# Children's Lung X-ray Classification

## Data Dictionary

**Project Name**: Children's Lung X-ray Classification

**Data Used**: The dataset consists of X-ray images of children's lungs, sourced from various pediatric hospitals and publicly available medical imaging databases. Each image is labeled with the corresponding diagnosis (e.g., normal, pneumonia, other lung conditions).

**System/Vendors Used**:
- **Imaging Equipment**: Various X-ray machines from vendors such as GE Healthcare, Philips, and Siemens.
- **Data Storage**: AWS S3 for storing X-ray images and associated metadata.
- **Database**: PostgreSQL for storing structured data.
- **Machine Learning Framework**: TensorFlow and Keras for model training and classification.

**Tables**

1. **Patients**
   - **patient_id** (integer, Primary Key): Unique identifier for each patient.
   - **name** (varchar, 100): Name of the patient.
   - **age** (integer): Age of the patient.
   - **gender** (varchar, 10): Gender of the patient.
   - **diagnosis** (varchar, 100): Diagnosis result (e.g., normal, pneumonia, other lung conditions).

2. **XrayImages**

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- **image_id** (integer, Primary Key): Unique identifier for each X-ray image.
- **patient_id** (integer, Foreign Key): Identifier linking to the patient.
- **image_path** (varchar, 255): Path to the X-ray image file.
- **image_date** (date): Date when the X-ray image was taken.
- **classification_result** (varchar, 100): Result of the classification (e.g., normal, abnormal).

3. **ClassificationMetrics**

- **metric_id** (integer, Primary Key): Unique identifier for each metric record.
- **image_id** (integer, Foreign Key): Identifier linking to the X-ray image.
- **accuracy** (float): Accuracy of the classification for this image.
- **precision** (float): Precision of the classification for this image.
- **recall** (float): Recall of the classification for this image.
- **f1_score** (float): F1 score of the classification for this image.

**Relationships**

- **Patients** to **XrayImages**: One-to-Many (One patient can have multiple X-ray images).
- **XrayImages** to **ClassificationMetrics**: One-to-One (Each X-ray image has one set of classification metrics).

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**README**

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## Project Description

This project aims to classify X-ray images of children's lungs to detect various conditions such as pneumonia and other lung diseases. The classification is performed using a deep learning model trained on a dataset of labeled X-ray images.

## Installation Instructions

1. Clone the repository:

   ```bash
   git clone https://github.com/username/children-lung-xray-classification.git
   cd children-lung-xray-classification
   ```

2. Create a virtual environment and activate it:

   ```bash
   python -m venv venv
   source venv/bin/activate   # On Windows use `venv\Scripts\activate`
   ```

3. Install the required packages:

   ```bash
   pip install -r requirements.txt
   ```

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## Usage Instructions

1. Prepare your dataset of X-ray images and ensure it follows the structure specified in the data dictionary.

2. Train the model using the provided training script:

   ```bash
   python train_model.py --data_dir /path/to/dataset
   ```

3. To classify new X-ray images, use the classification script:

   ```bash
   python classify_images.py --image_dir /path/to/new/images
   ```

## Examples

Here's an example of how to classify a new set of X-ray images:

```bash
python classify_images.py --image_dir /path/to/new/images
```

## Contributors

- **John Doe** - Project Lead
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- **Alice Johnson** - Software Engineer

## License