

Data Science in People Analytics: How NLP and Machine Learning can support targeted performance management



People Analytics Data Science Lab, Credit Suisse

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Why are we talking to you today?

1

**Corporate Culture &
Quality of Feedback**



2

**Performance
Evaluations**



3

**Insights from free-text
in HR**



What questions will we answer in this session?



Who is **Credit Suisse** and what does the **People Analytics Data Science Lab** do?



How are we leveraging **performance evaluations** and **Natural Language Processing (NLP)** to get insights on **culture**?



How can we **automatically assess** the **quality of performance evaluations** with NLP?

Who is Credit Suisse and what does the People Analytics Data Science Lab do?



Introduction to Credit Suisse



Founded in 1856, we are today a leading global wealth manager with strong investment banking capabilities.

Our purpose: We build lasting value by serving our clients with care and entrepreneurial spirit.

1'614 b CHF

Assets under management¹

4 x 4 + 8

Divisions, Regions, Functions

51'281

Employees (by count, not FTE)²

40.0%

Proportion of women (by count)²

Sources: 1) [Credit Suisse Annual Report 2021](#); 2) [Credit Suisse Sustainability Report 2021](#)

Introduction to People Analytics Data Science Lab

Our mandate:

- We use **state-of-the-art modeling** and **applications** meeting **highest ethical standards**, and collaborate with internal and external data science capacities.
- We **provide** value adding **insights** and use cases on HR topics, **oversee** Data Science use cases used in HR, and act as **consultants** for the HR community for optimal data-driven decision making.



Established in Jan 2021

2 Team members

One of **3** People Analytics teams

How are we leveraging performance evaluations and Natural Language Processing (NLP) to get insights on culture?



From text to insights

Idea

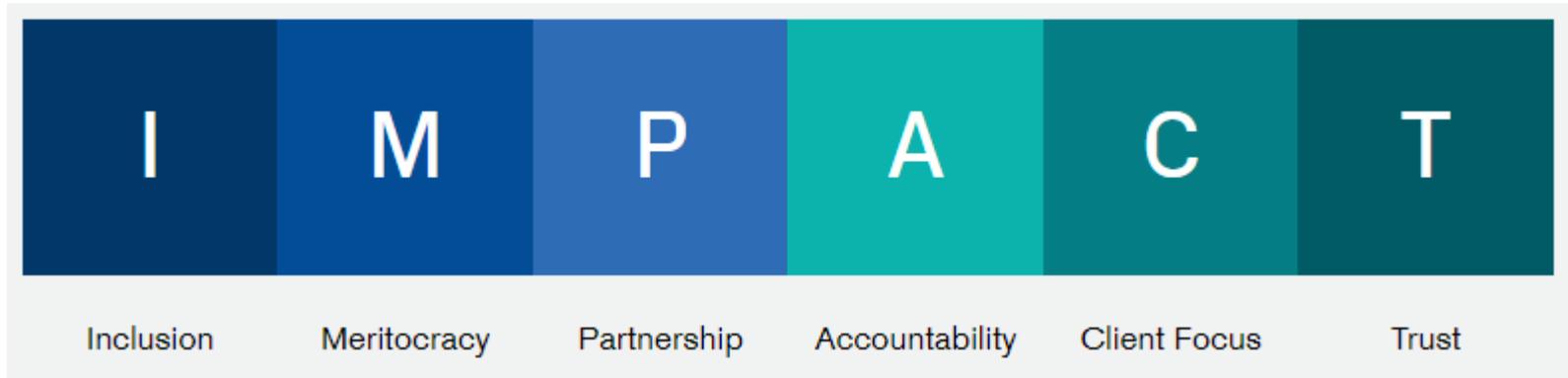


Getting insights from performance evaluations

- Interested in free-text in our performance evaluations on behavior written by our managers
- Key question: **Are our cultural values integral parts of how we evaluate our employee's behavior?**

A values-based Culture

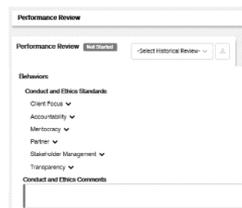
From Conduct & Ethics Standards to...



Source: [Credit Suisse Sustainability Report 2021](#)

From text to insights

Data collection and data engineering



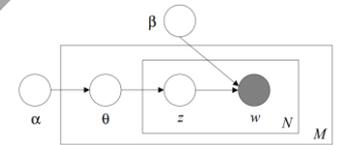
$$= \frac{P(\text{Language}|\text{Text}) \cdot P(\text{Text}|\text{Language}) \cdot P(\text{Language})}{P(\text{Text})}$$



- When was the first computer invented?
- How do I install a hard disk drive?
- How do I use Adobe Photoshop?
- Where can I learn more about computers?
- How to download a video from YouTube
- What is a special character?
- How do I clear my Internet browser history?
- How do you split the screen in Windows?
- How do I remove the keys on a keyboard?
- How do I install a hard disk drive?



	Employee Performance	
Text #1	1	1
Text #2	3	2
...		
Text #n



N = ~100'000
free-text comments

cd2 in R (Naïve Bayes)
80% classified as English

Text cleaning (removing stop words etc.)

Create Document-Term-Matrix with tf-idf weighting

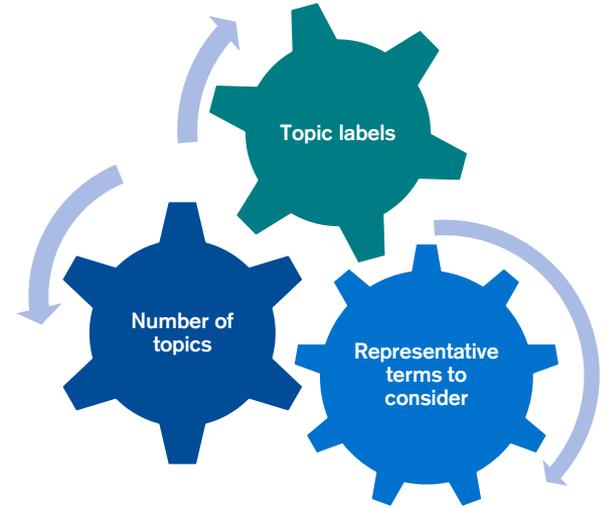
Modeling with Latent Dirichlet Allocation (LDA)

From text to insights

Expert judgment

Expert judgment needed to determine:

- Number of topics
 - Interpretability & meaning
 - Ease of communication to stakeholders
- Representative terms to consider
 - Might differ for stakeholder communication and modelling
- Topic labels
 - Representativeness of the most common term



From text to insights

Insights for Culture

Insights for Culture



We find evidence of our Corporate Culture

- We extracted 5 key topics for each seniority level for 2020 and 2021
- We find evidence for our Corporate Culture in performance evaluations
- Shift in value-based competency model from Conduct & Ethics Standards to IMPACT values can be observed
- Different seniority levels cover different topics

From text to insights

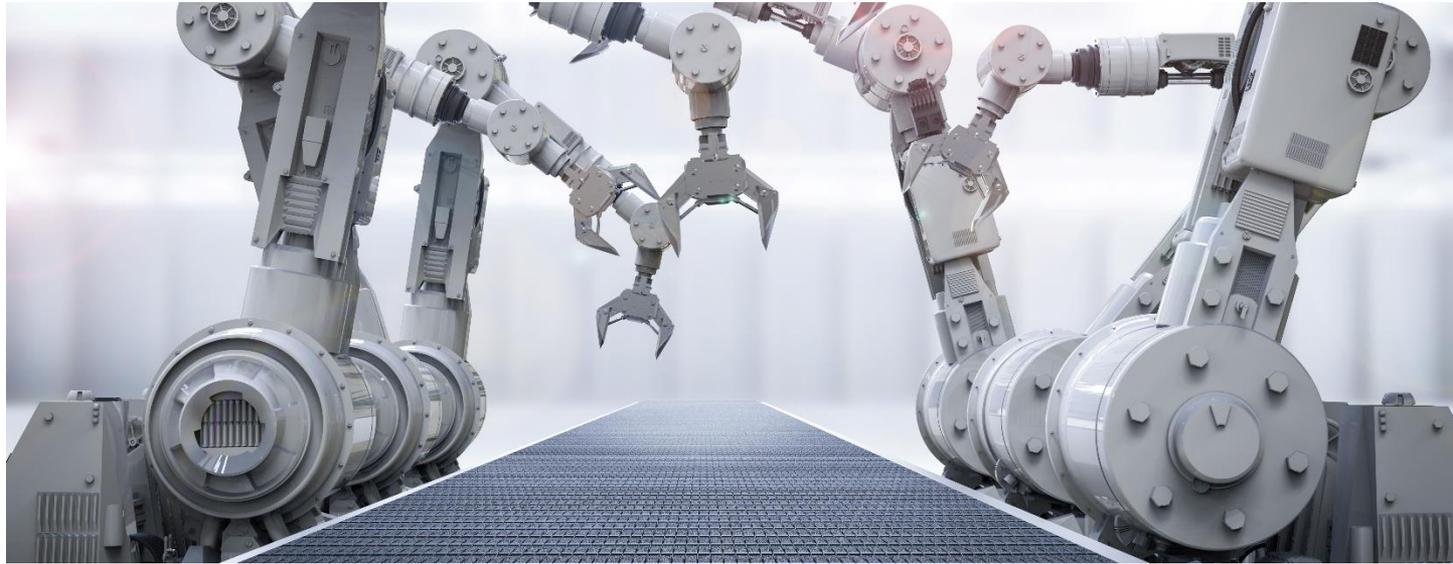
Communicating the value to the business



Explaining a complex model to a non-technical audience

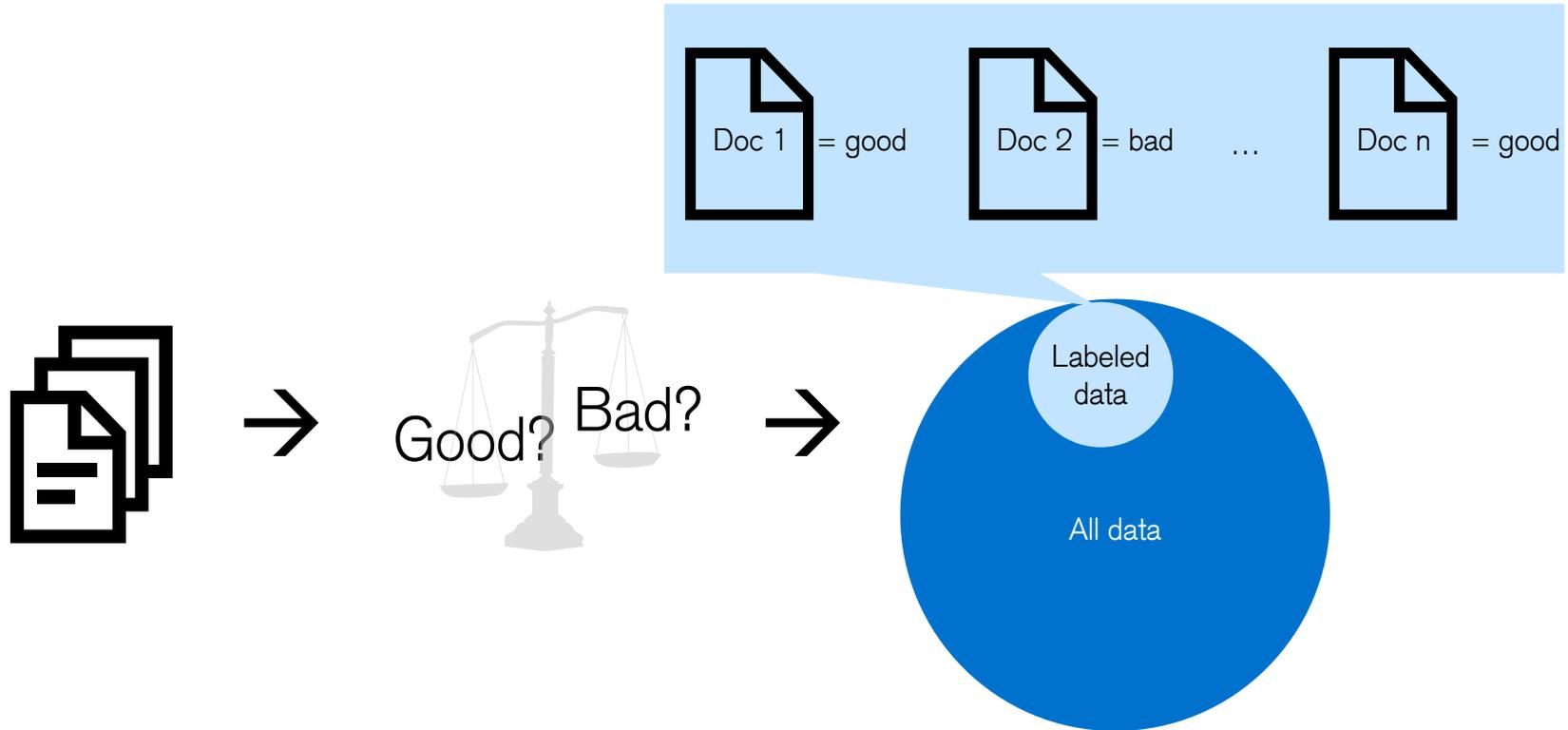
- We chose an intuitive visualization (word-cloud)
- We were transparent on the limitations of our method
- Culture Programs understands the value of the analysis and can define actions based on the insights

How can we automatically assess the quality of performance evaluations with NLP?



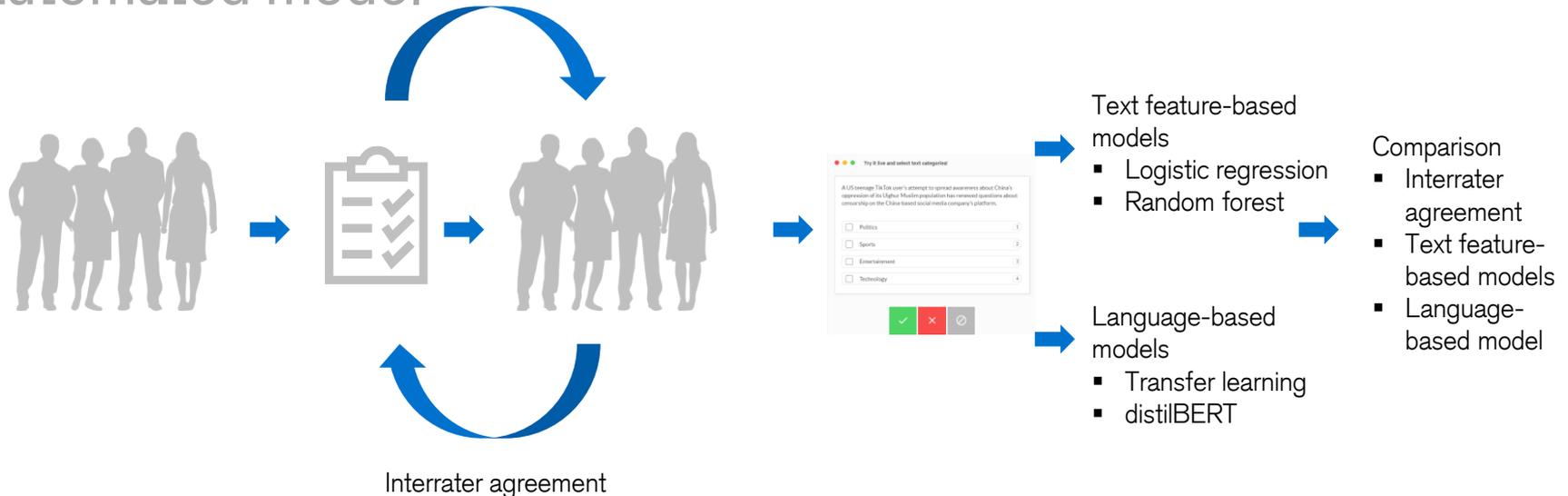
Text quality classification

From raw, unlabeled data to understanding «quality»



Text quality classification

Iterative process from defining quality guidelines to getting an automated model



Define guidelines

Rate & Refine

Finalize &
evaluate
agreement

Independently
label data

Build models

Compare models
and baseline

Final Remarks



- **Free-text performance evaluations** can be a **valuable source** of information for a company's **culture** and **performance management** in general
- Hands-on tips for those who want to use free-text for their work:
 - If your company is international, use a **language detector** to identify the language of the text
 - After looking at the results, **refine the model** also by extending the definition of your stop words
 - Before presenting results, **try different visualizations** and see which one is most effective
 - For text quality classification, data quality and clear guidelines are key
- If you have any feedback for us, please contact us at gianna.pfiffner@credit-suisse.com

Questions & Answers



Contact

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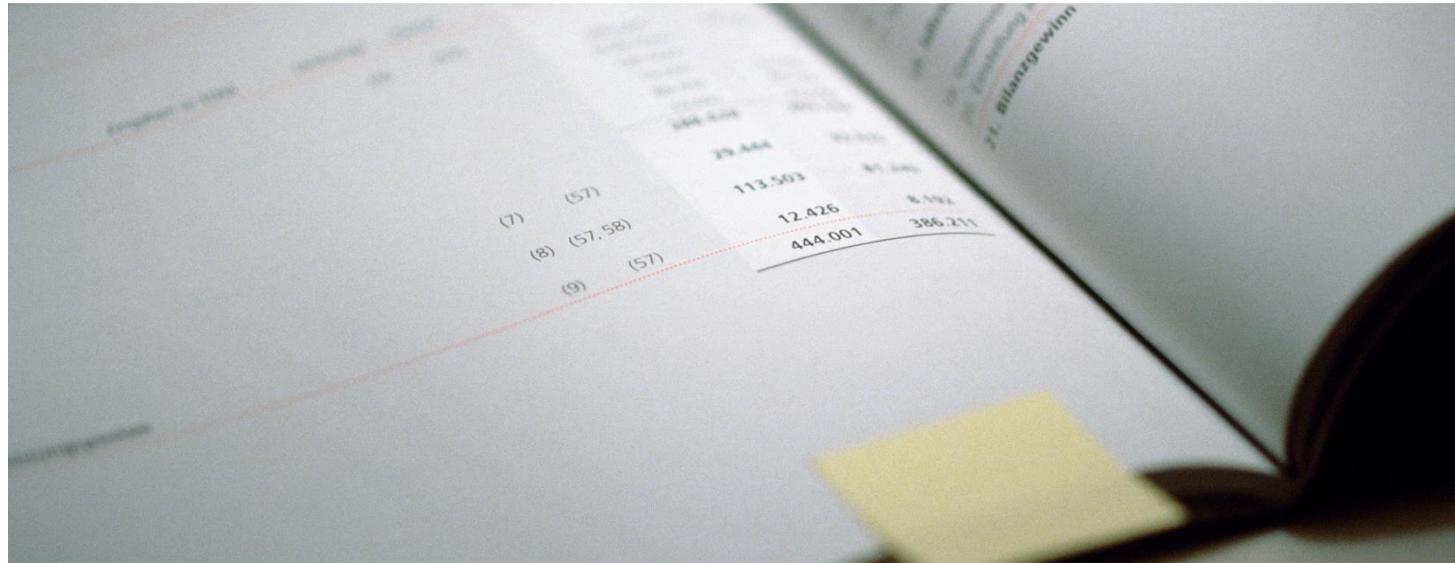
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Appendix



The image shows a close-up of an open financial statement book. The pages are filled with tables of numbers and text. A yellow sticky note is placed on the bottom right of the page. The text is in German, and the numbers are arranged in columns and rows, typical of a financial statement. The word 'Bilanzgewinn' is visible on the right page. The numbers are: 198.508, 25.444, 113.503, 12.426, 444.001, 8.192, and 386.211. There are also some numbers in parentheses: (7), (57), (8), (57,58), and (9), (57).

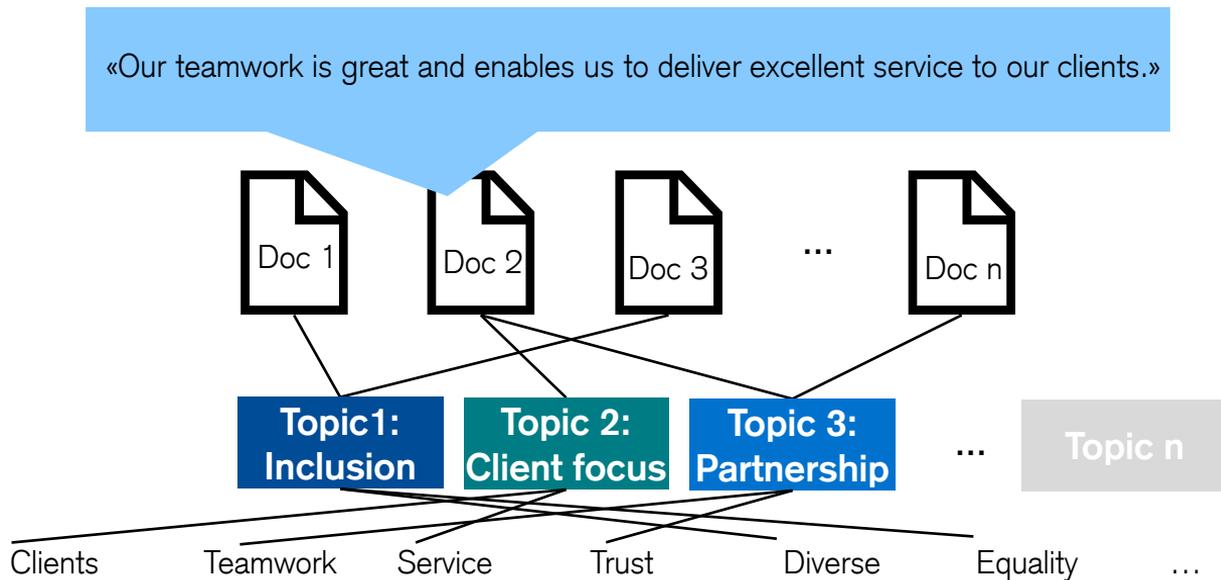
		198.508	25.444	113.503	12.426	8.192
(7)	(57)					
(8)	(57,58)					
(9)	(57)					
				444.001		386.211

From text to insights

Natural Language Processing (NLP)

Latent Dirichlet Allocation (LDA), implemented in R using «tidyverse», «topicmodels», «gofastr»

- Find a pre-defined number of topics that describe a set of documents
- Documents that are connected to the same set of words are assumed to be related to the same topics



Note: Exemplary illustration

Text quality classification - Approach comparison

Example: «2020 has been a very difficult year for the team»

«Simple» approach

Create model from scratch

1. Extract word types from text:
«2020 *NUM* has *AUX* been *AUX* a *DET* very *ADV* difficult *ADJ* year *NOUN* for *ADP* the *DET* team *NOUN*»
2. Create additional features based on step 1:
 - total words
 - adjectives
 - proper nouns
 - spaces
 - Performance rating (binary)
3. Train models only on features from step 2, not the actual text
 - Logistic regression → simple base line
 - Random forest → more complex model

«Language model» approach:

Fine-tuning pre-trained language model (distilBERT)

1. Use the pre-trained model's tokenizer to convert text into format that is readable to the model
[start 101 2020 12609 has 2038 been 2042 a 1037 very 2200 difficult 3697 year 2095 for 2005 the 1996 team 2136 end102]
2. Adjust the output layer of the model to the current task (e.g., text classification)
3. Train model on the actual text represented as outlined in step 1