

Project Assignment (Part I)

A health care centre is planning to store medical information in a new relational database that will organise all the data related to the encounters of patients with doctors in appointments and examinations. Patients are characterized by their name, date of birth, address and patient id (assigned by the health care centre upon registration).

Every doctor has a name and specialty and is identified by his/her registration number. Doctors can be technical specialists or clinical specialists (doctors of all the recognised specialties, such as cardiologists, orthopaedists, neurologists, etc., are in one of these groups). An appointment consists in a patient meeting with a clinical doctor at a certain office. As a result of the appointment, a clinical doctor may fill one or more requests for examination. For example, one examination may be related to a pain in the right foot, and another examination may be intended to monitor the heart condition. The date of each request is the same date of the appointment, and the request has a unique number.

A request for examination may comprise several studies. For example, an orthopaedist may request an X-Ray of both feet to check if there is any fracture, and also an echography of the right foot to observe if there is some inflammation. Each study has a date and a description (e.g. "X-ray both feet", "echography right foot"). A study is performed by a technical specialist using a certain equipment. An equipment has manufacturer, model and manufacturer's serial number. Each study collects one or more series of data; each series has a unique id and a name (e.g. "X-ray left foot", "X-ray right foot"). A series may contain multiple elements with a sequential index. For example, an X-Ray series consists of one or more images captured at different angles; each of these images is called an element of the series. A study could also be an MRI scan, in which the series would contain all of the collected images from the different slices. Or, in an ECG, where several electrodes measure heart voltages at different points, each electrode captures a signal, and each signal corresponds to an element of the ECG series.

The raw data of these elements (i.e. images or signals) are stored as files outside the database, and are referenced by an URL. The URL of an element is calculated from a base URL assigned to the series and the index of the element. When a series is collected, the technical specialist may annotate regions of interest in one of more of its elements (for instance, a fracture zone in an X-ray, or an arrhythmia interval in an ECG). If the element is an image, the region is a rectangle defined by two (x, y) points in normalized coordinates (i.e. both x and y in the range $[0.0, 1.0]$). For signal elements, the region is described by a pair (t_1, t_2) also in the range $[0.0, 1.0]$.

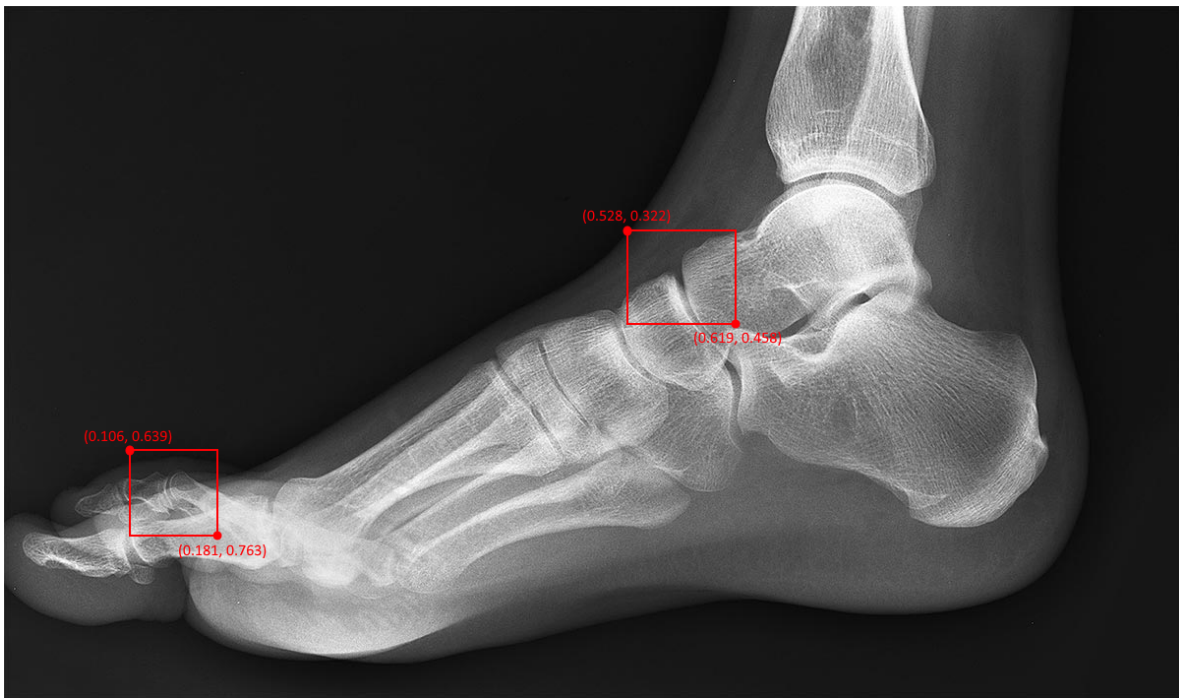


Figure 1. X-ray with annotated regions

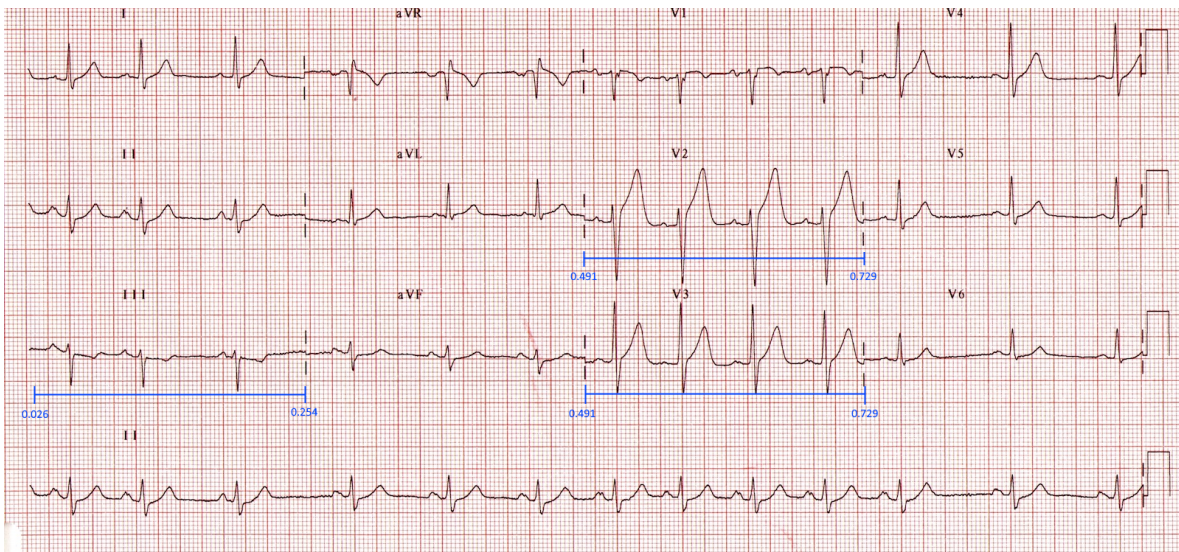


Figure 2. ECG with annotated regions

Expected Results

The report of your group must include two main results:

1. An E-R model describing your proposed database design. Every design decision that can be captured in the E-R model should be represented in the diagram. The E-R notation should be the same as in the slides for this course. You may use a diagram editor, such as *Dia*, to draw the final E-R model.¹
2. The relational model that is obtained by converting the E-R diagram into a set of tables. Please follow the conversion rules as explained in the slides for this course. To represent the relational model, use the following notation:

$$\begin{aligned} &table_1(\underline{column_1}, column_2, column_3, column_4, \dots) \\ &\quad column_2 : FK(table_2) \\ &\quad column_3, column_4 : FK(table_3) \\ &\quad \dots \end{aligned}$$

where $column_1$ is underlined because it is the primary key, and $column_2$ is a foreign key to $table_2$.

Submission Notes

The project report should be submitted to Fénix as a single PDF file.² Please check that the file is readable with a standard program such as Adobe Reader.

The document cover page should mention the names, student numbers, and group number of its authors.

If possible, the E-R diagram should be presented on a single page, and the relational model also on a single separate page.

The deadline for submission is Wednesday, October 26 2016 23:59 (Fénix time). According to Murphy's law, Fénix may have a downtime, and there might be peaks of activity that render the system unusable when the deadline approaches. Do not leave the submission to the last minute; ensure that the project is delivered properly and in a timely fashion.

¹ *Dia* is available for Linux, Mac, and Windows. See: <http://dia-installer.de/>

² In most word processors, there is a menu option such as: File | Save as... PDF (*.pdf). In *Dia*, you can export a diagram as an image (File | Export...) and then insert the image into a document.