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Judul :
NERSkill.Id: Annotated Dataset of Indonesian's Skill Entity Recognition

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3. **Artikel Accepted (7 Februari 2024)**

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Meilany Nonsi Tentua <meilany@upy.ac.id>

Please verify your contribution to NERSkill.Id: Annotated Dataset of Indonesian's Skill Entity Recognition

1 message

Data in Brief <em@editorialmanager.com> Mon, Dec 25, 2023 at 9:46 AM
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Journal: Data in Brief
Title: NERSkill.Id: Annotated Dataset of Indonesian's Skill Entity Recognition
Corresponding Author: DR Suprapto Suprapto
Co-Authors: Meilany Nonsi Tentua; Suprapto ; Afiahayati
Manuscript Number: DIB-D-23-02470

Dear Meilany Nonsi Tentua,

The corresponding author DR Suprapto Suprapto has listed you as a contributing author of the following submission via Elsevier's online submission system for Data in Brief.

Submission Title: NERSkill.Id: Annotated Dataset of Indonesian's Skill Entity Recognition

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If you did not co-author this submission, please contact the corresponding author directly at sprapto@ugm.ac.id.

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Data in Brief

NERSkill.Id: Annotated Dataset of Indonesian's Skill Entity Recognition

--Manuscript Draft--

Manuscript Number:	
Article Type:	Data Article
Keywords:	Natural Language Processing; Named Entity Recognition; Text Mining; Skill Entity Recognition; Indinesian Skill Entity
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First Author:	Meilany Nonsi Tentua
Order of Authors:	Meilany Nonsi Tentua
	Suprapto Suprapto
	Suprapto
	Afiahayati
Abstract:	NERSkill.Id is a manually annotated named entity recognition (NER) dataset focused on skill entities in the Indonesian language. The dataset comprises 418.868 tokens, each accompanied by corresponding tags following the BIO scheme. Notably, 15,51% of these tokens represent named entities, falling into three distinct categories: hard skill, soft skill, and technology. To construct this dataset, data were gathered from a job portal and subsequently processed using open-source libraries. Given the scarcity of annotated corpora for Indonesian, NERSkill.Id fills a significant void and offers immense value to multiple stakeholders. NLP researchers can harness the dataset's richness to advance skill entity recognition technology in the Indonesian language. Companies and recruiters can benefit by employing NERSkill.Id to enhance talent acquisition and job matching processes through accurate skill identification. Furthermore, educational institutions can leverage the dataset to adapt their courses and training programs to meet the evolving needs of the job market. This dataset can be effectively utilized for training and evaluating named entity recognition systems, empowering advancements in skill entity recognition for the Indonesian language.
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Cover letter

Desember 25, 2023

Editorial Data in Brief

Subject: Article Submission - " NERSkill.Id : Annotated Dataset of Indonesian's Skill Entity Recognition "

Dear Editor of Data In Brief

I am submitting a manuscript for consideration of publication in Data in Brief. The manuscript is entitled "**NERSkill.Id : Annotated Dataset of Indonesian's Skill Entity Recognition**". It has not been published elsewhere and that it has not been submitted simultaneously for publication elsewhere.

NERSkill.Id represents a significant milestone in linguistic research, being the initial annotated corpus specifically designed for NER datasets in the Indonesian language. The dedicated focus on skill entities adds a unique dimension to this corpus, addressing a crucial aspect often underrepresented in traditional NLP resources. The importance of this contribution cannot be overstated, as it not only enriches the existing resources for NLP in Indonesian but also opens new avenues for the development of sophisticated language models. I believe that the insights gained from my research on NERSkill.Id would be of great interest to the readership of Data in Brief.

Thank you for considering my submission. I look forward to the opportunity for further discussion and potential publication in Data in Brief.

Yours Sincerely,

Suprapto, Drs., M.I.Kom., Dr.
Department of Computer Science and Electronics
Faculty of Mathematics and Natural Sciences
Universitas Gadjah Mada

Article information

Article title
NERSkill.Id : Annotated Dataset of Indonesian's Skill Entity Recognition

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Keywords
Natural Language Processing, Named Entity Recognition, Text Mining, Skill Entity Recognition, Indinesian Skill Entity

Abstract

NERSkill.Id is a manually annotated named entity recognition (NER) dataset focused on skill entities in the Indonesian language. The dataset comprises 418.868 tokens, each accompanied by corresponding tags following the BIO scheme. Notably, 15,51% of these tokens represent named entities, falling into three distinct categories: hard skill, soft skill, and technology. To construct this dataset, data were gathered from a job portal and subsequently processed using open-source libraries. Given the scarcity of annotated corpora for Indonesian, NERSkill.Id fills a significant void and offers immense value to multiple stakeholders. NLP researchers can harness the dataset's richness to advance skill entity recognition technology in the Indonesian language. Companies and recruiters can benefit by employing NERSkill.Id to enhance talent acquisition and job matching processes through accurate skill identification. Furthermore, educational institutions can leverage the dataset to adapt their courses and training programs to meet the evolving needs of the job market. This dataset can be effectively utilized for training and evaluating named entity recognition systems, empowering advancements in skill entity recognition for the Indonesian language.

Specifications table

Subject	Data science
Specific subject area	Skill Entity Recognition from job description in Indonesian Language
Type of data	Tabular
How the data were acquired	The most data were programmatically scraped using the Beautifulsoup library for Python. The data cleaned and preprocessed using library in Python
Data format	Raw Standardized
Description of data collection	The dataset was compiled using a combination of automated scraping, processing, and manual annotation techniques. Initially, job descriptions from various job vacancies listed on a job portal were extracted through the use of BeautifulSoup Python library. Subsequently, the gathered text files underwent manual annotation, where undergraduate of Informatics annotators labeled each token with the appropriate tag using a spreadsheet application. The final output was exported in a tabular txt format, following the BIO tagging scheme. Each row in the resulting dataset represents a token along with its corresponding tag, enabling the dataset to be effectively utilized for named entity recognition tasks.
Data source location	The Web
Data accessibility	Public Repository Repository Name: Mendeley Data Data identification number: 10.17632/5s8r9ndfvc.1 Direct URL to data: https://data.mendeley.com/datasets/5s8r9ndfvc/1

Value of the data

- NERSkill.Id is the first annotated corpus for NER dataset focused on skill entities in the Indonesian language. It thus makes a valuable contribution to the available resources for Indonesian Language (NLP).
- This dataset is useful for computer NLP research community, companies, recruiters, and educational institutions
- This dataset can be used to evaluation or training in various tasks of skill recognition for transformer language models on the downstream task of NER.
- This dataset follows the BIO format and can thus be combined with other widely used corpora in standard to train large models.

1. Objective

The primary objective of creating this dataset is to procure a precisely annotated Named Entity Recognition (NER) corpus specifically focused on skill entities in the Indonesian language. Although NERSkill.Id is relatively small in size, it has significant potential for fine-tuning language models. Additionally, it can be effectively combined with larger pre-existing corpora to facilitate the training of more comprehensive and adaptable mixed Indonesian models for various NLP tasks.

2. Data description

Following the processes of scraping, preprocessing, and annotation, the ultimate version of the dataset comprises 418.868 tokens. Notably, 15,51% of these tokens correspond to named entities. Before the annotation (tagging) stage, the sentences outlining job requirements undergo a tokenization process. The dataset categorizes named entities into three distinct classes: hard skill, soft skill, and technology [1]. Subsequently, these tokens are marked using the BIO format [2](which stands for Beginning, Inside and Outside). The distribution of these specific named entities within the dataset is shown in Fig.1.

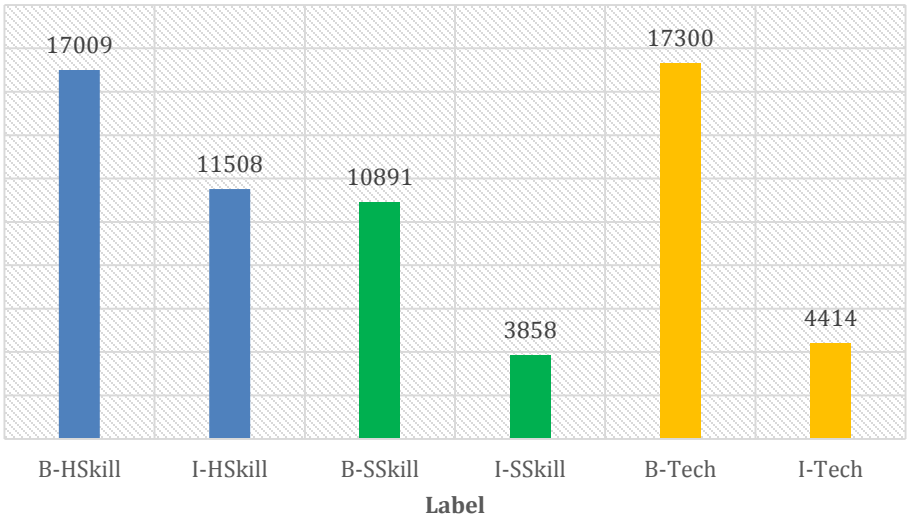

Figure 1. Distribution of Annotation

Hard skill (HSkill) refers to specific abilities required for a job, typically listed under the qualifications section of a job vacancy [3]. Examples of hard skills include web design, computer programming, data analysis, and computer networking. Soft skill (SSkill) encompasses personality traits, personal attributes, and communication abilities needed to interact effectively with others and cultivate sensitivity towards the environment [3]. Examples of soft skills include teamwork, critical thinking, and conflict management. Technology (Tech) represents the type of methods used within Hard Skills [4]. Examples of technologies include C#, Python, MySQL, SQL Server, and Javascript. The annotation table is presented in ConLL2003 format, consisting of 2 columnsword, and tag columns. The NERSkill-ID file is available in .txt format. Table 2 show the description of colomns in NERSkill.Id. Table 3. illustrates the annotation format of the data performed by the NERSkill.ID dataset.

Table 2. Description of columns in NERSkill.Id dataset.

Column	Description
Word	A word, number, or punctuation mark representing one token
Tag	The tag assigned to the token according to the BIO tagging scheme

Table 3. Ilustration of annotation data

Word	Tag
akrab	O
dengan	O
asp.net	B-Tech
core	I-Tech
(c#)	B-Tech
;	O
front-end	B-Hskill
frameworks	I-Hskill

2. Experimental design, materials and methods

Data scraping from job portal. The data used to create the corpus were scraped from the Indeed[1], Jobstreet[2], loker.id[3] dan Job.Id[4]. We used BeautifulSoup as Python library to extract data from indeed and Jobstreet. BeautifulSoup serves as a parser to separate HTML components into a sequence of easily readable elements. We collected manually for job description form loker.id and Job.id. From job portal, 4.394 job description were stored in text files. The full code of data scraping can be found on Mendeley[5].

Data annotation. The text files obtained from the scraping phase were filtered by selecting data with a minimum of 5 words. We divided the files to be annotated into 4 sections. Each file will be annotated manually by 2 different annotators. Eight annotators, all undergraduate informatics students, were employed to annotate skills mentioned in job descriptions using a spreadsheet application. Before distribution the file, the involved annotators convened for a briefing session. The objective was to create a mutual comprehension of the designated tags, which encompassed hard skill, soft skill, and technology. Table 2 shows the annotation rules used for NERSkill.Id. Each sample was collectively deliberated upon, and the author assumed the role of the ultimate decision-maker. Following this, annotations were performed on the annotators' individual computers using a spreadsheet application. In cases of disagreement, the authors intervened to resolve any discrepancies and ensure data quality throughout the

[1] https://id.indeed.com/
[2] https://www.jobstreet.co.id/
[3] https://www.loker.id/
[4] https://job.id/
[5] https://data.mendeley.com/datasets/5s8r9ndfvc/1

annotation process. Once the annotations were finalized, the output file was exported from the spreadsheet in txt format.

Tabel 4. Annotation rules

Entity Entity	Description
B-HSkill	Marks the beginning of a multi-word entity representing a Hard skill
I-HSkill	Refers to the following words within a Hard skill entity after B-HSkill
B-SSkill	Marks the beginning of a multi-word entity representing a Soft skill
I-SSkill	Refers to the following words within a Soft skill entity after B-SSkill
B-Tech	Marks the initiation of a multi-word entity representing a Technology
I-Tech	Refers to the words that follow within a Technology entity after B-Tech
O	Denotes words that do not belong to any recognized entity

Reference results. To test the usefulness of our data in training NER systems, we fine-tuning pretrained model language BERT[5], IndoBERT [6] and EBERT-RP[7] for NER modelling using NERSkill.Id. The model was trained on 5 epochs using a learning rate of 3e-5. The performance of the model on the test set, measured in terms of precision, recall, and F1-score is given in Table 5. We evaluate the model in token level and entity level.

Table 5. Evaluation of reference model on NERSkill.Id

Tag	BERT[5]			IndoBERT[6]			EBERT-RP[7]		
	P	R	F1	P	R	F1	P	R	F1
B-HSkill	84%	89%	87%	83%	88%	85%	88%	92%	90%
B-SSkill	94%	96%	95%	93%	95%	94%	95%	98%	97%
B-Tech	91%	90%	91%	90%	92%	91%	94%	95%	94%
I-HSkill	85%	77%	81%	84%	79%	82%	89%	87%	88%
I-SSkill	90%	90%	90%	94%	91%	93%	93%	86%	90%
I-Tech	74%	69%	72%	77%	66%	71%	88%	76%	82%

*P= Precision; R=Recall; F1=F1-Score

Ethics Statement

The data utilized to construct the dataset do not raise ethical issues, as they were sourced from a Job Portal rather than a social media platform or other sensitive data origins. Permission to employ data from the Job Portal was unnecessary. Our research did not involve any human or animal studies.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

NERSkill.Id (Original data) (Mendeley Data).

CRediT author statement

Meilany Nonsi Tentua: Methodology, Software, Investigation, Resources, Data Curation, Writing - Original Draft, Visualization; Suprapto: Investigation, Validation, Writing - Review & Editing, Supervision; Afiahayati: Writing - Review & Editing, Investigation, Validation.

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[1] CEDEFOP, *Online Job Vacancies and Skills Analysis*. 2019. [Online]. Available: https://www.voced.edu.au/content/ngv:82496

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[5] J. Devlin, M. W. Chang, K. Lee, and K. Toutanova, "BERT: Pre-training of deep bidirectional transformers for language understanding," *NAACL HLT 2019 - 2019 Conf. North Am. Chapter Assoc. Comput. Linguist. Hum. Lang. Technol. - Proc. Conf.*, vol. 1, no. Mlm, pp. 4171–4186, 2019.

[6] F. Koto, A. Rahimi, J. H. Lau, and T. Baldwin, "IndoLEM and IndoBERT: A Benchmark Dataset and Pre-trained Language Model for Indonesian NLP," in *Proceedings ofthe 28th International Conference on Computational Linguistics*, 2021, pp. 757–770. doi: 10.18653/v1/2020.coling-main.66.

[7] M. N. Tentua, Suprapto, and Afiahayati, "An Enhanced Bidirectional Encoder Transformers with Relative Position for Indonesian Skill Recognition," *ICIC Express Lett. - An Int. J. Res. Surv.*, vol. 18, no. In Press., 2024.

Research Data

Click here to download Research Data
https://data.mendeley.com/datasets/5s8r9ndfvc/1

2. Review dari DIB (16 Januari 2024)

- **Respon dari review**
- **Revisi pada artikel**

Gmail

Meilany Nonsi Tentua <meilany@upy.ac.id>

Your Data in Brief Submission: DIB-D-23-02470

1 message

Scientific Editor <em@editorialmanager.com> Tue, Jan 16, 2024 at 8:10 PM
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Manuscript No.: **DIB-D-23-02470**
Title: NERSkill.Id: Annotated Dataset of Indonesian's Skill Entity Recognition
Journal Title: Data in Brief
Corresponding Author: DR Suprapto Suprapto
All Authors: Meilany Nonsi Tentua; Suprapto Suprapto; Suprapto ; Afiahayati
Submit Date: **Dec 24, 2023**

Dear DR Suprapto:

Thank you again for your submission to Data in Brief. Your article will require revision before it can be accepted for publication.

I invite you to revise and resubmit your manuscript after having thoughtfully and carefully addressed the comments below and revising your manuscript accordingly.

I look forward to receiving your revised manuscript by
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PLEASE NOTE: Please submit your revised manuscript before the given due date as a clean file without comments or tracked changes. Please upload a second version with clear highlights by using the 'Track Changes' function in Microsoft Word, so that changes are easily visible to the editors and reviewers. Please provide a letter to editor to explain point by point the details of the revision and the response to the reviewers' comments. Usually authors are only permitted to revise their article twice for Data in Brief, so carefully address all comments, including formatting requests, when revising your manuscript. If you have any questions, please do not hesitate to contact dib-me@elsevier.com.

Yours sincerely,

Scientific Editor
Data in Brief

Reviewers (if applicable):

Handling editor:
Very clear and quality paper, suitable for the journal and for interesting application in the Name Entity Recognition field.

Just a minor remark noted in page 4: "before distribution the file" --" "before distributing the file"

Scientific editor:
Dear authors,

The handling editor received your manuscript very well, congratulations! There are some minor changes I would like to see addressed before this manuscript can be accepted for publication:
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I look forward to receiving the revised manuscript. In the meantime, I wish you a good weekend ahead.

With best wishes,

****

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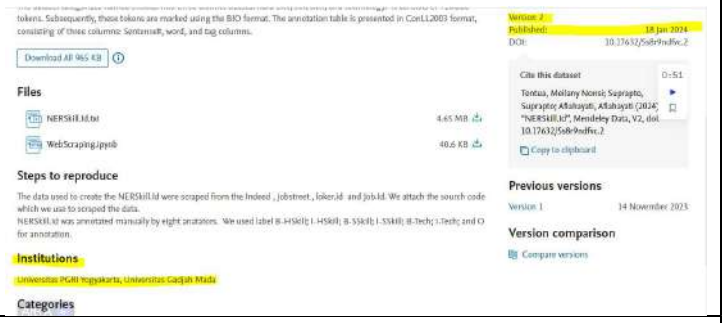
Detailed Response to Editors/ Reviewers

Thank you for the editor's feedback on our manuscript, entitled " **NERSkill.Id: Annotated Dataset of Indonesian's Skill Entity Recognition**", and **Manuscript No.: DIB-D-23-02470**. We have revised the manuscript according to the editor's feedback. Here are the details of the changes we have made.

1. Handling editor:

Comment	Respon
Very clear and quality paper, suitable for the journal and for interesting application in the Name Entity Recognition field. Just a minor remark noted in page 4: "before distribution the file" --" "before distributing the file"	Thank you for your kind words and feedback. We have change the word in that sentence. Here is a screenshot of the changes in the manuscript. Before distributing~~on~~ the file,

2. Scientific editor:

Comment	Respon
- Please list the address of your institute in the [Data source location] section of the specifications table.	Thank you for your feedback. We have list the address of our institute in the [Data source location] section of the specifications table. Here is a screenshot of the changes in data source location 
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ARTICLE INFORMATION

Article title

NERSkill.Id : Annotated Dataset of Indonesian's Skill Entity Recognition

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Meilany Nonsi Tentua[a] Suprapto[b*] Afiahayati[b]

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Keywords

Natural Language Processing, Named Entity Recognition, Text Mining, Skill Entity Recognition, Indonesian Skill Entity

Abstract

NERSkill.Id is a manually annotated named entity recognition (NER) dataset focused on skill entities in the Indonesian language. The dataset comprises 418.868 tokens, each accompanied by corresponding tags following the BIO scheme. Notably, 15,51% of these tokens represent named entities, falling into three distinct categories: hard skill, soft skill, and technology. To construct this dataset, data were gathered from a job portal and subsequently processed using open-source libraries. Given the scarcity of annotated corpora for Indonesian, NERSkill.Id fills a significant void and offers immense value to multiple stakeholders. NLP researchers can harness the dataset's richness to advance skill entity recognition technology in the Indonesian language. Companies and recruiters can benefit by employing NERSkill.Id to enhance talent acquisition and job matching processes through accurate skill identification. Furthermore, educational institutions can leverage the dataset to adapt their courses and training programs to meet the evolving needs of the job market. This dataset can be effectively utilized for training and evaluating named entity recognition systems, empowering advancements in skill entity recognition for the Indonesian language.

SPECIFICATIONS TABLE

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Data source location	The Web
Data accessibility	Repository name: Mendeley Data Data identification number: 10.17632/5s8r9ndfvc.2~~10.17632/5s8r9ndfvc.1~~ Direct URL to data: https://data.mendeley.com/datasets/5s8r9ndfvc/2~~https://data.mendeley.com/datasets/5s8r9ndfvc/1~~

VALUE OF THE DATA

- NERSkill.Id is the first annotated corpus for NER dataset focused on skill entities in the Indonesian language. It thus makes a valuable contribution to the available resources for Indonesian Language (NLP).
- This dataset is useful for computer NLP research community, companies, recruiters, and educational institutions
- This dataset can be used to evaluation or training in various tasks of skill recognition for transformer language models on the downstream task of NER.

- This dataset follows the BIO format and can thus be combined with other widely used corpora in standard to train large models.

BACKGROUND~~OBJECTIVE~~

The primary objective of creating this dataset is to procure a precisely annotated Named Entity Recognition (NER) corpus specifically focused on skill entities in the Indonesian language. Although NERSkill.Id is relatively small in size, it has significant potential for fine-tuning language models. Additionally, it can be effectively combined with larger pre-existing corpora to facilitate the training of more comprehensive and adaptable mixed Indonesian models for various NLP tasks.

DATA DESCRIPTION

Following the processes of scraping, preprocessing, and annotation, the ultimate version of the dataset comprises 418.868 tokens. Notably, 15,51% of these tokens correspond to named entities. Before the annotation (tagging) stage, the sentences outlining job requirements undergo a tokenization process. The dataset categorizes named entities into three distinct classes: hard skill, soft skill, and technology [1]. Subsequently, these tokens are marked using the BIO format [2](which stands for Beginning, Inside and Outside). The distribution of these specific named entities within the dataset is shown in Fig.1.

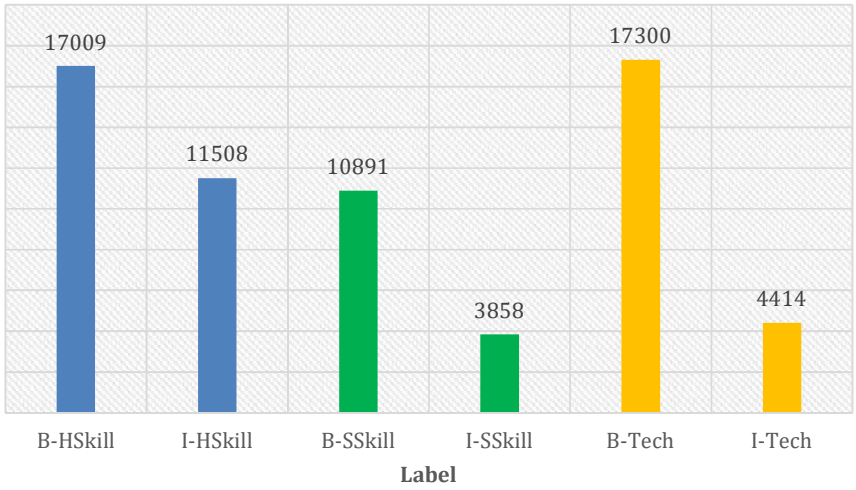

Figure 1. Distribution of Annotation

Hard skill (HSkill) refers to specific abilities required for a job, typically listed under the qualifications section of a job vacancy [3]. Examples of hard skills include web design, computer programming, data analysis, and computer networking. Soft skill (SSkill) encompasses personality traits, personal attributes, and communication abilities needed to interact effectively with others and cultivate sensitivity towards the environment [3]. Examples of soft skills include teamwork, critical thinking, and conflict management. Technology (Tech) represents the type of methods used within Hard Skills

[4]. Examples of technologies include C#, Python, MySQL, SQL Server, and Javascript. The annotation table is presented in ConLL2003 format, consisting of 2 columns word and tag columns. The NERSkill-ID file is available in .txt format. Table 2 show the description of colomns in NERSkill.Id. Table 3. illustrates the annotation format of the data performed by the NERSkill.ID dataset.

Table 2. Description of columns in NERSkill.Id dataset.

Column	Description
Word	A word, number, or punctuation mark representing one token
Tag	The tag assigned to the token according to the BIO tagging scheme

Table 3. Ilustration of annotation data

Word	Tag
akrab	O
dengan	O
asp.net	B-Tech
core	I-Tech
(c#)	B-Tech
;	O
front-end	B-Hskill
frameworks	I-Hskill

EXPERIMENTAL DESIGN, MATERIALS AND METHODS

Data scraping from job portal. The data used to create the corpus were scraped from the Indeed[1], Jobstreet[2], loker.id[3] dan Job.Id[4]. We used BeautifulSoup as Python library to extract data from indeed and Jobstreet. BeautifulSoup serves as a parser to separate HTML components into a sequence of easily readable elements. We collected manually for job description form loker.id and Job.id. From job portal, 4.394 job description were stored in text files. The full code of data scraping can be found on Mendeley Data[5].

Data annotation. The text files obtained from the scraping phase were filtered by selecting data with a minimum of 5 words. We divided the files to be annotated into 4 sections. Each file will be annotated manually by 2 different annotators. Eight annotators, all undergraduate informatics students, were employed to annotate skills mentioned in job descriptions using a spreadsheet application. Before distributingon the file, the involved annotators convened for a briefing session.

[1] https://id.indeed.com/
[2] https://www.jobstreet.co.id/
[3] https://www.loker.id/
[4] https://job.id/
[5] https://data.mendeley.com/datasets/5s8r9ndfvc/2https://data.mendeley.com/datasets/5s8r9ndfvc/1

The objective was to create a mutual comprehension of the designated tags, which encompassed hard skill, soft skill, and technology. Table 2 shows the annotation rules used for NERSkill.Id. Each sample was collectively deliberated upon, and the author assumed the role of the ultimate decision-maker. Following this, annotations were performed on the annotators' individual computers using a spreadsheet application. In cases of disagreement, the authors intervened to resolve any discrepancies and ensure data quality throughout the annotation process. Once the annotations were finalized, the output file was exported from the spreadsheet in txt format.

Tabel 4. Annotation rules

Entity Entity	Description
B-HSkill	Marks the beginning of a multi-word entity representing a Hard skill
I-HSkill	Refers to the following words within a Hard skill entity after B-HSkill
B-SSkill	Marks the beginning of a multi-word entity representing a Soft skill
I-SSkill	Refers to the following words within a Soft skill entity after B-SSkill
B-Tech	Marks the initiation of a multi-word entity representing a Technology
I-Tech	Refers to the words that follow within a Technology entity after B-Tech
O	Denotes words that do not belong to any recognized entity

Reference results. To test the usefulness of our data in training NER systems, we fine-tuning pretrained model language BERT[5], IndoBERT [6] and EBERT-RP[7] for NER modelling using NERSkill.Id. The model was trained on 5 epochs using a learning rate of 3e-5. The performance of the model on the test set, measured in terms of precision, recall, and F1-score is given in Table 5. We evaluate the model in token level and entity level.

Table 5. Evaluation of reference model on NERSkill.Id

Tag	BERT[5]			IndoBERT[6]			EBERT-RP[7]		
	P	R	F1	P	R	F1	P	R	F1
B-HSkill	84%	89%	87%	83%	88%	85%	88%	92%	90%
B-SSkill	94%	96%	95%	93%	95%	94%	95%	98%	97%
B-Tech	91%	90%	91%	90%	92%	91%	94%	95%	94%
I-HSkill	85%	77%	81%	84%	79%	82%	89%	87%	88%
I-SSkill	90%	90%	90%	94%	91%	93%	93%	86%	90%
I-Tech	74%	69%	72%	77%	66%	71%	88%	76%	82%

*P= Precision; R=Recall; F1=F1-Score

LIMITATIONS

Not applicable

ETHICS STATEMENT

The data utilized to construct the dataset do not raise ethical issues, as they were sourced from a Job Portal rather than a social media platform or other sensitive data origins. Permission to employ data from the Job Portal was unnecessary. Our research did not involve any human or animal studies.

CRediT author statement

Meilany Nonsi Tentua: Methodology, Software, Investigation, Resources, Data Curation, Writing - Original Draft, Visualization; Suprapto: Investigation, Validation, Writing - Review & Editing, Supervision; Afiahayati: Writing - Review & Editing, Investigation, Validation.

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DECLARATION OF COMPETING INTERESTS

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

~~Data Availability~~

~~NERSkill.Id (Original data) (Mendeley Data).~~

~~CRediT author statement~~

~~Meilany Nonsi Tentua: Methodology, Software, Investigation, Resources, Data Curation, Writing - Original Draft, Visualization; Suprapto: Investigation, Validation, Writing - Review & Editing, Supervision; Afiahayati: Writing - Review & Editing, Investigation, Validation.~~

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