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# Predição de Efetividade do tratamento de HIV

Nesse projeto, pretendemos estudar a relação da estrutura viral e a efetividade do tratamento de HIV. Para isso, usaremos algoritmos de similaridade genética para estabelecer as similaridades entre os vírus (especificamente a Transcriptase Reversa (RT) e Protease (PR) que compõem seu material genético) e pretendemos utilizar Machine Learning para tentar prever a efetividade do tratamento e suas relações.

Nessa fase, foi necessário propor um modelo RDF e XML. Os modelos propostos foram úteis para conseguir fazer consultas em uma tabela única, poupando tempo de máquina em joins desnecessários. Para conseguir relacionar o problema proposto com um catálogo de possíveis relações do vírus, o qual num modelo relacional seria de difícil navegação entre as relações hierárquicas.

Modelo conceitual
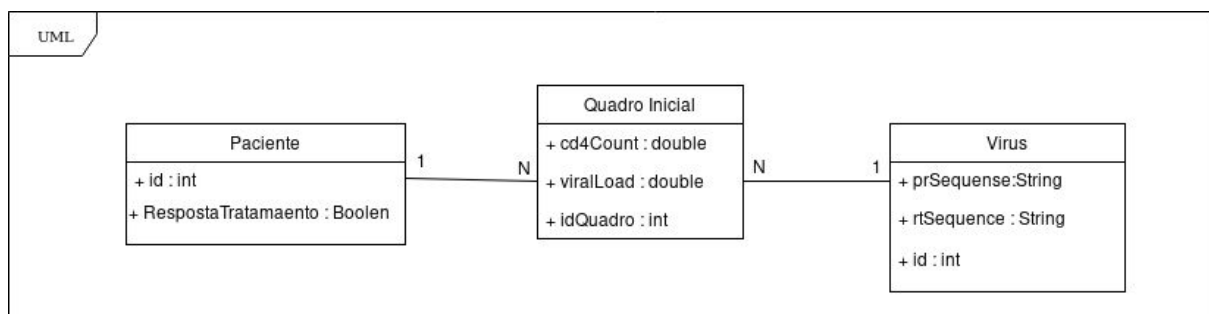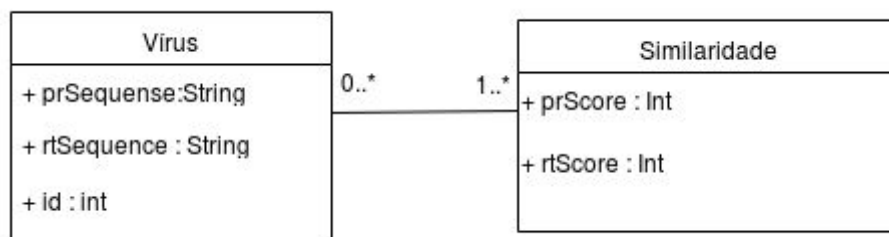
Modelo Lógico XML
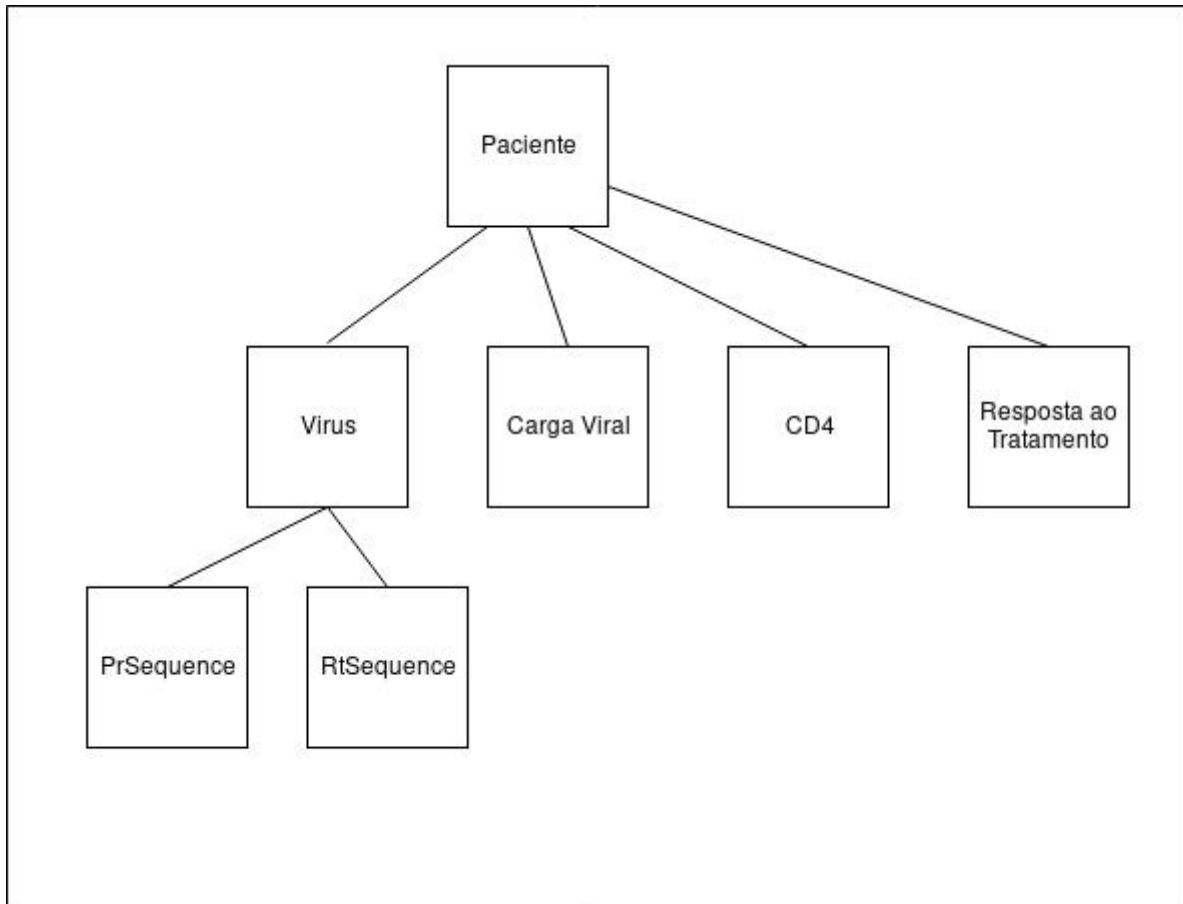
Consulta Xquery

Quantos pacientes responderam bem ao tratamento
let $root := doc('mydoc.xml')
for $p in ($root)
return count($p//root//Paciente[Resp=0])

ID dos pacientes ainda doentes
let $root := doc('mydoc.xml')
for $p in ($root//Paciente)
where $p[Resp=0]
return <Doente>{data($p/PatientID)}</Doente>

Pessoas que a contagem de cd4 menor que 50

```
let $root := doc('mydoc.xml')
for $p in ($root//Paciente)
where $p[CD4-t0 <50]
order by $p/PatientID
return <cd4>{data($p/PatientID)}</cd4>
```

Média de contagem cd4

```
let $root := doc('mydoc.xml')
for $p in ($root)
return avg($p//Paciente/CD4-t0)
```

Média de contagem VIRALLOAD

```
let $root := doc('mydoc.xml')
for $p in ($root)
return avg($p//Paciente/VL-t0)
```

Consulta SPARQL
Obter todos os tipos de infecções HIV

```
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#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX meshv: <http://id.nlm.nih.gov/mesh/vocab#>
PREFIX mesh: <http://id.nlm.nih.gov/mesh/>
PREFIX mesh2015: <http://id.nlm.nih.gov/mesh/2015/>
PREFIX mesh2016: <http://id.nlm.nih.gov/mesh/2016/>
PREFIX mesh2017: <http://id.nlm.nih.gov/mesh/2017/>

SELECT DISTINCT ?descriptor ?label
FROM <http://id.nlm.nih.gov/mesh>

WHERE {
  mesh:D015658 meshv:treeNumber ?treeNum .
  ?childTreeNum meshv:parentTreeNumber+ ?treeNum .
  ?descriptor meshv:treeNumber ?childTreeNum .
  ?descriptor rdfs:label ?label .
}

ORDER BY ?label
LIMIT 10
```

```
## Obter todos os tipos de doenças sexualmente transmissíveis
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#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX meshv: <http://id.nlm.nih.gov/mesh/vocab#>
PREFIX mesh: <http://id.nlm.nih.gov/mesh/>
PREFIX mesh2015: <http://id.nlm.nih.gov/mesh/2015/>
PREFIX mesh2016: <http://id.nlm.nih.gov/mesh/2016/>
PREFIX mesh2017: <http://id.nlm.nih.gov/mesh/2017/>
SELECT DISTINCT ?descriptor ?label
FROM <http://id.nlm.nih.gov/mesh>
WHERE {
        ?descriptor rdfs:label ?label .
        ?descriptor meshv:broaderDescriptor mesh:D015229
}
ORDER BY ?label

## Obter todas as annotations das infecções HIV
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#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX meshv: <http://id.nlm.nih.gov/mesh/vocab#>
PREFIX mesh: <http://id.nlm.nih.gov/mesh/>
PREFIX mesh2015: <http://id.nlm.nih.gov/mesh/2015/>
PREFIX mesh2016: <http://id.nlm.nih.gov/mesh/2016/>
PREFIX mesh2017: <http://id.nlm.nih.gov/mesh/2017/>

 SELECT DISTINCT ?label ?annotation
 FROM <http://id.nlm.nih.gov/mesh>

 WHERE {
   mesh:D015658 meshv:treeNumber ?treeNum .
   ?childTreeNum meshv:parentTreeNumber+ ?treeNum .
   ?descriptor meshv:treeNumber ?childTreeNum .
   ?descriptor rdfs:label ?label .
   ?descriptor meshv:annotation ?annotation
 }

 ORDER BY ?label
LIMIT 10
```

Obter todas as doenças relacionadas a slow vírus

```
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#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX meshv: <http://id.nlm.nih.gov/mesh/vocab#>
PREFIX mesh: <http://id.nlm.nih.gov/mesh/>
PREFIX mesh2015: <http://id.nlm.nih.gov/mesh/2015/>
PREFIX mesh2016: <http://id.nlm.nih.gov/mesh/2016/>
PREFIX mesh2017: <http://id.nlm.nih.gov/mesh/2017/>
 SELECT DISTINCT ?descriptor ?label
 FROM <http://id.nlm.nih.gov/mesh>
 WHERE {
   mesh:D012897 meshv:treeNumber ?treeNum .
   ?childTreeNum meshv:parentTreeNumber+ ?treeNum .
   ?descriptor meshv:treeNumber ?childTreeNum .
   ?descriptor rdfs:label ?label .
 }

 ORDER BY ?label
LIMIT 10
```

Obter todas as síndromes de deficiência imunológica

```
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#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX meshv: <http://id.nlm.nih.gov/mesh/vocab#>
PREFIX mesh: <http://id.nlm.nih.gov/mesh/>
PREFIX mesh2015: <http://id.nlm.nih.gov/mesh/2015/>
PREFIX mesh2016: <http://id.nlm.nih.gov/mesh/2016/>
PREFIX mesh2017: <http://id.nlm.nih.gov/mesh/2017/>

 SELECT DISTINCT ?descriptor ?label
 FROM <http://id.nlm.nih.gov/mesh>

 WHERE {
   mesh:D007153 meshv:treeNumber ?treeNum .
   ?childTreeNum meshv:parentTreeNumber+ ?treeNum .
   ?descriptor meshv:treeNumber ?childTreeNum .
   ?descriptor rdfs:label ?label .
 }

 ORDER BY ?label
LIMIT 10
```

Exemplo de tabela XML convertida no http://convertcsv.com/csv-to-xml.htm

```xml
<?xml version="1.0" encoding="UTF-8"?>
<root>
  <Paciente>
        <PatientID>1</PatientID>
        <Resp>0</Resp>

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GATAGGGGGAATTGGAGGTTTTATCAAAGTAARACAGTATGATCAGRTACCCATAGAAATCTATGGACATAAA
GCTGTAGGTACAGTATTAATAGGACCTACACCTGTCAACATAATTGGAAGAAATCTGTTGACTCAGCTTGGTT
GCACTTTAAATTTY</PRSeq>

<RTSeq>CCCATTAGTCCTATTGAAACTGTACCAGTAAAGCTAAAGCCAGGAATGGATGGCCCAAAAGTTAAA
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ATTTCAAAAATTGGGCCTGAAAATCCATATAATACTCCAGTATTTGCCATAAAGAAAAAAGACAGTACTACATG
GAGAAAATTAGTAGATTTCAGAGAACTTAATAAGAGAACTCAAGACTTCTGGGAAGTTCAAYTAGGAATACCA
CATCCCGCWGGGTTAAAAAAGAAYAAATCAGTAACAGTACTGGATGTGGGTGATGCATATTTCTCAGTTCCM
TTAGATAAAGACTTCAGGAAGTATACTGCATTTACCATACCTAGTATAAACAATGAGACACCAGGGATTAGAT
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ACCAGACAAAAAACATCAGAAAGAACCTCCATTCCTTTGGATGGGCTATGAACTCCATCCTGATAAATGGAC
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        <CD4-t0>145</CD4-t0>
  </Paciente>

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        <PatientID>2</PatientID>
        <Resp>0</Resp>

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AATAGGGGGAATTGGAGGTTTTATCAAAGTAAGACAGTATGATCAGATACCCATAGAAATCTGTGGACATAAA
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GCACTTTAAATTTT</PRSeq>

<RTSeq>CCCATTAGTCCTATTGAAACTGTACCAGTAAAATTAAAGCCAGGAATGGATGGCCCAAAAGTTAAA
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GGAGAAAGTAGTAGATTTCAGAGAACTTAATAAAAGAACTCAAGACTTCTGGGAAGTTCAATTAGGGATACC
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CTTAGATGAAGACTTCAGGAAGTATACTGCATTTACCATACCCAGTACAAACAATGAGACACCAGGGATTAG
ATATCAGTACAATGTGCTTCCACAGGGATGGAAAGGATCACCAGCAATATTCCAAAGTAGCATGACAAAAATT
```

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<RTSeq>CCCATTAGTCCTATTGAAACTGTACCAGTAAAATTAAAGCCAGGAATGGATGGCCCAAAGGTTAAA
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AGAGCCTTTTAGAAAACAAAATCCAAACATGGAAATCTATCAATACGTGGATGATTTGTATRTAGGATCTGAC
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        <CD4-t0>239</CD4-t0>
  </Paciente>

</root>