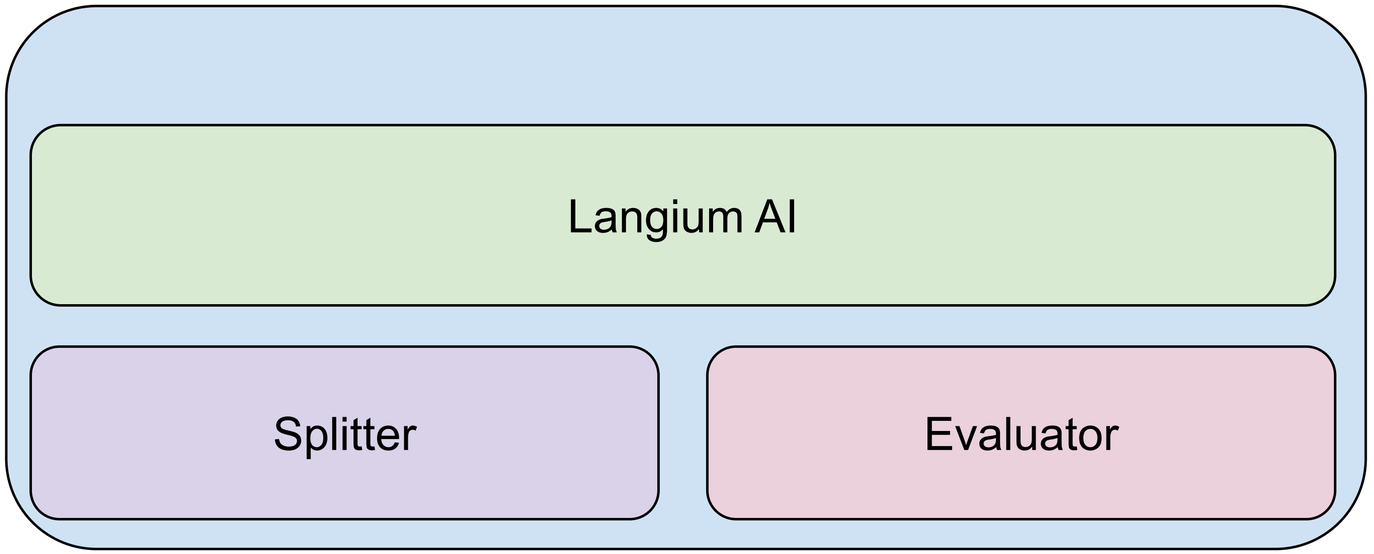
Solution

Where does Langium AI Fit in?



Solution

Splitter & Evaluator



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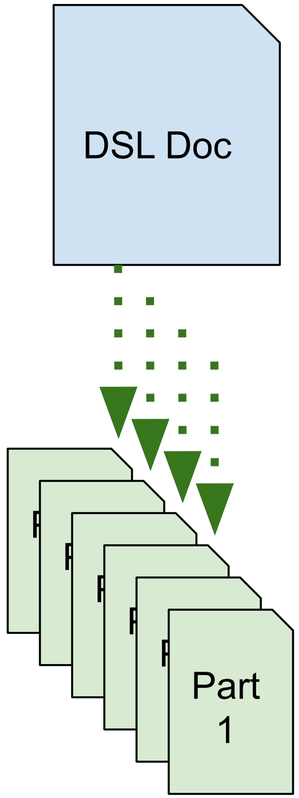

- Assists in Splitting DSL Documents
  - Intended for RAG-based apps
    - Splitting by functions, blocks, etc.
  - Can help *reduce* larger documents
  - Can help *remove* redundant chunks

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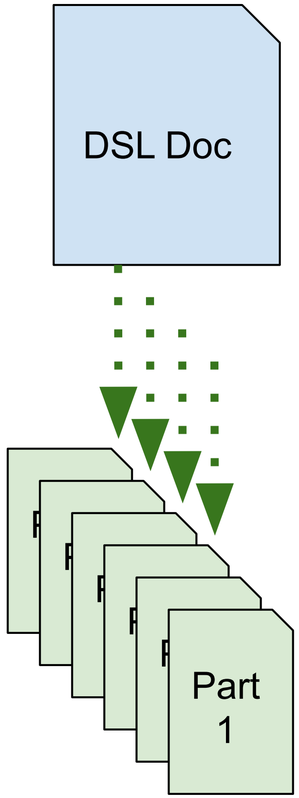
Splitter



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  - Intended for RAG-based apps
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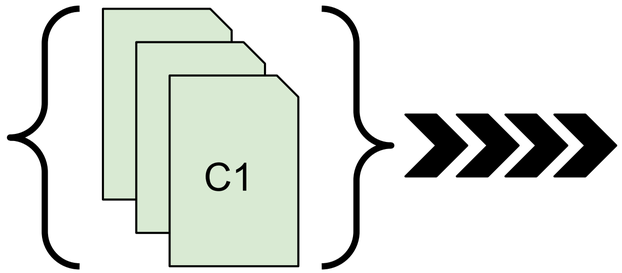
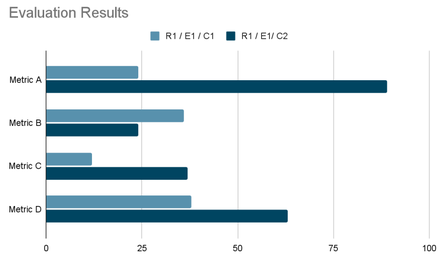
- Idea is to split using the syntax
  - ex. Rules of your grammar / AST nodes

Solution

Evaluator





- Produce metrics from input/output pairs
  - Prompt & Response
- Provide context history as needed
- Collect metrics into a reportable form

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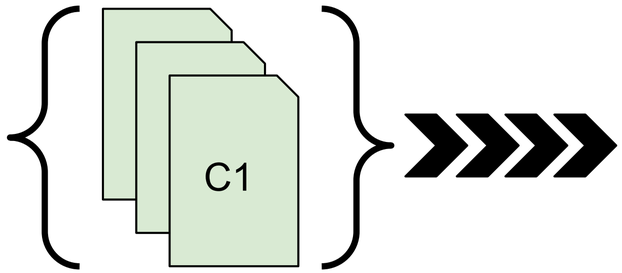

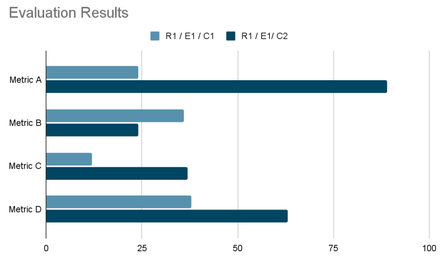

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- Helps determine *quality* of output
- Leverages your DSL's existing validations

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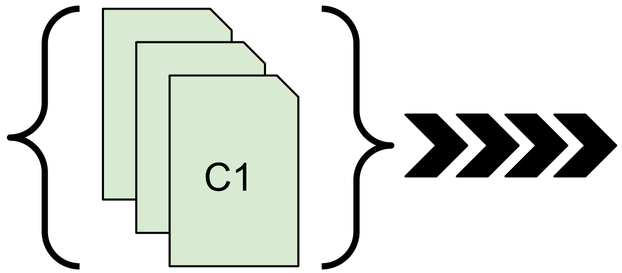

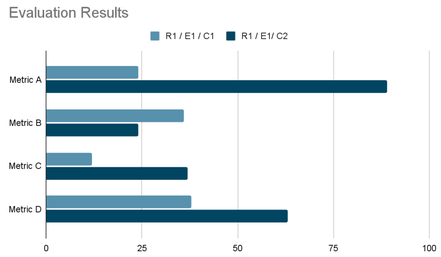

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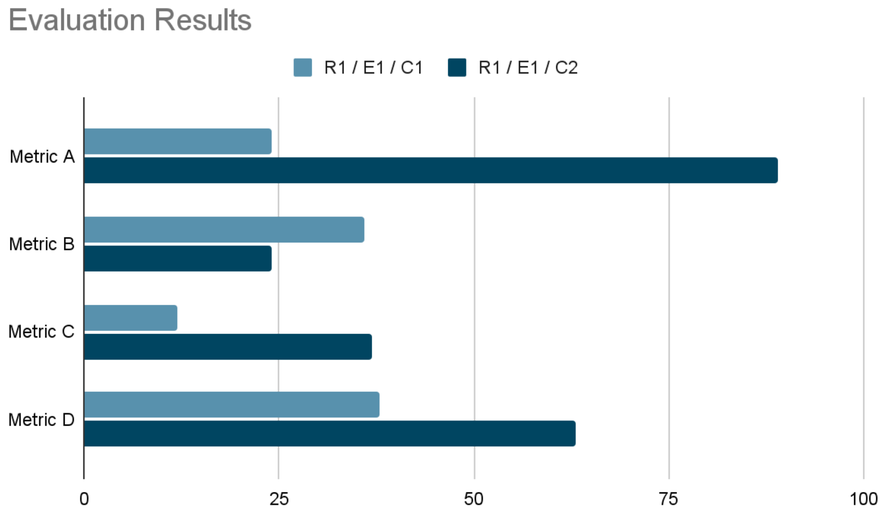
- Lets us *iterate* quickly and maintain *trust*

Solution

And Evaluator Results

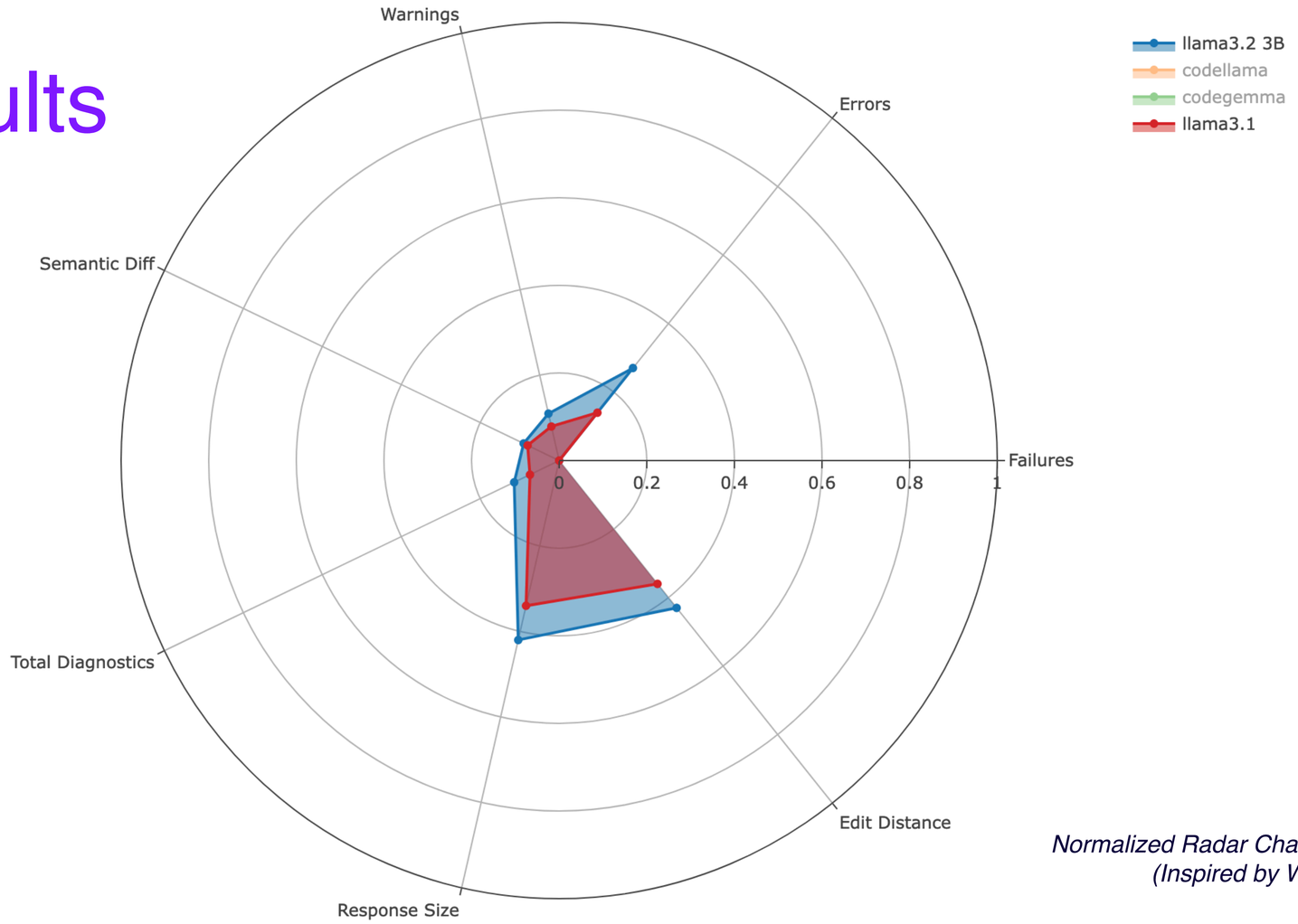


- Evaluation results capture
  - Input/Output
  - Metrics
  - Metadata

- Used for comparative analysis
- I.e. apples to apples analysis

Solution

Evaluator Results



Normalized Radar Chart using PlotlyJS
(Inspired by WandB)

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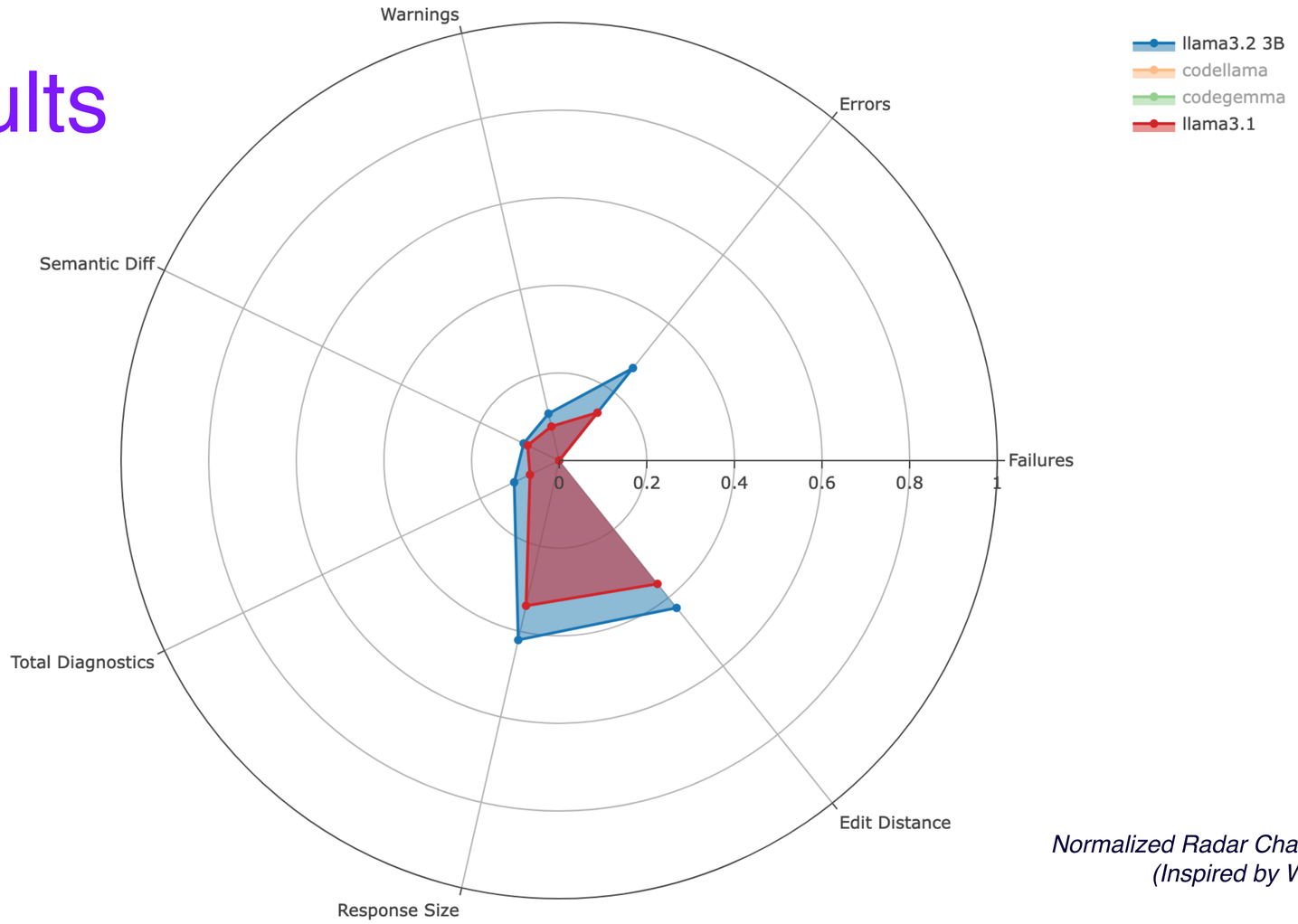

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Implementation

Overview of Splitter & Evaluator

Implementation

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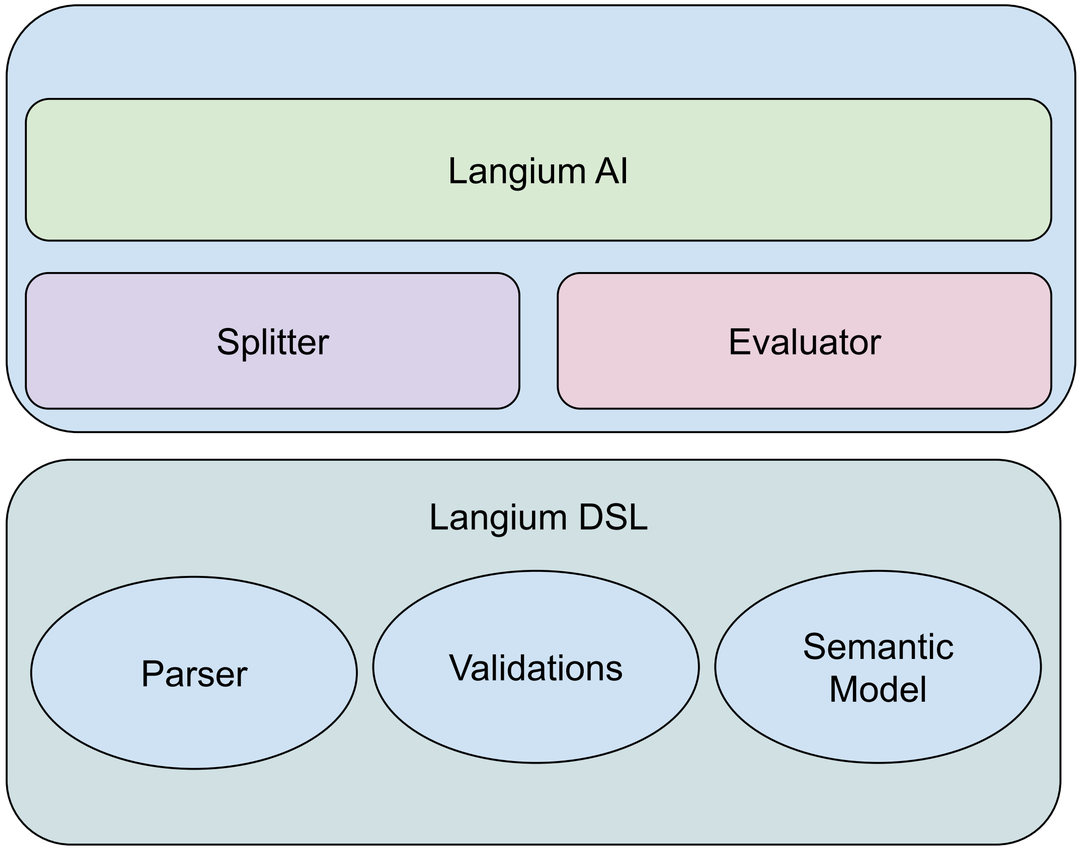
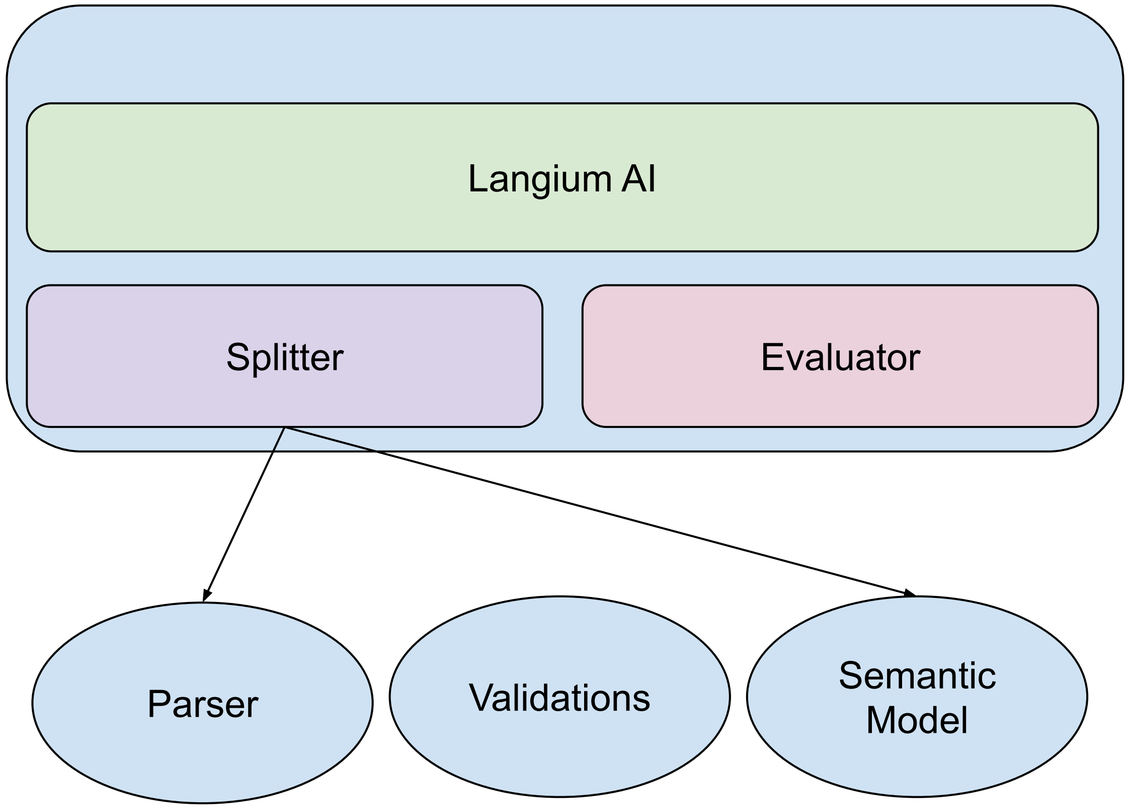


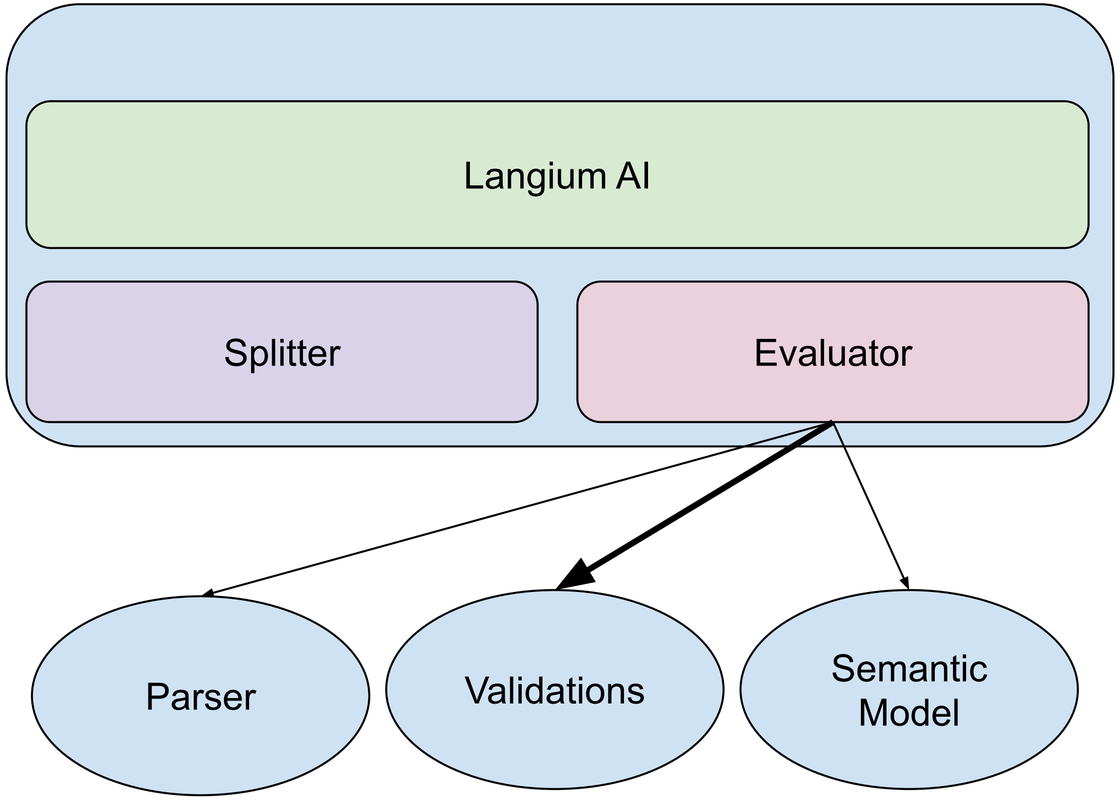
Implementation

Splitter



Implementation Overview

Evaluator



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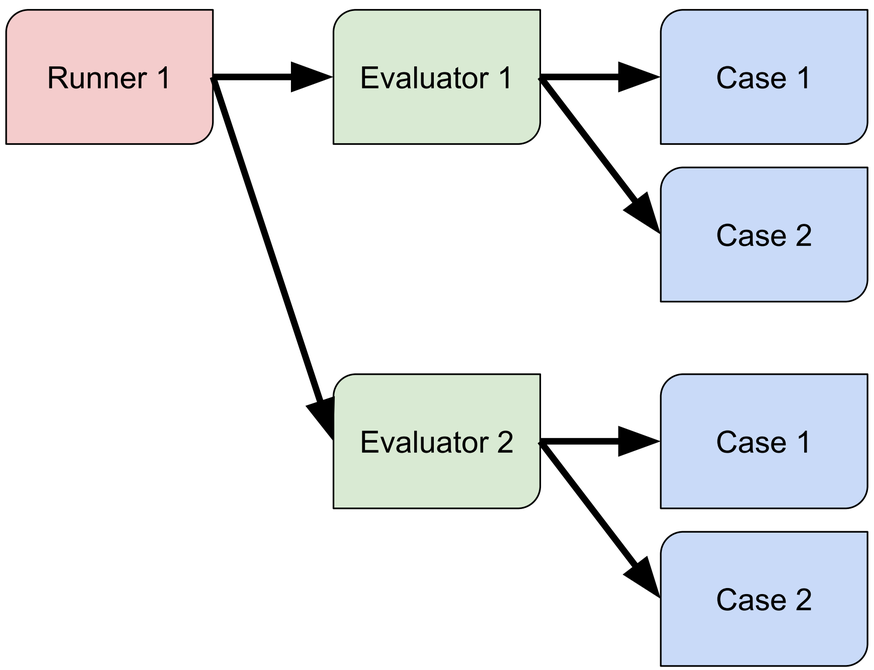

- Evaluations are defined as a matrix
  - Runners x Evaluators x Cases
  - **Runners** are invocable, take an input, run it on a model, and return the result
  - **Evaluators** define a strategy to assess a given response, provided some case
  - **Cases** define an input/output pair you want to assess

Implementation Overview

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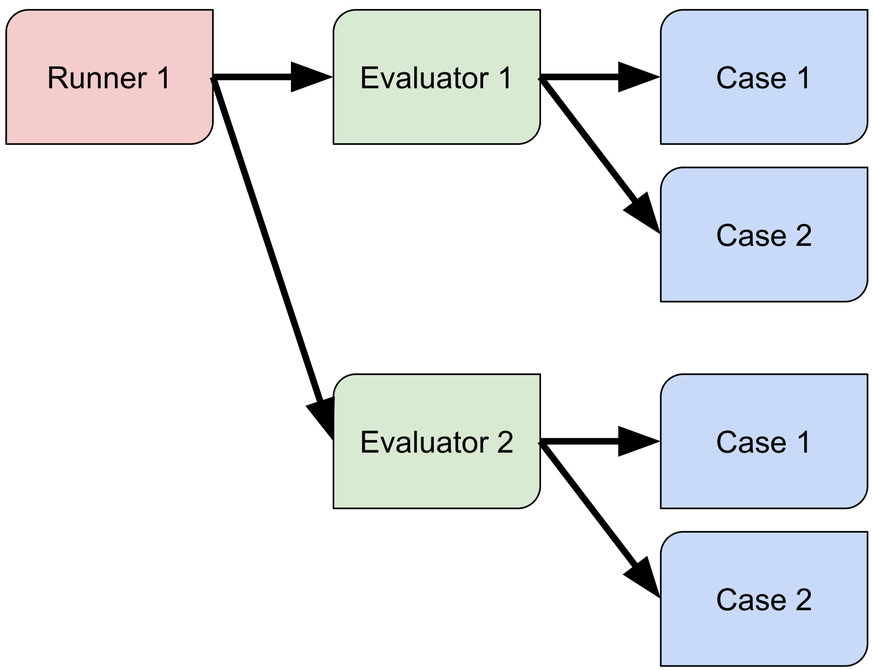

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  - **Cases** define an input/output pair you want to assess
- LangiumEvaluator is provided
  - Uses validations as *metrics*

Demo

Evaluator Code for the Langium DSL

Summary

Langium AI

- Supports developing AI applications for Langium DSLs
  - Provides doc splitting utilities
  - Provides tools for evaluating AI app performance
- Facilitates iterative development of AI applications
- Agnostic of your AI tooling

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Ideally, this helps to assess what you're already working on

Final Remarks

- Currently a WIP (repo will come soon)
- Looking to push out an 0.2.0 later this year
- We'll notify on www.typefox.io/blog & socials
- Plan is to:
  - Expand on splitter
  - Improve evaluator
  - Iterate based on practical needs (while staying agnostic)

TypeFox

That’s all.
Thanks for your attention!