Project 2: First-order logic

1 Description

1.1 Working with the Prolog tool (40%)

- Learn the Prolog language. Write a report on the main features of the language. It is necessary to give many illustrative examples, related to the knowledge of first-order logic you have learned.
- Learn a Prolog programming environment. Write a report on how to implement Prolog language on the studied tool. Present at least 5 illustrative examples.

  Recommended environment: SWI-Prolog (http://www.swi-prolog.org)
- Solving deductive problems using Prolog language on SWI-Prolog tool. Build a family tree of the British Royal family as shown in the image below.

  Build a knowledge base describing the relationships in the figure with the following predicates

  parent(Parent,Child)

  male(Person)

  married(Person, Person)

  female(Person)

  divorced(Person, Person)

  Define the following predicates based on the predicate above

husband(Person,Wife)	**grandparent(GP,GC)**	**sibling(Person1,Person2)**
wife(Person,Husband)	**grandmother(GM,GC)**	**brother(Person,Sibling)**
father(Parent,Child)	**grandfather(GF,GC)**	**sister(Person,Sibling)**
mother(Parent,Child)	**grandchild(GC,GP)**	**aunt(Person,NieceNephew)**
child(Child,Parent)	**grandson(GS,GP)**	**uncle(Person,NieceNephew)**
son(Child,Parent)	**granddaughter(GD,GP)**	**niece(Person,AuntUncle)**
daughter(Child,Parent)		**nephew(Person,AuntUncle)**

  Give a set of at least 20 questions to ask the newly constructed knowledge system, for example:

  - Who is Prince Andrew's mother?

  - Was Queen Elizabeth the wife of Mia Grace Tindall?

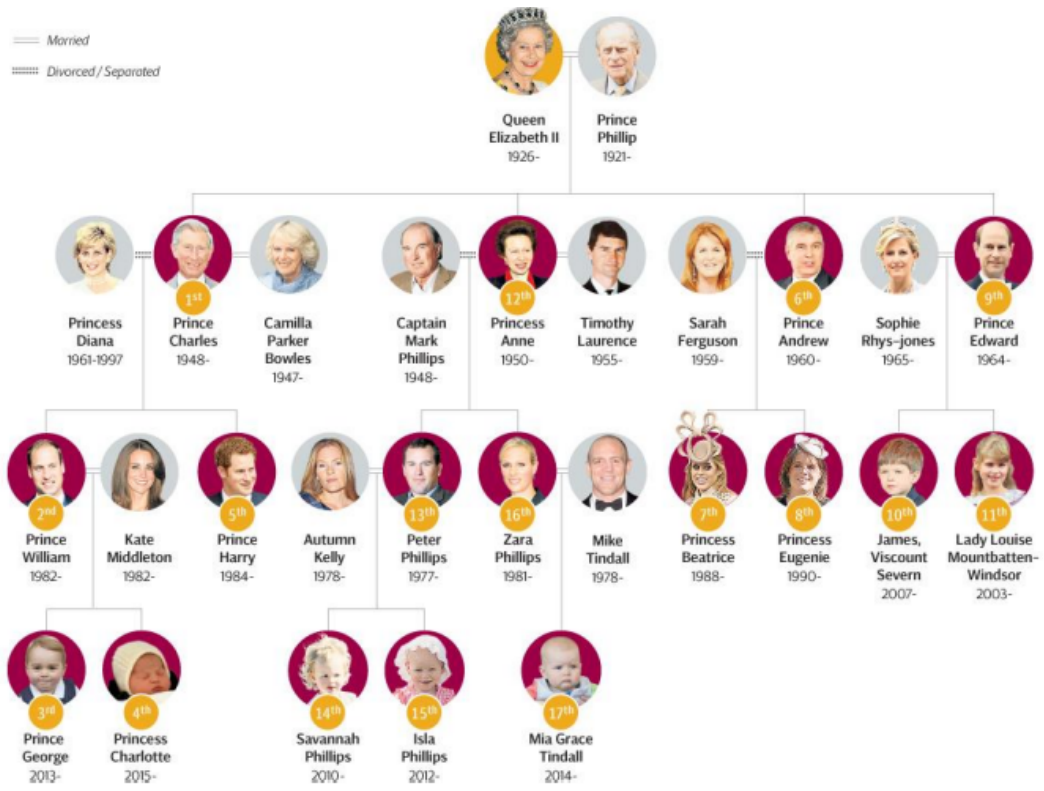
  Students need to submit a file containing the knowledge base building code and test dataset.

1.2 Build a Knowledge Base with Prolog (30%)

Students choose a topic to build a knowledge base so that there are many types of hierarchical relationships between objects (similar to the genealogical tree topic above).

Present in the report the diagram of the relationship between the objects in the selected topic.

Identify the most basic relationships in the topic and build a knowledge base with a minimum of predicates representing the underlying relations. The knowledge base must contain at least 50 predicates. Give a set of at least 20 questions to ask the newly constructed knowledge system, for example



- Who is Prince Andrew's mother?
- Is Queen Elizabeth the wife of Mia Grace Tindall?

Students need to submit a file containing the knowledge base building code and test dataset.

1.3 Implement logic deductive system in the programming language (30%)

Build a logical inference program using one of the learned deductive methods: forward reasoning, backward reasoning,... The program has the following input and output data:

- Input: a file containing knowledge base, and user questions.
- Output: the system's answer, inferred from the question on the basis of existing knowledge
- The syntax for representing the predicate is similar to the syntax of Prolog (students can change it if necessary but must specify the graph)

Verify the results of the self-installation system with the results of Prolog in two cases:

- The family tree of the British Royal Family
- Self-collected knowledge base above

2 Notice

- Each group has 3 - 4 members.

- Besides the above requirements, the report must also give the following information:
  - Estimating the degree of completion level for each requirement.
  - References (if any)
- Any plagiarism, any tricks, or any lie will have a zero score for the COURSE grade