



# FAIR Assessments

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# FAIR Assessment Approaches

- Ad hoc methods
- Questionnaire or Survey methods
- Programmatic methods
- Web-browser integrated tools
- Repository-integrated methods





# FAIR Assessment Approaches

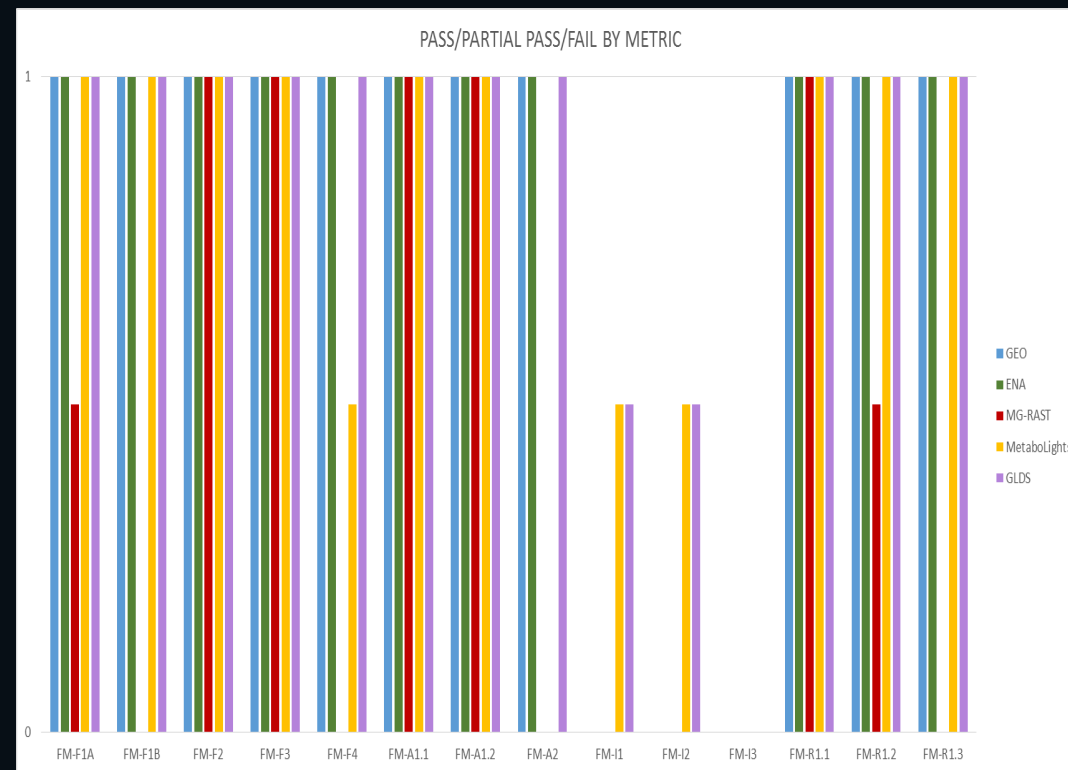
- Ad hoc methods
  - Derived from reading the FAIR principles +/- FAIR metrics ([fairmetrics.org](https://fairmetrics.org))



|                                                                                                                |                                                                                                    | GEO <sup>4</sup> | ENA <sup>7</sup> | MG-RAST <sup>6</sup> | Metabolights <sup>8</sup> | GLDS |
|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|------------------|------------------|----------------------|---------------------------|------|
|                                                                                                                | <div> <span>●</span> Pass<br/> <span>◐</span> Partial pass<br/> <span>○</span> Fail         </div> |                  |                  |                      |                           |      |
| <b>FAIR Principle</b>                                                                                          | <b>Metric</b>                                                                                      |                  |                  |                      |                           |      |
| F1. (meta)data are assigned globally unique and persistent identifier                                          | FM-F1A                                                                                             | ●                | ●                | ◐                    | ●                         | ●    |
| F1. (meta)data are assigned globally unique and persistent identifier                                          | FM-F1B                                                                                             | ●                | ●                | ○                    | ●                         | ●    |
| F2. data are described with rich metadata (defined by R1 below)                                                | FM-F2                                                                                              | ●                | ●                | ●                    | ●                         | ●    |
| F3. metadata clearly/explicitly include identifier of data it describes                                        | FM-F3                                                                                              | ●                | ●                | ●                    | ●                         | ●    |
| F4. (meta)data are registered or indexed in a searchable resource                                              | FM-F4                                                                                              | ●                | ●                | ○                    | ◐                         | ●    |
| A1. (meta)data are retrievable by identifier using a standardized communications protocol                      | N/A                                                                                                |                  |                  |                      |                           |      |
| A1.1 the protocol is open, free, and universally implementable                                                 | FM-A1.1                                                                                            | ●                | ●                | ●                    | ●                         | ●    |
| A1.2 the protocol allows for an authentication and authorization procedure, where necessary                    | FM-A1.2                                                                                            | ●                | ●                | ●                    | ●                         | ●    |
| A2. metadata are accessible, even when data are no longer available                                            | FM-A2                                                                                              | ●                | ●                | ○                    | ○                         | ●    |
| I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation. | FM-I1                                                                                              | ○                | ○                | ○                    | ◐                         | ◐    |
| I2. (meta)data use vocabularies that follow FAIR principles                                                    | FM-I2                                                                                              | ○                | ○                | ○                    | ◐                         | ◐    |
| I3. (meta)data include qualified references to other (meta)data                                                | FM-I3                                                                                              | ○                | ○                | ○                    | ○                         | ○    |
| R1. meta(data) are richly described with a plurality of accurate and relevant attributes                       | N/A                                                                                                |                  |                  |                      |                           |      |
| R1.1. (meta)data released with clear, accessible data usage license                                            | FM-R1.1                                                                                            | ●                | ●                | ●                    | ●                         | ●    |
| R1.2. (meta)data are associated with detailed provenance                                                       | FM-R1.2                                                                                            | ●                | ●                | ◐                    | ●                         | ●    |
| R1.3. (meta)data meet domain-relevant community standards                                                      | FM-R1.3                                                                                            | ●                | ●                | ○                    | ●                         | ●    |
| <b>Overall FAIRness Score</b>                                                                                  |                                                                                                    | 11               | 11               | 6                    | 10.5                      | 12   |

## Range of FAIRness Scores (all systems)

**PARTIAL PASS: 0-21%**



Berrios DC, Beheshti A, Costes SV, editors. FAIRness and Usability for Open-access Omics Data Systems. Proceedings of the 2018 AMIA Annual Symposium; PMC6371294





- Questionnaire or Survey methods

- Any groups with an understanding of FAIR can leverage these
- Any system can be assessed, without code development or execution
- FAIR Data Self Assessment Tool (<https://ardc.edu.au/resource/fair-data-self-assessment-tool/>)
- Do-I PASS for FAIR
  - Taco de Bruin, Sarah Coombs, Jutta de Jong, Irene Haslinger, Henk van den Hoogen, Frans Huigen, Mijke Jetten, Jacko Koster, Margriet Miedema, Sjef Öllers, Inge Slouwerhof, Ingeborg Verheul, & Jacquelyn Ringersma. (2020). Do I-PASS for FAIR. A self assessment tool to measure the FAIR-ness of an organization (Version 1)





- Programmatic methods

- Code-based assessments using metadata querying and applying rules to determine compliance
- FAIRsFAIR (<https://www.f-uji.net/?action=test>)
- FAIR Evaluation Service (<https://w3id.org/AmIFAIR>)

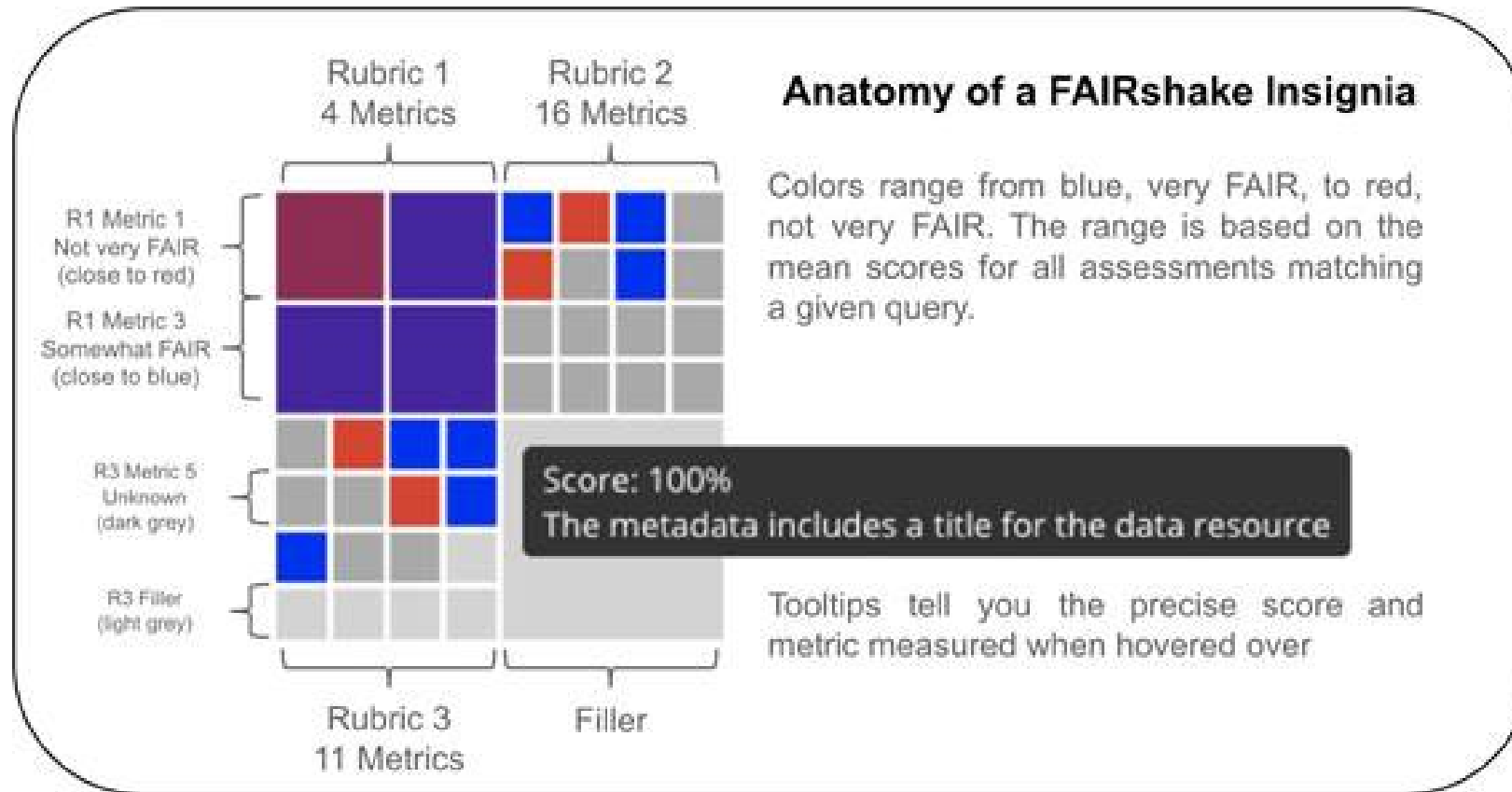


# BPS FAIR Evaluations using Gen 2 MI

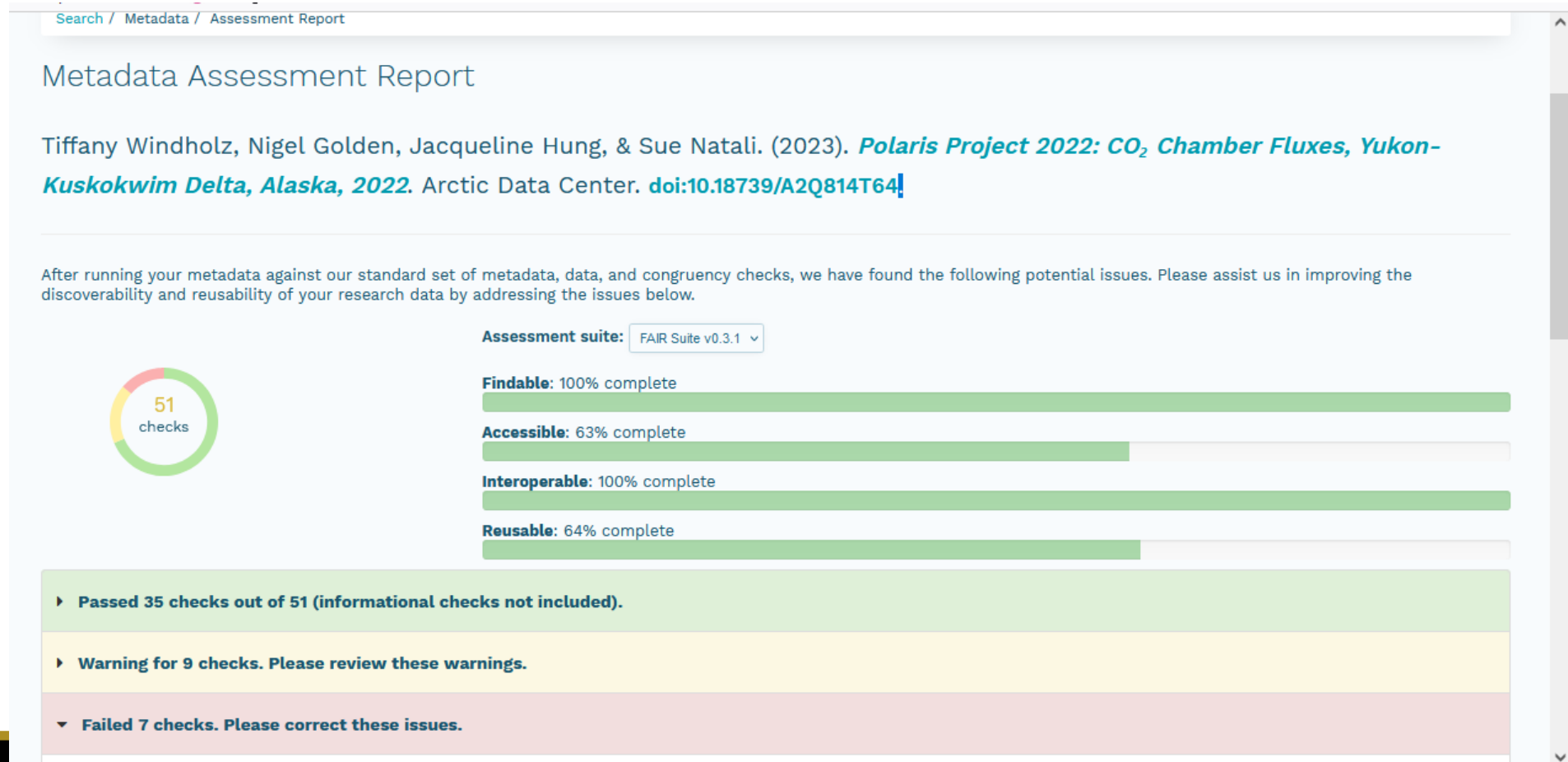
- Pilot study using FAIR Evaluator web site
- “Basic”, Cross-domain MIs: F A I R
- Quick, preliminary, automated evaluation using single dataset as input

| BPS Data Repo | Mis Tested | Mis Passed | Score (%) |
|---------------|------------|------------|-----------|
| GeneLab       | 22         | 11         | 50        |
| PSI           | 22         | 7          | 32        |
| ALSDA/LSDA    | 22         | 7          | 32        |

- Web-browser integrated tools
  - FAIRShake (<https://fairshake.cloud/>)



- Repository-integrated methods
  - Arctic Data Center/DateOne

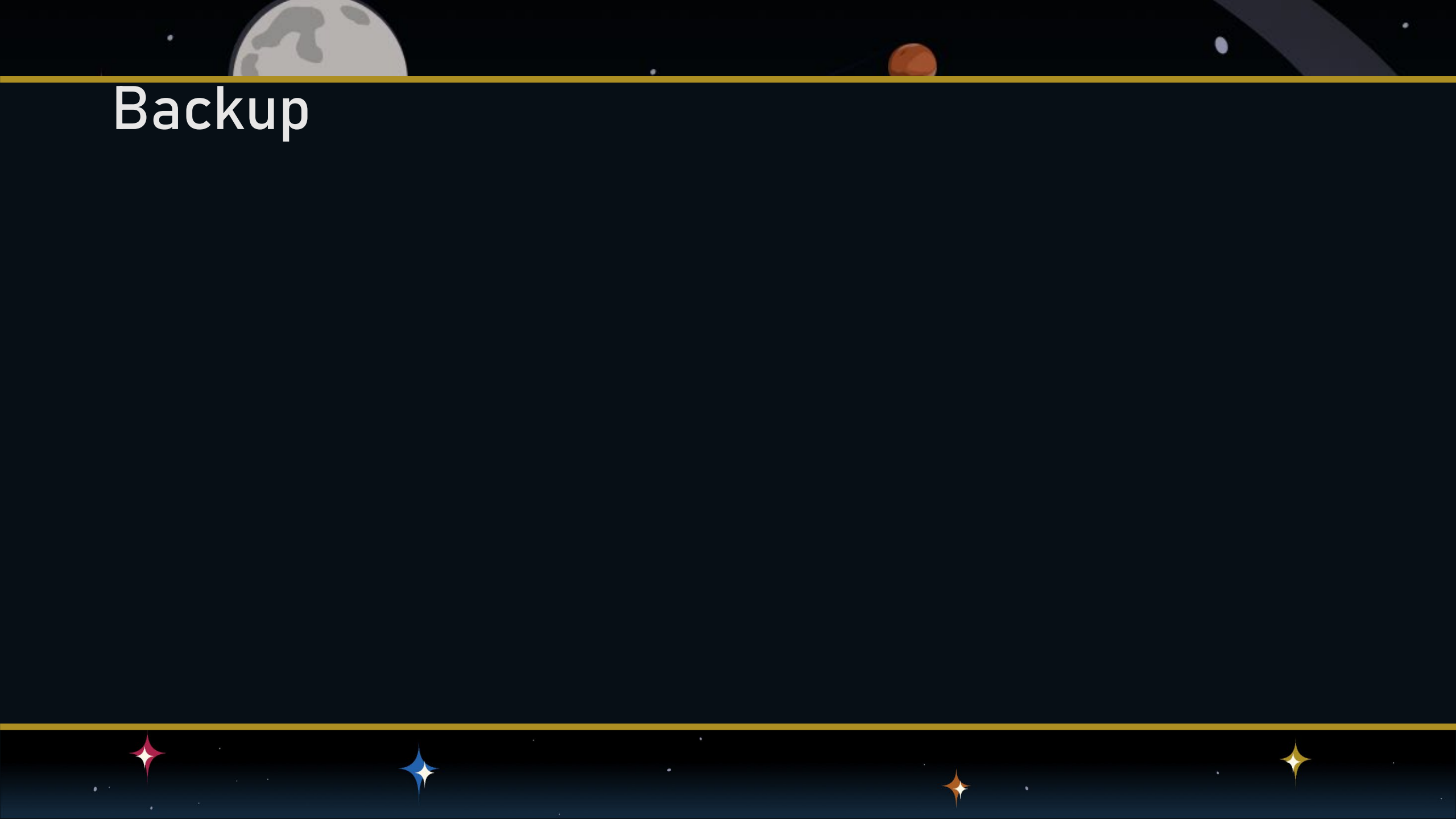




# Acknowledgements

- NLSP Team
  - Sandeep Shetye
  - Truong Le
  - John Dunn
- Mark Parsons
- Sylvain Costes (NASA)
- Afshin Beheshti
- Mark Wilkinson



The background is a dark blue gradient representing space. At the top, a large grey moon is partially visible on the left, and a small orange planet is on the right. A thin yellow horizontal line separates the top header area from the main content area. At the bottom, another thin yellow horizontal line separates the main content area from a footer area. The footer area contains several colorful stars (pink, blue, orange, and yellow) and a small grey ring-like object on the right.

# Backup

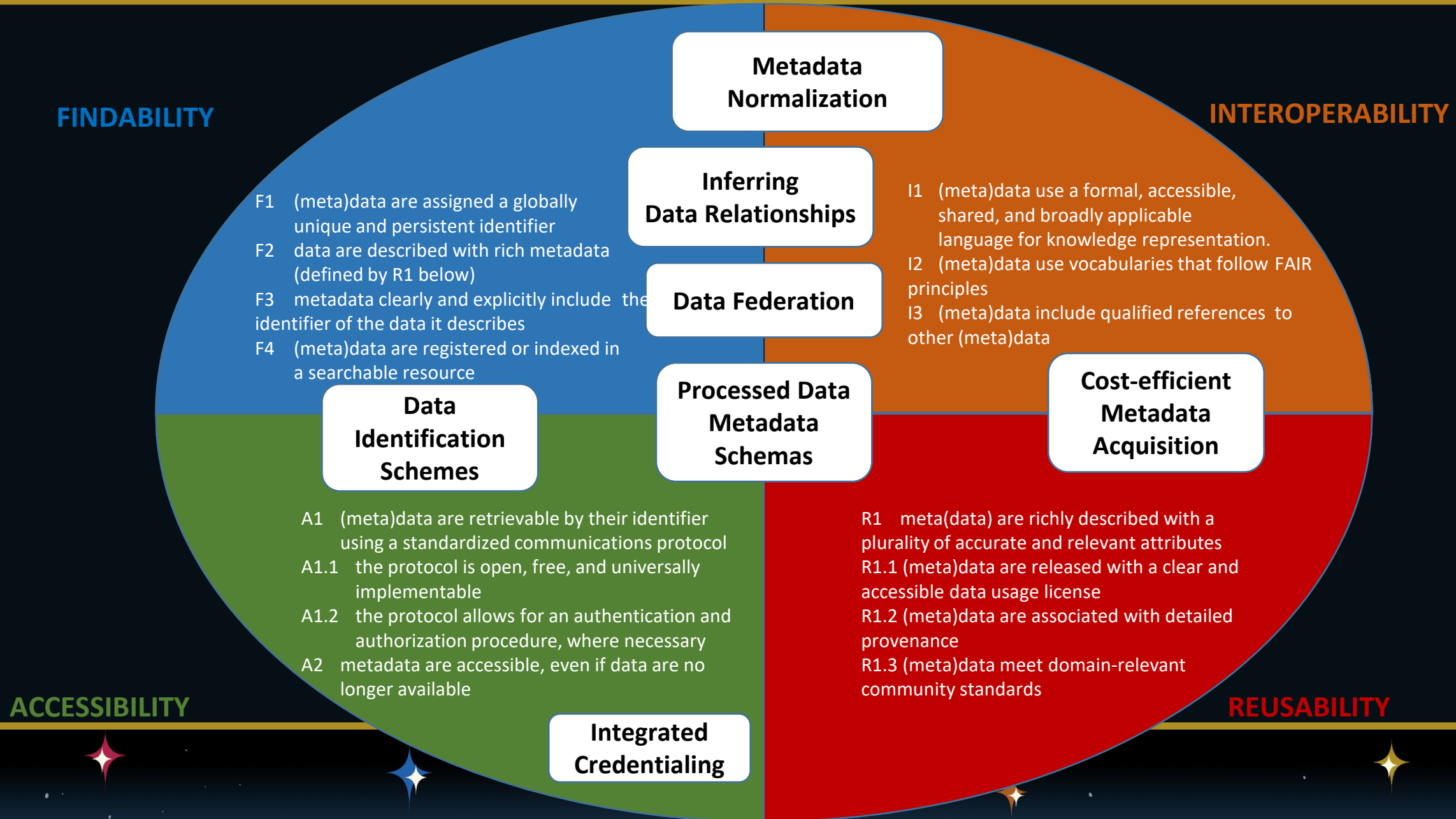


# FAIR

- FAIR is a set of principles relating to optimizing the capabilities of data systems
- Data systems are not properly labeled as “FAIR” or “NOT FAIR”:
  - Data systems must implement each of the principles
  - Some principles may only be implemented for some data/sets of data
  - FAIR principles have evolved and are going to continue to evolve
    - There are always going to be new and better methods to find data, to access data, to share and re-use data
    - Thus improving compliance with FAIR will be a continual process of systems improvement



# The “FAIR” Principles



# FAIR Metrics: Gen 1

- Designed to specify what should be measured in evaluating compliance with FAIR principles
- Textual and OWL format
- Provides guidance for evaluations, but not executable code
  - What is measured
  - Why/Rationale
  - Input
  - Description of testing method
  - Pass/Fail criteria
  - Scope
  - No detail on specific semantics tested for interoperability

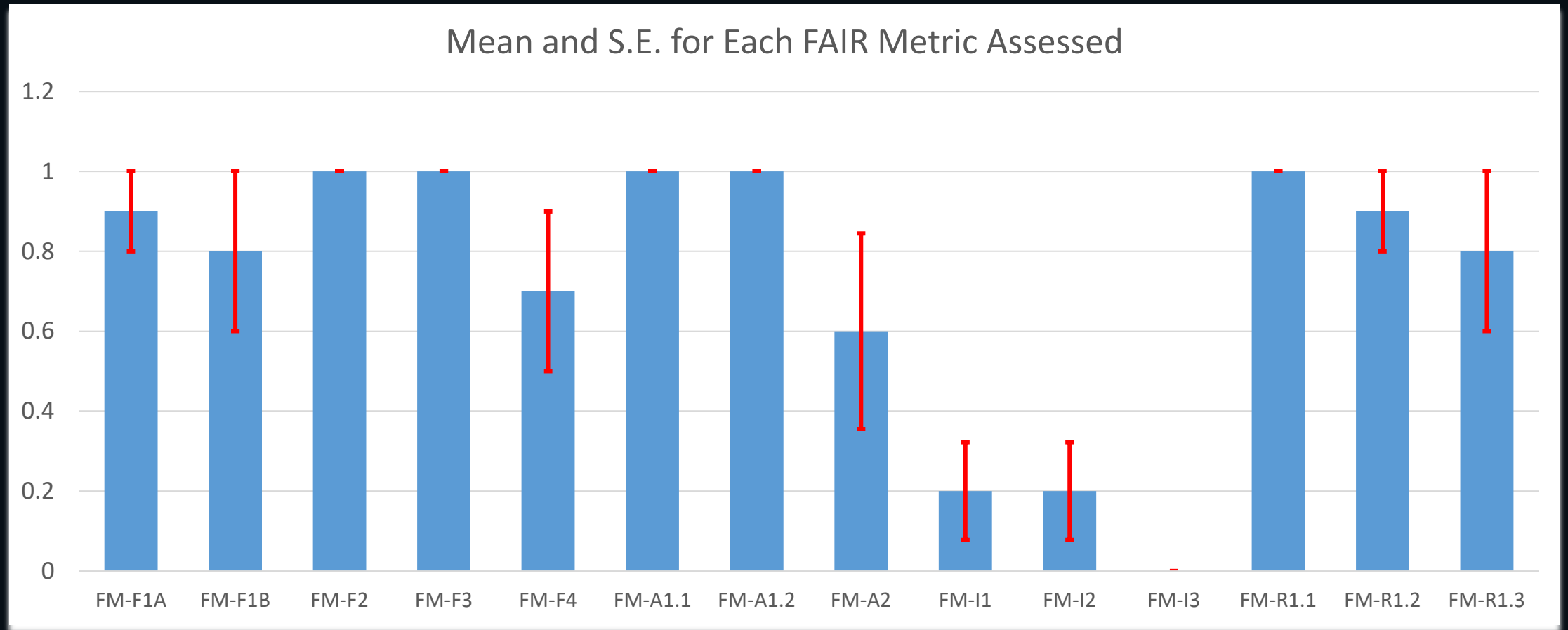
<https://github.com/FAIRMetrics/Metrics>

|                                                 |                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Metric Identifier                               | FM-F1B: <a href="https://purl.org/fair-metrics/FM_F1B">https://purl.org/fair-metrics/FM_F1B</a>                                                                                                                                                                                                                             |
| Metric Name                                     | Identifier persistence                                                                                                                                                                                                                                                                                                      |
| To which principle does it apply?               | F1                                                                                                                                                                                                                                                                                                                          |
| What is being measured?                         | Whether there is a policy that describes what the provider will do in the event an identifier scheme becomes deprecated.                                                                                                                                                                                                    |
| Why should we measure it?                       | The change to an identifier scheme will have widespread implications for resource lookup, linking, and data sharing. Providers of digital resources must ensure that they have a policy to manage changes in their identifier scheme, with a specific emphasis on maintaining/redirecting previously generated identifiers. |
| What must be provided?                          | A URL that resolves to a document containing the relevant policy.                                                                                                                                                                                                                                                           |
| How do we measure it?                           | Use an HTTP GET on URL provided.                                                                                                                                                                                                                                                                                            |
| What is a valid result?                         | Present (a 200,202,203 or 206 HTTP response after resolving all and any prior redirects. e.g. 301 -> 302 -> 200 OK.) or Absent (any other HTTP code)                                                                                                                                                                        |
| For which digital resource(s) is this relevant? | All                                                                                                                                                                                                                                                                                                                         |

# Pilot Testing of FAIR Metrics

- How FAIR is NASA GeneLab? Compared to similar data repositories? How could FAIR compliance be increased?
  - Berrios DC, Beheshti A, Costes SV, editors. FAIRness and Usability for Open-access Omics Data Systems. Proceedings of the 2018 AMIA Annual Symposium; [PMC6371294](#)
- 5 Omics Data Systems, including NASA GeneLab,
  - Similar to GeneLab:
    - Government-operated or government-funded, research lab-developed
    - Roughly similar archiving capabilities
    - Open access,
- 3 Raters that used manual testing and subjective evaluations of test results
  - PASS (1): No evidence of failure of any test, for any input
  - PARTIAL PASS (0.5): Failure of some, but not all test cases, or failure of some test steps/components
  - FAIL (0): No evidence of compliance to the principle, for any test cases
  - Rating consensus
    - Individually-assessed ratings combined through dialogue among the raters until consensus reached

# Results



# Conclusions

- All the omics systems assessed had some FAIRness shortcomings
  - All systems lacking at least some support for interoperable metadata (and data)
  - Lack of metadata schemes grounded in formal semantics (DL languages like RDF/OWL/etc.)
  - Some use ISA-Tab, which has at least been modeled in RDF, although they do not represent metadata in RDF
  - Community-derived, controlled vocabularies usage uncommon
  - Semantic linkage of data through metadata also uncommon
  - Lack of use of FAIR vocabularies
- Low prevalence of semantic normalization across data sets, perhaps due in part to
  - High costs
  - Lack of automated semantic normalization resources

# FAIR Metrics Gen 2

- Also known as Maturity Indicators (MIs)
- Designed to be executable by code
- Can be extended for domain-specific FAIRness evaluations
- MI Repository (open) [https://fair-evaluator.semanticscience.org/FAIR\\_Evaluator/](https://fair-evaluator.semanticscience.org/FAIR_Evaluator/)
- Evaluator service (for Gen 2 MIs and MI test execution)
- Evaluations repository (open)
- Input: DOIs of data sets
  - Record associated with DOI inspected
  - Metadata of DOI is evaluated
  - How to combine evaluations using multiple data sets?
- Output:
  - Detailed json of evaluation parameters, processes and results
  - Can be very lengthy, depending on MI

# Community-specific MIs

- Developed by specific data end-user communities (e.g., space life scientists)
- Possibly, but not necessarily, applicable to evaluations of repositories in other domains
- Checks for data FAIRness through domain-specific semantics standards
- Example domain-specific MIs:
  - Repository with GFF3 files and radiation biology experimental data
    - “Organism” field values from NCBITaxon ontology/taxonomy
    - “Factor studied” field must have values from Radiation Biology Ontology or other community-developed (OBO Foundry) ontology
    - GFF3 (General Feature Format) files must have “type” field values that are from the SO (Sequence Ontology)
    - “Tissue Phenotype” values must be from Human Phenotype Ontology
    - Etc.

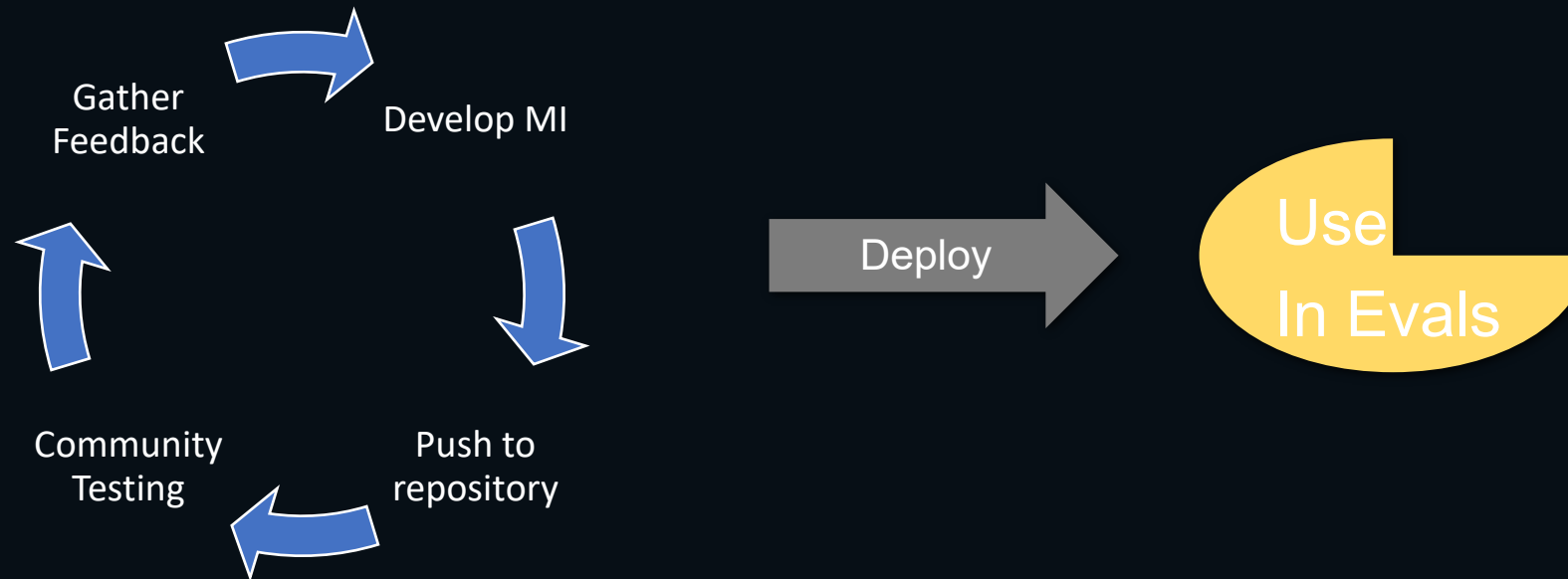
OBO Foundry: <http://www.obofoundry.org/>

Sequence Ontology: <http://www.sequenceontology.org/>

Human Phenotype Ontology: <https://hpo.jax.org/app/>

# Life Cycle of MI

- Users develop and test MIs
- Users submit MIs to community MI repository for feedback
- Users Incorporate feedback, refine MI
- After final blessing by community, deploy to community MI collection
- Systems use fully developed MI for FAIR evaluations



# GeneLab FAIR using Gen 2 MI

- Pilot study using FAIR Evaluator web site
- “Basic”, Cross-domain MIs: F A I R
- Quick, preliminary, automated evaluation using single dataset as input

| Principle        | Mis Tested | Mis Passed | Score (%) |
|------------------|------------|------------|-----------|
| Findability      | 8          | 4          | 50        |
| Accessibility    | 5          | 2          | 40        |
| Interoperability | 7          | 5          | 71        |
| Reusability      | 2          | 0          | 0         |
| Total            | 22         | 11         | 50        |

# LSDA FAIR using Gen 2 MI

- Pilot study using FAIR Evaluator web site
- “Basic”, Cross-domain MIs: F A I R
- Quick, preliminary, automated evaluation using single dataset as input

| Principle        | Mis Tested | Mis Passed | Score (%) |
|------------------|------------|------------|-----------|
| Findability      | 8          | 3          | 38        |
| Accessibility    | 5          | 2          | 40        |
| Interoperability | 7          | 2          | 29        |
| Reusability      | 2          | 0          | 0         |
| Total            | 22         | 7          | 32        |

# PSI FAIR using Gen 2 MI

- Pilot study using FAIR Evaluator web site
- “Basic”, Cross-domain MIs: F A I R
- Quick, preliminary, automated evaluation using single dataset as input

| Principle        | Mis Tested | Mis Passed | Score (%) |
|------------------|------------|------------|-----------|
| Findability      | 8          | 3          | 38        |
| Accessibility    | 5          | 2          | 40        |
| Interoperability | 7          | 2          | 29        |
| Reusability      | 2          | 0          | 0         |
| Total            | 22         | 7          | 32        |

# GeneLab FAIR Evaluation- Detailed Findability

| MI Group | Tests                                      | Result | Reason                                                                                                                    |
|----------|--------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------|
| F1       | Unique Identifier                          | PASS   |                                                                                                                           |
| F1       | Identifier Persistence                     | PASS   |                                                                                                                           |
| F1       | Data Identifier Persistence                | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose. |
| F2       | Structured Metadata                        | PASS   |                                                                                                                           |
| F2       | Grounded Metadata                          | PASS   |                                                                                                                           |
| F3       | Data Identifier Explicitly In Metadata     | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose  |
| F3       | Metadata Identifier Explicitly In Metadata | FAIL   | No metadata identifiers were found in the metadata record                                                                 |
| F4       | Searchable in major search engine          | FAIL   | Was unable to discover the metadata record by search in Bing using any method                                             |

# GeneLab FAIR Evaluation- Detailed Accessibility

| MI Group | Tests                                          | Result | Reason                                                                                                                    |
|----------|------------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------|
| A1.1     | Uses open free protocol for data retrieval     | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose. |
| A1.1     | Uses open free protocol for metadata retrieval | PASS   |                                                                                                                           |
| A1.2     | Data authentication and authorization          | FAIL   | No data identifier was found in the metadata record.                                                                      |
| A1.2     | Metadata authentication and authorization      | PASS   |                                                                                                                           |
| A2       | Metadata Persistence                           | PASS   | Was unable to find a persistence policy using any approach.                                                               |

# GeneLab FAIR Evaluation- Detailed

| MI Group | Tests                                               | Result | Reason                                                                                                                    |
|----------|-----------------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------|
| I1       | Metadata Knowledge Representation Language (weak)   | PASS   |                                                                                                                           |
| I1       | Metadata Knowledge Representation Language (strong) | PASS   |                                                                                                                           |
| I1       | Data Knowledge Representation Language (weak)       | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose. |
| I1       | Data Knowledge Representation Language (strong)     | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose. |
| I2       | Metadata uses FAIR vocabularies (weak)              | PASS   |                                                                                                                           |
| I2       | Metadata uses FAIR vocabularies (strong)            | PASS   |                                                                                                                           |
| I3       | Metadata contains qualified outward references      | PASS   |                                                                                                                           |



# GeneLab FAIR Evaluation- Detailed

| MI Group | Tests                              | Result | Reason                                         |
|----------|------------------------------------|--------|------------------------------------------------|
| R1       | Metadata Includes License (strong) | FAIL   | No License property was found in the metadata. |
| R1.1     | Metadata Includes License (weak)   | FAIL   | No License property was found in the metadata. |



# LSDA FAIR Evaluation- Detailed Findability

| MI Group | Tests                                      | Result | Reason                                                                                                                    |
|----------|--------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------|
| F1       | Unique Identifier                          | PASS   |                                                                                                                           |
| F1       | Identifier Persistence                     | FAIL   | The metadata GUID does not conform with any known permanent-URL system.                                                   |
| F1       | Data Identifier Persistence                | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose. |
| F2       | Structured Metadata                        | PASS   | (dataset page)<br>(experiment page FAIL: no structured metadata found)                                                    |
| F2       | Grounded Metadata                          | PASS   | (dataset page)<br>(experiment page FAIL: no linked-data style structured metadata found)                                  |
| F3       | Data Identifier Explicitly In Metadata     | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose  |
| F3       | Metadata Identifier Explicitly In Metadata | FAIL   | No metadata identifiers were found in the metadata record                                                                 |
| F4       | Searchable in major search engine          | FAIL   | Was unable to discover the metadata record by search in Bing using any method                                             |

# LSDA FAIR Evaluation- Detailed Accessibility

| MI Group | Tests                                          | Result | Reason                                                                                                                    |
|----------|------------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------|
| A1.1     | Uses open free protocol for data retrieval     | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose. |
| A1.1     | Uses open free protocol for metadata retrieval | PASS   |                                                                                                                           |
| A1.2     | Data authentication and authorization          | FAIL   | No data identifier was found in the metadata record.                                                                      |
| A1.2     | Metadata authentication and authorization      | PASS   |                                                                                                                           |
| A2       | Metadata Persistence                           | PASS   | Was unable to find a persistence policy using any approach.                                                               |

# LSDA FAIR Evaluation- Detailed Interoperability

| MI Group | Tests                                               | Result | Reason                                                                                                                                            |
|----------|-----------------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| I1       | Metadata Knowledge Representation Language (weak)   | PASS   | (dataset page)<br>(experiment page: FAIL)                                                                                                         |
| I1       | Metadata Knowledge Representation Language (strong) | PASS   | (dataset page)<br>(experiment page: FAIL)                                                                                                         |
| I1       | Data Knowledge Representation Language (weak)       | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose.<br>(dataset page)       |
| I1       | Data Knowledge Representation Language (strong)     | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose.<br>(dataset page)       |
| I2       | Metadata uses FAIR vocabularies (weak)              | FAIL   | No predicates were found that resolved to Linked Data.<br>(dataset page)                                                                          |
| I2       | Metadata uses FAIR vocabularies (strong)            | FAIL   | No predicates were found that resolved to Linked Data.<br>(dataset page)                                                                          |
| I3       | Metadata contains qualified outward references      | FAIL   | 0 of the 0 triples discovered in the linked metadata pointed to resources hosted elsewhere. The minimum to pass this test is 1.<br>(dataset page) |

# LSDA FAIR Evaluation– Detailed Reusability

| MI Group | Tests                              | Result | Reason                                                                                                                                                                                   |
|----------|------------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R1       | Metadata Includes License (strong) | FAIL   | No predicates were found that resolved to Linked Data. did not match any known identification system. (Dataset page)<br>No License property was found in the metadata. (Experiment page) |
| R1.1     | Metadata Includes License (weak)   | FAIL   | No predicates were found that resolved to Linked Data. did not match any known identification system. (Dataset page)<br>No License property was found in the metadata. (Experiment page) |

# PSI FAIR Evaluation- Detailed Findability

<https://fairsharing.github.io/FAIR-Evaluator-FrontEnd/#!/evaluations/5290>

| MI Group | Tests                                      | Result | Reason                                                                                                                    |
|----------|--------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------|
| F1       | Unique Identifier                          | PASS   |                                                                                                                           |
| F1       | Identifier Persistence                     | FAIL   | The metadata GUID does not conform with any known permanent-URL system.                                                   |
| F1       | Data Identifier Persistence                | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose. |
| F2       | Structured Metadata                        | PASS   |                                                                                                                           |
| F2       | Grounded Metadata                          | PASS   |                                                                                                                           |
| F3       | Data Identifier Explicitly In Metadata     | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose  |
| F3       | Metadata Identifier Explicitly In Metadata | FAIL   | No metadata identifiers were found in the metadata record                                                                 |
| F4       | Searchable in major search engine          | FAIL   | Was unable to discover the metadata record by search in Bing using any method                                             |

# PSI FAIR Evaluation- Detailed Accessibility

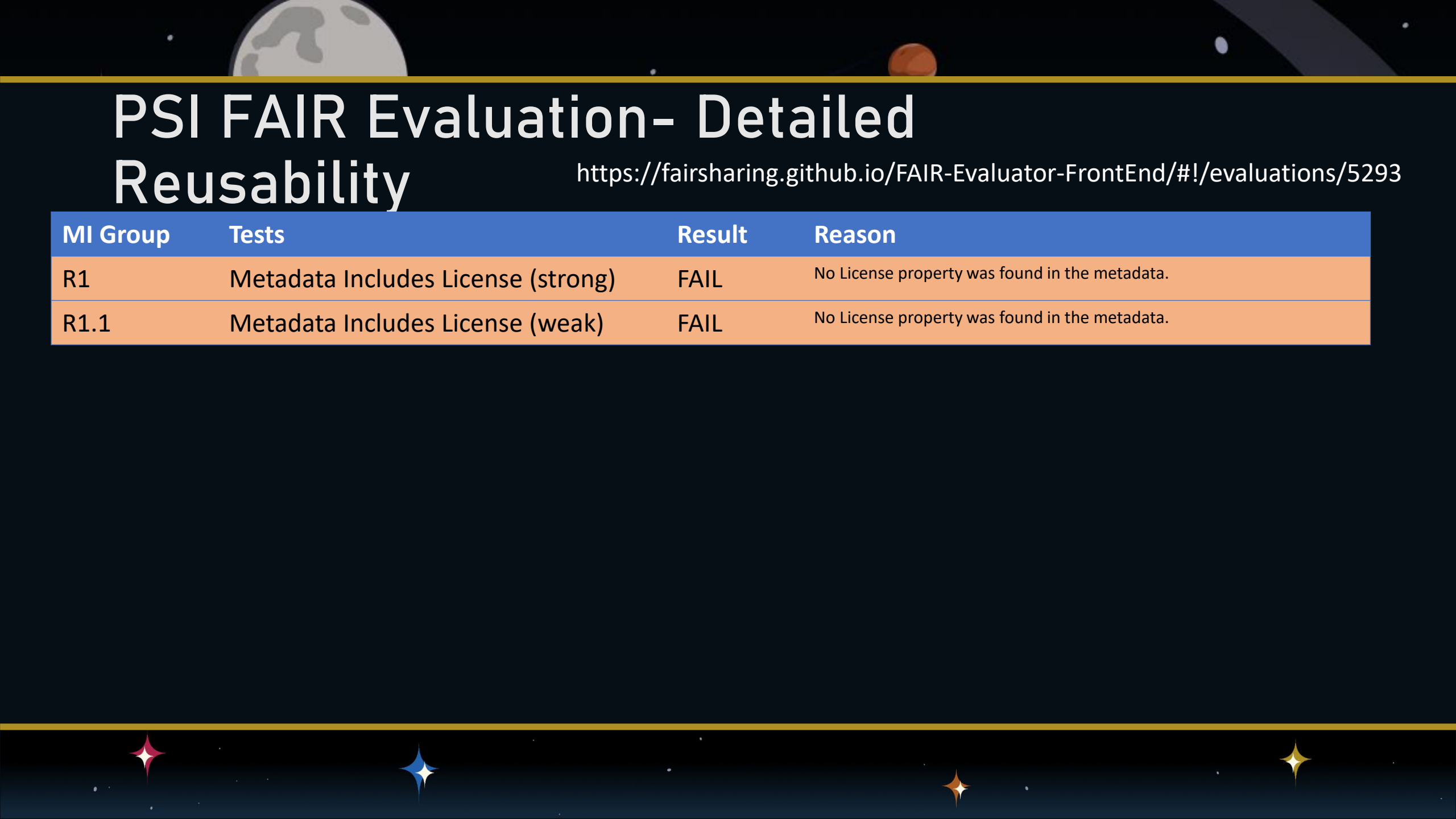
<https://fairsharing.github.io/FAIR-Evaluator-FrontEnd/#!/evaluations/5291>

| MI Group | Tests                                          | Result | Reason                                                                                                                    |
|----------|------------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------|
| A1.1     | Uses open free protocol for data retrieval     | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose. |
| A1.1     | Uses open free protocol for metadata retrieval | PASS   |                                                                                                                           |
| A1.2     | Data authentication and authorization          | FAIL   | No data identifier was found in the metadata record.                                                                      |
| A1.2     | Metadata authentication and authorization      | PASS   |                                                                                                                           |
| A2       | Metadata Persistence                           | PASS   | Was unable to find a persistence policy using any approach.                                                               |

# PSI FAIR Evaluation- Detailed Interoperability

<https://fairsharing.github.io/FAIR-Evaluator-FrontEnd/#!/evaluations/5292>

| MI Group | Tests                                               | Result | Reason                                                                                                                          |
|----------|-----------------------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------|
| I1       | Metadata Knowledge Representation Language (weak)   | PASS   |                                                                                                                                 |
| I1       | Metadata Knowledge Representation Language (strong) | PASS   |                                                                                                                                 |
| I1       | Data Knowledge Representation Language (weak)       | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose.       |
| I1       | Data Knowledge Representation Language (strong)     | FAIL   | Was unable to locate the data identifier in the metadata using any (common) property/predicate reserved for this purpose.       |
| I2       | Metadata uses FAIR vocabularies (weak)              | FAIL   | No predicates were found that resolved to Linked Data.                                                                          |
| I2       | Metadata uses FAIR vocabularies (strong)            | FAIL   | No predicates were found that resolved to Linked Data.                                                                          |
| I3       | Metadata contains qualified outward references      | FAIL   | 0 of the 0 triples discovered in the linked metadata pointed to resources hosted elsewhere. The minimum to pass this test is 1. |



# PSI FAIR Evaluation- Detailed Reusability

<https://fairsharing.github.io/FAIR-Evaluator-FrontEnd/#!/evaluations/5293>

| MI Group | Tests                              | Result | Reason                                         |
|----------|------------------------------------|--------|------------------------------------------------|
| R1       | Metadata Includes License (strong) | FAIL   | No License property was found in the metadata. |
| R1.1     | Metadata Includes License (weak)   | FAIL   | No License property was found in the metadata. |



# Moving Forward

- Detailed analysis of GeneLab MI failures
  - Scope work to address these failures
  - Generate a summary/FAIR report
- Explore options for obtaining and integrating the FAIR Evaluator
  - ?develop our own evaluator by extension
  - Explore COTS option (Wilkinson's spin-off)
  - for continual systems evaluation
  - data curation process improvement
- How are other repositories using or considering use of FAIR evaluation services?
- What are the domain-specific Maturity Indicators that could be developed to further interoperability in the areas of genomics?
  - Critical data interoperability will likely require these metrics be developed and continually applied to GeneLab data

