



Knowledge Graph Summarization

Kickoff Meeting

Prof. Dr. Axel-Cyrille Ngonga Ngomo

Tutor: Asep Fajar Firmansyah



Data Science Group
Paderborn University

Project Group - WiSe 2025

October 16, 2025

- ▶ About DICE and Tutor
- ▶ PG Organization
- ▶ PG Objectives Recap
- ▶ Goal & Grading
- ▶ First Task and Next Steps

What does the DICE group do?

- ▶ Data Integration
- ▶ Data Storage and Querying
- ▶ Interpretable Data Processing
- ▶ Machine Learning
- ▶ Natural Language Processing

For more information: <https://dice-research.org/groups/>

Asep Fajar Firmansyah

- ▶ Studied Informatics engineering and Information Technology in Indonesia
- ▶ PhD student since 2018
- ▶ Research associate since 2022
- ▶ Research Interest:
 - ▶ Knowledge Graph Summarization
 - ▶ KG Construction
 - ▶ Natural Language Processing

Section 1

PG Organization

How is this project group structured?

- ▶ **Semesters:** WiSe 25/26 and SoSE 26
- ▶ **Registration:** You need to register your self before 31.10.2025.
- ▶ **During Semesters:**
 - ▶ Regular Group Meetings – (Usually) Every Week
 - ▶ Weekly Report
- ▶ **Semester-end Requirements:**
 - ▶ Individual Report, Group Report, and Group Presentation
 - ▶ Grading and Feedback
- ▶ **Final Submission:** Source Code and Documentation

How is the project group setup and organized?

Module Handbook: *Project group is intended to be a preparation for industrial practice.*

- ▶ **Students:** Self-organized Dev Team
- ▶ **Supervisor:** Product Owner and Contact Point
- ▶ **Time Investment:**
 - ▶ 20 hours per week (with vacations)
 - ▶ 15 hours per week (without vacations)

What do we expect from you?

→ Be a valuable member of your team!

- ▶ Manage your project
- ▶ Write code(!) and commit it
- ▶ Communicate with team members
- ▶ Support each other where possible
- ▶ ...

→ We won't keep students if they are not participating in their team

- ▶ **Kickoff Meeting:** 16.10.2025, FU.136
- ▶ **Weekly Meetings:** Data DBD, FU.136
- ▶ **End WiSe 25/26:**
 - ▶ Individual Report, Group Report, and Group Presentation
 - ▶ Grading and Feedback
- ▶ **Between WiSe 25/26 and SoSe 26:** Vacations
- ▶ **Start SoSe 26:** Resume PG Work
- ▶ **Mid-July 2026:** End of the Implementation Phase
- ▶ **End SoSe 26:**
 - ▶ Individual Report, Group Report, and Group Presentation
 - ▶ Final Grading

► **Vacations:**

- Should be avoided during lecture time!
- In very urgent cases, contact your supervisor

► **Project Issues:**

- Problems within the team
- Hardware issues
- Personal issues

→ Get in touch with your supervisor

► **Illness:**

- Get a **Doctor's Certificate!**
- If you can foresee it, inform your teammates

Section 2

PG Objectives Recap

Knowledge Graphs

Introduction

A Knowledge Graph (KG) represents entities as nodes and their relationships as edges.

► Knowledge Graphs Everywhere



► Many open knowledge graphs



► Powering AI



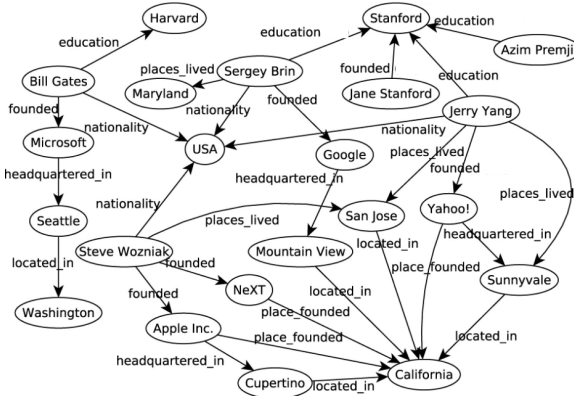
► Applied across diverse domains



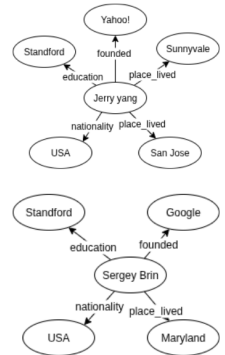
Knowledge Graphs

Structure and Representation

A knowledge Graph



Entity Description



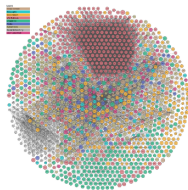
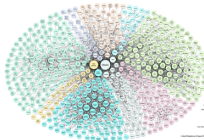
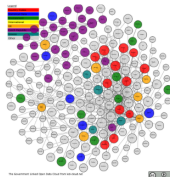
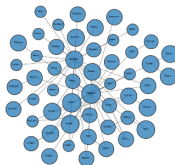
Why Summarize Knowledge Graphs?

Knowledge Graphs grow large and noisy

- ▶ Entities are connected by many facts
- ▶ Not all facts are relevant or important
- ▶ Verbose triples overwhelm users/systems

Key challenges

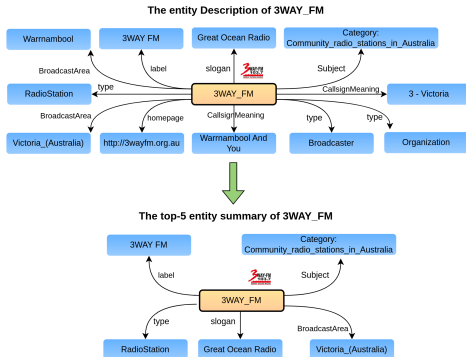
- ▶ Hard to extract the core meaning of an entity
- ▶ Inefficiency in search, reasoning, and downstream applications



Extractive Entity Summarization in Knowledge Graphs

Motivation

- **Problem:** Entities are often described with excessive and redundant information in KGs.
- **Solution:** Apply entity summarization to produce concise, informative views.
- **Goal:** Select a representative subset of triples by optimizing relatedness, informativeness, and diversity.



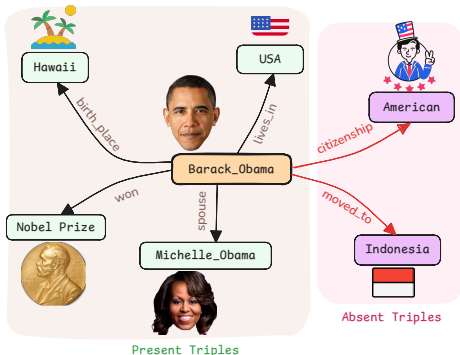
Firmansyah, A.F., Moussallem, D., Ngomo, AC.N. (2021). GATES: Using Graph Attention Networks for Entity Summarization. In *Proceedings of the 11th Knowledge Capture Conference (K-CAP '21)*, ACM, New York, NY, USA, pp. 73–80.

Firmansyah, A.F., Moussallem, D., Ngomo, AC.N. (2024). ESLM: Improving Entity Summarization by Leveraging Language Models. In *The Semantic Web – ESWC 2024*, LNCS, vol. 14664, Springer, Cham.

Abstractive Entity Summarization in Knowledge Graphs

Motivation

- **Problem:** The incompleteness of knowledge graphs leads to incomplete summaries
- **Solution:** Apply abstractive entity summarization, to make more complete summary.
- **Goal:** To go beyond extractive summarization by generating more complete and coherent summaries



Firmansyah, A.F., Zahera, H.M., Sherif, M.A., Moussallem, D., Ngomo, A.C.N. (2025). ANTS: Abstractive Entity Summarization in Knowledge Graphs. *The Semantic Web – ESWC 2025. LNCS*, vol. 15718, Springer, Cham.

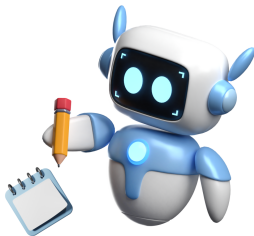
Improving the entity summarizer performance in generating an entity summary and address the challenges in entity summarization tasks

- ▶ Improve summary quality depends on relatedness, informativeness, and diversity.
- ▶ Explore the advanced techniques of NLP/ML
- ▶ Ensure Computational Efficiency
- ▶ Discover novel approaches



What types of tasks will the project group be responsible for?

- ▶ Study state-of-the-arts (SOTA) Models
- ▶ Reproduce SOTA models on New Benchmark Datasets
- ▶ Analyze the Limitation of SOTA Models
- ▶ Develop a New Entity Summarizer
- ▶ Evaluate the Models
- ▶ Create a Visualization



Section 3

Goals & Grading

Current Semester

What are the goals for the current semester?

1. Propose multiple (min. 2) approaches for Entity Summarization.
2. Run experiments and evaluate each approach.
3. Provide in-depth analysis on what works better and what doesn't.

→ Considerations:

- ▶ **Technical features:** Frequency & centrality, informativeness, and diversity & coverage
- ▶ **Specific feature:** Domain knowledge, context awareness, and personalization.

How will the students be graded?

▶ **Achieved Goals:**

- ▶ **Group:** What goals did the group achieve?
- ▶ **Individual:** How much did you contribute towards this goal?

▶ Reports and Presentations (Group, Individual)

▶ **Soft Skills (Group, Individual):**

- ▶ Commitment and engagement
- ▶ Collaborative and learning skills
- ▶ Motivation and volitional strategies
- ▶ Scientific writing and self-management

Section 4

Ice Breaker

"Talk is cheap. Show me the code." – Linus Torvalds

1. Choose each one model of entity summarizers from unsupervised and supervised learning method.
2. Reproduce the entity summarization models
3. Evaluate all models
4. Report findings

→ **Time Limit:** 1 Week

→ **Resources:** Access to DICE experiment servers.

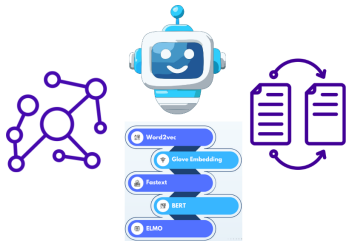
"A place for everything, everything in its place" – Benjamin Franklin

→ Organize Yourselves

- ▶ Team Structure: Flat, Hierarchical, Holacratic, ...
- ▶ Regular Meetings: <https://terminplaner6.dfn.de/>
- ▶ Communication: [UPB Matrix](#)
- ▶ Code Repository: <https://github.com/dice-group/KGSUMM-PG>

→ Try to use open-source tools wherever possible

That's all Folks!



Thank you!

dice-research.org/teaching/KGSUMM-2025

Have questions?

Email: asep.fajar.firmansyah@uni-paderborn.de

Matrix: [@asepff:chat.dice-research.org](https://t.me/asepff:chat.dice-research.org)

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