Knowledge Representation and Engineering - Exercises

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Contents

1 Introduction and Concepts

Exercise 1 What is **data**? What is **information**? What is **knowledge**?

Data A raw value without context, it simply exists in its form (either usable or not)

Information Data + Meaning, it can change the perception of the receiver about something

Meanings The **five C's of Davenport & Prusak** describe what can give meaning to data

Contextualization Purpose of data

Categorization Classified or generalization to concepts

Calculation Mathematical or statistical analysis

Correction Removal of erros

Condensation Removal of unnecessary elements

Knowledge Information + "something", generalized to increase applicability. What is "something"?

- The **four C's of Davenport & Prusak** describe what "something" can be

Comparison Similarity to other contexts

Consequence Implication in decision taking

Connection Relationship with other information

Conversation Feedback of people

Tobin "something" * application

Exercises 2 Identify the underlined sentences of the following paragraphs as **data**, **information** or **knowledge**.

Exercise 3 Identify **know-what** and **know-how** knowledge

About the following exercises

- Exercises 2 and 3 are grouped together for convenience
- The paragraphs are already splitted into separate sentences for the same reason
- We adopt these conventions: `this is data` *this is its meaning*

Knowledge extracted from the sentence above

Know-what if the extracted knowledge can be interpreted as a fact

Know-how if the extracted knowledge can be interpreted as a rule

1.1 2a and 3a

1. This course of `Knowledge Representation and Engineering` *course name* is composed of `three` *number of* chapters: `Introduction and Concepts` *chapter name*, `Knowledge Representation` *chapter name*, and `Knowledge Engineering` *chapter name*.

   Knowledge Knowledge Representation and Engineering is a course

   Knowledge Knowledge Representation and Engineering is composed by three chapters

   Knowledge Introduction and Concepts is a chapter of Knowledge Representation and Engineering

   Knowledge Knowledge Representation Knowledge Representation and Engineering

   Knowledge Knowledge Engineering chapter Knowledge Representation and Engineering

   Know-what it's a fact

2. Its a `six`-credit *number of* course with `two` *number of* week hours for theory and `two` *number of* week hours for problems and practice.

   Knowledge Knowledge Representation and Endineering is a six-credit course

   Knowledge Knowledge Representation and Endineering has two week hours for theory

   Knowledge Knowledge Representation and Endineering has two week hours for problems and practice

   Know-what it's a fact

3. Like all the other subjects in the master, `half` *amount* of the practical hours will be off class.

   Knowledge Knowledge Representation and Endineering is a subject of the master

   Knowledge All the subjects in the master have half of the practical hours off class

   Know-how it's a fact

4. As the rest of subjects, KRE will be continuously evaluated.

   Knowledge All the subjects in the master are continouosly evaluated

   Know-what it's a fact

5. Continuous evaluation in KRE will consist of `two` *amount of* theoretical-practical tests, and `two` *amount of* practical work deliveries.

   Knowledge The continuous evaluation of Knowledge Representation and Endineering consists of two theoretical-practical tests, and two practical work deliveries

   Know-what it's a fact

6. The final mark will be calculated as `30%` *amount* of the results of each one of the theoretical tests and `20%` *amount* of each practical work.

   Knowledge The final mark of Knowledge Representation and Endineering is 30% of the results of each one of the theoretical tests and 20% amount of each practical work

   Know-how it's a rule

7. For second evaluation, there will be a single exam.

   Knowledge The second evaluation of Knowledge Representation and Endineering is a single exam

   Know-what it's a fact

1.2 2b and 3b

1. Computer `hardware` *part* equals the collection of `physical` *type of* elements that comprise a computer system.

   Knowledge computer hardware is the collection of physical elements that comprise a computer system

   Know-what it's a fact

2. Computer hardware refers to the `physical` *type of* parts or components of a computer such as `monitor` *part name*, `keyboard` *part name*, `hard drive disk` *component name*, `mouse` *part name*, `printers` *part name*, `graphic cards` *component*, `sound`

`cards` *component name*, memory *component name*, motherboard *component name* and chips *component name*, etc. all of which are `physical` *type of* objects that you can actually touch.

Knowledge computer hardware is a collection of physical elements that are parts~components of a computer system

Knowledge monitor, hard drive disk, mouse, printers, graphic cards, sound cards, memory, motherboard, chips are part of computer hardware

Know-what it's a fact

3. In contrast, `software` *part* is untouchable.

   Knowledge software is untouchable

   Know-what it's a fact

4. Software exists as `ideas` *part of*, `application` *part of*, `concepts` *part of*, and `symbols` *part of*, but it has no substance.

   Knowledge software made of ideas, application, concepts and symbols

   Knowledge software has no substance

   Know-what it's a fact

5. A combination of `hardware` *part* and `software` *part* forms a usable computing system.

   Knowledge a usable computing system is made by hardware and software

   Know-what it's a fact

1.3 2c and 3c

1. Primary care is the health care given by a `health care provider` *role*.

   Knowledge primary care is health care

   Knowlegde health care provider provides primary care

   Know-what it's a fact

2. Typically this provider acts as the principal point of consultation for `patients` *role* within a health care system and coordinates other `specialists` *role* that the patient may need.

   Knowledge health care provider is the principal consultant for patients

   Knowledge health care provider coordinates other specialists

   Know-what it's a fact

3. Such a professional can be a `primary care physician` *role*, such as a `general practitioner` *role* or `family physician` *role*, or depending on the locality, health system organization, and patient's discretion, they may see a `pharmacist` *role*, a `physician assistant` *role*, a `nurse practitioner` *role*, a `nurse` (such as in the `United Kingdom` *location)*, a `clinical officer` *role* (such as in `parts of Africa` *location*), or an Ayurvedic or other `traditional medicine professional` *role* (such as in `parts of Asia` *location*).

   Knowledge primary care physician can be a health care provider

   Knowledge general practitioner is a primary care physician

   Knowledge family physician is a primary care physician

   Knowledge pharmacist can be a health care provider

   Knowledge physician assistant can be a health care provider

   Knowledge nurse practitioner can be a health care provider

   Knowledge nurse can be a health care provider in United Kingdom

   Knowledge clinical officer can be a health care provider in parts of Africa

   Knowledge traditional medicine professional can be a health care provider in parts of Asia

   Know-how it's a rule, defining the process used to choose a primary care physician

4. A `patient-centered` *type of* primary care stores all the information about one patient in the different episodes of care (eoc).

   Knowledge patient-centered primary care stores all the information about one patient in the different episodes of care (eoc)

Know-what it's a fact

5. A `patient` *role* has a `name`, `sex` (M~W), `race`, and a `date of birth` *attributes of a patient.*

   Knowledge name, sex, race and date of birth are attributes of a patient

   Know-what it's a fact

6. An eoc contains the `date when episode was created` *attribute of an eoc*, and a `sequence of encounters` *attribute of an eoc* between the health care professional and the patient.

   Knowledge date of creation and sequence of encounters with patient are attributes of a eoc

   Know-what it's a fact

7. Each encounter has a `date` a `reference to the health care provider` and a `set of treatments` *attributes of an encounter.*

   Knowledge date, reference to health care provider, set of treatments are attributes of an encounter

   Know-what it's a fact

8. A treatment is composed of a set of findings *part of treatment* which are `textual` *type of* descriptions of the patient signs and symptoms (for example, `fever`, `high blood pressure`, `breast pain`, ...).

   Knowledge treatment has a set of findings

   Knowledge set of findings collects textual descriptions of signs and symptoms

   Knowledge fever, high blood pressure, breast pain are symptoms

   Know-what its' a fact

9. A treatment can have attached a `disease or set of diseases` *attribute of a treatment* that the patient is treated of, and a set of `medical actions` *attribute of a treatment* that can be of the sort: `pharmacological`, `test order`, `visit` (to provider such as a specialist), or `recommendation`.

   Knowledge treatment may have a set of diseases that the patient is treated of

   Knowledge treatment may have a set of medical actions

   Knowledge medical action can be pharmacological, test order, visit (to a specialist), or recommendation.

   Know-what it's a fact

1.4 2d and 3d

1. A chair is a raised surface used to sit on, commonly for use by `one` *number of* person.

   Knowledge chair is a raised surface used to sit on

   Knowledge chair is commonly used by one person at a time

   Know-what it's a fact

2. Chairs are most often supported by `four` *number of* legs and have a back; however, a chair can have `three` *number of* legs or could have a different shape.

   Knowledge chair is often supported by four legs and have a back

   Knowledge chair can vary in shape and number of legs

   Know-what it's a fact

3. A chair without a back or arm rests is a `stool` *type of chair*, or when raised up, a `bar stool` *type of chair.*

   Knowledge stool is a chair without a back

   Knowledge bar stool is a raised up stool

   Know-what it's a fact

4. A chair with arms is an `armchair` *type of chair* and with folding action and inclining footrest, a recliner.

   Knowledge amrchair is a chair with arms, folding action, inclining footrest, recliner

   Know-what it's a fact

5. A permanently fixed chair in a train or theater is a `seat` *type of chair* or, in an airplane, `airline seat` *type of chair*; when riding, it is a `saddle` *type of chair* and `bicycle saddle` *type of chair*, and for an automobile, a `car seat` *type of chair* or `infant car seat` *type of chair.*

Knowledge seat is a permanently fixed chair

Knowledge airline seat is a seat in an airplane

Knowledge saddle is a seat used to ride

Knowledge bicycle saddle is a saddle for a bike

Knowledge car seat is a seat in a car

Knowledge infant car sear is a seat in a car

Knowledge-what it's a fact, describing specific nomenclature for different scenarios

Knowledge-how it's a rule, describing the underlying logic naming logic for some of the scenarios

6. With wheels it is a `wheelchair` *type of chair* and when hung from above, a `swing` *type of chair*.

   Knowledge wheelchair is a chair with wheels

   Knowledge swing is a hung chair

   Know-what it's a fact

1.5 2e and 3e

1. The Nobel Prizes are `annual` *frequency* `international` *scope* awards bestowed by `Scandinavian committees` *awarder* in recognition of `cultural and scientific advances` *type of achievement*.

   Knowledge nobel prizes are annual

   Knowledge nobel prizes are international

   Knowledge nobel prizes are awarded by Scandinavian commitees

   Knowledge nobel prizes are awarded for cultural and scientific advances

   Know-what it's a fact

2. The will of the `Swedish` *nationality* `chemist` *qualification* `Alfred Nobel` *name*, the `inventor of dynamite` *achievement*, established the prizes in `1895` *year*.

   Knowledge Alfred Nobel is swedish

   Knowledge Alfred Nobel is a chemist

   Knowledge Alfred Nobel is the inventor of dynamite

   Knowledge Alfred Nobel established the nobel prizes in 1895

   Know-what it's a fact

3. The `2` *number of* prizes in `Physics`, `Chemistry`, `Physiology or Medicine`, `Literature`, and `Peace` were first awarded in `1901`.

   Knowledge Physics, Chemistry, Physiology or Medicine, Literature, and Peace are nobel prizes

   Knowledge Physics had 2 nobel prizes in 1901

   Know-fact it's a fact

4. The Peace Prize is awarded in `Oslo, Norway` *location*, while the other prizes are awarded in `Stockholm, Sweden` *location*.

   Knowledge Peace prize is awarded in Oslo, Norway

   Knowledge Physics, Chemistry, Physiology or Medicine, Literature are awarded in Stockholm, Sweden

   Know-what it's a fact

5. Each Nobel Prize is regarded as the `most prestigious` *level of recognition of* award in its field.

   Knowledge nobel prizes are the most prestigious award in their field

   Know-what it's a fact

6. In 1968, `Sveriges Riksbank` *name* instituted an award that is often associated with the Nobel prizes, the `Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel` *name of the prize*.

   Knowledge Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel is an award associated with the Nobel prizes

   Knowledge Sveriges Riksbank instituted the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel

   Know-what it's a fact

7. The first such prize was awarded in `1969` *date of awarding.*

   Knowledge Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel was awarded for the first time in 1969

   Know-what it's a fact

8. Although it is `not an official Nobel Prize` *relationship with Nobel prize*,its `announcements and presentations` *events shared with Nobel prizes* are made along with the other prizes.

   Knowledge Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel is not an official nobel prize

   Knowledge Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel shares announcements and presentations with nobel prizes

   Know-what it's a fact

9. `The Royal Swedish Academy of Sciences` *awarder name* awards the `Nobel Prize in Physics`, the `Nobel Prize in Chemistry`, and the `Nobel Memorial Prize in Economic Sciences` *names of prizes*

   Knowledge The Royal Swedish Academy of Sciences awards Nobel Prize in Physics, the Nobel Prize in Chemistry, and the Nobel Memorial Prize in Economic Sciences

   Know-what it's a fact

10. `The Nobel Assembly at Karolinska Institutet` *awarder name* awards the `Nobel Prize in Physiology or Medicine` *name of prize.*

    Knowledge The Nobel Assembly at Karolinska Institutet awards the Nobel Prize in Physiology or Medicine.

    Know-what it's a fact

11. `The Swedish Academy` *awarder name* grants the `Nobel Prize in Literature` *name of prize*

    Knowledge The Swedish Academy grants the Nobel Prize in Literature

12. The `Nobel Peace Prize` *name of prize* is not awarded by a Swedish organization but by the `Norwegian Nobel Committee` *awarder.*

    Knowledge The Nobel Peace Prize is awarded by the Norwegian Nobel Committee

    Know-what it's a fact

13. Each recipient, or laureate, receives a `gold medal`, a `diploma`, and a `sum of money` *prizes of the award* which depends on the Nobel Foundation's income that year.

    Knowledge the awarded of the nobel prize receives a gold medal, a diploma and a sum of money depending on the Nobel Foundation's income that year

    Know-what it's a fact

14. In `2011` *year*, each prize was worth `1.15 million` *prize value.*

    Knowledge the value of each noble prize was 1.15 million in 2011

    Know-what it's a fact

The whole text starting from sentence 9 and ending in sentence 12 may be also seen as a **Know-how** knowledge describing a rule deciciding who should be the awarder for a specific prize.

1.6 2f and 3f

1. A `stock market` *type of market* is a `public market` *type of market* for the trading of company stock (shares) and derivatives at an agreed price.

   Knowledge stock market is a public market

   Knowledge company stock (shares) and derivatives are traded in a stock market

   Know-what it's a fact

2. A `share` *type of unit* is a unit of account for various financial instruments including stocks, and investments.

   Knowledge a share is a unit of account used for financial instruments and investments

   Knowledge a stock is a financial instrument

Know-what it's a fact

3. On the other hand, a `derivative` *type of financial instrument* is a financial instrument that has a value, based on the expected future price movements of the asset to which it is linked.

   Knowledge a derivative is a financial instrument

   Knowledge the value of a derivative is based on the expected future price movements of the asset to which it is linked

   Know-what it's a fact

The whole text starting from sentence 2 and ending in sentence 3 may be also seen as a **Know-how** knowledge describing a rule to distinguish stock and derivatives.

1.7 2g and 3g

1. Engines can be classified into `internal` *type of combustion* and `external` *type of combustion* `combustion` *type of engine* engines.

   Knowledge combustion can be internal or external

   Knowledge combustion engines can be classified on their type of combustion

   Know-what it's a fact

2. `Internal combustion engines` (`ICE`) *type of engine* are engines in which the combustion of a fuel (substance) occurs with an oxidizer (substance) in a combustion chamber.

   Knowledge in ICE the combustion of fuel (substance) occurs with an oxidizer (substance) in a combustion chamber.

   Know-what it's a fact

3. On the contrary, in `external combustion engines` (`ECE`) *type of engine*, such as `steam engines` or `Stirling engines` *types of engines*, the energy is delivered to a working fluid (substance) different of a combustion product.

   Knowledge in ECE the energy is delivered to a working fluid (substance) different of a combustion product

   Knowledge steam engines are ECE

   Knowledge Stirling engines are ECE

   Know-what it's a fact

4. Working fluids can be `air`, `hot water`, or `pressurized water` *types of working fluids*.

   Knowledge air, hot water and pressurized water can be working fluids

The whole text starting from sentence 1 and ending in sentence 4 may be also seen as a **Know-how** knowledge describing a rule to distinguish between different kind of engines.

1.8 2h and 3h

1. `Chronic disease` *name of* treatment divides each disease in stages.

   Knowledge chronic diseas treatment divides each disease in stages

   Know-what it's a fact

2. Patients that have `one` *number of* `chronic disease` *type of* are classified in `one` *number of* of these stages.

   Knowledge a patient having a chronic diseases is classified in a disease's stage

   Know-what it's a fact

3. `General` *type of* practitioners base their decisions in the current stage of the patient and the time this patient has been in that stage.

   Knowledge a practitioner needs current stage and its duration to make a decision on a patient

   Know-what it's a fact

4. In general, a patient that is in a `mild-moderate dangerous` *type of* stage (`MDS`) *type of* is asked to modify his-her lifestyle (`diet, salt intake reduction, moderate exercise`) *types of*, if the patient has been in a MDS for a significant period, he~she is prescribed with `one` *number of* drug to `minimal` *amount of* dosage, while the patient is not improving the dosage is increased with fix increments.

Knowledge if patient is in MDS stage then ask to change lifestyle

Knowledge if patient is in MDS stage for a long time then prescribe minimal dose of a drug

Knowledge if patient is in MDS stage for a long time and he doesn't improve then increase dosage by fix increments

Know-how it's a rule, or better a procedure describing a sequence of steps dealing with multiple scenarios

5. If a `maximal` *amount of* dosage is reached, then a second drug to `minimal` *amount of* dosage is prescribed

   Knowledge if dosage is maximal then prescribe second drug at minimal dosage

   Know-how part of the previous procedure

6. Patients can reach treatments with `4` *number of* drugs

   Knowledge if dosage is maximal then prescribe second drug at minimal dosage

   Know-how can be seen as a part of the previous procedure

   Know-what or as a general fact

7. Patients that arrive in `highly dangerous` *type of* stage (`HDS`) *type of* are directly prescribed with `one` *number of* drug and recommended lifestyle changes.

   Know-what it's a rule

2 TODO Knowledge Representation

3 TODO Knowledge Engineering

4 TODO Knowledge Representation in the Web