

AGU23

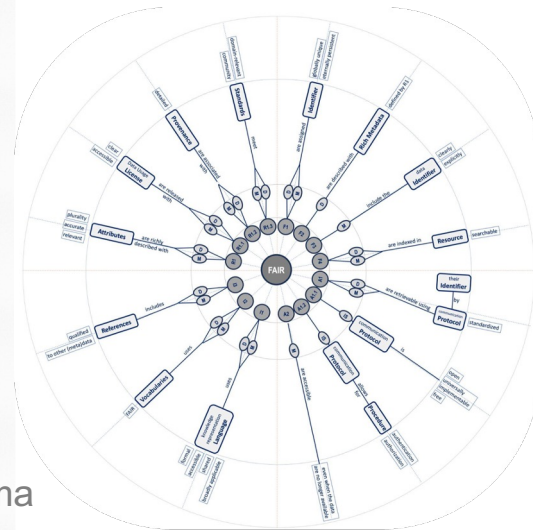
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San Francisco, CA & Online Everywhere
11-15 December 2023

Towards A Novel Framework For Harmonized Quality Measures Of FAIRness Assessments

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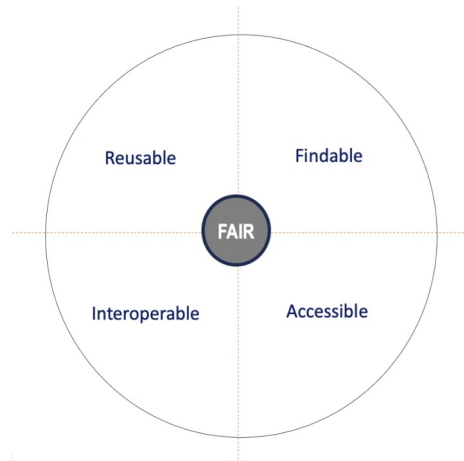


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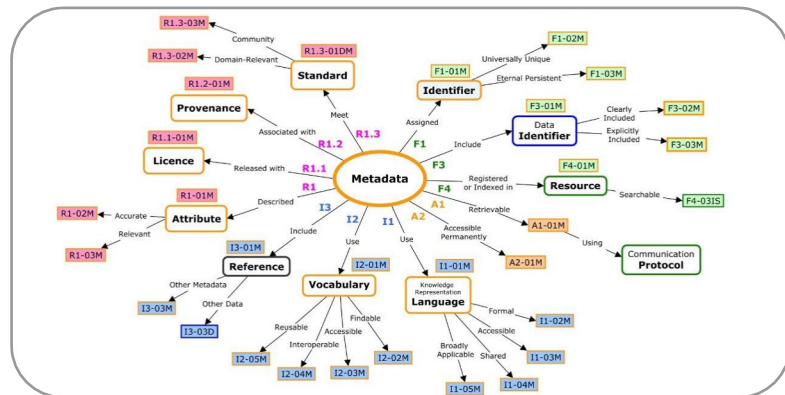
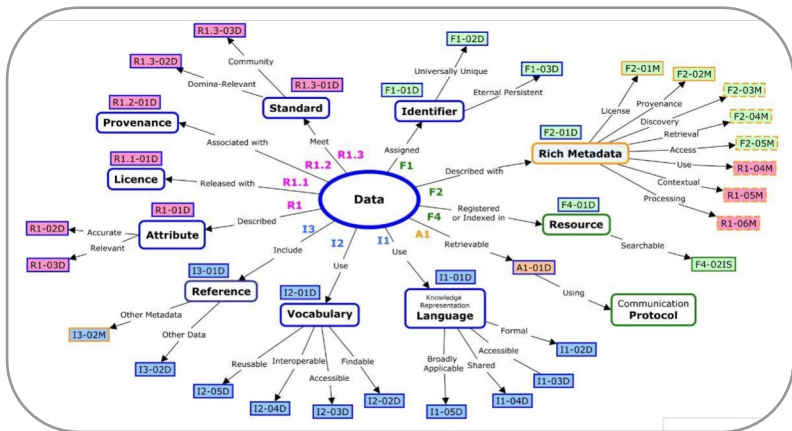
FAIR Data Guiding Principles

- Formulated in Wilkinson et al. (2016);
- Set of guidelines - data stewardship behaviors for prompting data sharing;
- FAIR stands for Findable, Accessible, Interoperable, and Reusable (Dimensions);
- Simple, catchy, positive
 - increasingly accepted and adopted world wide;

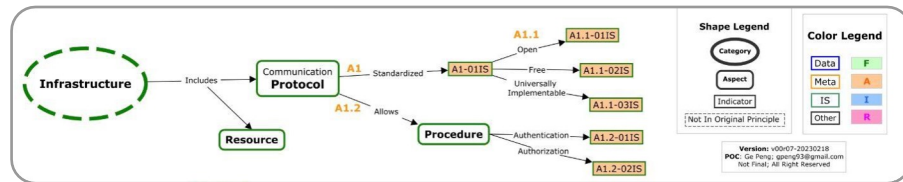


→ **Requirements for FAIR-compliance assessment and reporting!**

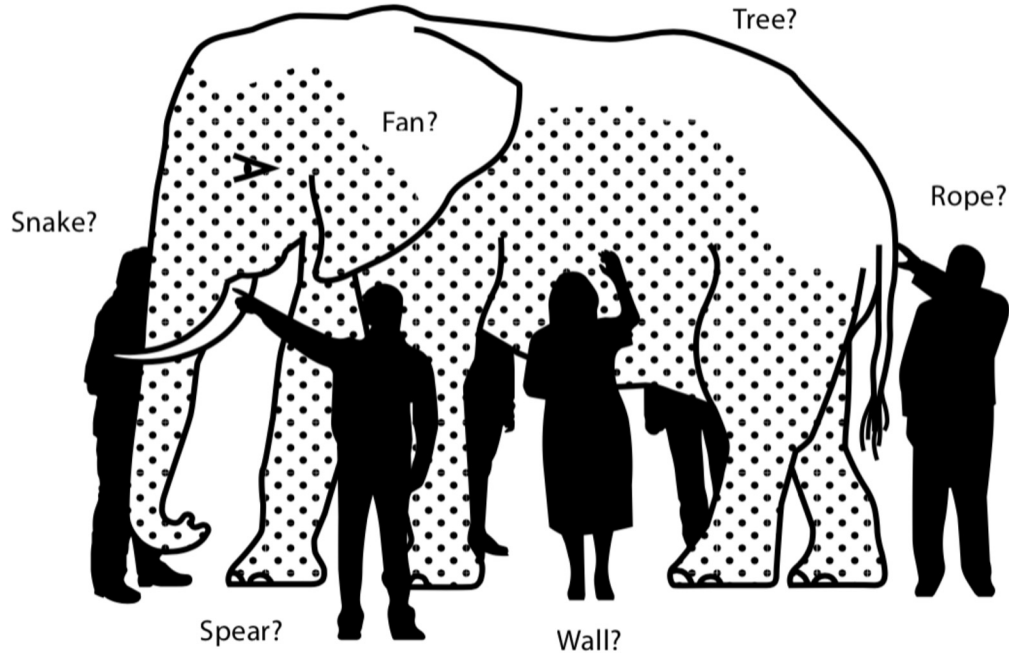
Under the Hood – Complex Systems!



Concept mapping for FAIR Principles (Wilkinson et al. 2016) for each category: **Data - D** (top); **Metadata - M** (top right); and **Infrastructure - IS** (bottom right). Shape and color legends on the IS diagram. Based on Peng (2023; DOI: [10.5281/zenodo.7896948](https://doi.org/10.5281/zenodo.7896948))



What does being FAIR mean?

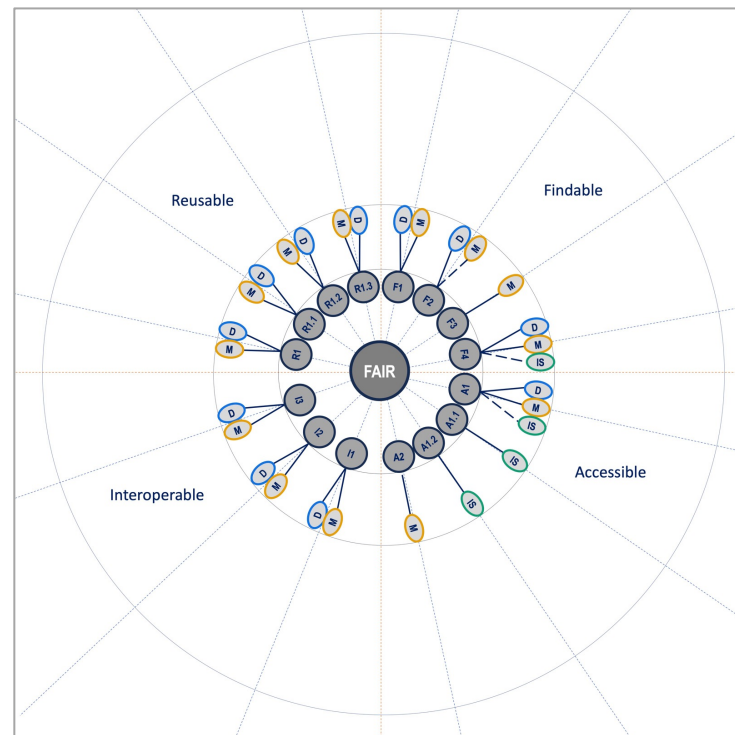


➔ Many, diverse FAIRness assessment models/indicators have been developed

Dissecting FAIR Principles - High Level

- A total of 15 principles;
- Three categories:
 - Data (D),
 - Metadata (M), and
 - Infrastructure (IS)
- 28 category-specific requirements

It gets more complicated quickly from here!



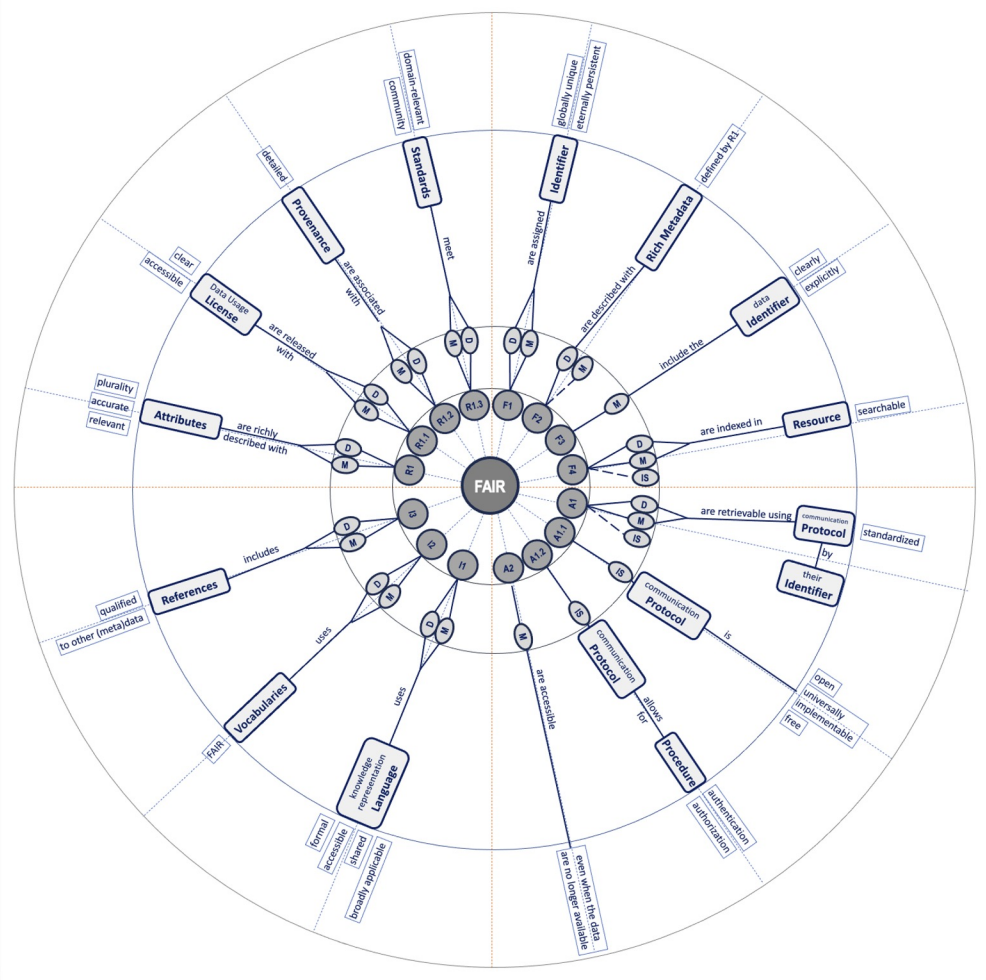
Source: Peng et al. (2024)

Dissecting FAIR Data Principles – Deep Dive

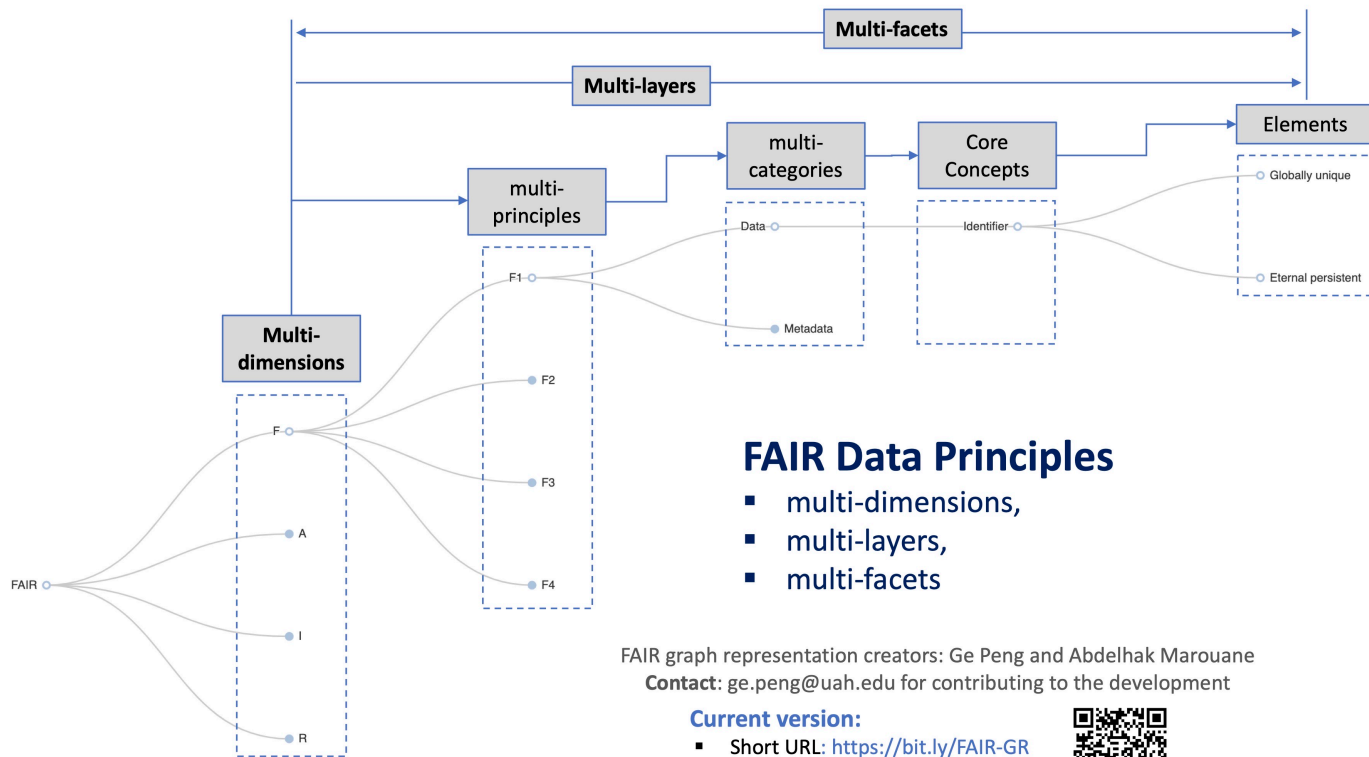
- 21 core concepts;
- 48 elements;
- 80+ indicators!



Complex systems



FAIR Graph Representation Tool – Exploring FAIR Interactively



FAIR graph representation creators: Ge Peng and Abdelhak Marouane

Contact: ge.peng@uah.edu for contributing to the development

Current version:

- Short URL: <https://bit.ly/FAIR-GR>
- Scan the barcode:

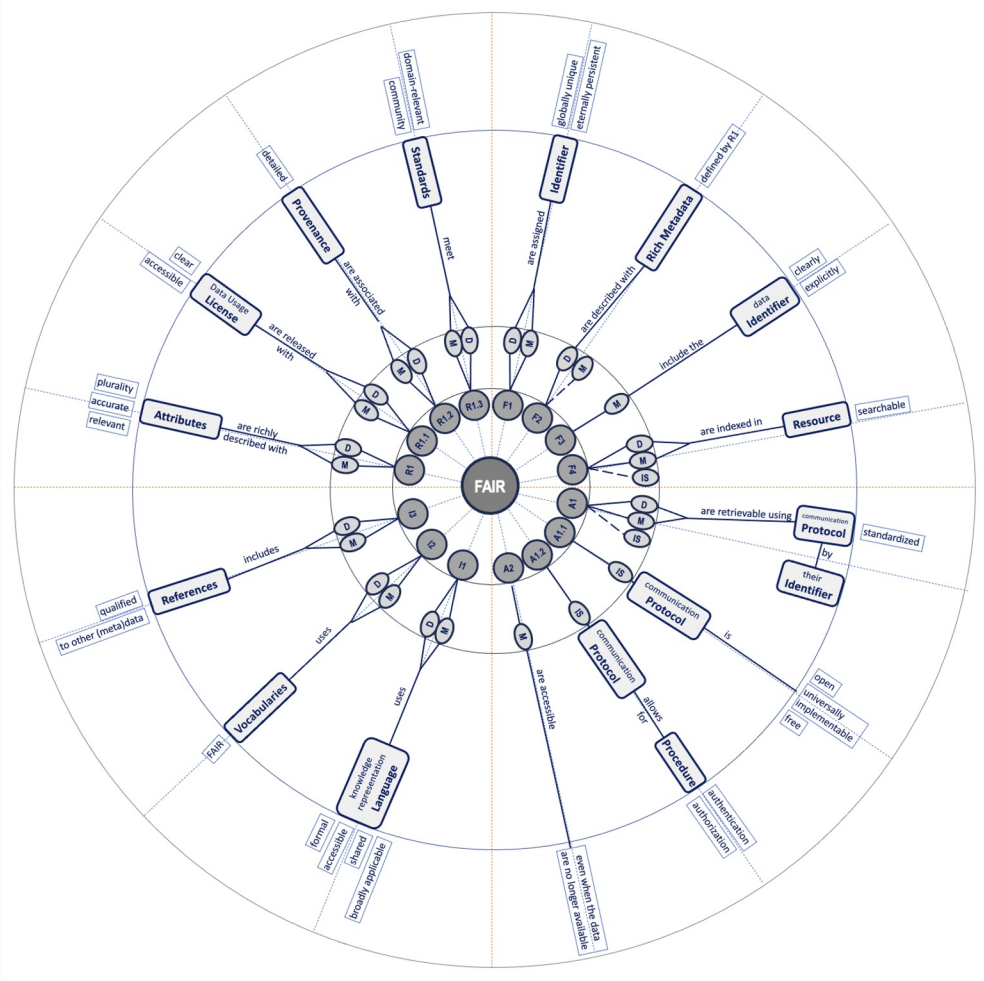


Filled circle: an additional layer in the current branch; Open circle: the end of the branch

Assessing FAIRness

- Domain/discipline dependency:
 - Rich metadata
- Application dependency
- Spectrum of FAIRness
- Holistic FAIRness

Endless combinations...



Assessing FAIRness – Upstream

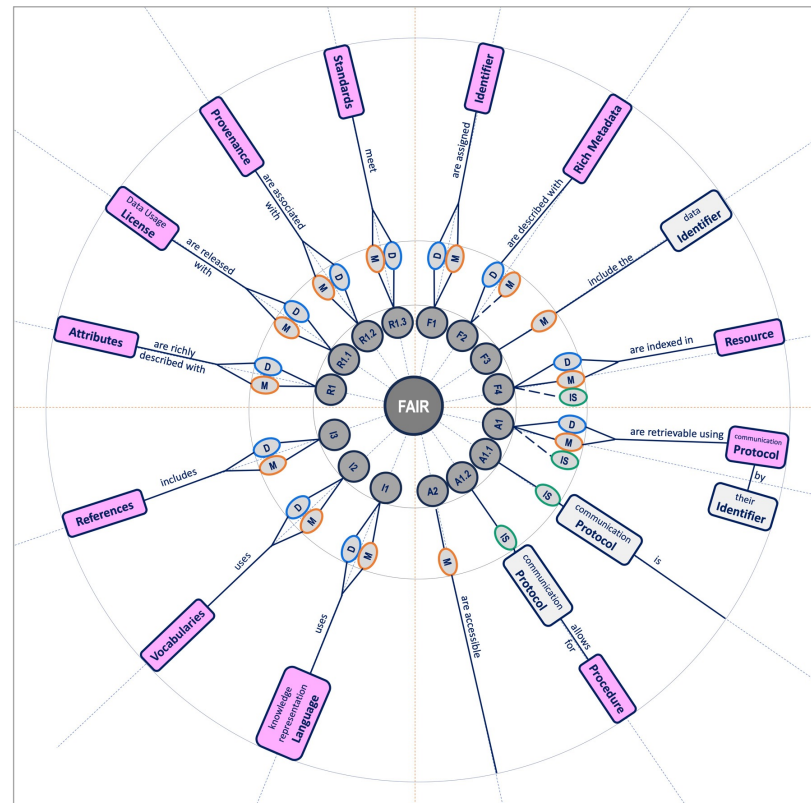
- What to measure?
- How to ensure holistic FAIRness assessments?
- Upstream of domain & application dependency

→ Introducing Quality Measures

Harmonized Quality Measurements of FAIRness Assessment

- Identifier
- Rich Metadata
- (Searchable) Resource
- (Communication) Protocol
- (knowledge representation) Language
- Vocabulary
- Reference
- Attribute
- (Data usage) License
- Provenance
- Standard

➤ Ensure Holistic FAIRness Assessment



FAIRness Assessment Workflow Built on Harmonized Quality Measurements

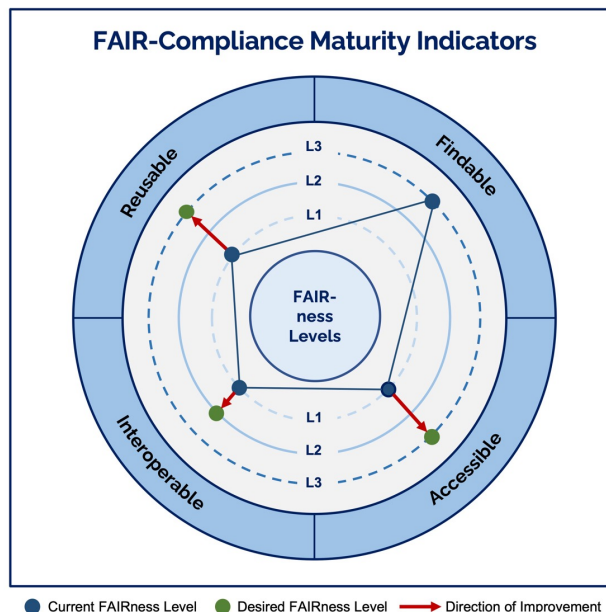
- Identifier persistent and unique →
- Rich Metadata
- (Searchable) Resource
- (Communication) Protocol
- (Knowledge representation) Language
- Vocabulary
- Reference
- Attribute
- (Data usage) License
- Provenance
- Standard

- ☐ Level 1 (Minimal) – Internal
- ☐ Level 2 (Intermediate) – Domain
- ☐ Level 3 (Optimal) – Global

→ Set stage for a FAIR-Compliance Maturity Matrix (FAIR-MM)

FAIR-MM provides a holistic, tiered, structured approach to assess, report and enhance FAIRness of digital data

Metrics-Based FAIR Digital Object Improving Process



Source: Peng et al. (2024)

Path Forward & Acknowledgement

A manuscript is to be submitted to a peer-review journal soon.

I thank all my co-authors for their contribution to the manuscript:

Gary Berg-Cross, Mingfang Wu, Robert R. Downs, Sudhir R. Shrestha, Lesley Wyborn, Nancy Ritchey, Hampapuram K. Ramapriyan, Jeanette Clark, Jenny Wood, Zhong Liu, and Abdelhak Marouane.

Peng et al. 2024: A Novel Framework for Harmonizing Quality Measures of FAIRness Assessments. *To be submitted.*

Update 2024-01-19: Submitted to a peer-reviewed journal. Preprint is available at Zenodo:
[https://doi.org/ 10.5281/zenodo.10533920](https://doi.org/10.5281/zenodo.10533920)

Takeaways

- FAIR is simple and catchy but implementation is complex and can be overwhelming;
- FAIR Data Guiding Principles are multi-dimensional, multi-layered, and multi-faceted;
- Establishing a common set of quality measures helps ensure the holistic and consistent assessment of FAIRness.

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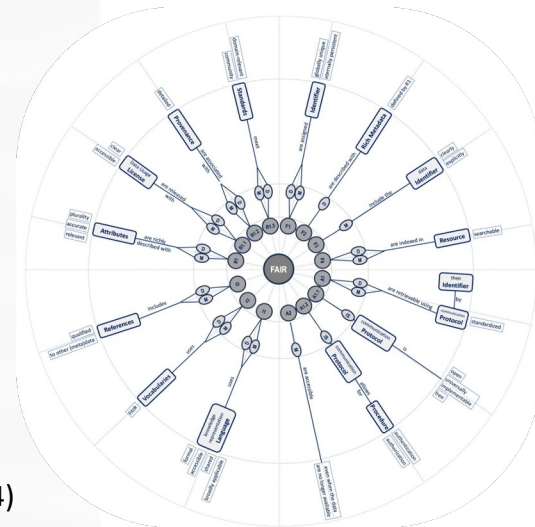
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Thank You!

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