Lab 9 – Shapes

CC7220-1 – October 14, 2024

Let's play with shapes! Specifically we will focus on SHACL. Copy and paste the following RDF graph into the left window of RDF Playground (`http://rdfplayground.dcc.uchile.cl/`):

```
@prefix : <http://ex.org/data/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>.
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#>.
@prefix xsd: <http://www.w3.org/2001/XMLSchema#>.

:MagnusCarlsen a :Person ; :name "Magnus Carlsen" ; :dob "30 November, 1990" ; :country :Norway .
:HansNiemann :name "Hans Niemann" ; :dob "2003-06-20"^^xsd:date .

:MC-HN-SC-2022-1 a :ChessMatch ;
  :white :MagnusCarlson ;
  :black :HansNiemann;
  :date "2022-09-04"^^xsd:date ;
  :opening :NimzoIndian ;
  :result :Black ;
  :next :HM-MC-JBGC-2022-1 ;
  :prev :HM-MC-JBGC-2022-1 ;
  :condition :Resignation ;
  :pgn "1.d4 Nf6 2.c4 e6 3.Nc3 Bb4 4.g3 0-0 5.Bg2 d5 6.a3 Bxc3+ 7.bxc3 dxc4 8.Nf3 c5 9.0-0 " . #abbreviated

:HM-MC-JBGC-2022-1 a :ChessMatch ;
  :black :HansNiemann ;
  :white :MagnusCarlsen ;
  :date "2022-09-19"^^xsd:date ;
  :opening :IndianDefence ;
  :result :WhiteWin , :Drama ;
  :prev :MC-HN-SC-2022-1 ;
  :condition :Resignation ;
  :pgn "1.d4 Nf6 2.c4" . #not abbreviated

:NimzoIndian a :ChessOpening ;
  :pgn "1.d4 Nf6 2.c4 e6 3.Nc3 Bb4" .

:IndianDefense a :ChessOpening ;
  :pgn "d4 Nf6" .

:SinquefieldCup2022 a :HumanChessTournament ; :match :MC-HN-SC-2022-1 ; :venue :StLouis .
:JuliusBaerGenerationCup2022 a :HumanChessTournament ; :match :HM-MC-JBGC-2022-1 .

:HumanChessTournament rdfs:subClassOf :ChessTournament .
```

Now copy and paste the following shapes graph into the SHACL tab on the right:

```
@prefix : <http://ex.org/data/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix s: <http://ex.org/shapes/> .
@prefix sh: <http://www.w3.org/ns/shacl#> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

s:ChessMatch a sh:NodeShape ;
  sh:targetClass :ChessMatch ;
  sh:property [ sh:path :result ; sh:minCount 1 ; sh:maxCount 1 ] .
```

Hit the VALIDATE GRAPH button. Below in the results window you should see a report indicating if there are any violations of the constraints. You should see one indicating that one of the matches has two results. For each of the following questions, you should **extend** the above shapes graph to indicate further constraints and hopefully identify further data quality issues with the RDF graph.

1. [7.5 MARKS] Add a new shape targetting values of `:pgn` to ensure that the value is a string that starts with "`1`".
2. [7.5 MARKS] Add a new shape targetting instances of `:ChessTournament` (or its subclasses) to indicate that each instance should have at least one value for `:venue` (for over the board) or `:website` (for online).
3. [7.5 MARKS] Extend the `s:ChessMatch` shape to indicate that the each targetted node should have exactly one result, and it should be `:WhiteWin`, `:BlackWin`, `:Draw` or `:Incomplete`.
4. [7.5 MARKS] The `:next` property should indicate the next match between the same players in a future date, while the `:prev` should indicate the inverse of this relation. Extend the `s:ChessMatch` shape to indicate that `:prev` and `:next` cannot have the same value.
5. [7.5 MARKS] Extend the `s:ChessMatch` shape to indicate that any value for `:opening` must be an instance of the class `:ChessOpening`. (Note the typo: `:IndianDefense` vs. `:IndianDefence`.)
6. [7.5 MARKS] Add a new shape (no direct target) called `s:ChessPlayer` to indicate that chess players must have exactly one country, exactly one value for date of birth, and that the value for date of birth has the datatype `xsd:date`. Then extend the `s:ChessMatch` shape to indicate that values of `:white` and `:black` must satisfy the chess player shape.
7. [7.5 MARKS] Extend the `s:ChessMatch` shape to indicate that the date of the previous match must be the same or come before the current match.
8. [7.5 MARKS] Extend the `s:ChessMatch` shape to indicate that the next chess match (if there is one) must have the same players; it's okay if they interchange playing black or white. (Note the typo: `MagnusCarlson` vs. `:MagnusCarlsen`.)

SUBMIT: one file – `shapes.ttl` – with the SHACL definitions required for each question. Be sure to clearly indicate the commands added for each question with comments (e.g., `"# Q2"` without the quotes).