Proposed database for the storage and analysis of digital mammograms in Costa Rica

Database model documentation

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1. Model details

Model name:

Proposed database for the storage and analysis of digital mammograms in Costa Rica

Version:

2.3

Database engine:

PostgreSQL

Description:

2. Tables

2.1. Table Patient

Description:

This table stores basic patient information inspired by the DICOM standard.

2.1.1. Columns

Column name	Type	Properties	Description
uuid	uuid	PK	Universally unique identifier of the patient in the database.
given_name	varchar(35)		The given name of the person.
family_name	varchar(35)		The family name of the person, usually the last name.
other_ids	jsonb	null	JSON array of alternate identifiers for the patient.
email	varchar(320)	null	Email address of the patient
address	jsonb		JSON object containing information about the region of the patient, for instance, country, state/province, city
sex	smallint		Sex of the patient, according to the ISO/IEC 5218: Codes for the representation of human sexes.
birthdate	date		Birthdate of the patient
created_at	timestamp		Date and time when the patient was created
updated_at	timestamp		Date and time when the patient was last updated
active	boolean		Defines whether the patient is active

2.2. Table Study

Description:

This table stores basic study information inspired by the DICOM standard.

2.2.1. Columns

Column name	Type	Properties	Description
uuid	uuid	PK	Universally unique identifier of the study in the database.
patient_uuid	uuid		Reference to the uuid of the patient.
description	varchar(255)		Description or classification of the Study performed.
summary	jsonb	null	Stores information about the overall study and reporting information, for instance, the BI-RADS category
created_at	timestamp		Date and time when the study started
updated_at	timestamp		Date and time when the study was last updated
active	boolean		Defines whether the study is active
hospital_id	int		Hospital where the study started

2.3. Table Series

Description:

This table stores basic series information inspired by the DICOM standard.

2.3.1. Columns

Column name	Type	Properties	Description
uuid	uuid	PK	Universally unique identifier of the series in the database.
study_uuid	uuid		Reference to the uuid of the study.

laterality	char(1)	null	Laterality of (paired) body part examined. Required if the body part examined is a paired structure. R = right, L = left
description	varchar(255)		User provided description of the Series
body_part	varchar(35)		Text description of the part of the body examined
created_at	timestamp		Date and time when the series started
updated_at	timestamp		Date and time when the series was last updated
active	boolean		Defines whether the study is active
hospital_id	int		Hospital where the series were captured

2.4. Table Instance

Description:

This table stores basic instance/image information inspired by the DICOM standard.

2.4.1. Columns

Column name	Type	Properties	Description
uuid	uuid	PK	Universally unique identifier of the instance in the database.
series_uuid	uuid		Reference to the uuid of the series.
comment	text	null	
original	boolean		Describes whether an image pixel values were based on source data or have been derived in some manner from the pixel value of one or more other images

image	pgcv_core.ndarray_int4		The datatype containing the image data. Refer to the pgcv PostgreSQL extension.
created_at	timestamp		Datetime the image pixel data creation started.
updated_at	timestamp		Datetime the image pixel data was last updated
active	boolean		Defines whether an instance is active

2.5. Table Region

Description:

This table stores information about the regions found in an image using a segmentation method

2.5.1. Columns

Column name	Type	Properties	Description
instance_uuid	uuid	PK	Reference to the uuid of the instance.
method	varchar(70)	PK	Method used to extract the region properties. This allows for different segmentation functions
props	pgcv_core.regionprops	PK	The datatype containing properties of the region. Refer to the pgcv PostgreSQL extension.
category	varchar(70)	null	Class of region according to a classifier
created_at	timestamp		Datetime the region information was extracted from the image
updated_at	timestamp		Datetime the region was last updated
active	boolean		Defines whether the region is active

2.6. Table Hospital

Description:

Table that stores information about the hospitals

2.6.1. Columns

Column name	Type	Properties	Description
id	serial	PK	The hospital identifier and primary key
type	varchar(20)		The type of hospital. In Costa Rica, there are 6 types of hospitals
director	varchar(70)		The name of the hospital's director
tel_central	varchar(15)		Telephonic central of the hospital
tels	varchar[]		Telephone numbers of the hospital
location_id	int		The identifier of the hospital location tuple

2.7. Table Location

Description:

Location information of the hospitals

2.7.1. Columns

Column name	Type	Properties	Description
id	serial	PK	The identifier of each location tuple
state	varchar(35)		The state/province where the hospital is located
address	varchar(100)		The given street address of the hospital
lat_lng	decimal(9,6)[2]		A latitude and longitude tuple indicating the hospital's coordinates

2.8. Table Services

Description:

Services of the hospitals

2.8.1. Columns

Column name	Type	Properties	Description
id	serial	PK	The identifier of the service
service_area	varchar(35)		The service area that includes particular services
service_name	varchar(70)		The given service name

2.9. Table Offers

Description:

Relationship that stores which services are offered by which hospitals

2.9.1. Columns

Column name	Type	Properties	Description
hospital_id	int	PK	Identifier of the hospital that offers the service
services_id	int	PK	Identifier of said service

2.10. Table Schedule

Description:

Attention schedules of each hospital

2.10.1. Columns

Column name	Type	Properties	Description
hospital_id	int	PK	Hospital referencing the schedule
category	varchar(35)	PK	Category of the schedule, e.g.: visits
name	varchar(70)	PK	Name of the schedule
when	jsonb		JSON array containing schedule objects. Each schedule objects contains a list of days and a time interval

2.11. Table Treats

Description:

Table that registers every-time a patient visits an hospital, meaning, everytime a patient is treated in a given hospital

2.11.1. Columns

Column name	Type	Properties	Description
patient_uuid	uuid	PK	The patient identifier
hospital_id	int	PK	The hospital identifier
visit_datetime	timestamp	PK	A timestamp of when the patient was treated

3. Views

3.1. View instance_thumbnails

Description:

Materialized view of the Instance thumbnails. This view provides access to the data URIs of each Instance

SQL:

```
SELECT
      uuid,
      series_uuid,
      pgcv_core.thumbnail_uri_base64(image) AS thumbnail_uri,
      created_at
FROM med_img.Instance
WHERE active = true;
```

3.1.1. Columns

Column name	Type	Properties	Description
uuid	uuid		Universally unique identifier of the instance in the database.
series_uuid	uuid		Reference to the uuid of the series.
thumbnail_uri	varchar		Data URIs of the thumbnail of each Instance
created_at	timestamp		Datetime the Instance was created

4. References

4.1. Reference Study_Patient

Patient	0..*	Study
uuid	<->	patient_uuid

4.2. Reference Series_Study

Study	0..*	Series
uuid	<->	study_uuid

4.3. Reference Image_Series

Series	0..*	Instance
uuid	<->	series_uuid

4.4. Reference Region_Instance

Instance	0..*	Region
uuid	<->	instance_uuid

4.5. Reference Hospital_Location

Location	0..*	Hospital
id	<->	location_id

4.6. Reference Offers_Hospital

Hospital	0..*	Offers
id	<->	hospital_id

4.7. Reference Offers_Services

Services	0..*	Offers
id	<->	services_id

4.8. Reference Schedule_Hospital

Hospital	0..*	Schedule
id	<->	hospital_id

4.9. Reference Study_Hospital

Hospital	0..*	Study
id	<->	hospital_id

4.10. Reference Series_Hospital

Hospital	0..*	Series
id	<->	hospital_id

4.11. Reference Treats_Patient

Patient	0..*	Treats
uuid	<->	patient_uuid

4.12. Reference Treats_Hospital

Hospital	0..*	Treats
id	<->	hospital_id

5. Areas

5.1. Derived from the DICOM data model subject area

5.1.1. Tables

- Patient
- Study
- Series
- Instance

5.1.2. References

- Study_Patient
- Series_Study
- Image_Series
- Region_Instance
- Hospital_Location
- Offers_Hospital
- Offers_Services
- Schedule_Hospital
- Study_Hospital
- Series_Hospital
- Treats_Patient
- Treats_Hospital

5.2. Adds analysis to a medical imaging database subject area

5.2.1. Tables

- Region

5.2.2. References

- Study_Patient
- Series_Study
- Image_Series
- Region_Instance
- Hospital_Location
- Offers_Hospital
- Offers_Services
- Schedule_Hospital
- Study_Hospital
- Series_Hospital
- Treats_Patient
- Treats_Hospital

5.3. Hospital Information subject area

5.3.1. Tables

- Hospital
- Location
- Services
- Offers
- Schedule
- Treats

5.3.2. References

- Study_Patient
- Series_Study
- Image_Series
- Region_Instance
- Hospital_Location
- Offers_Hospital
- Offers_Services
- Schedule_Hospital
- Study_Hospital
- Series_Hospital
- Treats_Patient
- Treats_Hospital

6. Notes

ISO/IEC 5218: Codes for the representation of human sexes

Not known ..... (0)
Male ..... (1)
Female ..... (2)
Not applicable . (9)