



Enhancing Conversational AI Model Performance and Explainability for **Sinhala-English** Bilingual Speakers

2022-056

Progress Presentation - II

The Team



Supervisor
Dr. Lakmini Abeywardhana



Co – Supervisor
Ms. Dinuka Wijendra



Dissanayake D.M.I.M.
IT19069432
(Explainable AI)



Hameed M.S.
IT19064932
(Codeless Interface)



Jayasinghe D.T.
IT19075754
(Language & Interactions)



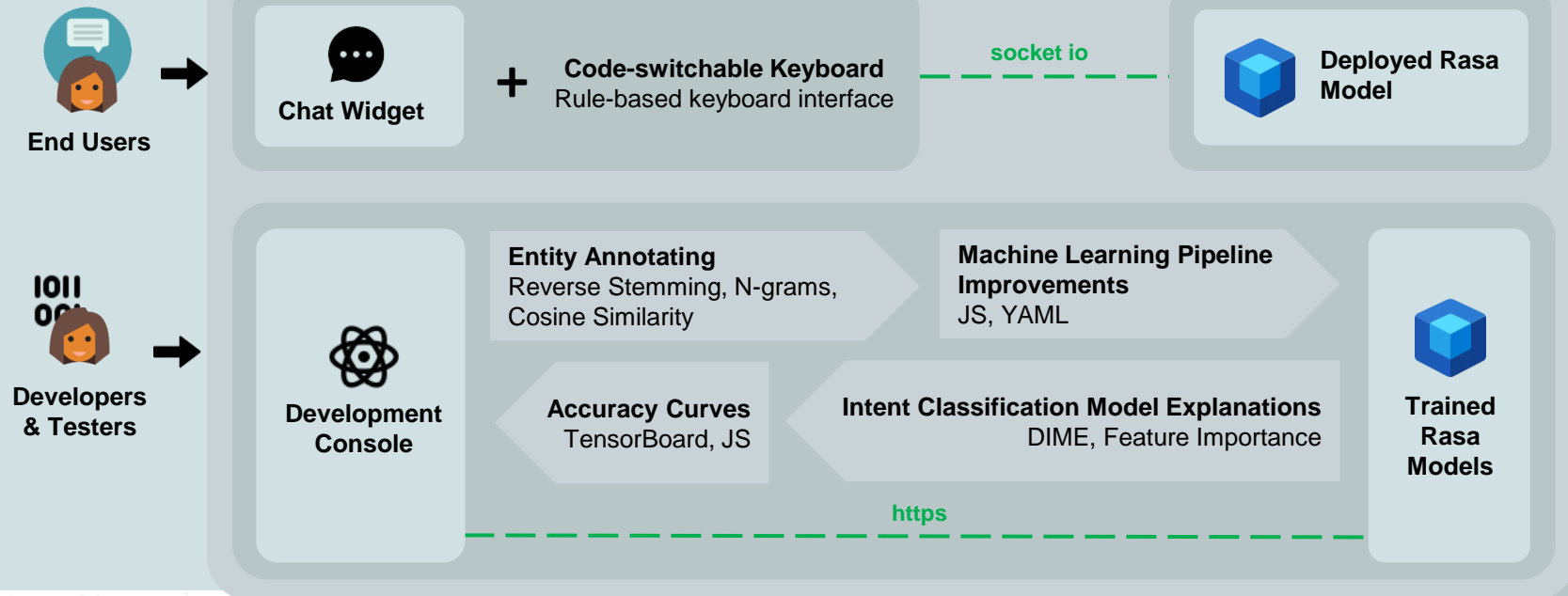
Sakalasooriya S.A.H.A.
IT19051208
(Entity Annotation)



kolloge



Sysyem Architecture



98%

SIENA: Annotating entities using reverse-stemming & other techniques



to develop a data annotation tool for code-mixed text data for efficient
custom entity tagging.



Sakalasooriya S.A.H.A.
IT19051208
Data Science

Problem



Why custom name entity tagging is
very time consuming?  

Any solution?



Solution

FILES

- nlu.yml
- academic_performance.yml
- degrees.yml
- exams.yml
- general.yml
- internships.yml
- modules.yml
- nlu.yml

KNOWLEDGE

- it ඩිග්
- ඩිග්
- ඩිග්වර්ගී
- ඩිග්

Save as RASA NLU data | Import knowledge base | Export knowledge base

ENTITIES

- it_degree:degree
- ds_degree:degree
- building:place
- labs:place

Add new entity

degrees.yml

මයාලයෙ මොනවද නිශෙන ඩිග්?

SLIIT එකේ නිශෙන ඩිග්ස් මොනවද?

මයාලයෙ නිශෙන IT ඩිග් වර්ග මොනවද ?

SLIIT එකේ නිශෙන building:place labs:place ?

SLIIT එකේ Data Science ඩිග්ස් නිශෙනවද ?

SLIIT එකේ නිශෙන උපාධි මොනවද ?

Manage entities

Entity name

In a given user message, the thing that a user is trying to convey or accomplish (e.g., greeting, specifying a location).

Value name

In here you can provide a value for the entity

Save

Cancel

Open

Organize

Desktop

Documents

Downloads

Music

Pictures

Videos

Devices and drives

OS (C:)

322 GB free of 475 GB

File name:

Microsoft Excel Comma Separ

Open

Cancel

Downloads

What do you want to do with knowledge-16653...

Open

Save as

Requirements



Recommend name entities



Import corpus into SINEA



Export annotated text from SIENA



Import portable knowledge base into SINEA



Export portable knowledge base from SINEA



spaCy



Non-functional Requirements



Make as a SIENA secure software



Able to easily maintain



Easily install

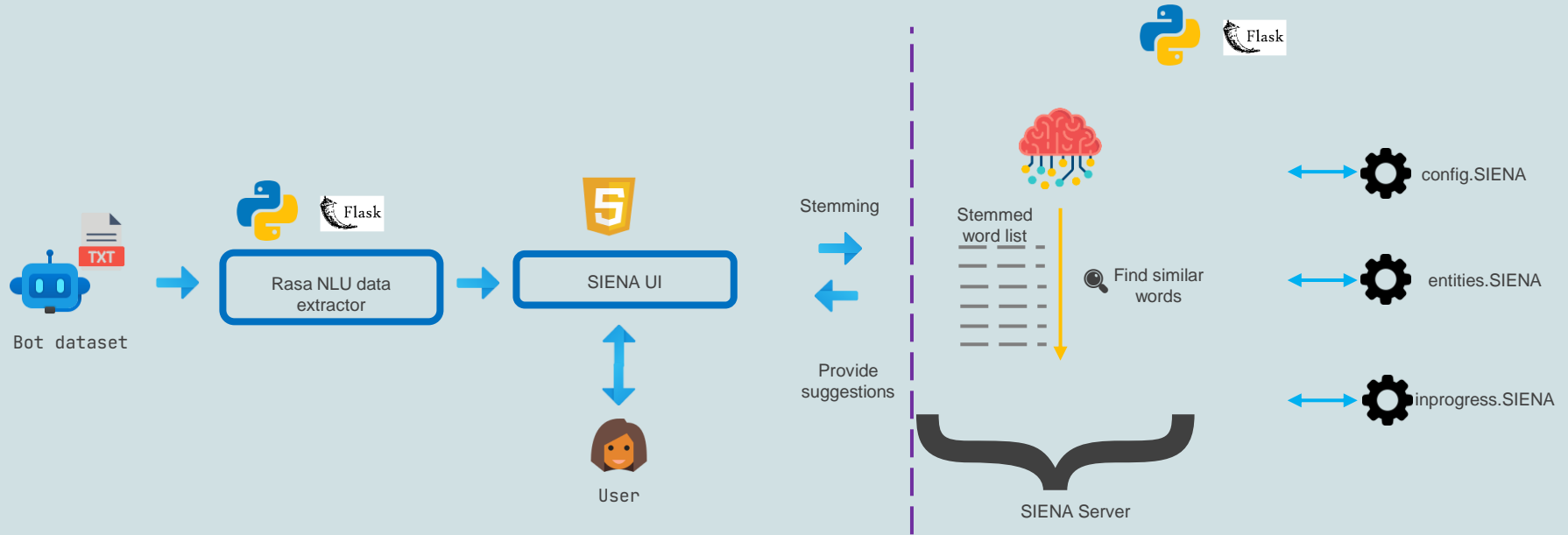


SIENA should be reliable



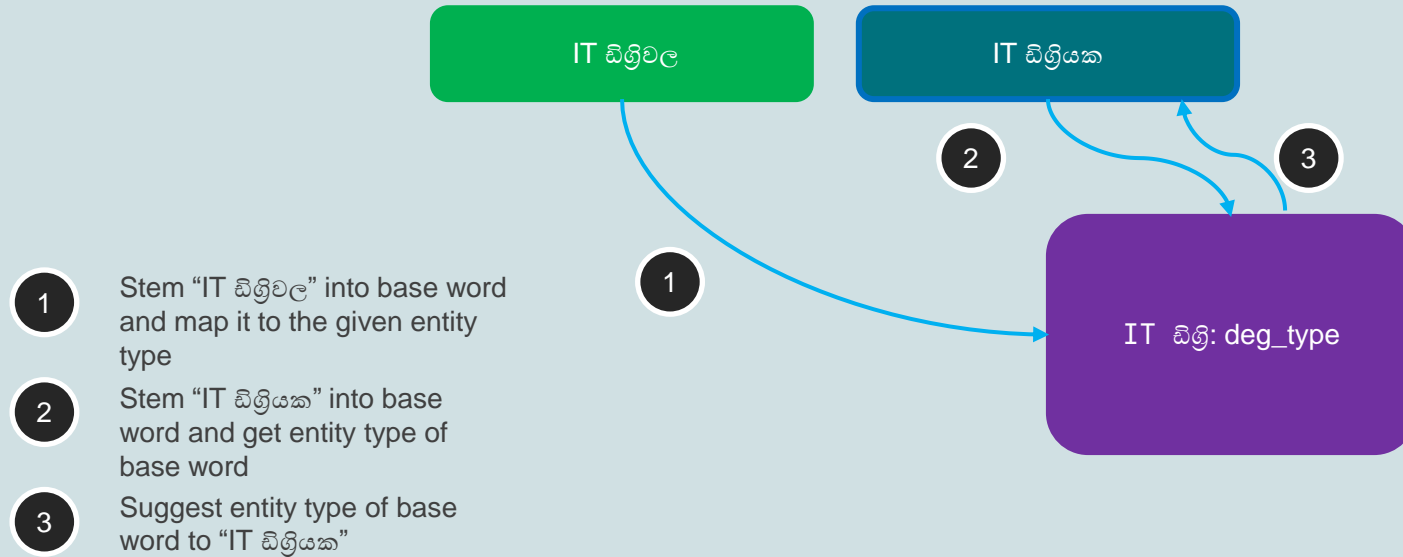
Compatibility

Solution Flow

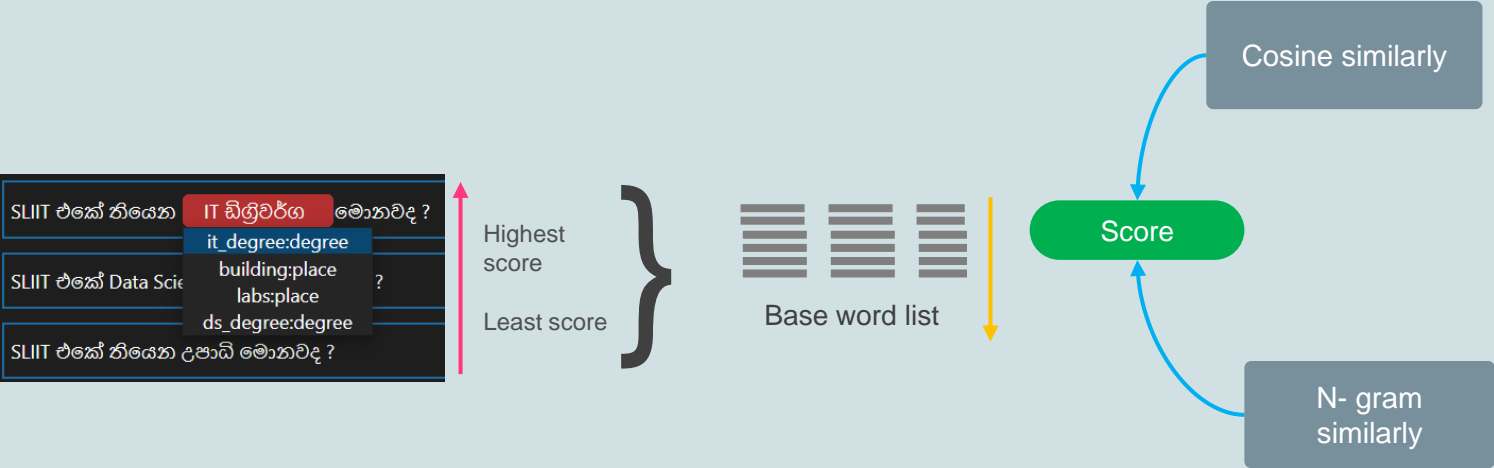


Methodology

Reverse stemming



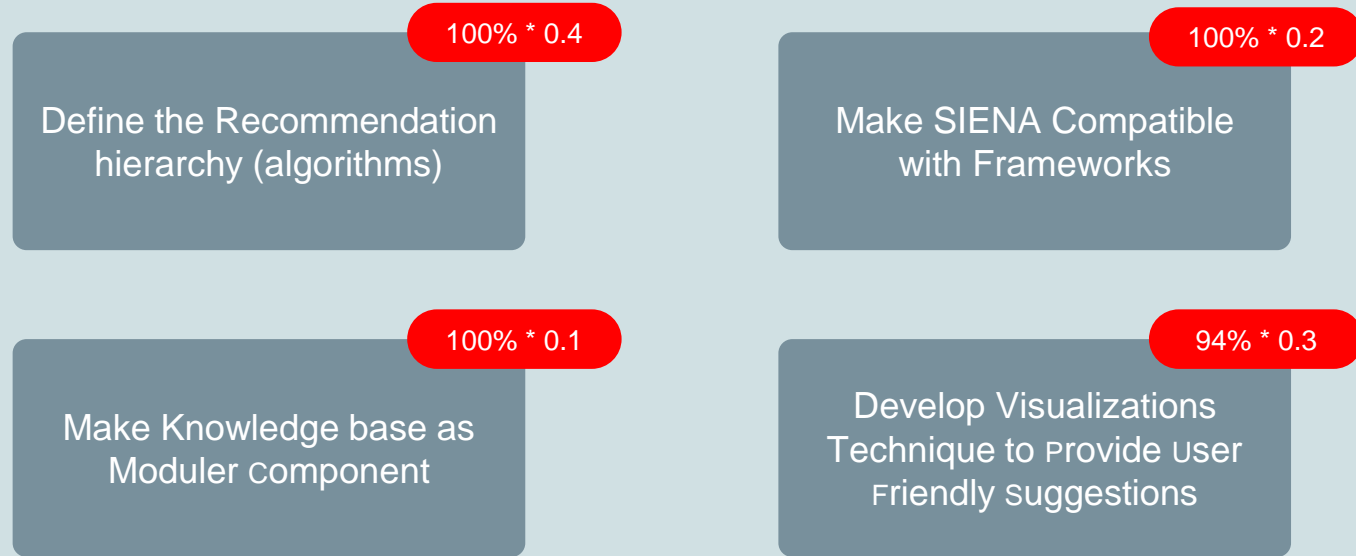
Sort recommendations according to the similarity



Slightly different base forms due to:

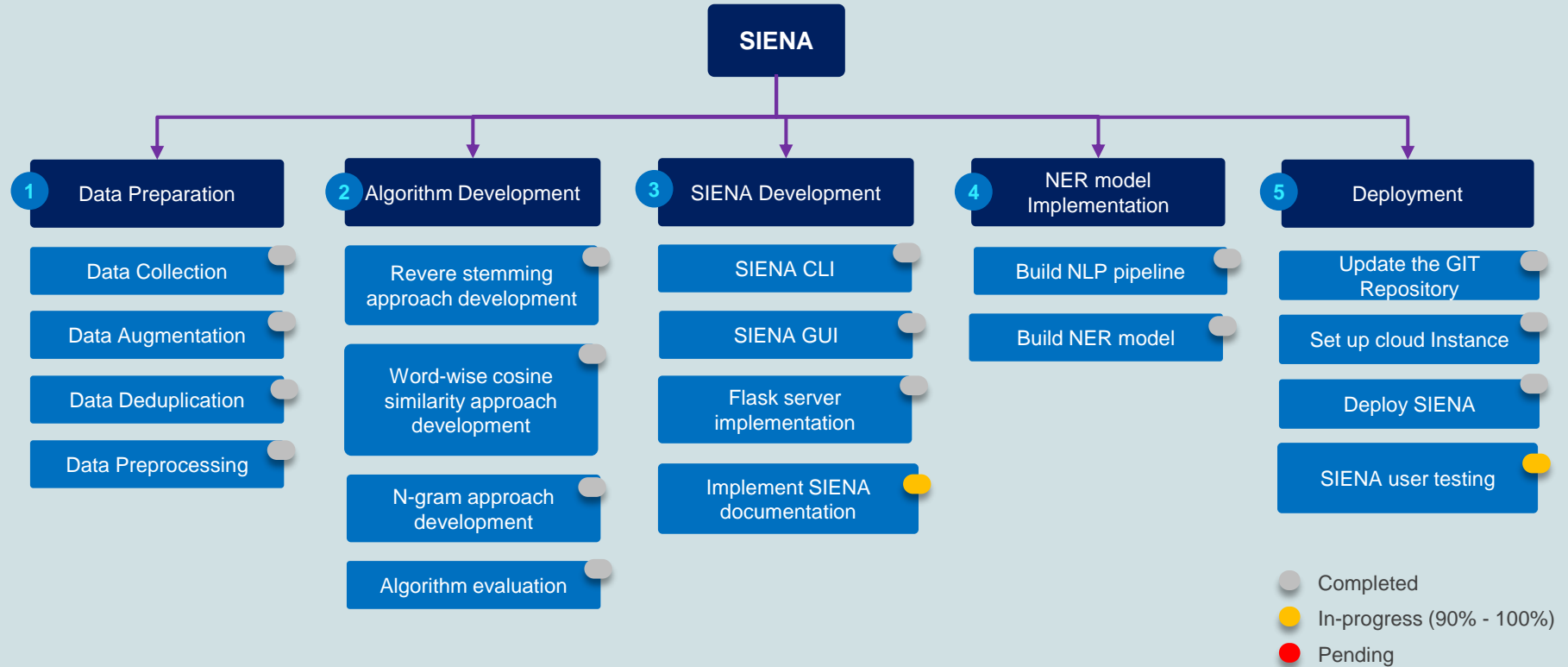
- Spelling mistakes
- Different Singlish typing patterns
- Limitations of stemming algorithm

Sub Objectives



Overall completion = (objective completion) x (objective weight) = 98%

Breakdown Structure



Technologies

Backend Development



Python



pandas



Rasa



Flask

Secure flask server

.SIENA files to save configuration data

Frontend Development



HTML

Project Management

Git

GitLab
GitHub



PyPI

Test PyPI

Best practices

Docstrings & PEP-8 Style

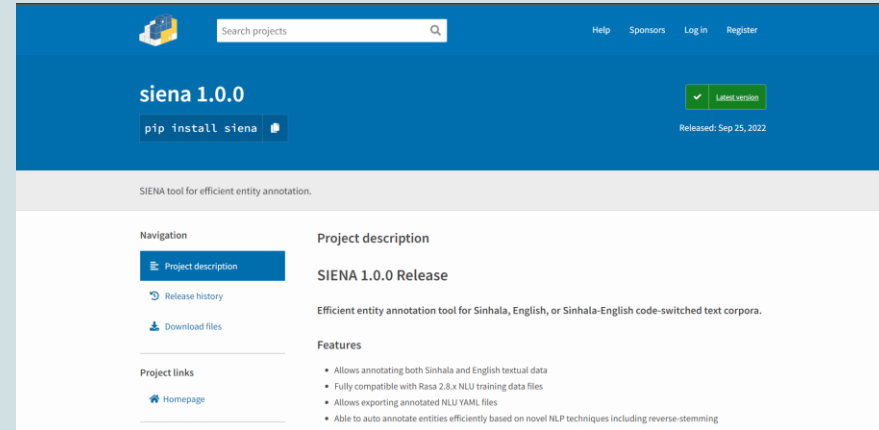
```
def init_project(uploads: bool = True, exports: bool = True, cache: bool = True) -> bool:
    """Creates mandatory file and folders for SIENA
    """
    if uploads:
        Path("uploads").mkdir(parents=True, exist_ok=True)
    if exports:
        Path("exports").mkdir(parents=True, exist_ok=True)
    if cache:
        Path("siena_cache").mkdir(parents=True, exist_ok=True)

    fle = Path(SIENA_CONFIG_PATH)
    fle.touch(exist_ok=True)

    fle = Path(SIENA_ENTITIES_PATH)
    fle.touch(exist_ok=True)
    fle = Path(SIENA_IN_PROGRESS_PATH)
    fle.touch(exist_ok=True)

    return True
```

Available on pypi



The screenshot shows the PyPI page for the SIENA package. The header is blue with the package name 'siena 1.0.0' and a 'Latest version' button. Below the header, there's a navigation bar with links for 'Project description', 'Release history', and 'Download files'. The main content area is white and contains a 'Project description' section with the text 'SIENA 1.0.0 Release' and 'Efficient entity annotation tool for Sinhala, English, or Sinhala-English code-switched text corpora.' Below this, there's a 'Features' section with a list of bullet points: 'Allows annotating both Sinhala and English textual data', 'Fully compatible with Rasa 2.8.x NLU training data files', 'Allows exporting annotated NLU YAML files', and 'Able to auto annotate entities efficiently based on novel NLP techniques including reverse-stemming'.

Testing

Unit testing

```
siena > test > Functions.py test_stem_word
You, 14 hours ago | 1 author (You)
1  from siena.core.actions import (
2  allowed_file_nlu,
3  allowed_file_knowledge,
4  )
5  from siena.core.similarity import(
6  si_stemmer_sentence_custom
7  )
8
9  def test_yaml_file_ext():
10 | assert allowed_file_nlu("test.yaml") == True, "It should be True"
11 | assert allowed_file_nlu("test.exe") == False, "It should be False"
12
13 def test_csv_file_ext():
14 | assert allowed_file_knowledge("sample.csv") == True, "It should be True"
15 | assert allowed_file_knowledge("sample.ccv") == False, "It should be False"
16
17 def test_stem_word():
18 | assert si_stemmer_sentence_custom("අශ්වයකු") == "අශ්වය", "It should be අශ්වය"
```

Integration testing

Dashboard

Annotations

Token Mapping

Configurations

Models

Explanations

Dark Mode

Annotations

FILES

support.yml

out_of_scope.yml

ru.yml

examns.yml

modules.yml

general.yml

diagnos.yml

intersteps.yml

academic_performance.yml

support.yml

sis ರವರ Hotline number ರೀತಿಯಲ್ಲಿ

ಈಗಲೇ ರವರ Hotline number ರೀತಿಯಲ್ಲಿ

ಈಗಲೇ ರವರ number ರೀತಿಯಲ್ಲಿ

ಈಗಲೇ ರವರ phone number ರೀತಿಯಲ್ಲಿ

sis ರವರ phone number ರೀತಿಯಲ್ಲಿ

sis ರವರ ಖಾಸಿ ರವರ ರೀತಿಯಲ್ಲಿ

ಇಂ sis ರವರ call ರವರ ರವರ ರೀತಿಯಲ್ಲಿ

ಇಂ sis ರವರ ಖಾಸಿ ರವರ ರವರ ರೀತಿಯಲ್ಲಿ

SLEET ರವರ call ರವರ ರವರ ರೀತಿಯಲ್ಲಿ

SLEET ರವರ ಖಾಸಿ ರವರ ರವರ ರೀತಿಯಲ್ಲಿ

SLEET ರವರ ಖಾಸಿ ರವರ ರವರ ರೀತಿಯಲ್ಲಿ

ಈಗಲೇ ರವರ ಖಾಸಿ ರವರ ರೀತಿಯಲ್ಲಿ

sis ರವರ Examination Department ರವರ ರೀತಿಯಲ್ಲಿ

ಈಗಲೇ ರವರ Examination Department ರವರ ರೀತಿಯಲ್ಲಿ

ಇಂ sis ರವರ Examination Department ರವರ ರೀತಿಯಲ್ಲಿ

SAVE NEW DATA

IMPORT KB

EXPORT KB

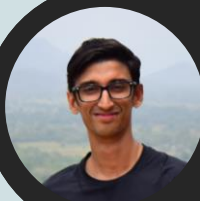
References

- [1] Anastasia Zhukova, Felix Hamborg, Bela Gipp, 'ANEA: Automated (Named) Entity Annotation for German Domain-Specific Texts' Available: <https://arxiv.org/pdf/2112.06724.pdf>
- [2] Pontus Stenetorp, Sampo Pyysalo, Goran Topic, Tomoko Ohta, Sophia Ananiadou, and Jun'ichi Tsujii, 'BRAT: a Web-based Tool for NLP-Assisted Text Annotation' Available: <https://aclanthology.org/E12-2021.pdf>
- [3] Kalina Bontcheva, Hamish Cunningham, Ian Roberts, Angus Roberts, Valentin Tablan, Niraj Aswani, Genevieve Gorrell, 'GATE Teamware: a web-based, collaborative text annotation framework', Available: <https://www.jstor.org/stable/42636386>
- [4] Jie Yang, Yue Zhang, Linwei Li, Xingxuan Li, 'YEDDA: A Lightweight Collaborative Text Span Annotation Tool', Available: <https://aclanthology.org/P18-4006.pdf>
- [5] J.B Dissanayake, Basaka mahima, ISBN: 9789556963656
- [6] "Spacy Styleguide",
<https://spacy.io/styleguide>
- [7] "Spacy Data formats · spaCy API Documentation",
<https://spacy.io/api/data-formats>
- [8] "Vector Icons and Stickers - PNG, SVG, EPS, PSD and CSS",
<https://www.flaticon.com/>

99%

Code-less Maintenance and Model Performance Evaluation

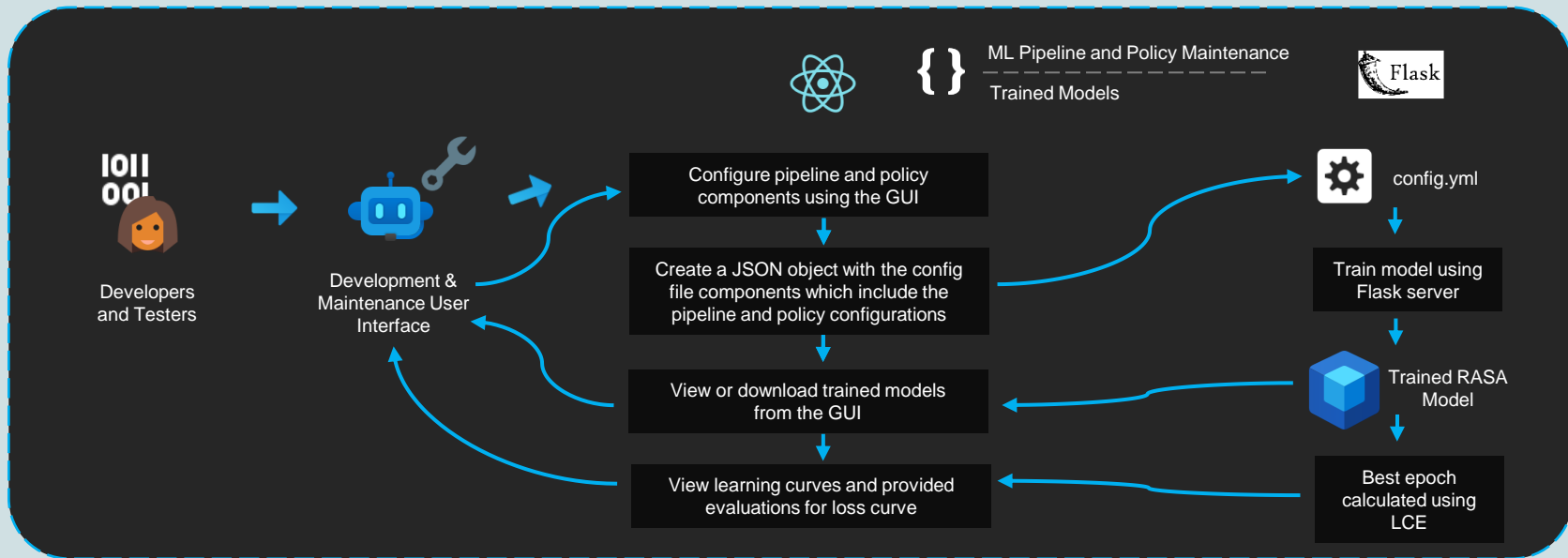
Enabling non-machine learning experts to effectively improve and evaluate conversational AI machine learning models



Hameed M.S.
IT19064932
Software Engineering



Implemented Research Component Flow





Model Improvement Existing Solution



Rasa X Solution

Configuration

Edit the [yaml](#) configuration file for your Rasa model. You can learn more about the available options in [the Rasa documentation](#).

```
1 language: en
2 pipeline: supervised_embeddings
3 policies:
4   - name: MemoizationPolicy
5   - name: KerasPolicy
6   - name: MappingPolicy
7
```

Save



Model Improvement Proposed Solution

Modify Rasa NLU Configurations

Select an Intent Classifier:

DIET Classifier

☒ Advanced Component Configurations:

Epochs

Ranking Length

Train

Window Help rasatest2.8.12 - config.yml

test-diet-exp.py x nlu.yml x domain.yml x config.yml

language: en

pipeline:

- name: WhitespaceTokenizer
- name: RegexFeaturizer
- name: LexicalSyntacticFeaturizer
- name: CountVectorsFeaturizer
- name: CountVectorsFeaturizer
analyzer: char_wb
min_ngram: 1
max_ngram: 4
- name: DIETClassifier
ranking_length: 0
epochs: 100
constrain_similarities: true
- name: EntitySynonymMapper
- name: ResponseSelector
epochs: 100
constrain_similarities: true
- name: FallbackClassifier
threshold: 0.3
ambiguity_threshold: 0.1



Model Improvement Implemented Solution

Pipeline Components

Language Models

☐ SpacyNLP

Tokenizers

☒ WhitespaceTokenizer

☐ SpacyTokenizer

Featurizers

☐ SpacyFeaturizer

☒ RegexFeaturizer

☒ CountVectorsFeaturizer

☐ LexicalSyntacticFeaturizer

Classifiers

☐ KeywordClassifier

☒ DIETClassifier

☐ FallbackClassifier

Extractors

☐ SpacyEntityExtractor

☐ CRFEntityExtractor

☒ RegexEntityExtractor

☐ EntitySynonymMapper

WhitespaceTokenizer

Intent Tokenization Flag:

Intent Split Symbol:

Token Pattern:

RegexFeaturizer

Case Sensitive:

Use Word Boundaries:

Number of Additional Patterns:

Policies

Policies

☐ TEDPolicy

☒ UnexpectTEDIntentPolicy

☒ MemoizationPolicy

☐ AugmentedMemoizationPolicy

☐ RulePolicy

UnexpectTEDIntentPolicy

Epochs:

Max History:

MemoizationPolicy

Max History:

[Train Model](#)

```

1 language: en
2 pipeline:
3   - name: WhitespaceTokenizer
4     intent_tokenization_flag: false
5     intent_split_symbol: _
6     token_pattern: ' '
7   - name: RegexFeaturizer
8     case_sensitive: true
9     use_word_boundaries: true
10  - name: CountVectorsFeaturizer
11    analyzer: word
12    min_ngram: 1
13    max_ngram: 1

```

```

29 policies:
30   - name: UnexpectTEDIntentPolicy
31     epochs: 20
32     max_history: 8
33   - name: MemoizationPolicy
34     max_history: 3

```



Version 2.0

Provides the option to set the pipeline and policy configurations using configurations from existing models

Added a custom tokenizer(SEETM) for token mapping

Added links to kolloqe documentation containing explanations for provided components

Policy Components

You can configure your policy components from scratch. For further details regarding the components refer [kolloqe docs](#)

Policies

- ☒ TEDPolicy
- ☐ UnexpectedIntentPolicy
- ☐ MemoizationPolicy
- ☐ AugmentedMemoizationPolicy
- ☒ RulePolicy

TEDPolicy

Epochs	Max History
300	8
Split Entities By Comma	Constrain Similarities
True	True

RulePolicy

Core Fallback Threshold		
0.3		
Enable Fallback Prediction	Restrict Rules	Check for Contradictions
True	True	True

TRAIN MODEL RESET

Choose Configuration from existing models

Instead of configuring models from scratch, choose configurations of previous models

Existing Models Custom Settings

Pipeline Components

You can configure your pipeline components from scratch. For further details regarding the components refer [kolloqe docs](#)

Tokenizers

- ☒ Token Mapping
- ☒ SEETMTokenizer

SEETMTokenizer

No configurations needed

Featurizers

- ☒ RegexFeaturizer
- ☒ CountVectorsFeaturizer
- ☐ LexicalSyntacticFeaturizer

RegexFeaturizer

Case Sensitive	Use Word Boundaries
True	True

CountVectorsFeaturizer

Analyzer	Min N-gram	Max N-gram
word	1	1
OOV Token	Use Shared Vocab	Additional Vocabulary Text Size
None	False	1000
Additional Vocabulary Response Text Size	Additional Vocabulary Action Text Size	
1000	1000	

DIETClassifier

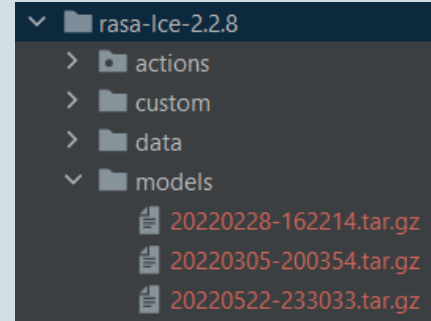
Epochs	Entity Recognition	Intent Classification
300	True	True


CRFEntityExtractor

BILOU Flag	Max Iterations
True	50
L1 Regularization Weight	L2 Regularization Weight
0.1	0.1
Split Entities by Comma - Address	Split Entities by Comma - Email
False	True






Trained Models





- Chatbot
- Configuration
- Model**

View all your trained models here!

	20220228-162214.tar.gz	Download Model	Delete Model
	20220305-200354.tar.gz	Download Model	Delete Model
	20220522-233033.tar.gz	Download Model	Delete Model



Trained Models

Version 2.0

Train and Test accuracy of each model is displayed

Added option to view learning curves for each trained model

Models

Trained Models

View all your trained models here!

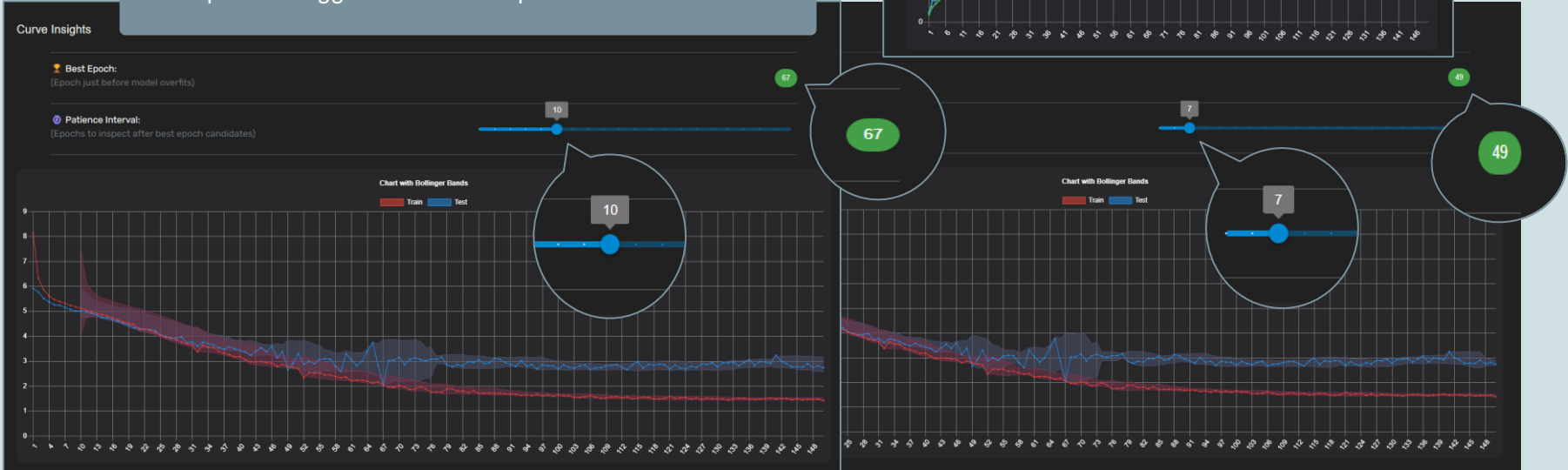
	20221007-232503.tar.gz Train Accuracy: 67% Test Accuracy: 55%	Latest		CURVE		DOWNLOAD		DELETE
	20221007-232105.tar.gz Train Accuracy: 70% Test Accuracy: 66%			CURVE		DOWNLOAD		DELETE
	20221007-210634.tar.gz Train Accuracy: 73% Test Accuracy: 62%			CURVE		DOWNLOAD		DELETE
	20221007-195821.tar.gz Train Accuracy: 99% Test Accuracy: 81%			CURVE		DOWNLOAD		DELETE
	20221007-194322.tar.gz Train Accuracy: 76% Test Accuracy: 68%			CURVE		DOWNLOAD		DELETE



Learning Curves

Option to view accuracy and loss curve for evaluations

Best epoch is suggested based on patience interval selected





Data Improvement Requirements

Functional Requirements

- ✓ Should be able to choose pipeline and policy components and train models without knowing what dependencies they require and the required order
- ✓ Should be able to view and evaluate learning curves of trained models
- ✓ Should be able to suggest the best epoch to train a model after evaluating the loss curve of a trained model.

Non-Functional Requirements

- ✓ Should increase the efficiency of training a model by reducing errors using the UI compared to manually typing the pipeline and policy components
- ✓ Should reduce the time consumed to create the pipeline and policy components by reducing the need to type by increasing clickable components

Best Practices

Maintain a properties file for the front-end

2

```
axios
169 .get(`${configs.getModelListEndpoint}`, {
170   headers: {
171     "Content-Type": "application/json",
172   },
173 })
174 .then(async (res) => {
175   const data = res.data;
176
177   if (Object.hasOwn(data, "status")) {
178     // error has occurred
179     openGetModelFailAlert(true);
180   } else {
181     // no error
182     if (data["model_list"] === null) {
183       openGetModelFailAlert(true);
184     } else {
185       setTrainedModels(data["model_list"]);
186       setLatestModel(data["latest_model"]);
187     }
188   }
189 });
```

1

```
Configuration.jsx  configs.js  Curve.jsx  Model.jsx  Dashboard.jsx
src > JS configs.js > [e] configs
You, 3 days ago | 2 authors (Ishara Dissanayake and others)
1 let api = ""; // "http://localhost:6070";
2
3 let kolloqeDocsHost = "https://docs.kolloqe.com";
4
5 export const configs = {
6   api: api,
7   snackbarVerticalPosition: "bottom",
8   snackbarHorizontalPostion: "left",
9
10  // DIME
11  explainEndpoint: `${api}/api/dime/explain`,
12  abortExplainEndpoint: `${api}/api/dime/abort`,
13  dimeStatsEndpoint: `${api}/api/dime/stats`,
14  modelEndpoint: `${api}/api/dime/model`,
15  explanationEndpoint: `${api}/api/dime/explanation`,
16  visualizationEndpoint: `${api}/api/dime/explanation/visualize`,
17  dimeConfigEndpoint: `${api}/api/dime/configs`,
18
19  // RASAC
20  trainModelEndpoint: `${api}/api/rasac/bot/train`,
21  abortTrainEndpoint: `${api}/api/rasac/bot/abort`,
22  getModelListEndpoint: `${api}/api/rasac/botstore/models`,
23  getModelCurveDatapointsEndpoint: `${api}/api/rasac/botstore/curve/`,
```




Best Practices

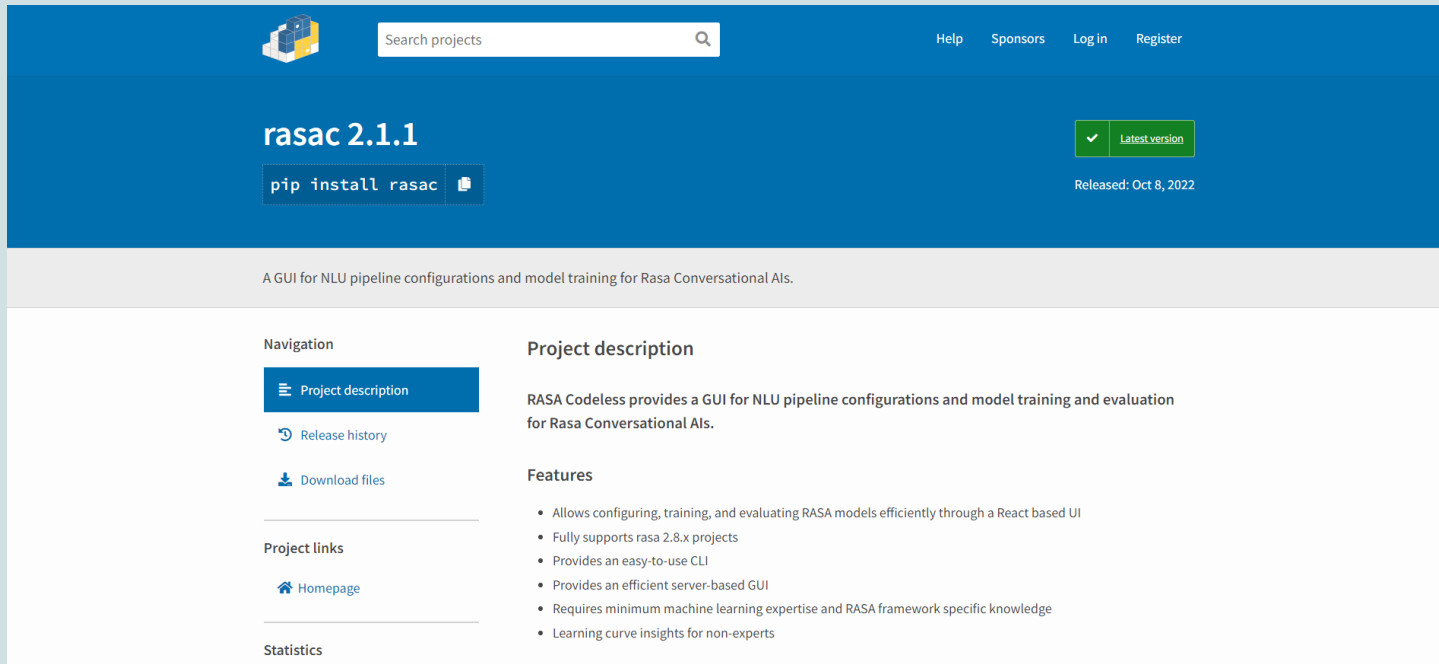
Maintain a constants file for the back-end

```
1  import ...
2
3
4  PACKAGE_NAME = "kolloge"
5  PACKAGE_VERSION = "0.0.1a4"
6  LOGGING_FORMAT_STR = '%(asctime)s\t%(levelname)s\t%(name)s - %(message)s'
7
8
9  # server env
10 class ServerEnv:
11     STRICT_LOCAL = "strict_local" # triggers server explanations without subprocess
12     DEV = "dev" # enables server debugging
13     PROD = "prod" # disables server debugging
14     ENV_LIST = [DEV, PROD, STRICT_LOCAL, "Dev", "StrictLocal", "Prod"]
15
16
17 class Theme:
18     DARK = "dark"
19     LIGHT = "light"
20     THEME_LIST = [DARK, LIGHT, "Dark", "Light"]
```

```
2
94
95 def _initialize_env(self) -> NoReturn:
96     # primary env vars
97     try:
98         host = os.environ.get("KOLLOQE_HOST")
99         port = os.environ.get("KOLLOQE_PORT")
100         theme = os.environ.get("APP_THEME")
101         sinhala = BoolStr.to_bool(value=str(os.environ.get("SINHALA_ENABLED")).lower())
102         env = os.environ.get("APP_ENV")
103         secure_url = BoolStr.to_bool(value=str(os.environ.get("SECURE_BOT_URL")).lower())
104
105         self.host = str(host).lower() if host else KOLLOQE_HOST
106         self.port = int(port) if port else KOLLOQE_PORT
107         self.theme = str(theme).lower() if theme in Theme.THEME_LIST else self.theme
108         self.sinhala = sinhala
109         self.env = str(env).lower() if env in ServerEnv.ENV_LIST else None
110         self.secure_url = secure_url
111
112     if not self.env or not self.host or not self.port:
113         raise KollogeEnvException()
```

Additional Work

Publishing individual component PyPi



The screenshot shows the PyPI project page for 'rasac 2.1.1'. The header is dark blue with a search bar and navigation links (Help, Sponsors, Log in, Register). The main content area is also dark blue, featuring the project name 'rasac 2.1.1', a 'pip install rasac' button, and a 'Latest version' badge. Below this, a light gray banner states: 'A GUI for NLU pipeline configurations and model training for Rasa Conversational AIs.' The main content area is white and divided into two columns. The left column contains a 'Navigation' sidebar with links to 'Project description' (selected), 'Release history', and 'Download files'. The right column contains the 'Project description' and 'Features' sections. The 'Project description' states: 'RASA Codeless provides a GUI for NLU pipeline configurations and model training and evaluation for Rasa Conversational AIs.' The 'Features' section lists five bullet points: 'Allows configuring, training, and evaluating RASA models efficiently through a React based UI', 'Fully supports rasa 2.8.x projects', 'Provides an easy-to-use CLI', 'Provides an efficient server-based GUI', and 'Requires minimum machine learning expertise and RASA framework specific knowledge'. The 'Statistics' section is partially visible at the bottom.

Search projects

Help Sponsors Log in Register

rasac 2.1.1

pip install rasac

Latest version

Released: Oct 8, 2022

A GUI for NLU pipeline configurations and model training for Rasa Conversational AIs.

Navigation

- Project description
- Release history
- Download files

Project links

- Homepage

Statistics

Project description

RASA Codeless provides a GUI for NLU pipeline configurations and model training and evaluation for Rasa Conversational AIs.

Features

- Allows configuring, training, and evaluating RASA models efficiently through a React based UI
- Fully supports rasa 2.8.x projects
- Provides an easy-to-use CLI
- Provides an efficient server-based GUI
- Requires minimum machine learning expertise and RASA framework specific knowledge
- Learning curve insights for non-experts



Test Classes

```
// Unit Testing
test("curveExplainer", () => {
  const curveExplainer = jest.fn((patienceInter, train_loss, test_loss) => {
    var trainUpper = 0;
    var trainLower = 0;
    var testUpper = 0;
    var testLower = 0;

    const trainBollinger = boll(train_loss, patienceInter, 2);
    trainUpper = trainBollinger.upper;
    trainLower = trainBollinger.lower;

    const testBollinger = boll(test_loss, patienceInter, 2);
    testUpper = testBollinger.upper;
    testLower = testBollinger.lower;

    let tempArray = [];
    let minLoss = test_loss[0];
    let bestEpoch = 1;

    for (let i = 0; i < train_loss.length; i++) {
      if (i < patienceInter - 1) {
        if (test_loss[i] < minLoss) {
          minLoss = test_loss[i];
          bestEpoch = i + 1;
        }
      } else {
        if (test_loss[i] < trainBollinger.upper[i]) {
          if (test_loss[i] < minLoss) {
            minLoss = test_loss[i];
            bestEpoch = i + 1;
          }
        }
      }
    }
  });
});
```

The screenshot shows a VS Code editor with a dark theme. The top bar shows several open files: OffCanvasExplanation.jsx, Model.jsx, Curve.jsx, Curve.test.js (active), package.json, and app_styles.css. The active file, Curve.test.js, contains Jest test cases for the curveExplainer function. The code includes a 'break;' statement, a 'return bestEpoch;' statement, and several 'expect' calls with 'toBe' assertions. The terminal at the bottom shows the test results for 'src/components/curve/Curve.test.js', indicating that all tests passed.

```
src > components > curve > Curve.test.js > test("curveExplainer") callback > curveExplainer > jest.fn() callback
304 |         break;
305 |       }
306 |     }
307 |   }
308 |
309 |   if (test_loss[i] < minLoss) {
310 |     minLoss = test_loss[i];
311 |     bestEpoch = i + 1;
312 |   }
313 | }
314 |
315 | return bestEpoch;
316 | });
317 |
318 | // testing for the best epoch on 1st dataset with varying patience intervals of 5, 9, and 21 with
319 | expect(curveExplainer(5, train_loss_1, test_loss_1)).toBe(31);
320 | expect(curveExplainer(9, train_loss_1, test_loss_1)).toBe(31);
321 | expect(curveExplainer(21, train_loss_1, test_loss_1)).toBe(47);
322 | expect(curveExplainer(25, train_loss_1, test_loss_1)).toBe(47);
323 | });
324 |
```

TERMINAL GITLENS PROBLEMS OUTPUT DEBUG CONSOLE JUPYTER

```
PASS src/components/curve/Curve.test.js
✓ curveExplainer (14 ms)

Test Suites: 1 passed, 1 total
Tests: 1 passed, 1 total
Snapshots: 0 total
Time: 3.027 s
Ran all test suites related to changed files.

Watch Usage: Press w to show more.
```



Sub Objectives

95% * 0.1

Developing a solution for non-technical users to configure and efficiently retrain machine learning models.

100% * 0.6

Developing a solution for non-technical users to view all train models and evaluate them

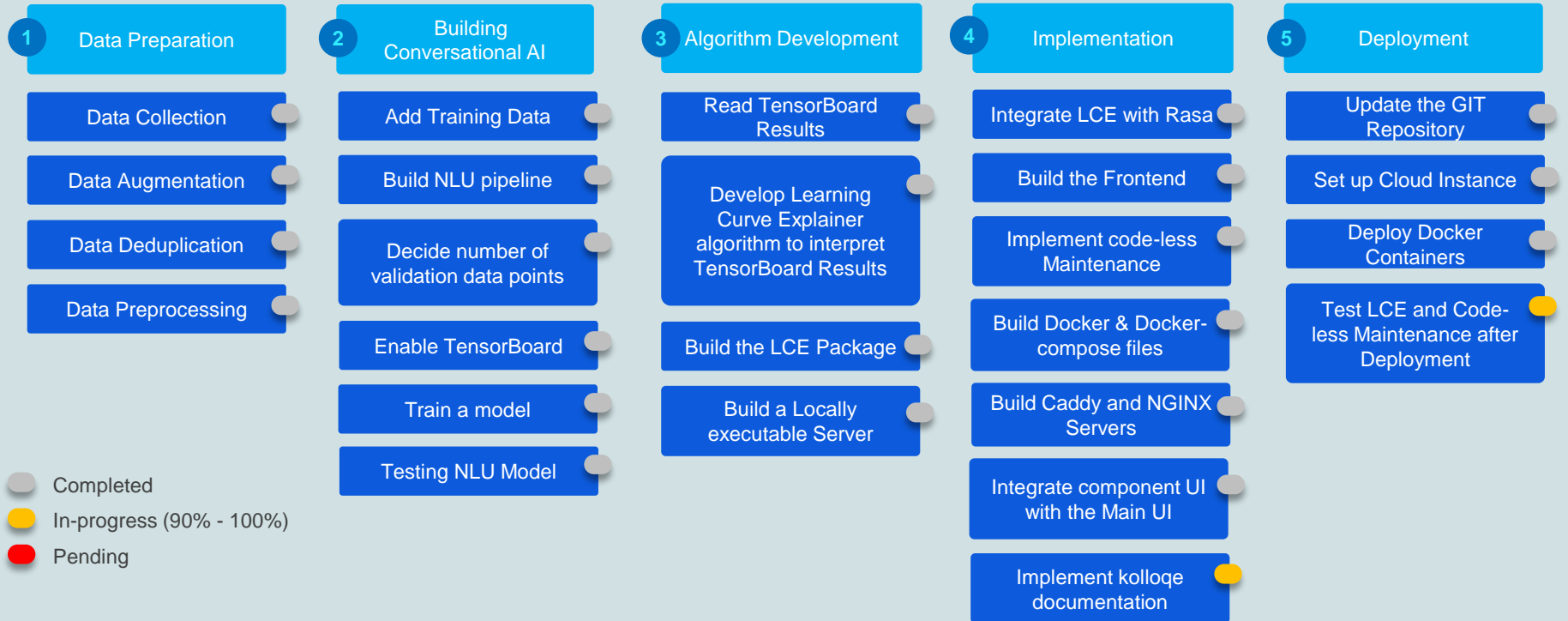
100% * 0.3

Developing an algorithm to identify what the best epoch is to train a model and suggesting it in the UI.

Overall completion = (objective completion) x (objective weight) = **99%**



Work Breakdown Structure





Technologies

Frontend Development



React

Backend Development



Python



TensorBoard



Rasa



Flask

Project Management



Git

GitLab
GitHub



PyPi



References

[1]. T. Bocklisch, J. Faulkner, N. Pawlowski, en A. Nichol, “Rasa: Open source language understanding and dialogue management”, *arXiv preprint arXiv:1712. 05181*, 2017.

[2]. “Introduction to rasa X,” *Open source conversational AI*, 10-Dec-2021. [Online]. Available: <https://rasa.com/docs/rasa-x/>. [Accessed: 22-Jan-2022].

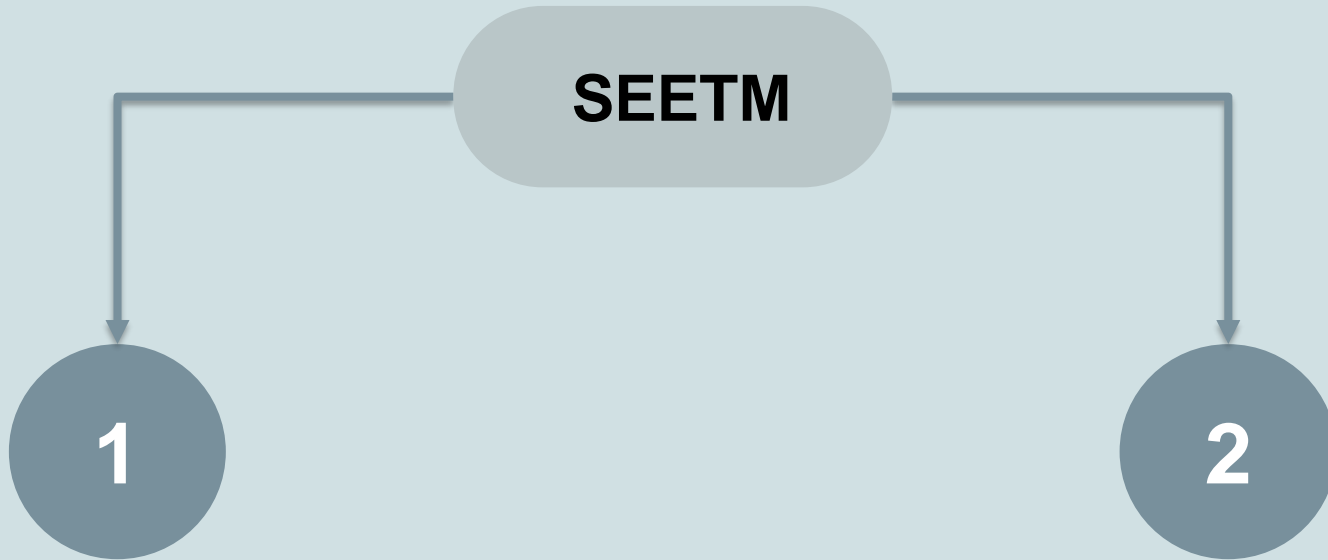
97.5%

SEETM: Sinhala-English Equivalent Token Mapper

Developing rule-based approaches to process code-mixed textual data and make word embeddings models lightweight using token mapping.



Jayasinghe D.T.
IT19075754
Data Science



How can I type Sinhala and English words together?

No Sinhala English Code-switching Typing Support in Chatbots!





1

Solution Found !





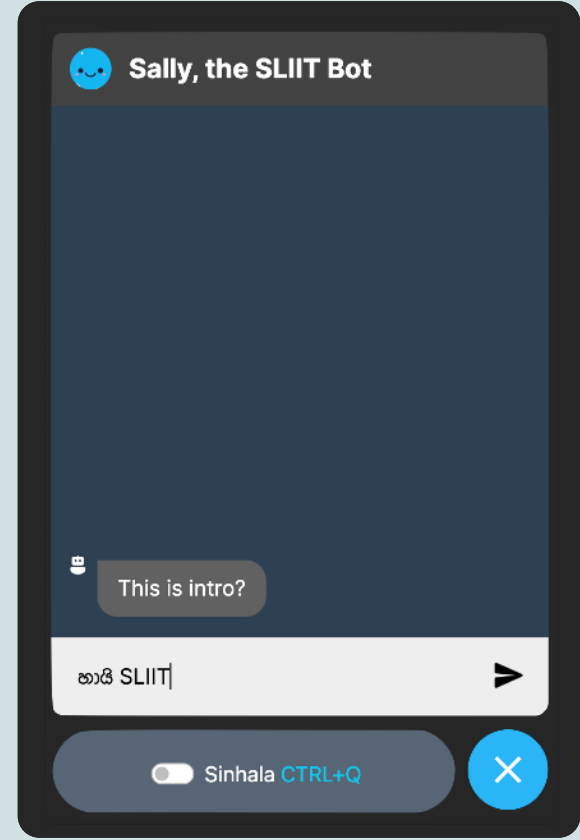
Sinhala-English code-switchable

Keyboard Interface

Code-Switching

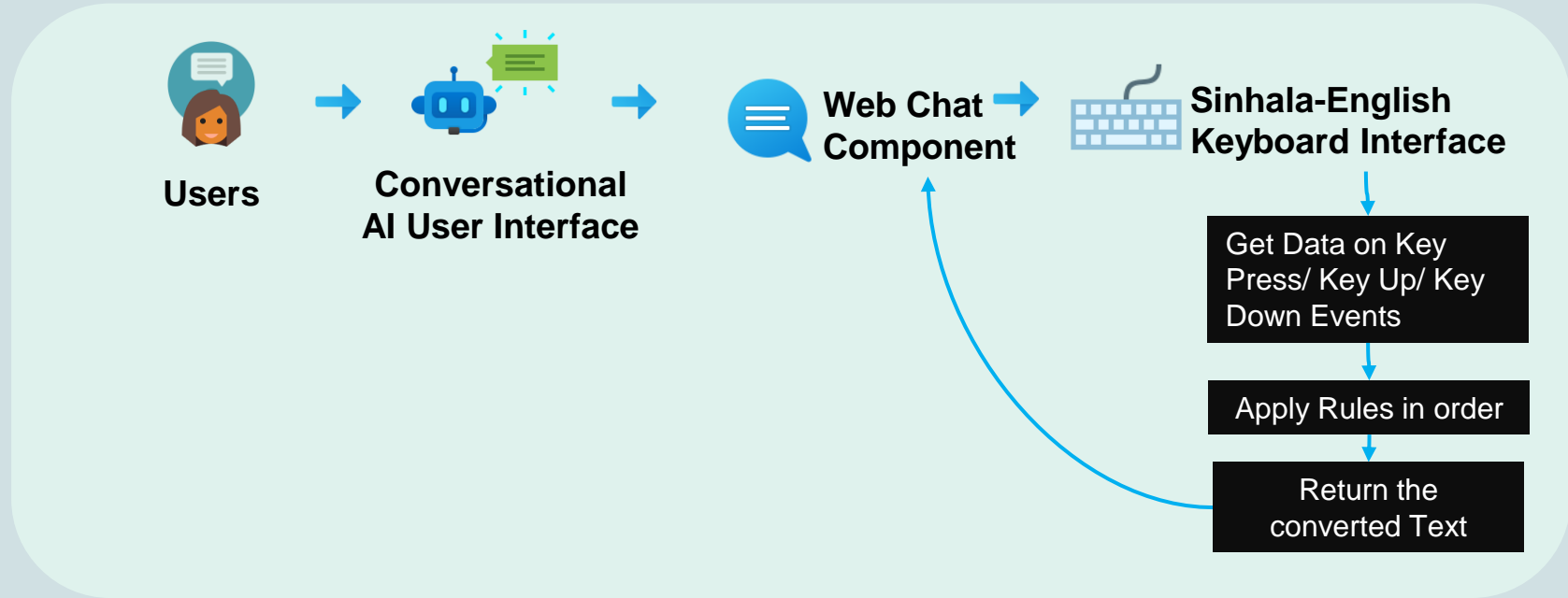
Library Membership

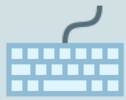
එකට apply
කරන්නේ කොහොමද?





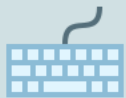
Research Flow





Keyboards Comparison

Keyboard Name	Default (Misleading character Map)	Changes
Helakuru Keyboard (හෙළකුරු)	<ul style="list-style-type: none">Backspace + a → ூc → ක්u → ூ (when re-enter)ou → ூQ/q → ද්	<ul style="list-style-type: none">Backspace + a → අc → ච්u → උau → ூQ/q → (Shortcut) (dh → ද්)



Keyboards Comparison

Keyboard Name	Default (Misleading character Map)	Changes
UCSC Unicode Real-Time Font Converter	<ul style="list-style-type: none">• c → c• q → ຈຸ• Q → Q• U → U• V → V• E → E• F → F• H → H• M → M• O → O• S → S• W → W• x, X → x• z → z	<ul style="list-style-type: none">• c → ຈຸ• Q/q → (Shortcut)• U → ຸ• V → ຈຸ• E → ຈຸ• F → ຈຸ• H → ຸ• M → ຈຸ• O → ຈຸ• S → ຈຸ• X → ຈຸ• x → ຸ• W → ຈຸ• z → ຈຸ

1
2

Keyboard Interface Ruleset

Rule Activation

Rule		English Representation: aakramaNaya	
		Character Mapping	Output
1.	Non-joining Character Mappings	skipped as there are no non-joining characters	aakramaNaya
2.	Special Character Mappings	skipped as there are no special characters	aakramaNaya
3.	“Rakaranshaya” Mapping	kra → ක් + ඌ + අ → කු	aaකුmaNaya
4.	Consonant + Vowel Mappings	ma → ම + අ → ම Na → න් + අ → න ya → ය් + අ → ය	aaකුමNaya aaකුමණya aaකුමණය
5.	Pure Consonant Mappings	skipped as there are no pure consonants left	aaකුමණය
6.	Pure Vowel Mappings	aa → ආ	ආකුමණය

✓ [105] 0s convert("aakramaNaya")

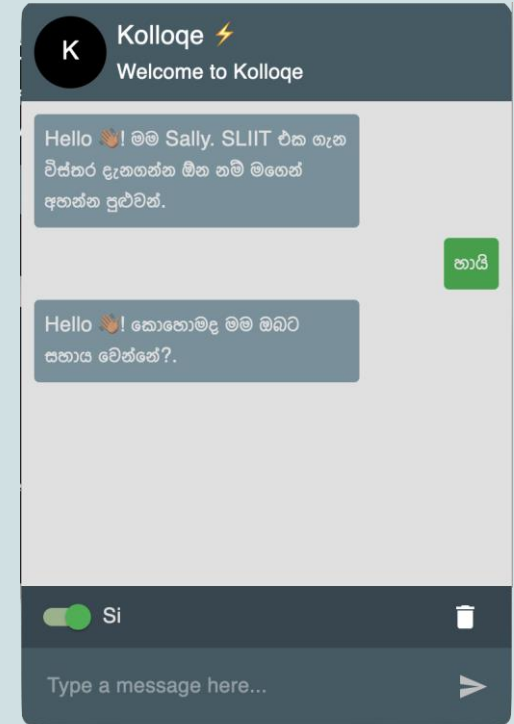
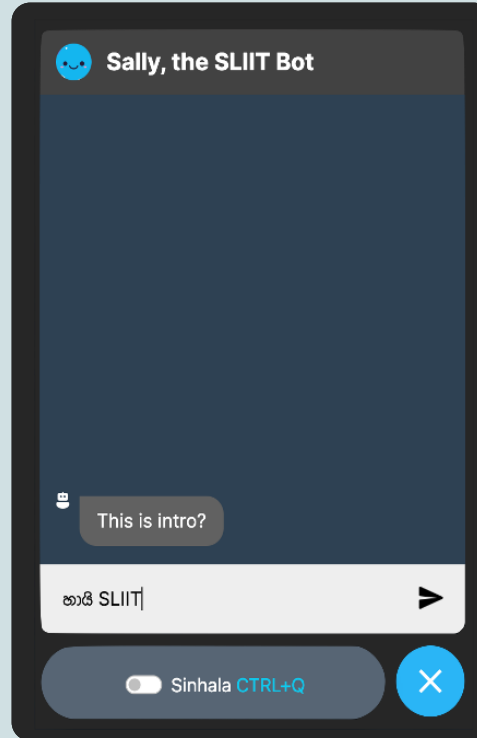
Rule 3.1 [Detected]: aakramaNaya
 Rule 3.1 [Replaced]: aaකුmaNaya
 Rule 4 [Detected]: aaකුmaNaya
 Rule 4 [Replaced]: aaකුmaණya
 Rule 4 [Detected]: aaකුmaණya
 Rule 4 [Replaced]: aaකුමණya
 Rule 4 [Detected]: aaකුමණya
 Rule 4 [Replaced]: aaකුමණය
 Rule 6 [Detected]: aaකුමණය
 Rule 6 [Replaced]: ආකුමණය
 'ආක්\u200dරමණය'

ආකුමණය

React based Keyboard Interface

Keyboard works on chatbot

```
KeyboardInterface.jsx
1 import { Input, TextField } from "@mui/material";
2 import React, { Component } from "react";
3 import PropTypes, { number, string } from "prop-types";
4
5 export default class KeyboardInput extends Component {
6   constructor(props) {
7     super(props);
8     this.state = {
9       language: this.props?.defaultLanguage,
10      text: this.props?.value || "",
11      previousText: "",
12      newText: "",
13      outOfScopeText: this.props?.value || "",
14      shortcutKeyStore: {},
15    };
16
17    // refs
18    const utilizeFocus = () => {
19      const ref = React.createRef();
20      const setFocus = () => {
21        ref.current && ref.current.focus();
22      };
23      return { setFocus, ref };
24    };
25    this.inputRef = utilizeFocus();
26
27    // handlers
28    this.handleInputChange = this.handleChange.bind(this);
29    this.handleInputKeyDown = this.handleInputKeyDown.bind(this);
30    this.handleInputKeyUp = this.handleInputKeyUp.bind(this);
31    this.handleInputKeyPress = this.handleInputKeyPress.bind(this);
32    this.handleInputReset = this.handleInputReset.bind(this);
33    this.handleInputFocus = this.handleInputFocus.bind(this);
34    this.handleConvert = this.handleConvert.bind(this);
35    this.handleLanguage = this.handleLanguage.bind(this);
36    this.setText = this.setText.bind(this);
37  }
38
39  componentDidMount() {
40    // ...
41  }
42 }
```



X

Equivalent words in Code-Switching datasets

IT

Information
technology

අයිටී

තොරතුරු තාක්ෂණය



isn't this similar?
ML models see **equivalent words** as different features!



2

Solution Found !



Translating approach



Pronunciation based approach



1 2 ↓ IPA Mapping


eɪ ဇီ	aɪ အိ	aʊ အူ	ɔ အို	ɔɪ ဇီ	oʊ ဇီ	æ အဲ		
ɪ ဝီ	u ဇီ	ɪ ဇီ	ʊ ဇီ	ə အဲ	ɛ ဇီ	ʊ အဲ	æ အဲ	ɑ အာ
tʃ ချီ	dʒ ဇီ	p ဇီ	b ဇီ	t ဇီ	d ဇီ	k ဇီ	g ဇီ	θ ဇီ
ð ဇီ	f ဇီ	v ဇီ	s ဇီ	z ဇီ	ʃ ဇီ	ʒ ဇီ	w ဇီ	m ဇီ
n ဇီ	ŋ ဇီ	ɹ ဇီ	r ဇီ	j ဇီ	h ဇီ	ɫ ဇီ	l ဇီ	


<https://americanipachart.com/>


CONSONANTS


THE 24 CONSONANTS USED IN STANDARD AMERICAN


p b t d k g


p  /pig/

b 

t  /tʌ-tət/

d 

k 

g 

Translating approach



Pronunciation based approach

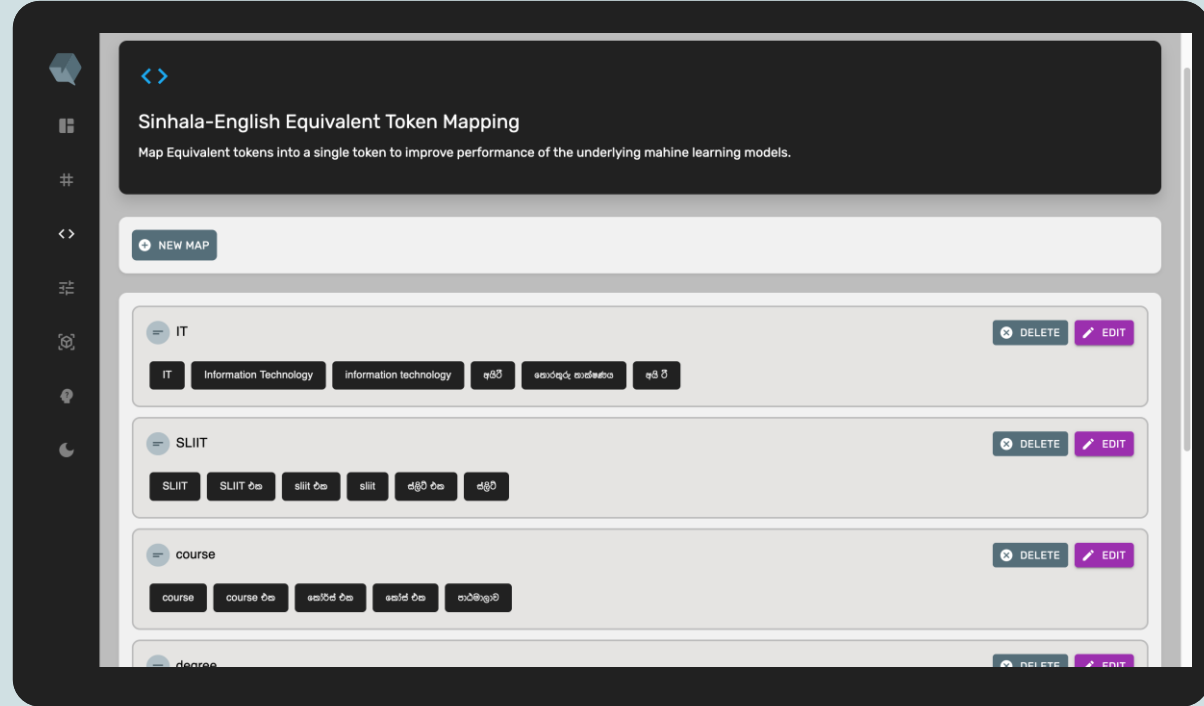


User defined rule-based map



✔ Equivalent Token Mapping

Rule	Equivalent Tokens
උපාධි	උපාධි, degrees, ඩිග්‍රි, ඩිග්‍රිස්, ඩිග්‍රි, ඩිග්‍රිස්
sliit	sliit, SLIIT, ශ්‍රී ලංකා තොරතුරු තාක්ෂණ ආයතනය, ස්ලීට්, ස්ලීට් එක





Token Mapping In action

```
2022-10-11 13:06:12 INFO      rasa.shared.nlu.training_data.training_data - Number of response exa
2022-10-11 13:06:12 INFO      rasa.shared.nlu.training_data.training_data - Number of entity examp
2022-10-11 13:06:12 INFO      rasa.nlu.model - Starting to train component SEETMTokenizer
2022-10-11 13:06:12 INFO      kolloge_components.tokenizers.seetm_tokenizer -
Persisted:
Source: ඔන්ලයින් චයිට් තිසනවද
Mapped:ඔන්ලයින් viva තිසනවද
2022-10-11 13:06:12 INFO      kolloge_components.tokenizers.seetm_tokenizer -
Persisted:
Source: ඔයාලගෙ තිසන IT ඩි ග්‍රි වර්ග මොනවද ?
Mapped:ඔයාලගෙ තිසන IT degree වර්ග මොනවද ?
2022-10-11 13:06:12 INFO      kolloge_components.tokenizers.seetm_tokenizer -
Persisted:
Source: ඕනෑමලිපිගෙ තිසන business ඩි ග්‍රි මොනවද ?
Mapped:ඕනෑමලිපිගෙ තිසන business degree මොනවද ?
2022-10-11 13:06:12 INFO      kolloge_components.tokenizers.seetm_tokenizer -
Persisted:
Source: තිසන ඩි ග්‍රි වර්ග මොනවද ?
Mapped:තිසන degree වර්ග මොනවද ?
2022-10-11 13:06:12 INFO      kolloge_components.tokenizers.seetm_tokenizer -
Persisted:
Source: ජිලි ටි එකේ ඩි ග්‍රි වල තිසන ජිප්පෙලයිසේෂන්ස් මොනවද
Mapped:ජිලි ටි එකේ degree වල තිසන ජිප්පෙලයිසේෂන්ස් මොනවද
2022-10-11 13:06:12 INFO      kolloge_components.tokenizers.seetm_tokenizer -
Persisted:
Source: හැෆේෂ Foundation course එක කරන්න ඕනෙද
Mapped:හැෆේෂ Foundation course කරන්න ඕනෙද
2022-10-11 13:06:12 INFO      kolloge_components.tokenizers.seetm_tokenizer -
Persisted:
Source: Foundation course එක කරන ගමන් ම degree එක කරන්න පුලුවන්ද
Mapped:Foundation course කරන ගමන් ම degree කරන්න පුලුවන්ද
2022-10-11 13:06:12 INFO      kolloge_components.tokenizers.seetm_tokenizer -
Persisted:
```



OVV Handling



Same Vector
(Features)



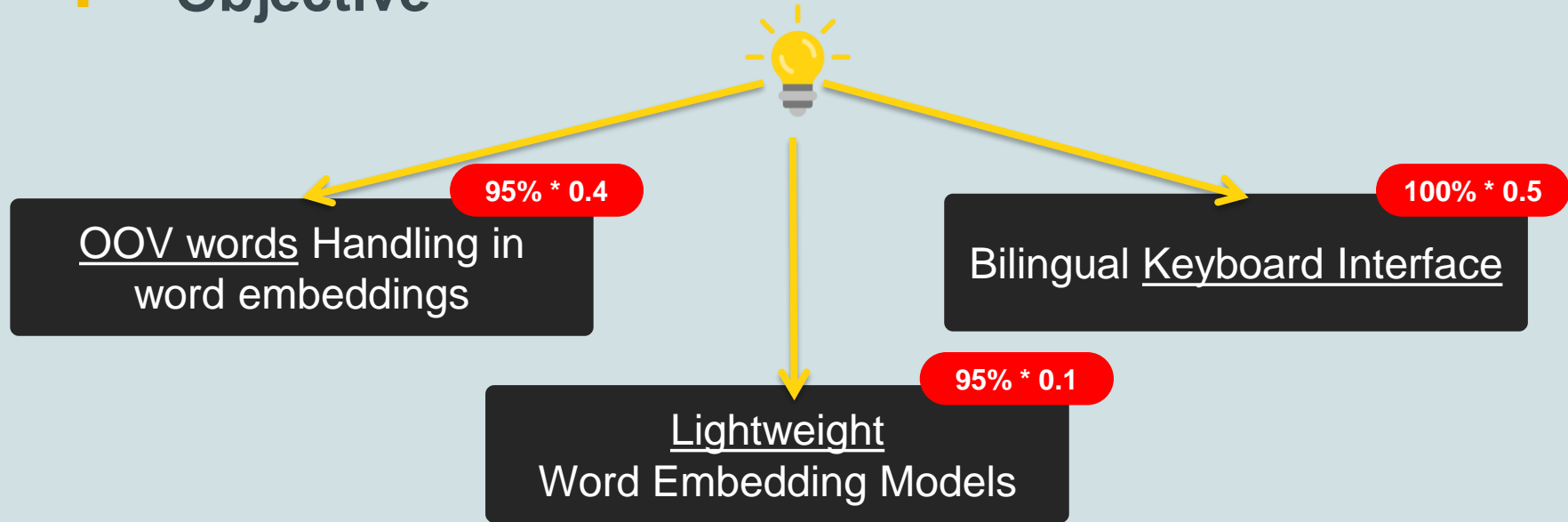
Specific Objective

Assigning the same word
vector to equivalent words in
a Sinhala-English code-
switched text corpus





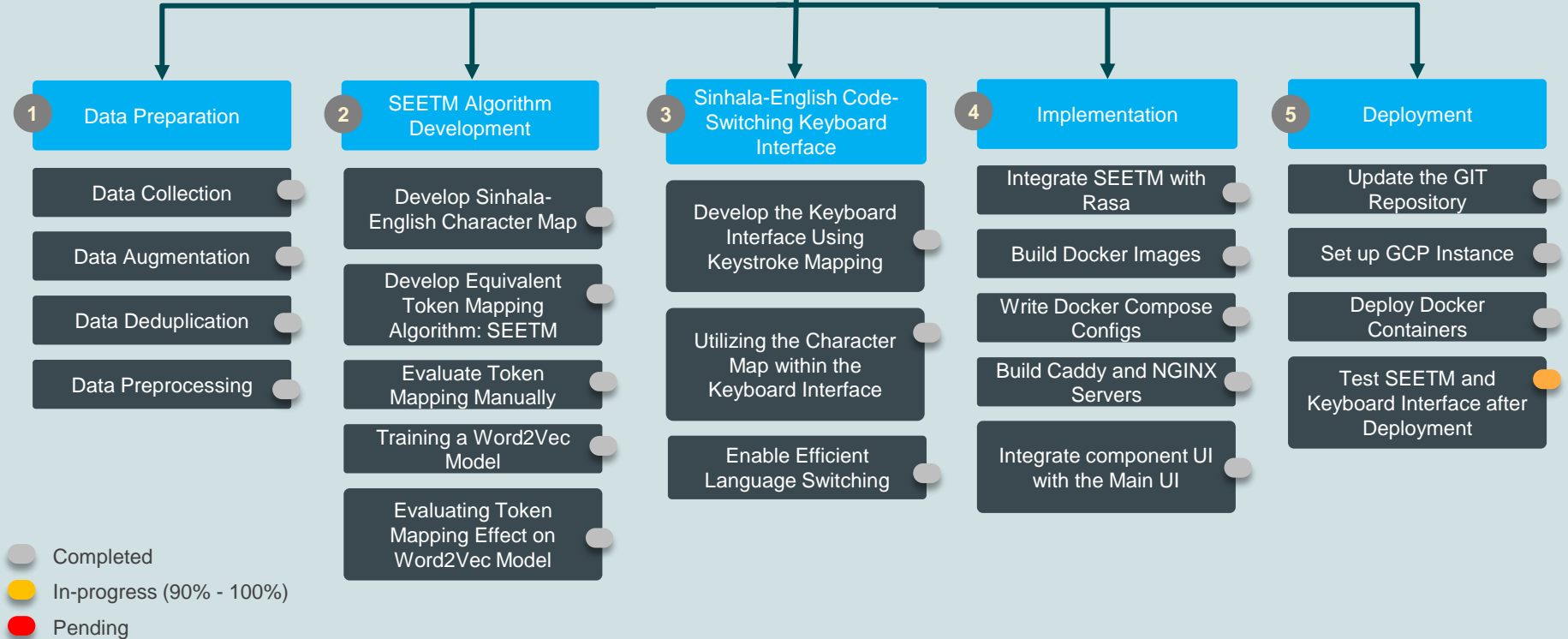
Sub Objective



Overall completion = (objective completion) x (objective weight) = **97.5%**

Work Breakdown Structure

SEETM





Best Practices

1

Semantic Versioning Releases

2

Implemented Versions

Releases / v1.1.0

SEETM 1.1.0 Release Latest

dinushiTJ released this 7 hours ago · v1.1.0 · 442bfe1


SEETM (Sinhala-English Equivalent Token Mapper) allows creating of equivalent token maps and replacing them with a base token to avoid OOV tokens and generate a single feature for all equivalent tokens in a Sinhala-English code-switching dataset in rasa-based conversational AIs.

Features

- Allows mapping multiple equivalent tokens into a base token
- Fully supports rasa 2.8.x projects
- Provides an easy-to-use CLI
- Provides an efficient server-based GUI
- Provides a fully-functional custom whitespace tokenizer
- Fully supports Sinhala in the GUI

What's Cooking?

- Mapping suggestions in the SEETM server GUI
- Automatically generated mappings



```
component-token-mapping
├── keyboard_interface
│   ├── media
│   └── static
│       ├── bootstrap
│       │   ├── jquery-3.6.0.min.js
│       │   ├── kbi-0.0.1.js
│       │   ├── kbi-0.0.2.js
│       │   ├── kbi-1.0.0.js
│       │   ├── kbi-1.0.1.js
│       │   ├── kbi-2.0.0.js
│       │   ├── kbi-2.0.1.js
│       │   └── kbi-2.0.2.js
│       ├── kbi_changelog.md
│       ├── kbi_themesets.md
│       ├── rasa_webchat.js
│       ├── rasa_webchat_100.js
│       ├── rasa_webchat_101.js
│       ├── toast-builder-1.0.0.js
│       ├── webchat.html
│       └── webchat_2.0.2.html
```



Functional Requirements

- ✓ Ability to type in Sinhala using an English keyboard.
- ✓ Ability to switch between typing Sinhala and English
- ✓ Ability to type emojis if required
- ✓ SEETM should handle out-of-vocabulary words in Word2Vec models when at least one of the representations of equivalent tokens are present in training data.



Non-Functional Requirements



Efficiency



Reliability



Modularity



Usability



Scalability



Sinhala CTRL+Q





References

[1]. T. KasthuriArachchi and E. Y. A. Charles, "Deep Learning Approach to Detect Plagiarism in Sinhala Text," *2019 14th Conference on Industrial and Information Systems (ICIIS)*, 2019, pp. 314-319, doi: [10.1109/ICIIS47346.2019.9063299](https://doi.org/10.1109/ICIIS47346.2019.9063299).

[2]. A. Kugathanan and S. Sumathipala, "Standardizing Sinhala Code-Mixed Text using Dictionary based Approach," *2020 International Conference on Image Processing and Robotics (ICIP)*, 2020, pp. 1-6, doi: [10.1109/ICIP48927.2020.9367353](https://doi.org/10.1109/ICIP48927.2020.9367353).

[3]. <https://americanipachart.com/>



99%

DIME: Dual Interpretable Model-Agnostic Explanations

Using global explanations to generate local interpretations
in intent classification models using explainable AI



Dissanayake D.M.I.M.
IT19069432
Data Science

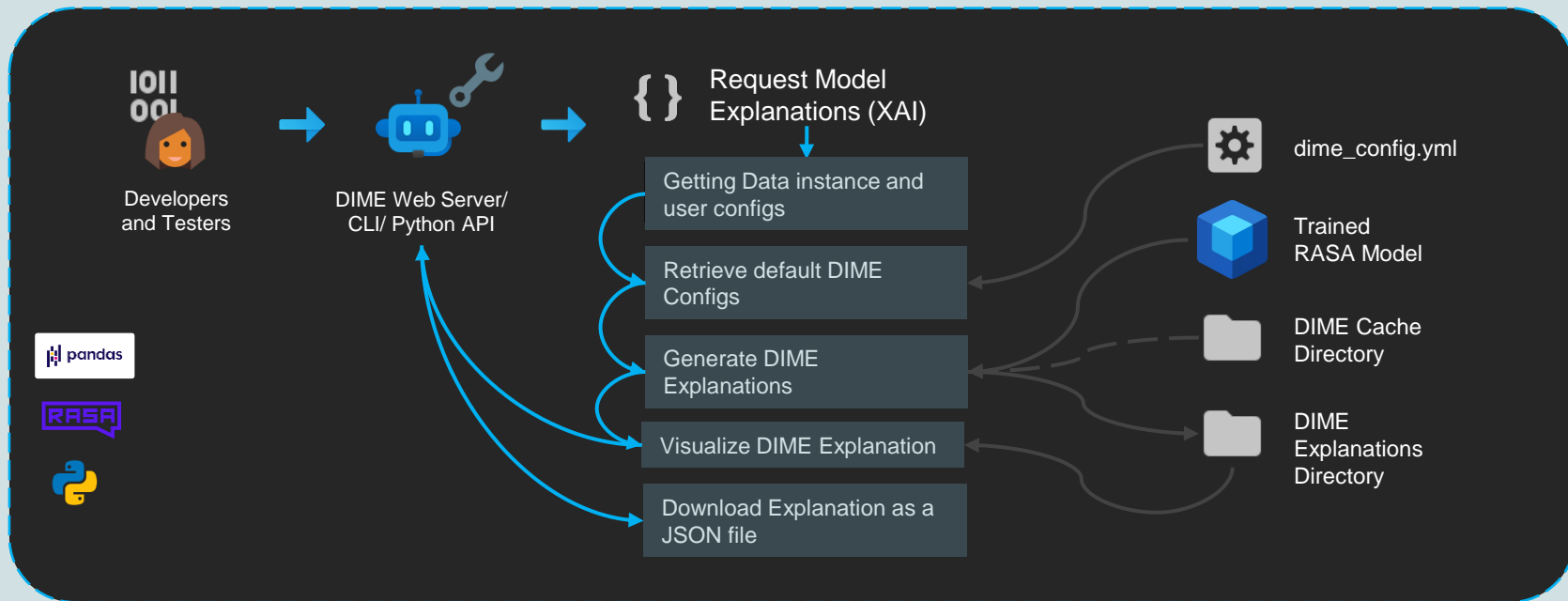


Functional Requirements

- ✓ DIME should provide methods to calculate global and local explanations
- ✓ DIME should provide a local server as a visualization tool
- ✓ DIME should be applicable to any text classification model that outputs confidence scores for predictions
- ✓ DIME should provide adjustable configurations required for explanations
- ✓ DIME should utilize caching to optimize calculations



Generating DIME Explanations





Non-functional Requirements



Efficient Calculations



Reliable Explanations



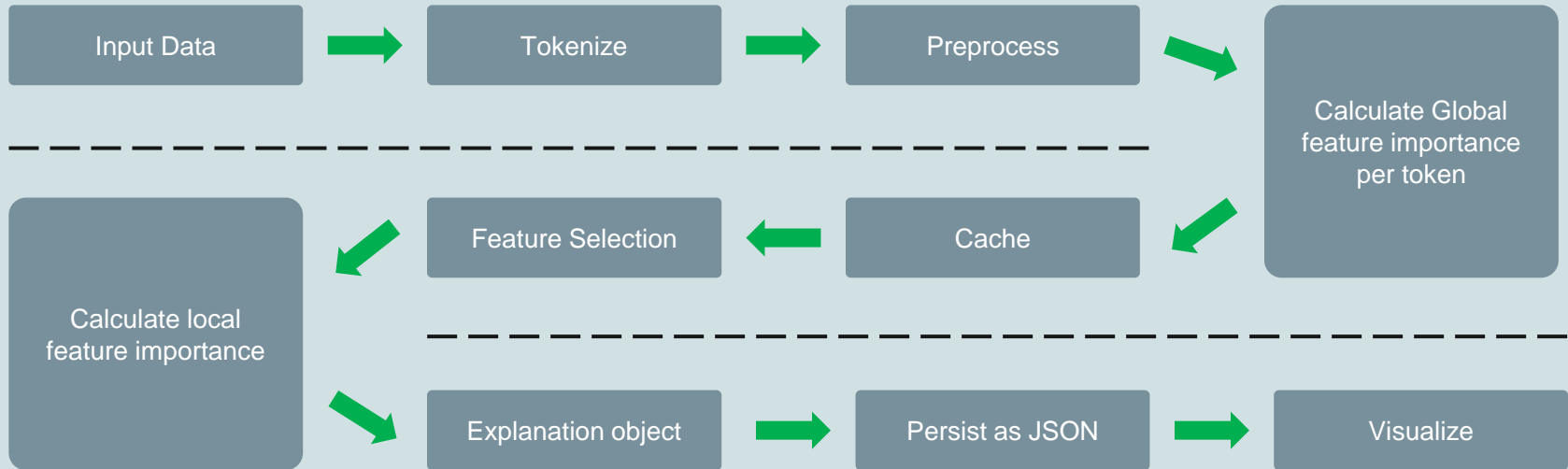
Simple & Interpretable Visualizations



Modular package



DIME Algorithm





DIME Algorithm cont.

2022-05-22 23:21:17,315 INFO dime_xai.shared.explanation - DIME explanations were persisted in dime_explanations directory under dime_results_20220522_232117.json

DUAL FEATURE IMPORTANCE SCORES

DATA INSTANCE: SLIIT එකේ නිගමන උපාධි මොනවද?

PREDICTED INTENT: degrees_degrees_offered

CONFIDENCE: 0.979936957359314

Explanation Type: dual

Case Sensitive: True

Global Metric: confidence

N-grams: -

Ranking Length: 10

Global feature importance scores (Raw):

Selected token list based on global score:

Global feature importance scores (Normalized):

Global feature importance probability scores:

මොනවද=4.373067244887352, නිගමන=1.5122178196907043, එකේ=0.4100315570831299, උපාධි=0.15255939960479736, SLIIT=0.14157140254974365

මොනවද, නිගමන, එකේ, උපාධි, SLIIT

මොනවද=1.0, නිගමන=0.34580255345002325, එකේ=0.09376292065083305, උපාධි=0.034886131646650956, SLIIT=0.03237347944174832

මොනවද=0.6636470349671681, නිගමන=0.2294908392811836, එකේ=0.06222548427978721, උපාධි=0.0231520778287742, SLIIT=0.021484563643086846

මොනවද: 0.6636470349671681

නිගමන: 0.2294908392811836

එකේ: 0.06222548427978721

උපාධි: 0.0231520778287742

SLIIT: 0.021484563643086846

Dual feature importance scores (Raw):

Dual feature importance scores (Normalized):

Dual feature importance probability scores:

SLIIT=0.006376385688781738, උපාධි=0.004443705081939697, මොනවද=0.004433035850524902, එකේ=0.0008720159530639648, නිගමන=-0.002359926700592041

SLIIT=1.0, උපාධි=0.69690029725738, මොනවද=0.6952270560302118, එකේ=0.13675709024285368, නිගමන=0.0

SLIIT=0.3954312750660728, උපාධි=0.27557617313841093, මොනවද=0.2749145212264587, එකේ=0.054078030569057606, නිගමන=0.0

SLIIT: 0.3954312750660728

උපාධි: 0.27557617313841093

මොනවද: 0.2749145212264587

එකේ: 0.054078030569057606

නිගමන: 0.0



DIME Interfaces



CLI Interface
(terminal)

```
Command Prompt - "C:\Program ...  
(rasa288) D:\dime_test\test>dime  
usage: dime [-h] [-v] {server,explain,visualize,init} ...  
  
starts DIME CLI  
  
positional arguments:  
  {server,explain,visualize,init}  
    server                desired DIME interface to run [cli/server]  
                           run DIME server, a web-based visualization tool for  
                           DIME.  
    explain               run DIME CLI explainer, a terminal-based explainer  
                           tool for DIME.  
    visualize             run DIME CLI visualizer, a terminal-based  
                           visualization tool for already generated DIME  
                           explanations.  
    init                  create init dir structure for a new explanation  
                           process.
```





DIME Interfaces



GUI Interface (web)

The screenshot displays the DIME web interface. On the left is a dark sidebar with icons for home, list, expand/collapse, list, search, help, and a user profile. The main content area has a header with the DIME logo and a 'QUICK INSTRUCTIONS' button. Below this is a section titled '3 Explanations' with a sub-header 'All previously generated explanations can be easily managed, quickly visualized, exported, or imported here.' and a 'MANAGE EXPLANATIONS' button. The main content area is divided into two tabs: 'EXPLANATIONS' (active) and 'CONFIGURATIONS'. The 'EXPLANATIONS' tab contains a text input field with the placeholder 'Provide a sentence to be explained and make sure it is longer than a single word. Then, simply tap **Explain** button to get the explanation. If required to change the current DIME configurations, please navigate to the **Configurations** tab.' Below this is a 'Data Instance:' section with the text '(Sentence to be explained)' and a language selector 'EN'. To the right of the language selector is a text input field containing the Sinhala sentence 'SLIIT එකේ තියෙන උපාධි මොනවද?'. Below the input field are two buttons: 'EXPLAIN' and 'RESET'.



DIME Interfaces



GUI Interface (web)

The screenshot displays the 'Explanations' section of the DIME web interface. On the left is a dark sidebar with navigation icons. The main content area has a header with 'Explanations' and two buttons: 'PEAK' (purple) and 'UPLOAD' (green). Below the header is a dark box with a question mark icon and the text 'Dual Explanations' and 'All dual explanations previously generated can be visualized here, lightning fast. Have you tried Peak? It's even faster.' Below this is a table listing three JSON files with their respective dates and actions.

File Name	Date	Visualize	Download	Delete
dime_results_20221011_163708.json	2022.10.11 16-37-08			
dime_results_20221011_121134.json	2022.10.11 12-11-34			
dime_results_20221010_170946.json	2022.10.10 17-09-46			

At the bottom of the table is a pagination bar showing '< 1 >'.



DIME Interfaces



GUI Interface (web)

The screenshot displays the DIME web interface with the 'CONFIGURATIONS' tab selected. The interface includes a sidebar with navigation icons and a main content area. The main content area has a header with 'EXPLANATIONS' and 'CONFIGURATIONS' tabs. Below the header, there is a text box explaining that DIME configurations can be altered and providing instructions on how to restore previous configurations or reset them. The main configuration section contains three settings: 'Select the Model Mode' with radio buttons for 'Local' (selected) and 'REST'; 'Data Path' with a text input field containing './data/'; and 'Models Path' with a text input field containing './models/'. At the bottom, there is a 'Select a Model' dropdown menu with 'Latest' selected.

EXPLANATIONS CONFIGURATIONS

DIME configurations can be altered if required. Use either **Restore Previous** to set the configs to the previous version or **Reset** to reset the configurations to the initial version.

Select the Model Mode:
(Local or REST)

- ☒ Local
Any RASA models trained and stored in the server itself
- ☐ REST
Any running DIME supported RASA conversational AI in a remote instance

Data Path:
(Path where the RASA data files are at)

Models Path:
(Path where the RASA models are at)

Select a Model:
("Latest" will automatically pick up the

./data/

./models/

Latest



Best Practices

The Code

Threading

Docstrings

PEP8

Releases

Git

GitLab



GitHub



PyPI

Test PyPI

Docstrings & PEP8

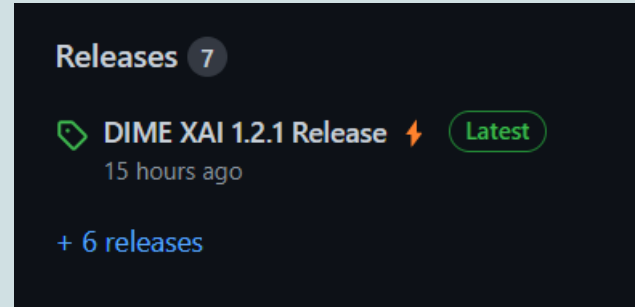
```
def get_all_tokens(
    instances: Union[Text, List],
    merge: bool = False
) -> Optional[Union[List, Dict]]:
    """
    Returns all tokens present in a single string instance
    or a list of string instances

    Args:
        instances: single string instance or a list of strings
        merge: if True, merges a list of strings passed as
                a list of unmerged strings, returns the list
                of tokens per each string instance as a dictionary

    Returns:
        for a single string, returns the list of tokens.
        for a list of unmerged strings, returns the list
        of tokens per each string instance as a dictionary
    """
    instances_copy = instances
    if not instances_copy:
        return None

    if merge and isinstance(instances_copy, List):
```

Versioning



Releases 7

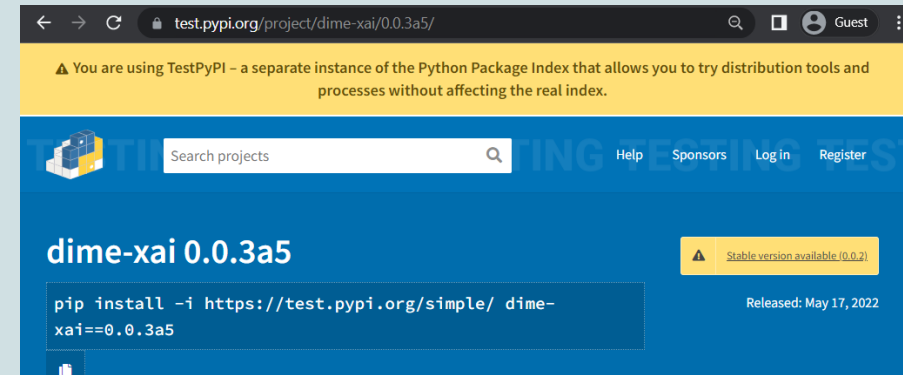
DIME XAI 1.2.1 Release ⚡ Latest

15 hours ago

+ 6 releases



Test PyPI alpha version release



test.pypi.org/project/dime-xai/0.0.3a5/

You are using TestPyPI – a separate instance of the Python Package Index that allows you to try distribution tools and processes without affecting the real index.

Search projects


dime-xai 0.0.3a5

Stable version available (0.0.2)

Released: May 17, 2022





```
pip install -i https://test.pypi.org/simple/ dime-xai==0.0.3a5
```

Vulnerability and Security Testing with Snyk

 **[Snyk] Fix for 7 vulnerabilities** #19
thisishara wants to merge 1 commit into `main` from `snyk-fix-c86b1a6f8c20a061...`

Vulnerabilities that will be fixed

By pinning:

Severity	Priority Score (*)	Issue	Upgrade	Breaking Change	Exploit Maturity
	686/1000 <i>Why?</i> Proof of Concept exploit, Has a fix available, CVSS 7.3	HTTP Header Injection SNYK-PYTHON-AIOHTTP-1584144	<code>aiohttp:</code> <code>3.7.4 -></code> <code>3.8.0</code>	No	Proof of Concept
	758/1000 <i>Why?</i> Proof of Concept exploit, Recently disclosed, Has a fix available, CVSS 7.3	Arbitrary Code Execution SNYK-PYTHON-JOBLIB-3027033	<code>joblib:</code> <code>1.0.1 -></code> <code>1.2.0</code>	No	Proof of Concept
	654/1000 <i>Why?</i> Has a fix available, CVSS 8.8	Deserialization of Untrusted Data SNYK-PYTHON-NETWORKX-1062709	<code>networkx:</code> <code>2.5.1 -></code> <code>2.6</code>	No	No Known Exploit
	506/1000 <i>Why?</i> Proof of Concept exploit, Has a fix available, CVSS 3.7	NULL Pointer Dereference SNYK-PYTHON-NUMPY-2321964	<code>numpy:</code> <code>1.18.5 -></code> <code>1.22.2</code>	No	Proof of Concept

None yet

Milestone

No milestone

Development


Successfully merging the issues.


None yet

Notifications

You're receiving notifications on this thread.

2 participants



 Lock conversation





DIME Python Package

<https://pypi.org/manage/project/dime-xai/releases/>



Open-source



Rasa Compatible

pypi.org/manage/project/dime-xai/releases/

Search projects

Your account > dime-xai

- Releases 12
- Collaborators 1
- Security history
- Settings

dime-xai
Explains DIETClassifier model predictions in Rasa chatbot framework.

Releases 12

Version	Release date	Files
1.2.1	about 15 hours ago	2 files (1 Wheel, 1 Source)
1.2.0	about 16 hours ago	2 files (1 Wheel, 1 Source)
1.1.3	Oct 10, 2022	2 files (1 Wheel, 1 Source)
1.1.2	Oct 9, 2022	2 files (1 Wheel, 1 Source)

15 hours ago

thisishara

v1.2.1

4843208

Compare

DIME XAI 1.2.1 Release Latest

DIME (Dual Interpretable Model-agnostic Explanations) is mainly used to explain RASA 2.8.X. Models.

Features

- Explains RASA DIET Classifiers using feature importance
- Generates dual feature importance scores (Global FI + Local FI)
- Efficient
- Total confidence drop as the feature importance score
- Able to explain both local and REST Rasa models
- Easy to use DIME CLI
- GUI with a dedicated server on-demand
- Generate, Store, Download, Upload, and Peak DIME explanations. Read more

<https://github.com/DIME-XAI/dime-xai>



Specific Objective

Develop DIME, an Explainable AI approach to deliver local model explanations with the help of global feature importance.



Sub Objectives

100% * 0.4

Find Global and Local Explanations logically

95% * 0.15

Develop a python package for DIME

100% * 0.05

Modify DIET intent classifier to get all confidence scores

100% * 0.3

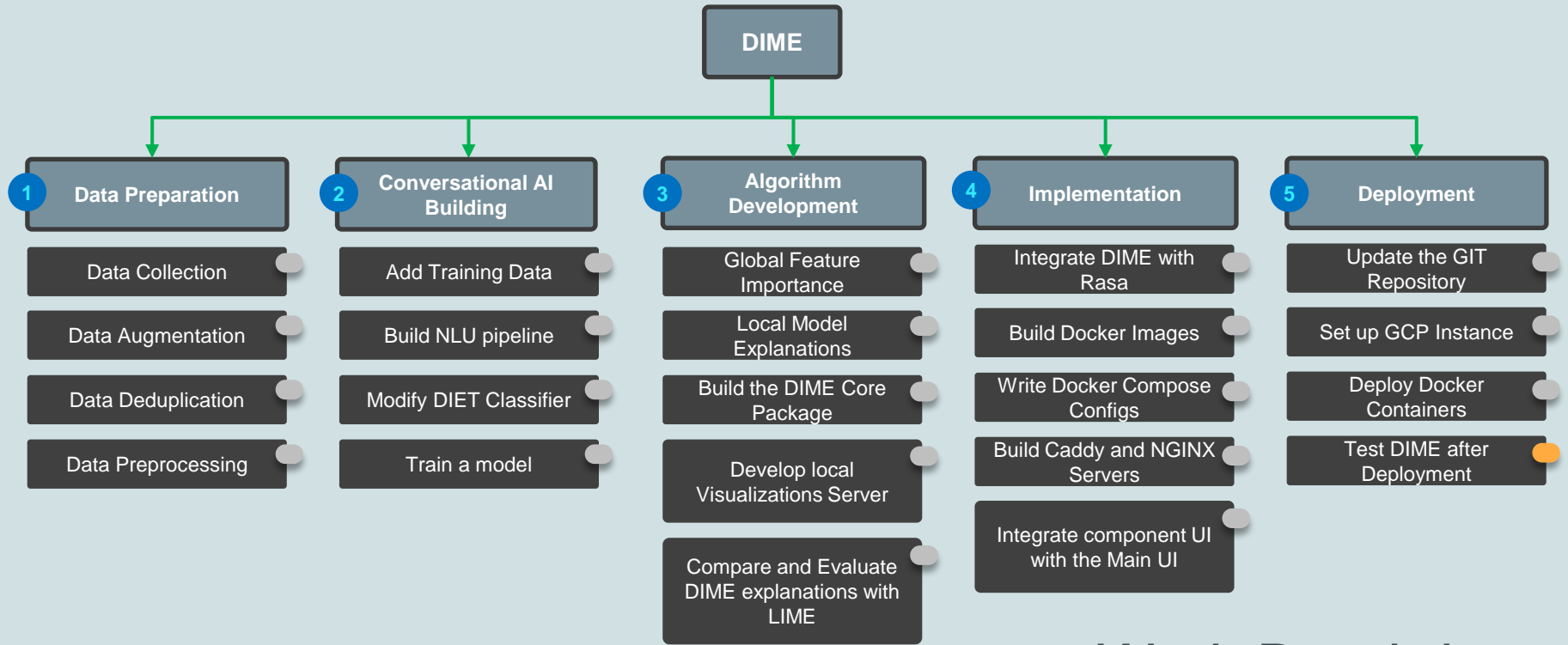
Visualize explanations in an interpretable manner

100% * 0.1

Integrate DIME with Rasa seamlessly

Overall completion = (objective completion) x (objective weight) =

99.25%



- Completed
- In-progress (90% - 100%)
- Pending

Work Breakdown Structure



References

[1]. M. T. Ribeiro, S. Singh, C. Guestrin, “‘why should I trust you?’: Explaining the predictions of any classifier,” 16 Feb 2016. [Online]. Available: <https://arxiv.org/abs/1602.04938>

[2]. S. Lundberg, S. Lee, “A Unified Approach to Interpreting Model Predictions,” 2017. [Online]. Available: <https://arxiv.org/abs/1705.078744>

[3]. T. Bunk, D. Varshneya, V. Vlasov, A. Nichol, “DIET: Lightweight Language Understanding for Dialogue Systems,” 2020. [Online]. Available: <https://arxiv.org/abs/2004.09936>



Business Model



DEMO PACKAGE

FREE for one month

10 Question Categories

Entity Annotation
Model Evaluations
Model Explainability



ON PREM PACKAGE

\$ 299.99 one time

1 Free Maintenance

(\$50.00 per additional call)

∞ Question Categories
All ML Tools



CaaS PACKAGE

STARTER

\$ 9.99/Month

20 Question Categories

Entity Annotation
Limited Model Evaluations
No Model Explainability

PRO

\$ 34.99/Month

50 Question Categories

Entity Annotation
Model Evaluations
Limited Model
Explainability



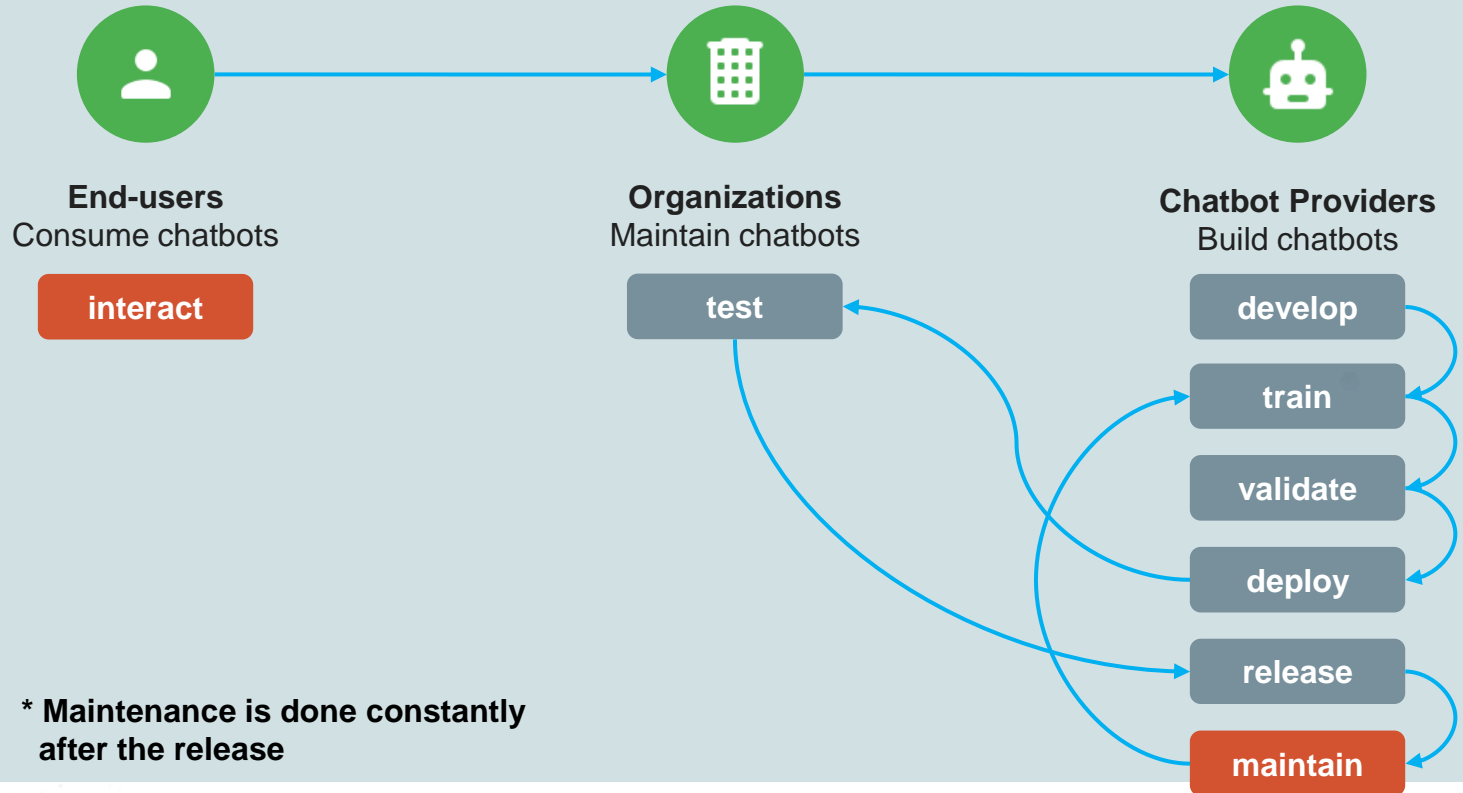
GENIUS

\$ 49.99/Month

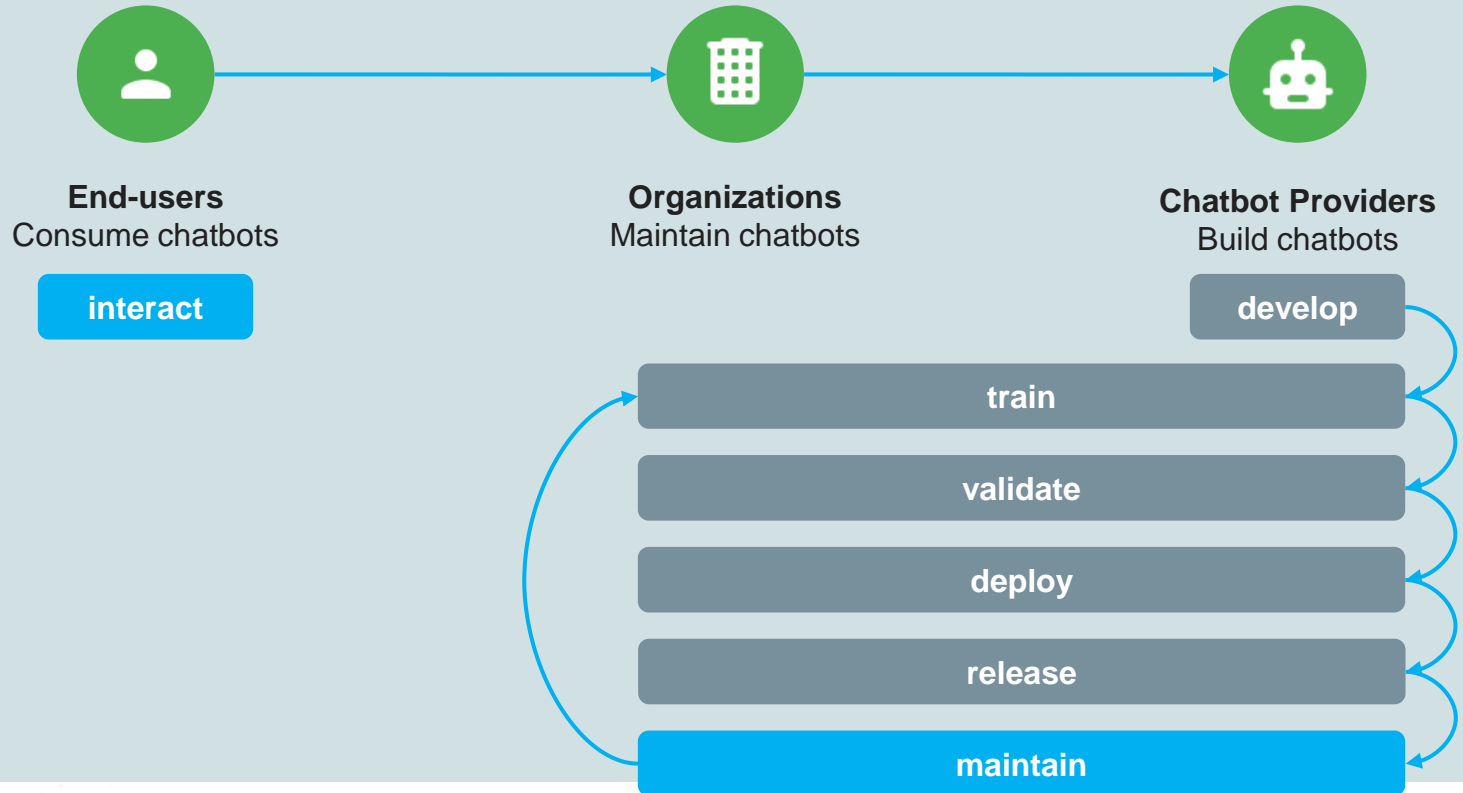
100 Question Categories *

Entity Annotation
Model Evaluations
Model Explainability

Chatbot development lifecycle



Chatbot development lifecycle





Thank You



**NLP Tools for
Sinhalese**



**Simple No-Code
Development
Console**



**Model
Evaluations &
Explainability**



Any Questions



Demonstration