

To run: Install PyKE from <http://pyke.sourceforge.net> and use python3 to run driver.py

An overview of your project, including your motivation for tackling it and how you scoped it.

Our project is a inference based implementation of 20 questions, where the human player picks a person and our system guesses that system and asks the least amount of questions possible. Given a knowledge base of facts and a set of rules, our driver uses forward chaining to iterate through all the possible ways to describe the people in the knowledge base and then decide the best questions to ask.

Our motivation for our project was we wanted to build something that was both fun to play and we would learn from building. We initially setting on the game “Guess Who” but realized that a game that featured the computer playing a human offered a better opportunity to implement, build and learn about inferences and knowledge representation rather than just representation in a game that had two human playing each other. We originally scoped the project as world leaders so we could have facts relating both to the actual leaders, who the human player choose, but also nations which gave us a good opportunity for our driver to infer facts about leaders from the nations they lead. Later we added celebrities to expand the appeal of the game for potential players.

A description of what you built. What reasoner did you use, what knowledge representation resources did you use? What did you get off the shelf, and what did you build?

We settled on the PyKE python knowledge engine as it fit our project well, it allowed us to define text files of LISP like facts and rules and then reason about these facts and rules in python. Python worked well for us as it was easy to use git to collaborate as a group and we had a better idea of how to an implement entropy calculator, other decision tree like features and collect user answers for our game in Python.

The PyKE engine (<http://pyke.sourceforge.net>) came off the shelf and provided us a reasoning engine, from which we used the forward chaining engine. Our group built the driver which uses the forward chaining engine to iterate through all possible ways to describe the the people in the fact base and calculates the entropy (basically for each way to describe a person in the fact base, how close to 50% of the remaining people would using that description to ask the player a question eliminate) and then asks the best question, given the players previous answers, the facts and the rules.

Examples of your system in action, including screen shots and real output.

A discussion of how you evaluated your system’s performance – what are the relevant measures, and how did your system come out with regard to them?

Is this person male ? (Yes/No) yes
Is this person a world_leader ? (Yes/No) yes
Is this person's official title president ? (Yes/No) yes
Is this person a dictator ? (Yes/No) no
Is this person the ruler/leader of United_States ? (Yes/No) no
The person you are thinking of is Emmanuel_Macron

Note that:

- 1) Male is not a fact in the fact base, the driver inferred it because Macron was not defined as female.
- 2) Dictator is inferred by if a nation the free_elections attribute or not, and the driver responsible about the leader by knowing the nations they lead/rule.
- 3) Office title of "president" is inferred if a leader has no other title defined.

Is this person male ? (Yes/No) yes
Is this person a world_leader ? (Yes/No) yes
Is this person a dictator ? (Yes/No) yes
Is this person allies with Xi_Jinping ? (Yes/No) yes
Is this person the ruler/leader of Russia ? (Yes/No) yes
The person you are thinking of is Vladimir_Putin

Note that:

- 1) The allies with questions comes from nations being defined as allies in the fact base, the driver uses the rules to find leaders that are allied.

Our biggest metrics are does the system figure out the the player's choice in the shortest amount of questions and is the system able to reason new facts about the the people but combining other facts and rules. Our final system was able to fully accomplish both of these goals.

An evaluation of the project itself: What worked well, what didn't work well, and what might you have done differently.

Our system works well in its ability to use the rules to find questions that are better in the sense that they get them to an answer quicker than if it only used the given descriptions of the people in the fact base. So essentially the system ability to use forward chaining inference makes the system more efficient at its goal of guessing the people the player chose.

When design the system we found we were not able to remove things for the fact base. We would have liked to do that when a players answer eliminated a number of people from being the player's choice. For example when the system asked the player if the person is a dictator and the player answers no, we would have liked to actually change the fact base and remove

Putin, among other. This was not possible in PyKE so we ended up making a list of eliminated people in our driver and then filtering the results from the forward chainer.

In a parallel universe we would have possibly made a nice front end for the player.