

Case 2 – Pneumonia X-ray Images

Neural Networks for Machine Learning Applications

Spring 2023

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Pneumonia

([/njuːˈmoʊniə/ new-MOHN-ee-ə](#))

Pneumonia is an inflammatory condition of the lung primarily affecting the small air sacs known as alveoli.

Symptoms typically include some combination of productive or dry cough, chest pain, fever and difficulty breathing.

Pneumonia is usually caused by infection with viruses or bacteria, and less commonly by other microorganisms.

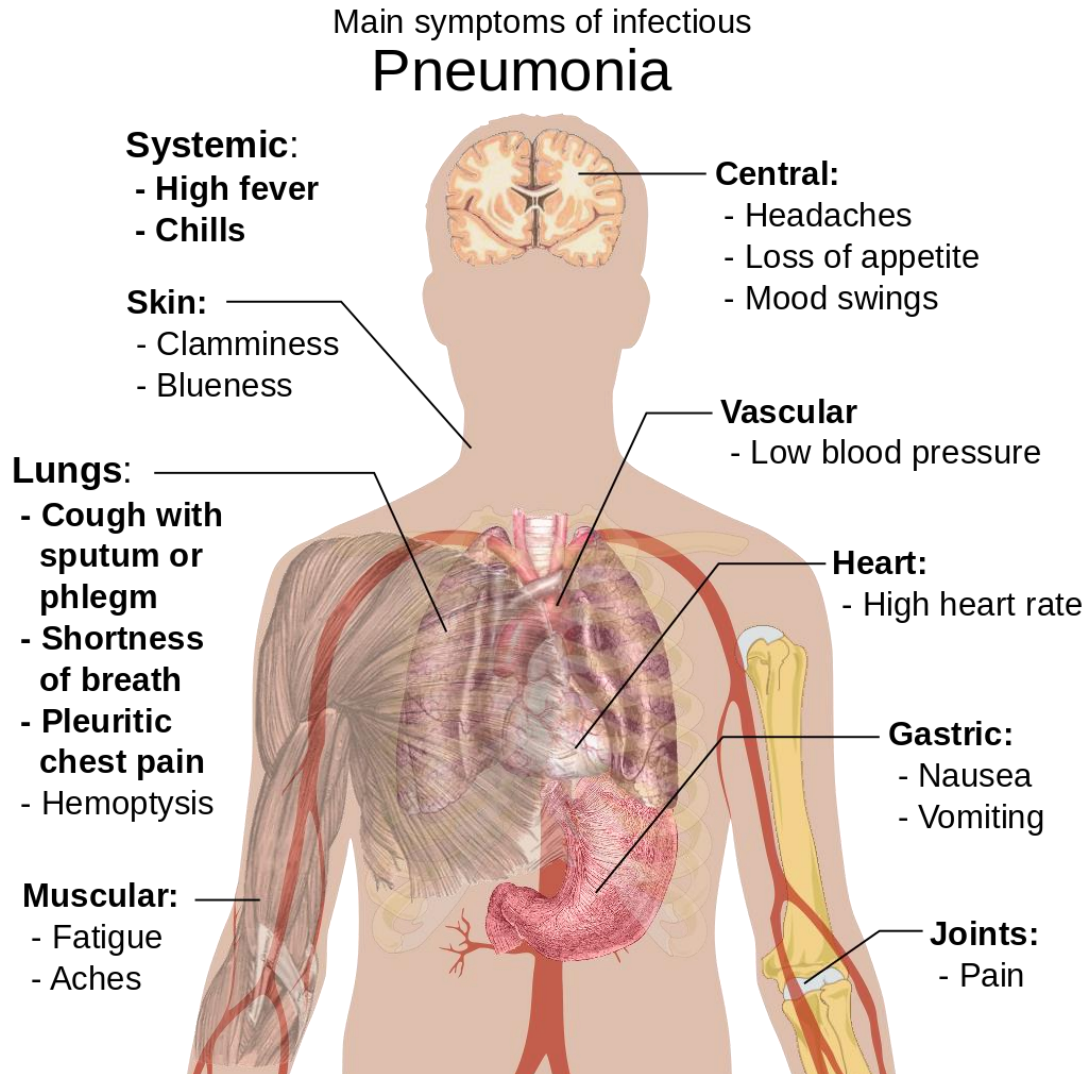
Diagnosis is often based on symptoms and physical examination. Chest X-rays, blood tests, and culture of the sputum may help confirm the diagnosis.

[Pneumonia \(Wikipedia\)](#)



[Chest X-ray](#) of a pneumonia caused by [influenza](#) and [Haemophilus influenzae](#), with patchy consolidations, mainly in the right upper lobe (arrow)

Signs and symptoms



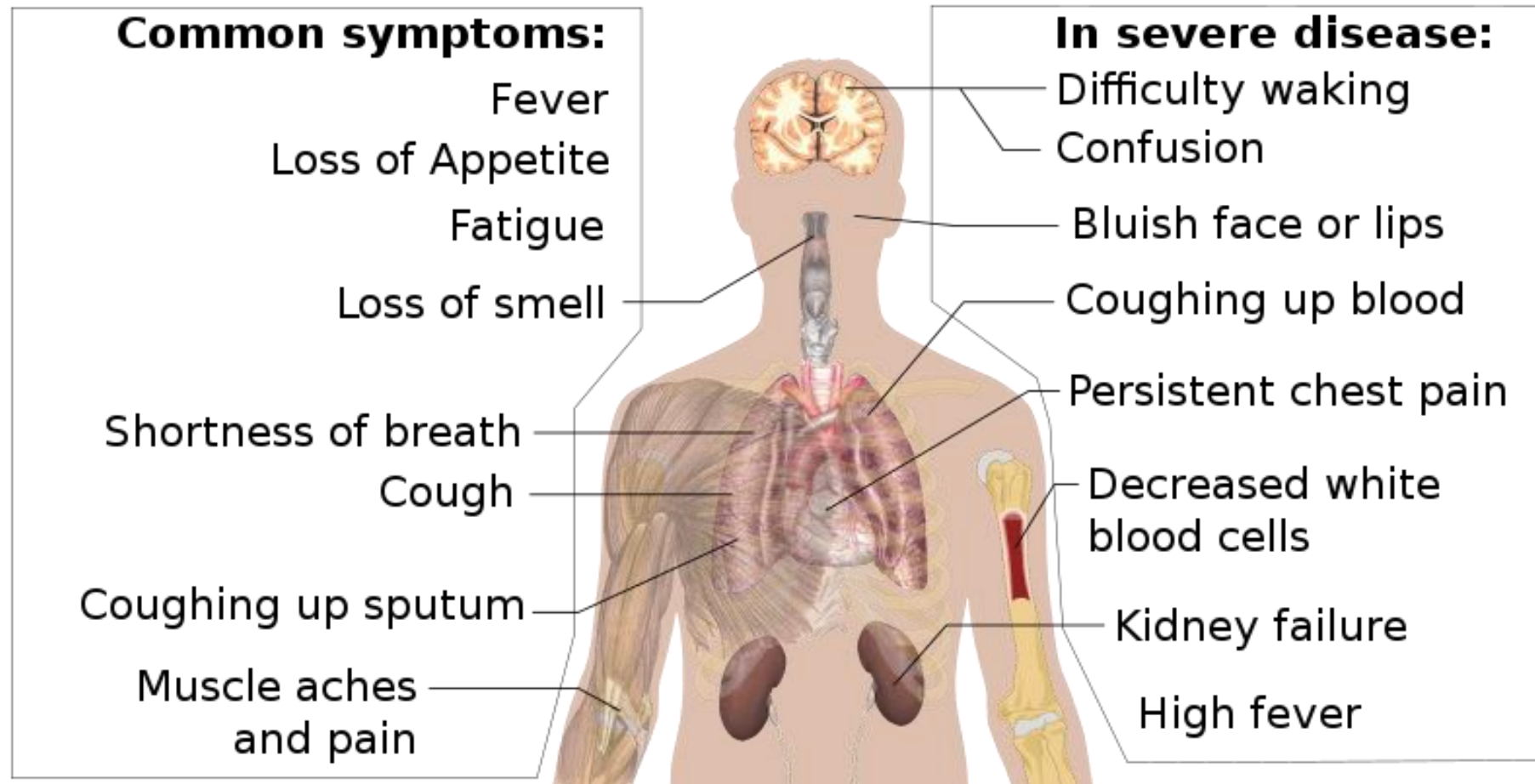
People with infectious pneumonia often have a productive cough, fever accompanied by shaking chills, shortness of breath, sharp or stabbing chest pain during deep breaths, and an increased rate of breathing.

In elderly people, confusion may be the most prominent sign.

Symptoms frequency ^[21]	
Symptom	Frequency
Cough	79–91%
Fatigue	90%
Fever	71–75%
Shortness of breath	67–75%
Sputum	60–65%
Chest pain	39–49%

[Pneumonia \(Wikipedia\)](#)

Covid 19 - Signs and symptoms



Why COVID-19 pneumonia lasts longer, causes more damage than typical pneumonia

COVID-19 pneumonia spreads like multiple wildfires, leaving destroyed lung tissue in its wake

January 11, 2021 | By Marla Paul



Bacteria or viruses like influenza that cause pneumonia can spread across large regions of the lung within hours. In the modern intensive care unit, these bacteria or viruses are usually controlled either by antibiotics or by the body's immune system within the first few days of the illness.

Trending

Northwestern Law to honor Kenyan judge

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<https://news.northwestern.edu/stories/2021/01/why-covid-19-pneumonia-worse-than-typical-pneumonia/>

Pneumonia detection in chest X-ray images using convolutional neural networks and transfer learning

Rachna Jain ^a, Preeti Nagrath ^a, Gaurav Kataria ^a, V. Sirish Kaushik ^a, D. Jude Hemanth ^b  

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<https://doi.org/10.1016/j.measurement.2020.108046>

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Highlights

- Deep learning-based pneumonia detection in x-ray images is done in this work.
- Different models of deep learning and transfer learning are analysed in this work for the image classification application.
- An extensive analysis is carried out in this work with several experimental results.

<https://www-sciencedirect-com.ezproxy.metropolia.fi/science/article/pii/S0263224120305844>

3.1. Dataset

The dataset used is available on Kaggle under the name “Chest X-Ray Images (Pneumonia).” This 1.16 GB dataset contains 5216 images for training and 624 images for testing. Images in this dataset are grayscale with the dimension of 64×64 . The dataset consists of three types of images - Normal, Bacterial Pneumonia, and Viral Pneumonia. The dataset is available on the following weblink: <https://www.kaggle.com/paultimothymooney/chest-xray-pneumonia>.



Fig. 2 consists of three images where a normal chest x-ray image shows no abnormal opacification in the lungs, lobar consolidation is exhibited in the x-ray images of the chest in case of Bacterial Pneumonia. More diffuse ‘interstitial’ pattern is observed in both the lungs of Viral Pneumonia patients. The chest x-ray images depicted above are of patients in the age group of one to five from Guangzhou Women and Children’s Medical Centre, Guangzhou.



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Fig. 2. Shows the “Chest X-Ray dataset (pneumonia), comprising of three types of images which are Normal, Bacterial Pneumonia, and Viral Pneumonia.

Labeled Optical Coherence Tomography (OCT) and Chest X-Ray Images for Classification




Published: 6 January 2018 | Version 2 | DOI: 10.17632/rscbjbr9sj.2
Contributors: Daniel Kermany, Kang Zhang, Michael Goldbaum

Description

Dataset of validated OCT and Chest X-Ray images described and analyzed in "Deep learning-based classification and referral of treatable human diseases". The OCT Images are split into a training set and a testing set of independent patients. OCT Images are labeled as (disease)-(randomized patient ID)-(image number by this patient) and split into 4 directories: CNV, DME, DRUSEN, and NORMAL.

Download All 6704 MB ⓘ

Files

-  ChestXRay2017.zip
-  code2017.zip
-  OCT2017.tar.gz



1 GB 

19 KB 

5 GB 



Dataset metrics

Usage	
Views:	133059
Downloads:	43175
Mentions	
News Mentions:	3
Social Media	
Tweets:	1

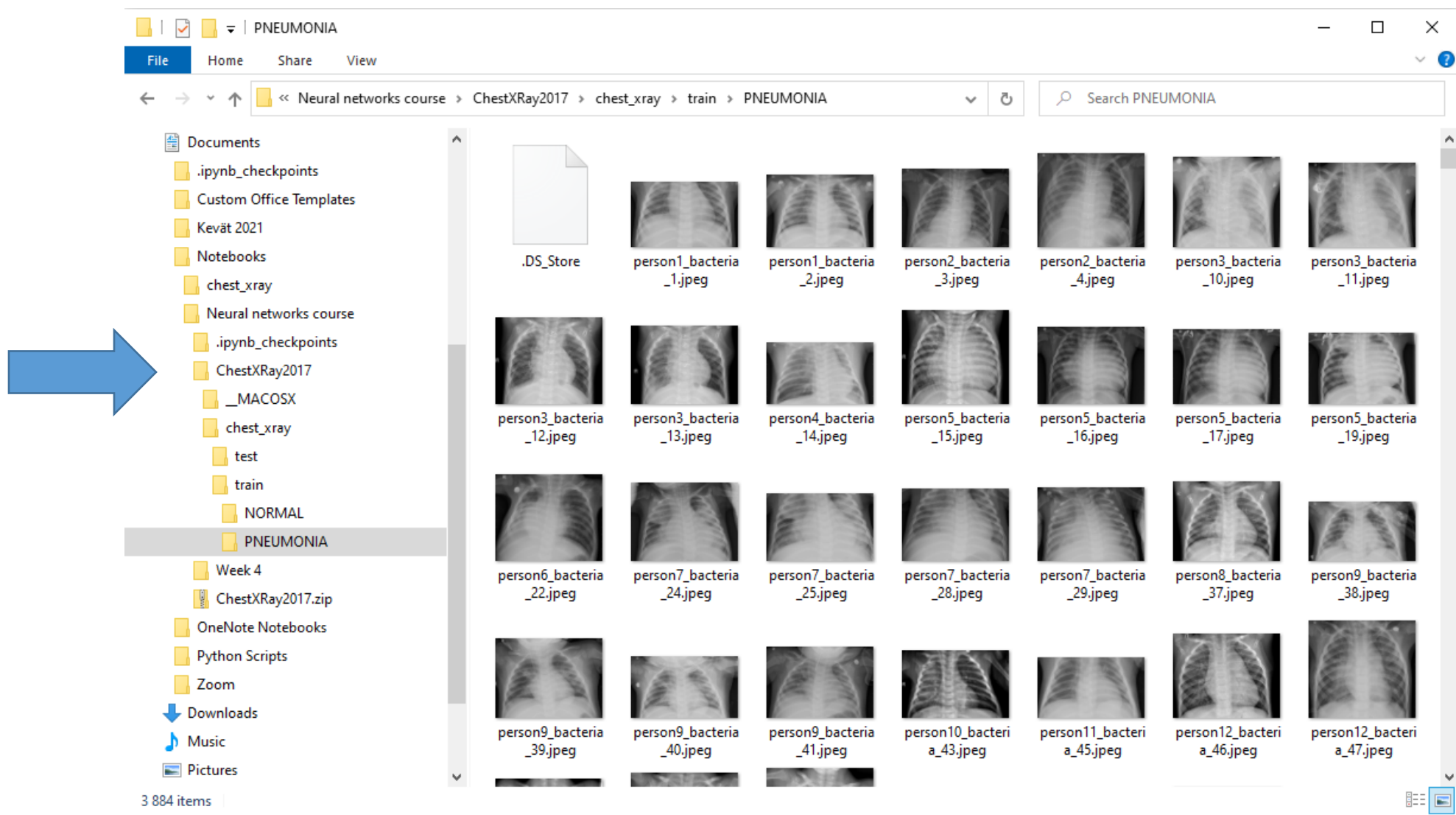
 [View details >](#)

Latest version

Version 3 1 June 2018

36
Citations

Extracted files and folders




Kaggle Dataset

Dataset

Chest X-Ray Images (Pneumonia)

5,863 images, 2 categories

 Paul Mooney • updated 3 years ago (Version 2)

Data

Tasks (1)

Notebooks (943)

Discussion (38)

Activity

Metadata

Download (2 GB)

New Notebook

Usability 7.5

License Other (specified in description)

Tags online communities, health, biology, image data, medicine

Description


Context

[http://www.cell.com/cell/fulltext/S0092-8674\(18\)30154-5](http://www.cell.com/cell/fulltext/S0092-8674(18)30154-5)

Normal

Bacterial Pneumonia

Viral Pneumonia



<https://www.kaggle.com/paultimothymooney/chest-xray-pneumonia>

Identifying Medical Diagnoses and Treatable Diseases by Image-Based Deep Learning

Daniel S. Kermany ¹⁴ • Michael Goldbaum ¹⁴ • Wenjia Cai ¹⁴ • ... M. Anthony Lewis • Huimin Xia •

Kang Zhang ¹⁵ • [Show all authors](#) • [Show footnotes](#)

[Open Archive](#) • DOI: <https://doi.org/10.1016/j.cell.2018.02.010> • [Check for updates](#)

Highlights

Summary

Graphical

Abstract

Keywords

Introduction

Results











Discussion


Highlights


- An artificial intelligence system using transfer learning techniques was developed
- It effectively classified images for macular degeneration and diabetic retinopathy
- It also accurately distinguished bacterial and viral pneumonia on chest X-rays
- This has potential for generalized high-impact application in biomedical imaging

[https://www.cell.com/cell/fulltext/S0092-8674\(18\)30154-5](https://www.cell.com/cell/fulltext/S0092-8674(18)30154-5)

Statistics of Case 2 Dataset





 Search




Chest X-Ray Images (Pneumonia)

[Data Card](#) [Code \(1777\)](#) [Discuss](#)

▲ 5474

[New Notebook](#) [Download \(2 GB\)](#)  

 **Activity Overview**

DATASET STATS

VIEWS	DOWNLOADS
1811412	205129
DOWNLOAD PER VIEW RATIO	TOTAL UNIQUE CONTRIBUTORS
0.11	1595

NOTEBOOKS STATS

NOTEBOOKS	NOTEBOOK COMMENTS
1777	1890
UPVOTE PER NOTEBOOK RATIO	NOTEBOOK UPVOTES
4.30	7645

Exercise

- Open [Case 2. Pneumonia X-ray image analysis \(Template\) | Kaggle](#)
 - Get familiar with [Chest X-Ray Images \(Pneumonia\) | Kaggle](#)
 - Try [Case 2. First trial | Kaggle](#)
 - Study [Brief Intro to CNNs | Kaggle](#)