DocOIE : A Document-level Context-Aware Dataset for OpenIE

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Presented by : Amira Chebbi

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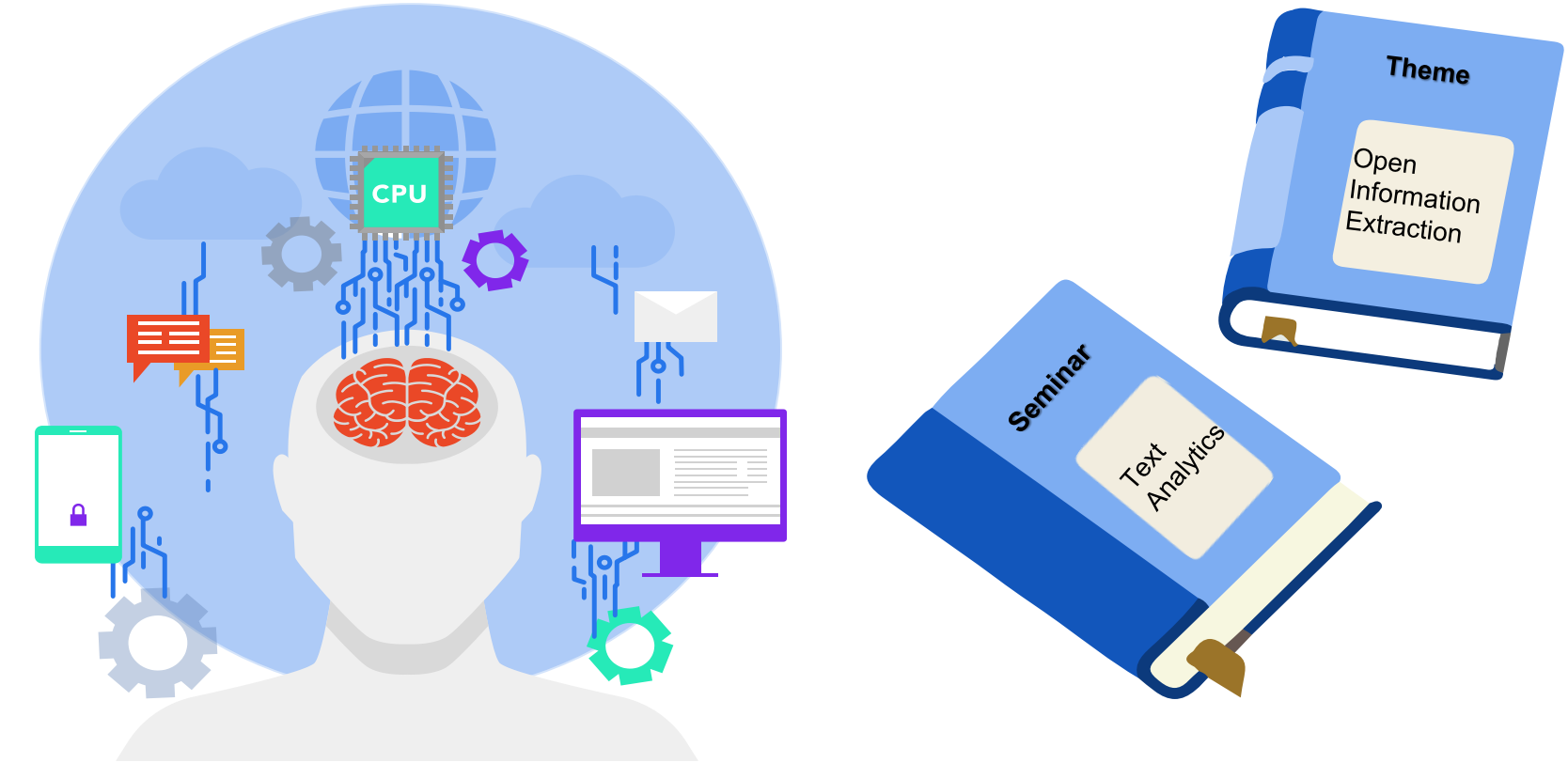
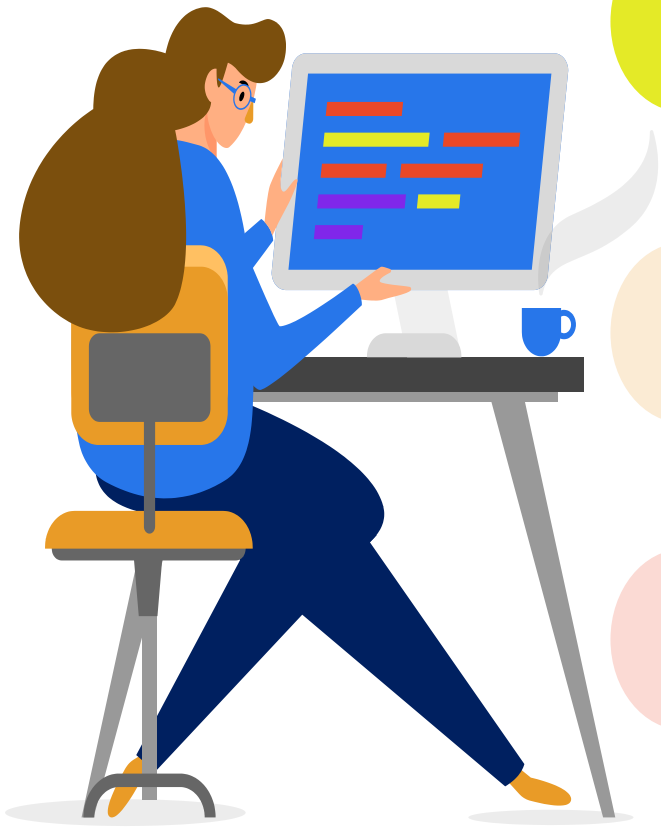


Overview



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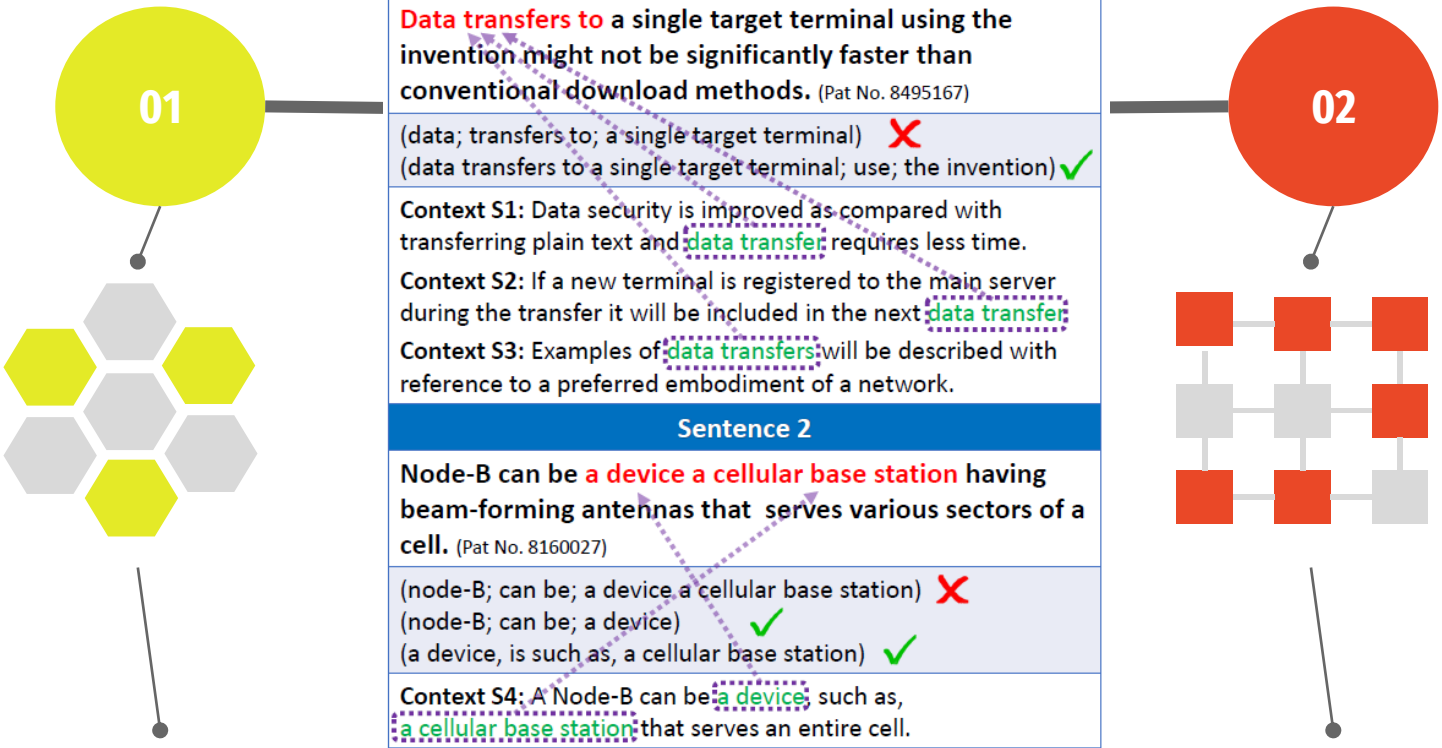
Introduction - **Problematic**

DocOIE : A Document-level Context-Aware Dataset for OpenIE



Part-of-speech Ambiguity

Is it a Verb or a Noun ?

Syntactic Ambiguity

What is the relationship between this two words ?

Introduction - **Proposed Solution**

DocOIE : A Document-level Context-Aware Dataset for OpenIE

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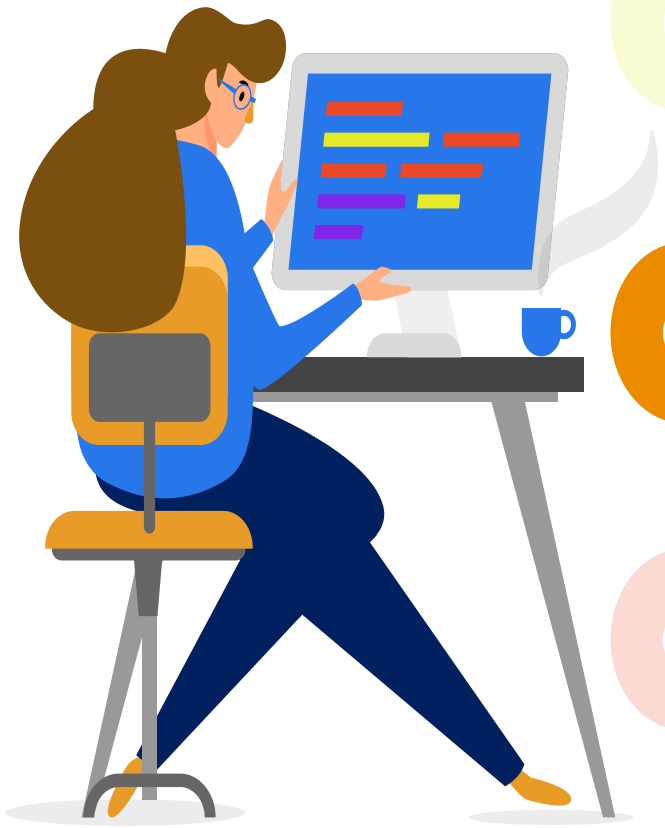
DocOIE proposed solutions

01 **New Task in OpenIE**
Extract relational tuples with document-level context

02 **DocOIE**
Expert-annotated dataset

03 **DocIE**
Neural OpenIE system

Overview



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Related work - **OpenIE Datasets**

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OpenIE Datasets	
OIE2016 (Gabriel Stanovsky and Ido Dagan. 2016)	first large-scale dataset constructed for OpenIE tasks and comes with a standard scoring framework.the gold tuples are automatically generated according to human crafted rules.
Wire57(Lechelle et al., 2019)	manually annotates 57 sentences + scoring improvement
CaRB (Bhardwaj et al. (2019))	50 expert-annotated sentences + a sophisticated scoring framework

Related work - OpenIE Datasets - **Problems**

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Dataset's size problem

The number of the annotated sentences ramains small

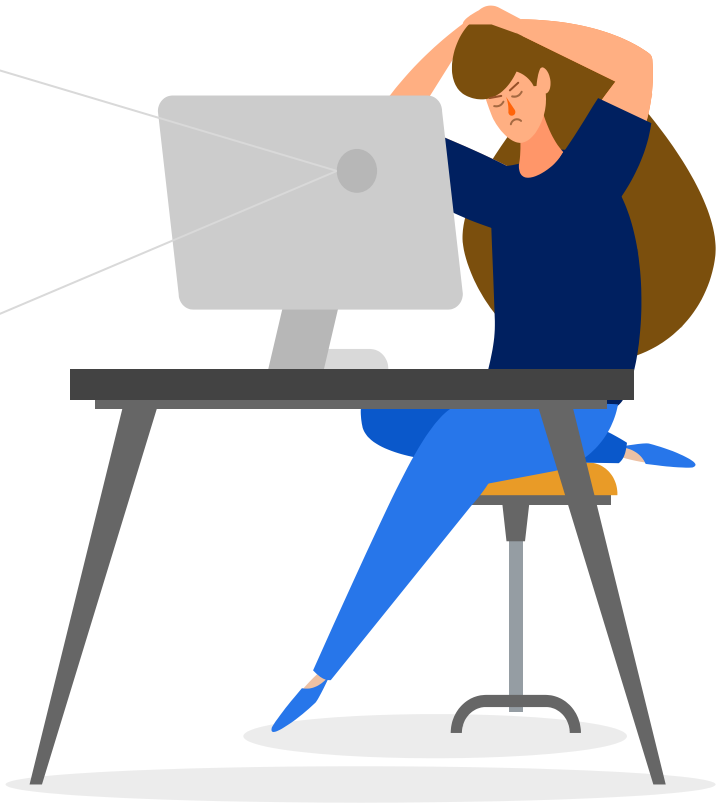
01

No referring to contextual Information

The Annotation is elaborated on a sentence-level and not a document-level

02

OpenIE Datasets Problems



Related works - **OpenIE Models**

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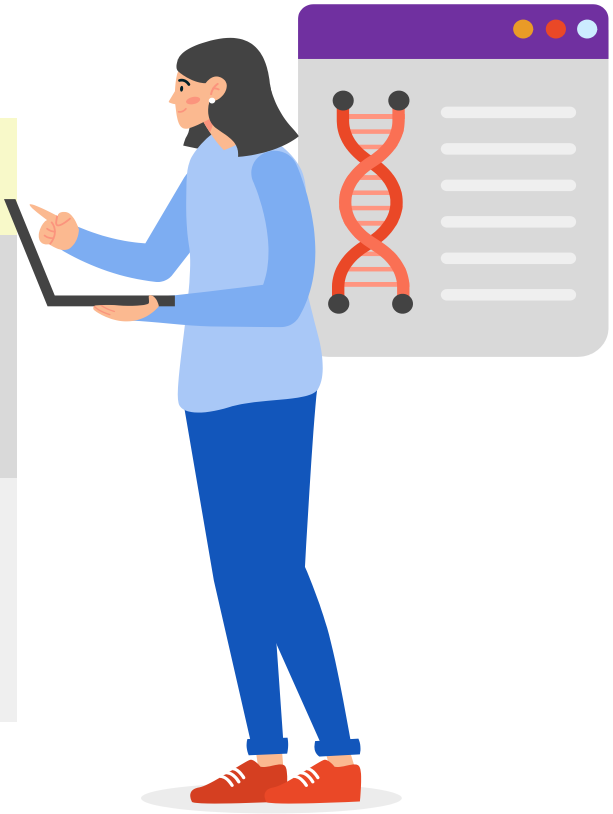
OpenIE Models	
TextRunner (Yates et al., 2007)	the first OpenIE system,extract relational tuples based on handcrafted rules or statistical methods
neural OpenIE systems (Cui et al., 2018; Zhan and Zhao, 2020; Kolluru et al., 2020a,b)	They extract tuples in an end-toend manner, not requiring prior syntactic or semantic analysis.



Related works - OpenIE Models - **Problems**

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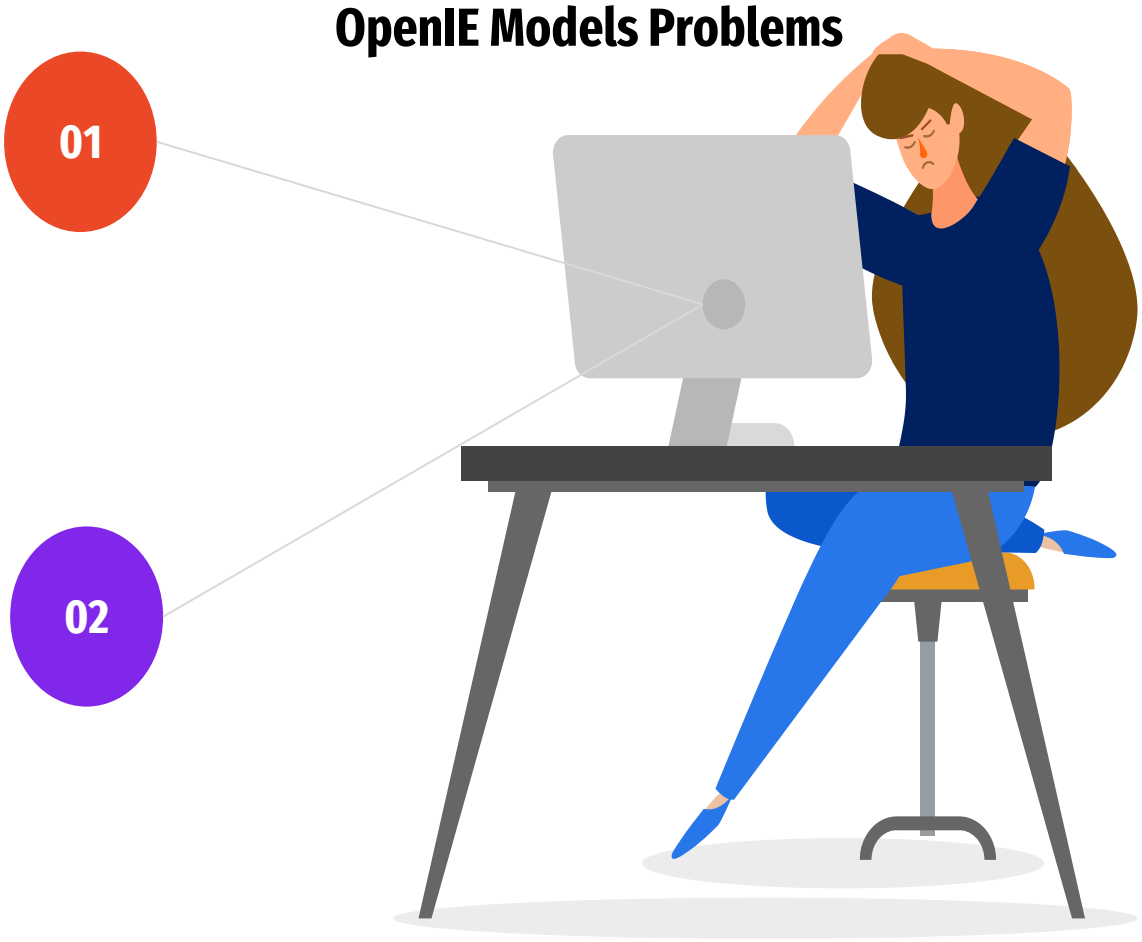
Error accumulation for traditional models

Because they rely on prior syntactic or semantic analysis

No consideration of the document-level context

The tuple extraction is based only on the sentence-level



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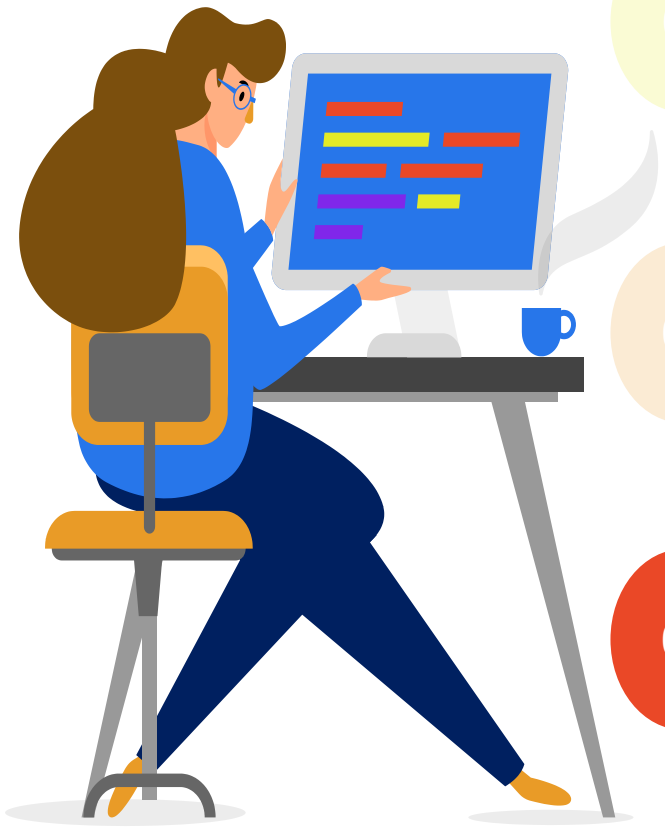

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Methodology – **DocOIE Dataset**

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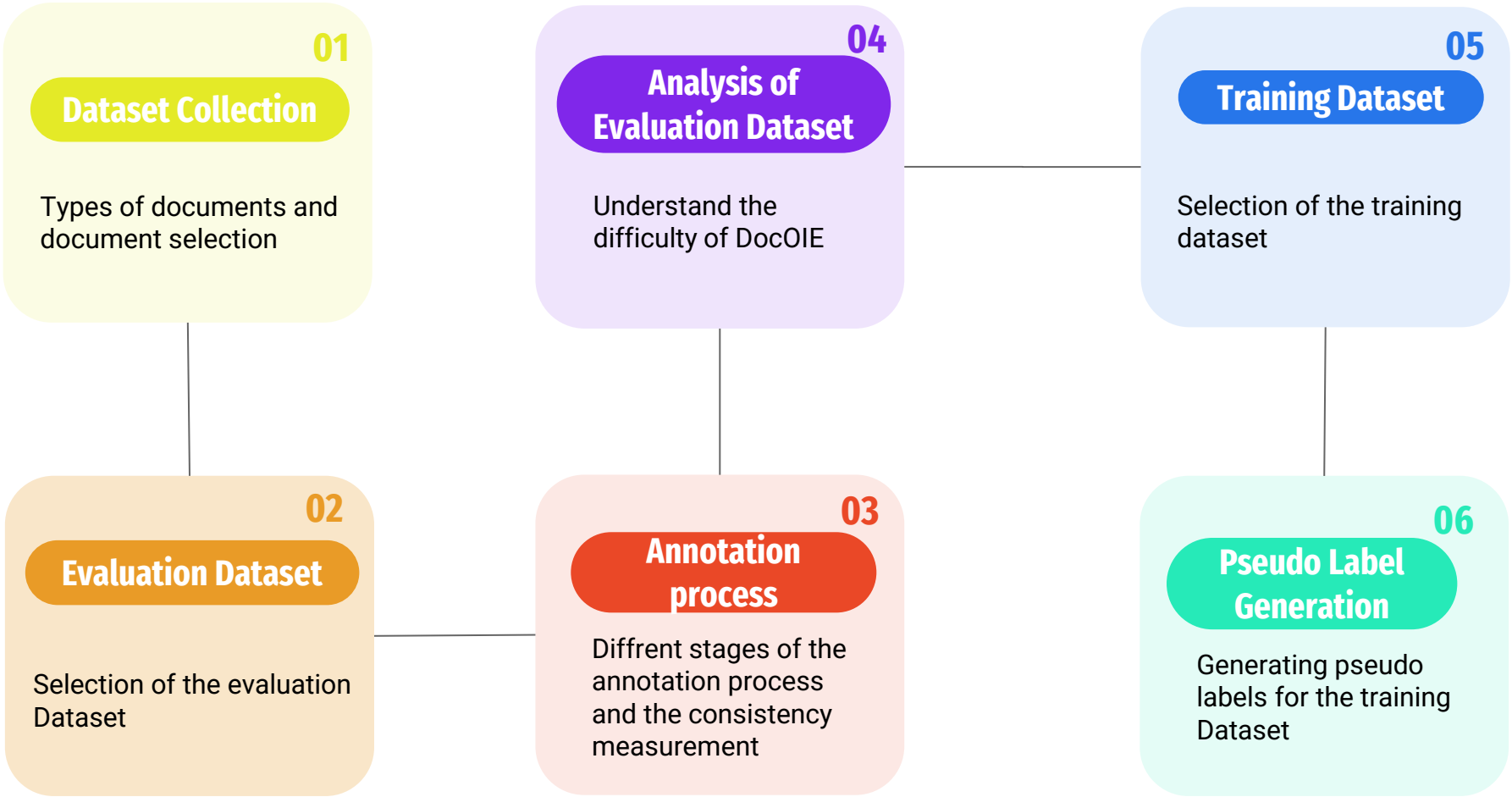
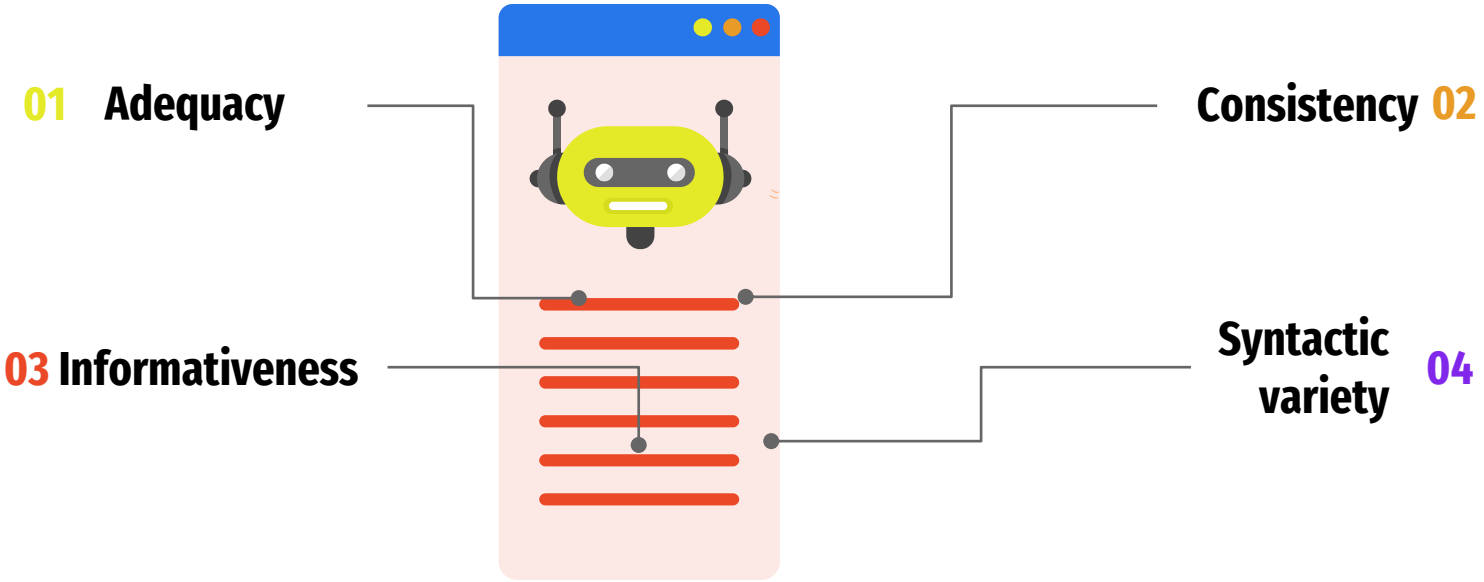


Methodology –DocOIE Dataset

1- Dataset Collection

- Document types : News and Wikipedia articles
- Document selection criterias :



- Keyword selection criterias : Magnitude and Diversity
- Document cleaning

Methodology –DocOIE Dataset
2-Evaluation Dataset

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- Randomly select 80 documents (40 each domain)
- From each document , select randomly 10 sentences
- Result : 800 expert-annotated sentences from the DocOIE evaluation Dataset

Methodology –DocOIE Dataset

3- Annotation process

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Annotation process and consistency measurement

Stage 1

1- Annotation

The two annotators practiced annotations independently on 100 sentences

2- Cross validation

Crossvalidation of the results , discussion and then update

Stage 2

1- Annotation

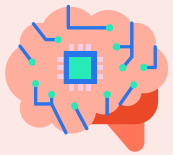
The two experts annotated independently other 100 sentences

2- Consistency Measurement

Evaluation used at tuple-level using the CaRB scorer

Stage 3

Based on the high-level annotation consistency , each expert annotate independently 300 sentences.



Methodology –DocOIE Dataset

4- Analysis of evaluation dataset

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- Used to understand the difficulty of DocIE , similar to (Gashteovski et al., 2019).

Sentence-level Analysis

Evaluate sentence complexity by the number of :

- Conjunction words
- Terminology mention
- Dependent clause

and

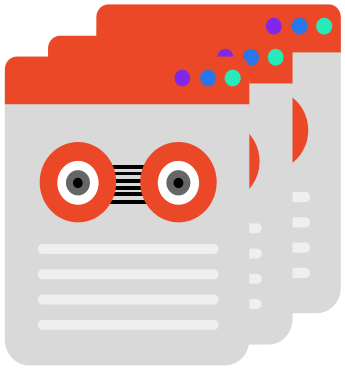
Tuple-level Analysis

The analysis of a tuple is based on three points :

- Negative polarity
- Possibility
- Under-specificity

Methodology –DocOIE Dataset

5- Trainig Dataset



- Select 2400 documents randomly (1200 each Domain)

- The 1200 documents in each domain contain around 120.000 sentences (sufficient for the openIE model)

Methodology –DocOIE Dataset

6- Pseudo Label generation

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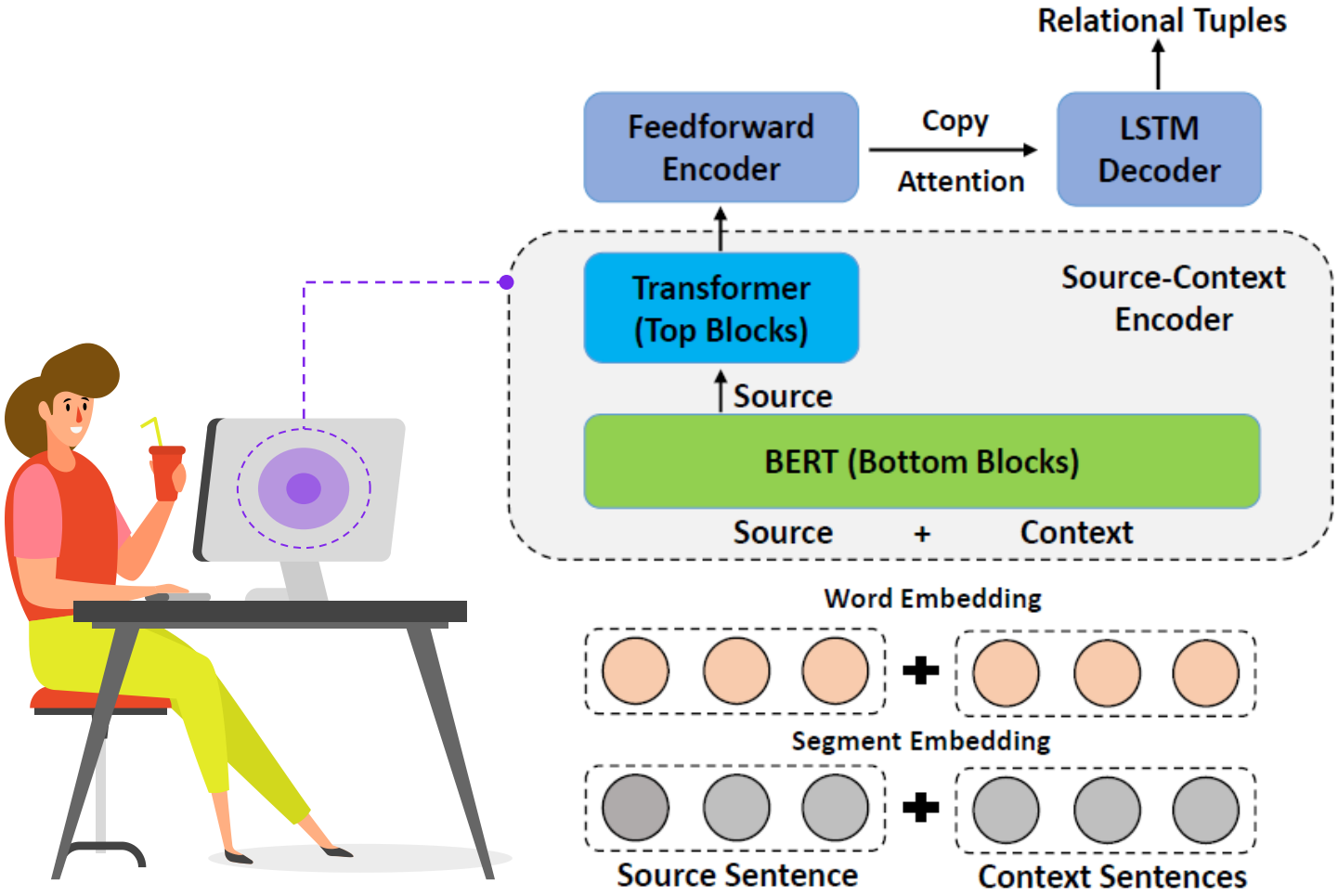
- Generation of the pseudo labels by bootstrapping with traditional OpenIE models(Kolluru et al.,2020b; Cui et al., 2018; Zhao et al., 2020)

- But First : Evaluation of the performance of the traditional OpenIE models on the evaluation Dataset using CaRB scorer(to guarantee better quality of pseudo labels)

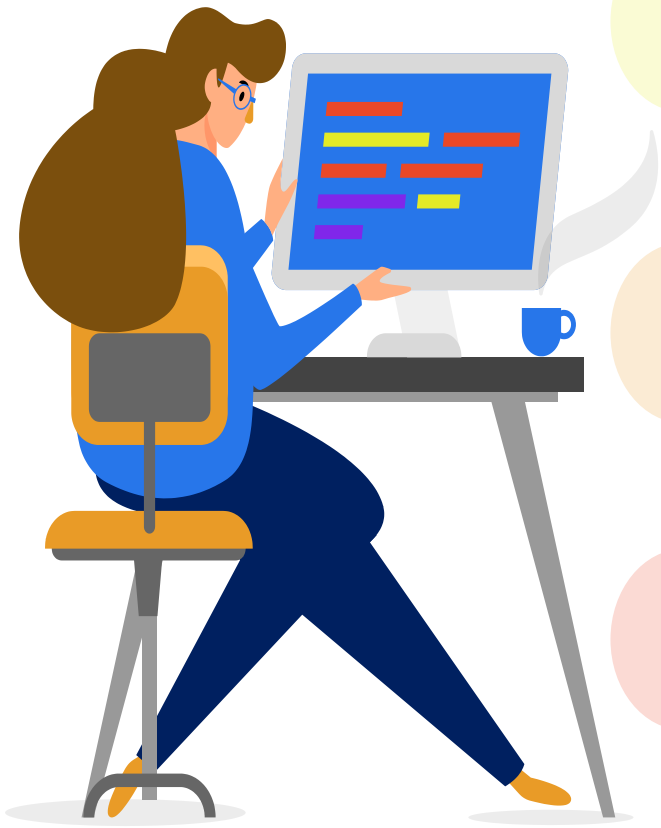
- The evaluated models were : Reverb (Fader et al., 2011), Clausie (Corro and Gemulla, 2013), Stanford OpenIE (Angeli et al.,2015), OpenIE4 (Mausam, 2016) , OpenIE5 , Rev+Oie4 and Oie4+ Rev

- Results shows that : both Reverb and OpenIE4 are the best performing individual models and their combinations lead to the best and second best F1 scores in both domains.

Methodology –DocIE Model



Overview



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Results - DocIE Against sentence-level OpenIE systems

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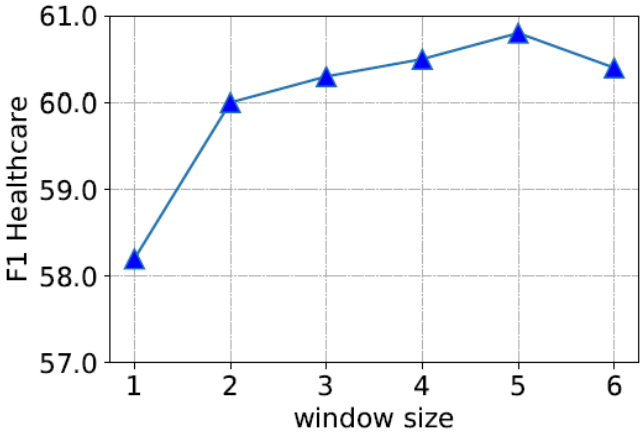
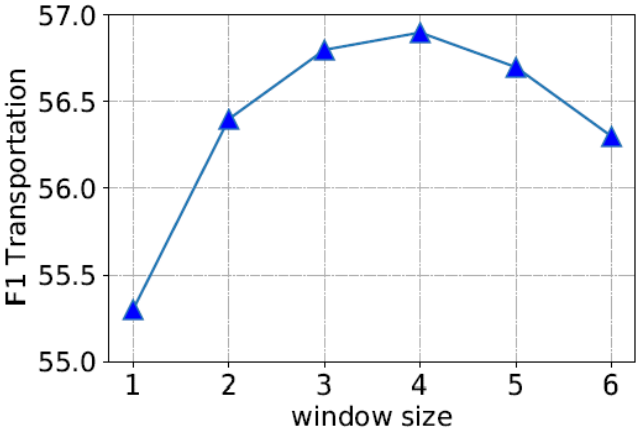
System	Healthcare				Transportation			
	AUC	Prec	Rec	F1	AUC	Prec	Rec	F1
Rev+Oie4	36.8	75.8	47.7	58.6	31.0	**74.2**	42.4	54.0
Oie4+Rev	35.8	59.6	**55.3**	57.4	30.1	53.4	52.7	53.0
CopyAttention+BERT	46.8	77.9	48.6	59.8	38.3	55.3	56.9	56.1
IMOJIE	39.7	**80.1**	46.4	58.7	35.8	63.5	49.2	55.5
DocIE w/o transformer	47.1	76.2	49.9	60.3	**38.5**	55.8	57.0	56.4
DocIE w transformer	**47.4**	74.4	51.3	**60.8**	**38.5**	56.0	**57.5**	**56.9**

- DocIE with transformer achieves the best AUC and F1 in both domains .
- DocIE without transformer is the second best performer and outperforms all the sentence-level systems .

Results - **Impact of the context Window size**



(a) Healthcare



(b) Transportation

The optimal windowsize for the healthcare is 5

The optimal windowsize for the transportation is 4

8-10 sentences provide sufficient context

and

Large window size may introduce noise

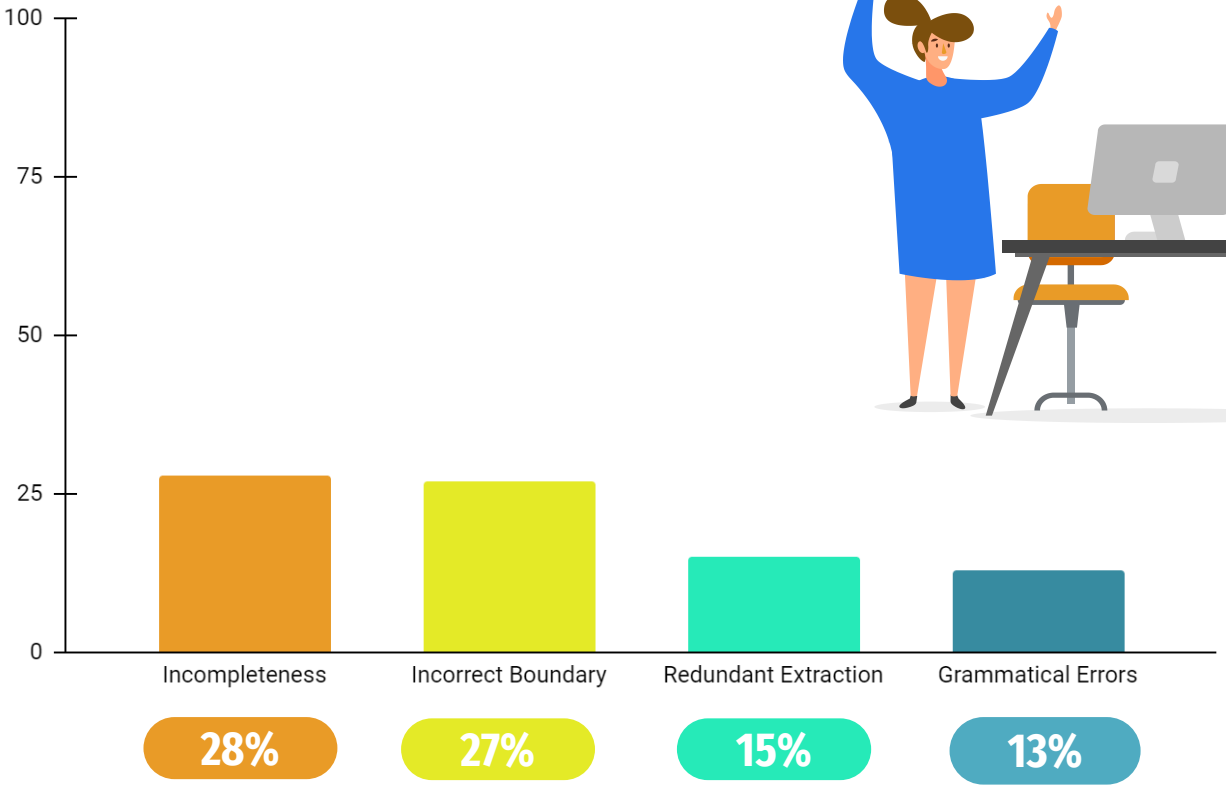
Results - Error Analysis

01 Incompleteness
Fails to cover at least one key phrase in either arguments or relations

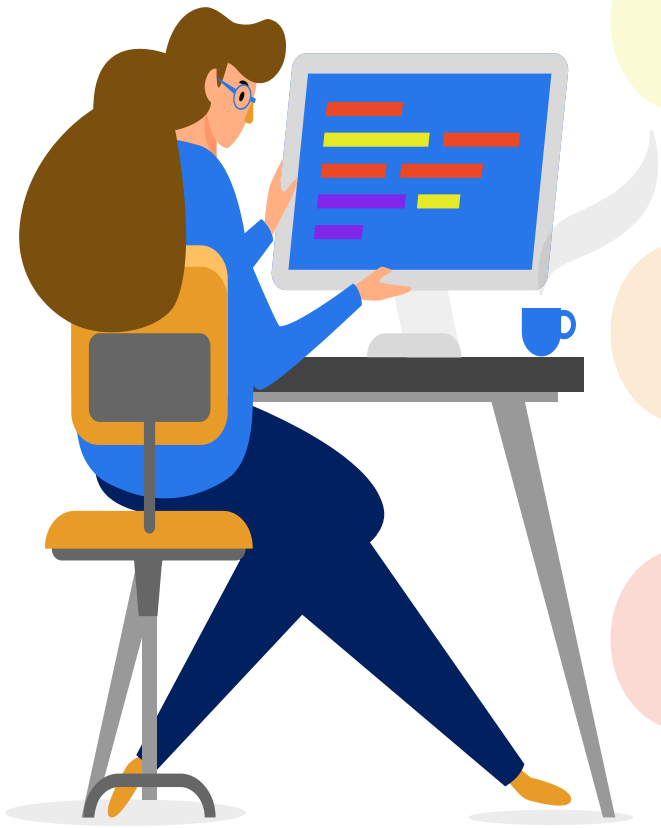
02 Incorrect Boundary
Misinterpretaion of the syntactic meaning of the sentence , leading to incorrect Boundary

03 Redundant extraction
The same relational fact is extracted multiple times

04 Grammatical Errors
Extracions are not grammatically correct



Overview



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Analysis – **Contributions**

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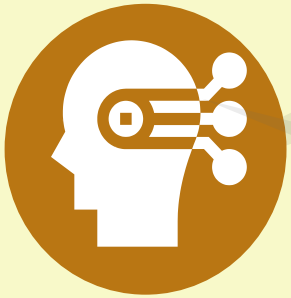
Contribution-facet



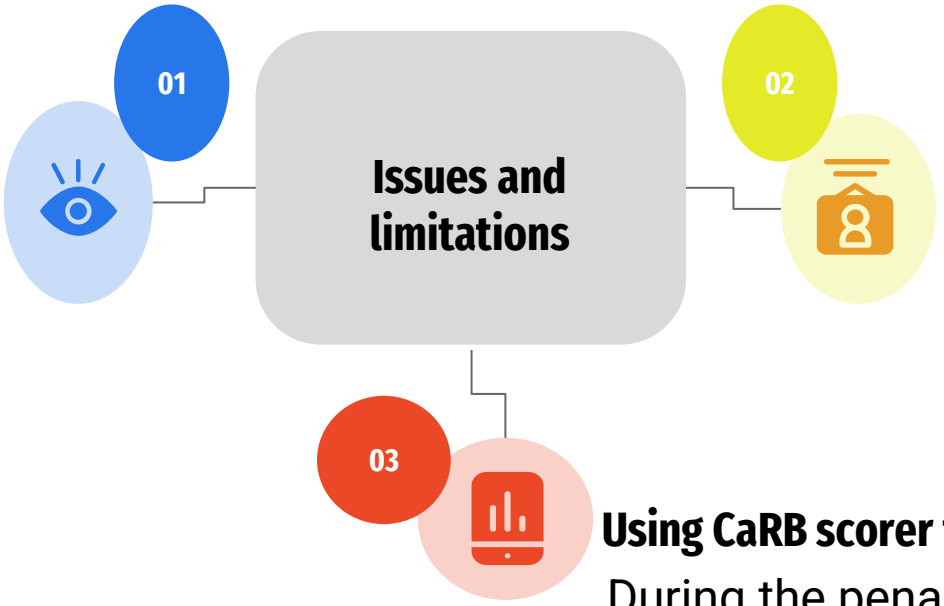
Positive outcomes

Better correct understanding of various topics First document-level context-aware OpenIE dataset and model

Relation to public policy

better analysis and helps in writing the adequate public policy and taking the right measurement in many areas.

Analysis – **Possible Issues and limitations**



No Generalization

DocIE Dataset is restricted to specific type of documents

Domains restriction

Foucus only on two domains : Transportion and Health-care

Using CaRB scorer for Evaluation

During the penalization CaRB scorer does not take the contextual sentences into consideration

Analysis – **Future Work**

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01 **Model Improvement**

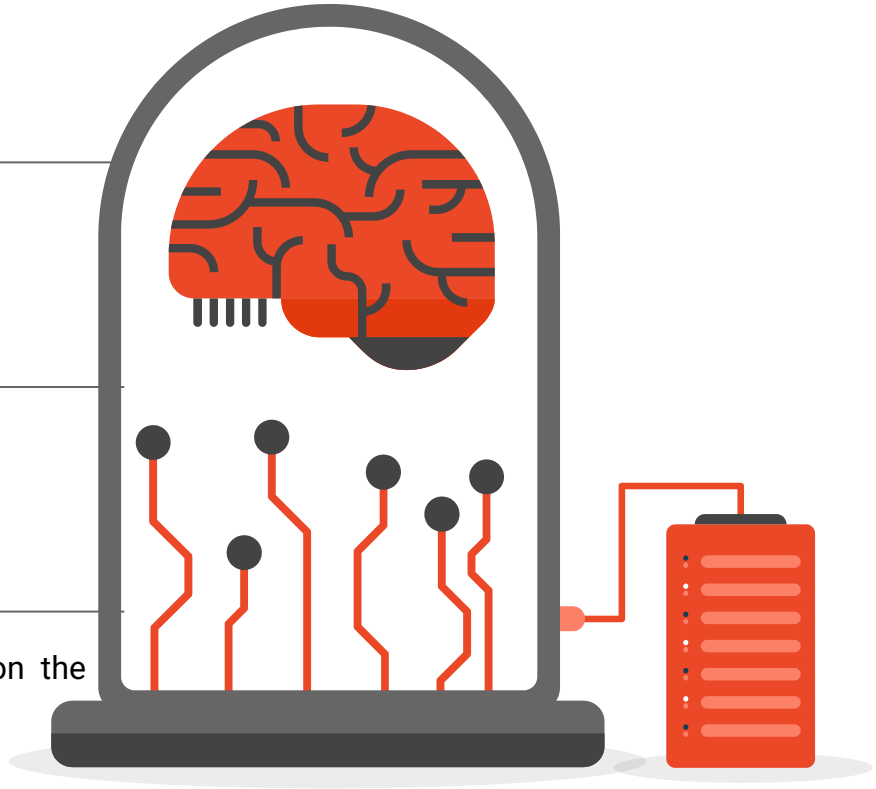
Research on more effective context-aware models

02 **Pseudo-Labels**

Invistigate the possiblity of not relying on pseudo labels

03 **Adapted Scorer**

Trying to develop a new scorer that takes into consideration the contextual informations



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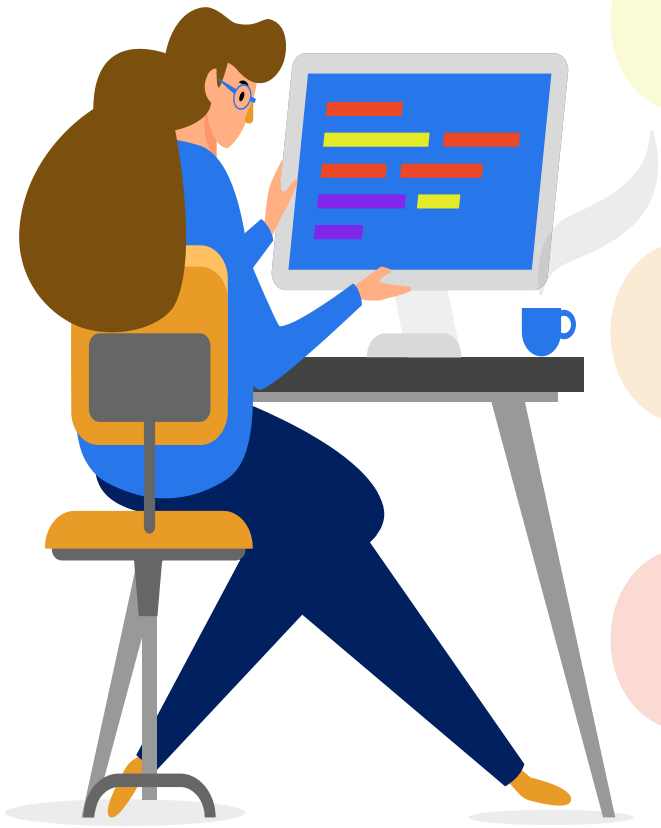

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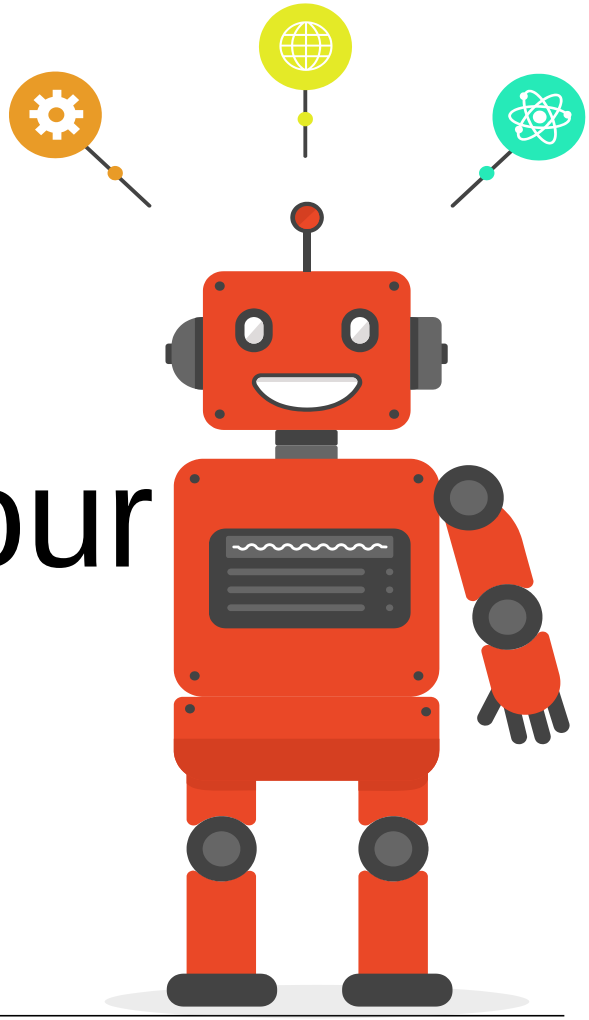
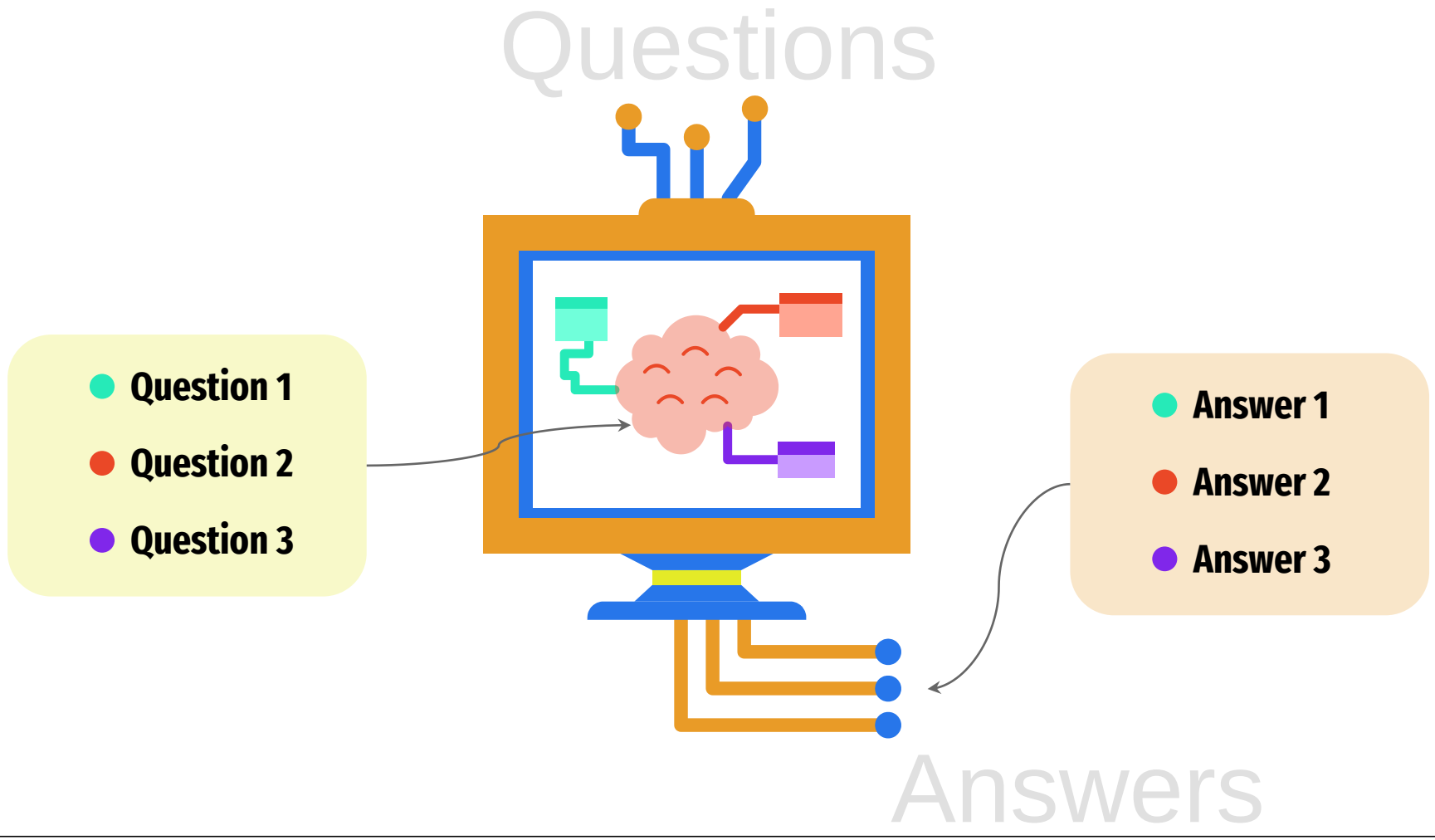
Refrences

- DocOIE: A Document-level Context-Aware Dataset for OpenIE
- Creating a Large Benchmark for Open Information Extraction
- WiRe57 : A Fine-Grained Benchmark for Open Information Extraction
- CaRB: A Crowdsourced Benchmark for Open IE
- TextRunner: Open Information Extraction on the Web
- Span Model for Open Information Extraction on Accurate Corpus

Thank you for your Attention



Q/A Part


Questions
Question 1
Question 2
Question 3
Answer 1
Answer 2
Answer 3
Answers