




# XCOVID

Diagnóstico de COVID por  
classificador de rede neural de  
Raio-X pulmonar



# Sumário

- **Apresentação do Grupo**
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- **Rede Neural**
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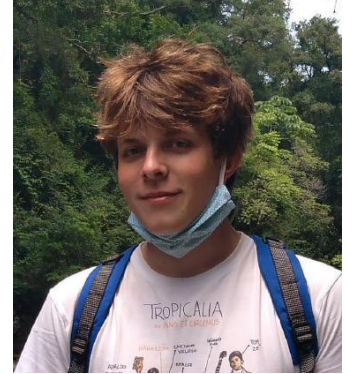
# Grupo



**Luís G. Cattelan**



**Mateus Guimarães**



**Marcos Tidball**



**GFC**  
Grupo de Física Computacional

# Motivação

PCR-RT é o principal meio de diagnóstico para COVID, entretanto:

- Caro
- Demorado
- Necessita de insumos especiais

# Motivação

O vírus ataca principalmente o sistema respiratório

Afeta o pulmão logo no início da infecção

**18%** dos casos não severos e **2,9%** dos severos não apresentam anomalia em exames de Raio-X

Ainda assim, estudos mostram que exames de Raio-X podem ser usado para diagnóstico de pacientes.

# Motivação

Qualidades do Raio-X pulmonar:

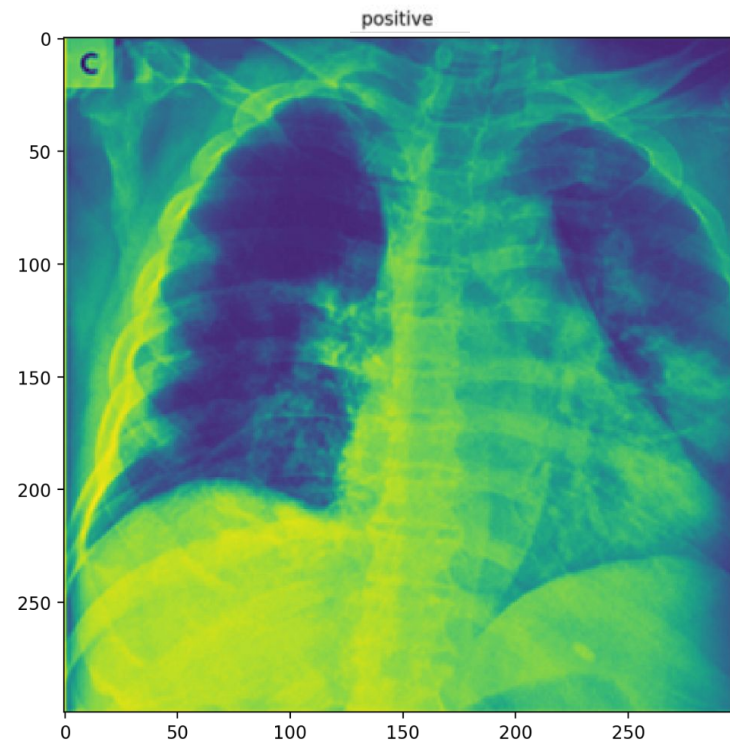
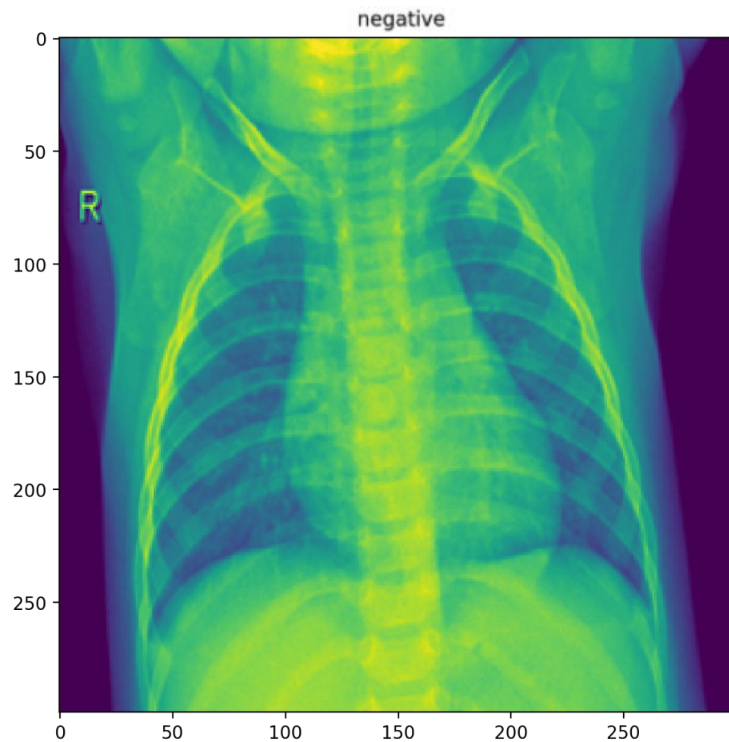
- Rapidez
- Disponibilidade

# Literatura

**Table 1** Related work summary

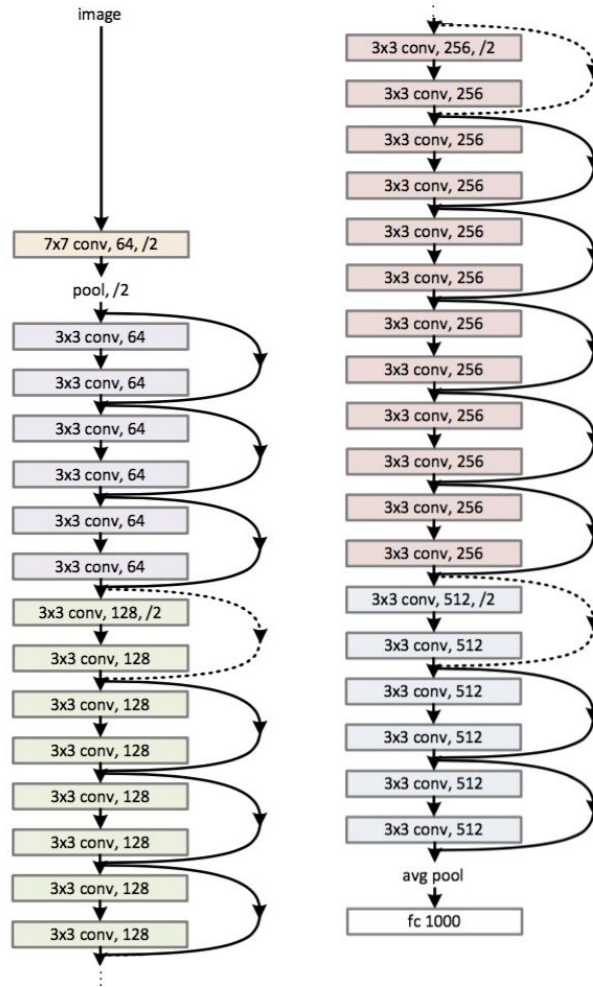
Related work	Technique	Dataset	Accuracy (%)
Wang et al. [21]	Inception transfer learning	Chest CT scan	85.2
Sethy et al. [32]	Deep learning	Chest X-ray images	95.38
Azemin et al. [20]	Deep learning	Chest X-ray images	71.9
Oh et al. [24]	Statistical method	Chest X-ray images	88.9
XCOVNet model	CNN	Chest X-ray images	98.44

# Rede Neural

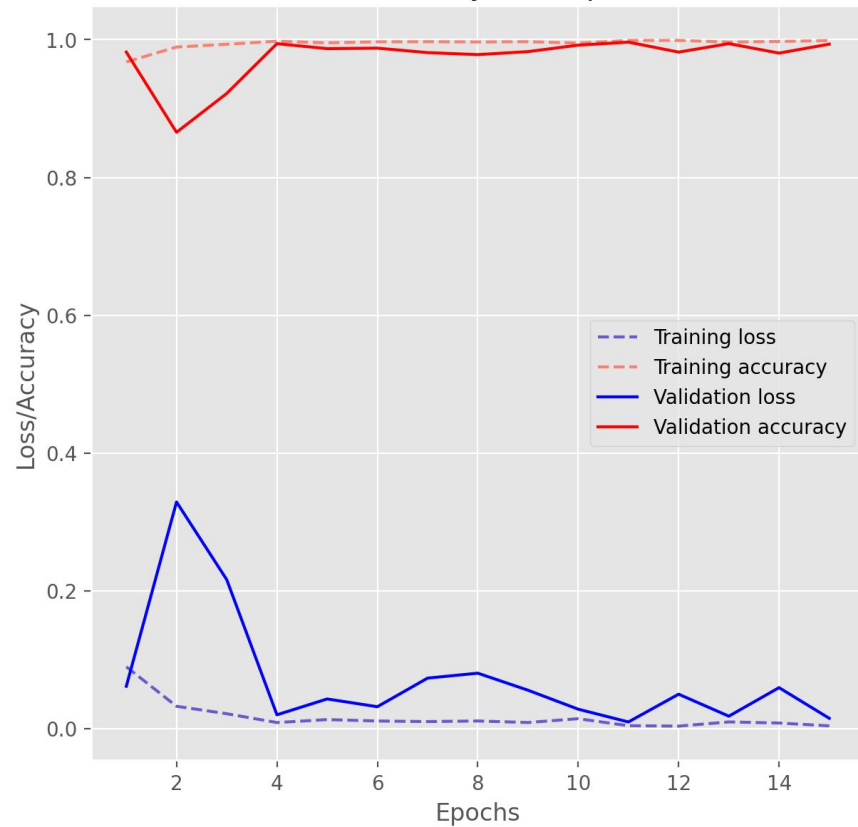




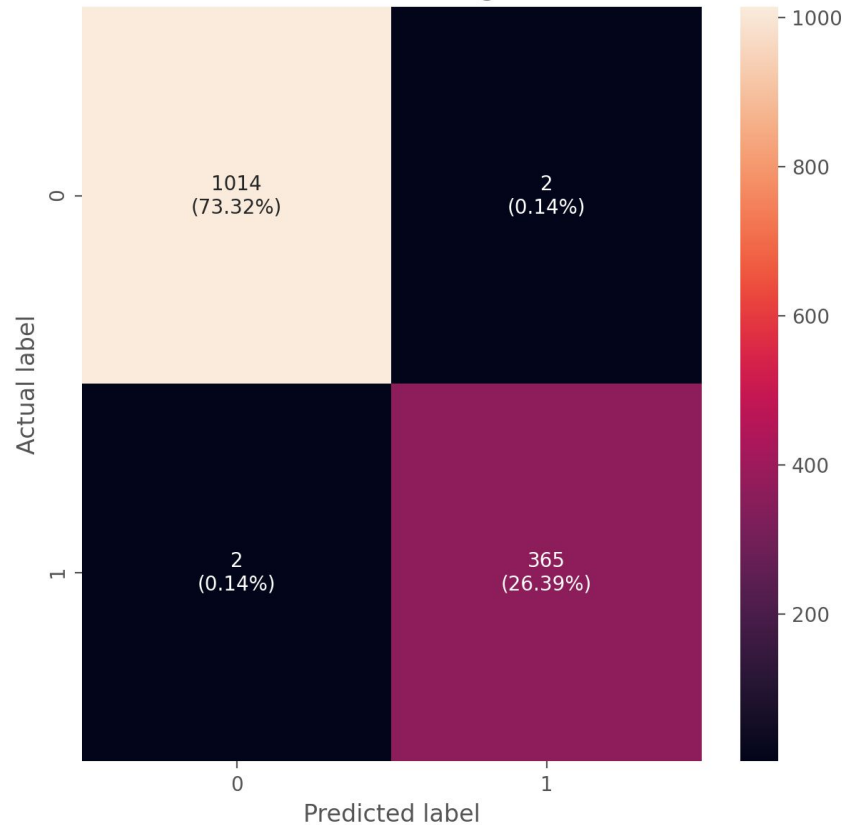
# 34-layer residual



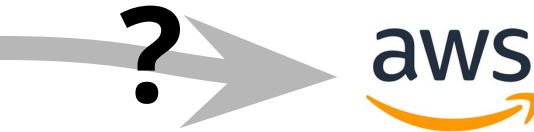
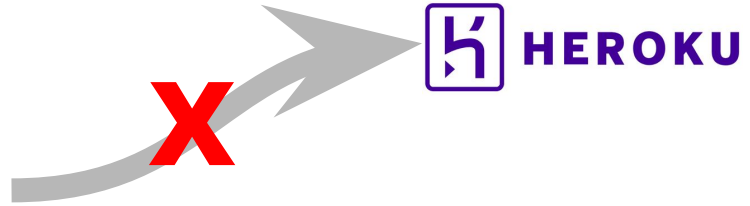
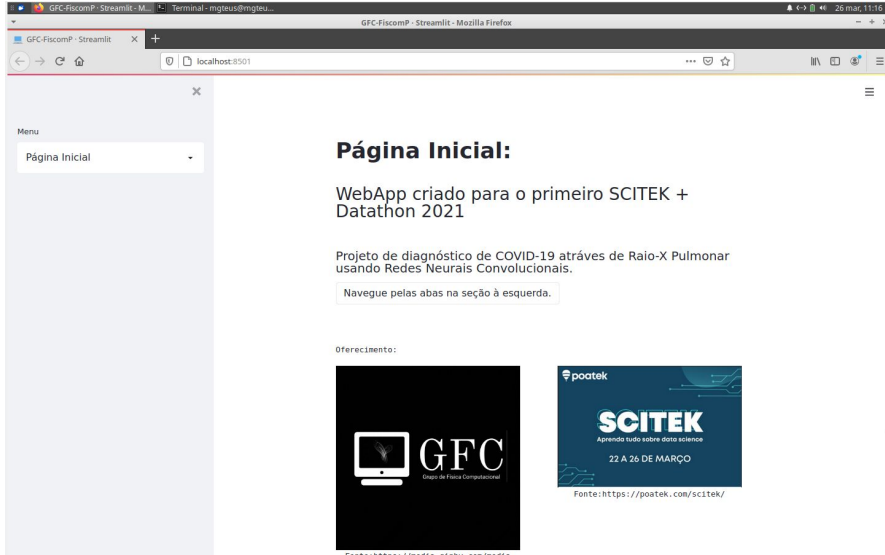
### Loss/Accuracy over Epochs



### Confusion matrix @0.50



# WebApp



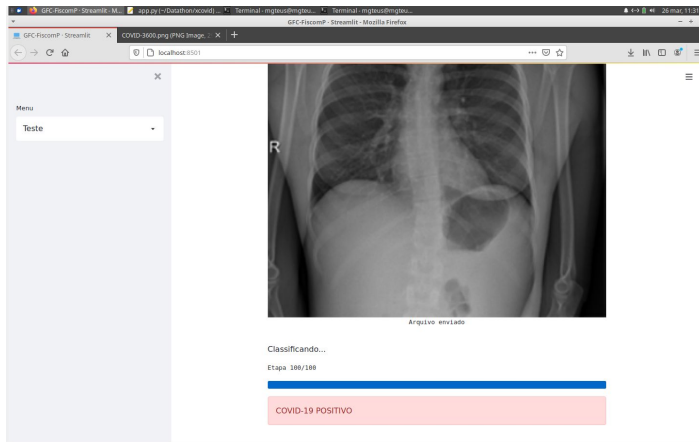


1.

```

40
41 elif choice == "Teste":
42     st.title("Classificação de imagens usando Redes Neurais Convolucionais")
43     st.header("Diagnóstico de COVID a partir de Raio-X pulmonar")
44     fueto = st.file_uploader("Envie aqui o raio-x:", type=["jpg", "png"])
45     bot = st.button("Enviar")
46     if fueto is not None:
47         image = Image.open(fueto)
48         st.image(image, caption="Arquivo enviado", use_column_width=True)
49         st.write("")
50         st.write("Classificando...")
51         latest_it = st.empty()
52         bar = st.progress(0)
53         for i in range(100):
54             latest_it.text(f'Etapa {i+1}/100')
55             bar.progress(i+1)
56             time.sleep(0.05)

```



2.

```

|x = predict(fueto)[0]
|if x == 0:
|    st.success("COVID-19 Negativo")
|else:
|    st.warning("COVID-19 Positivo")

```

```

22 def predict(image_path, save_path):
23     # load image
24     img = Image.open(image_path).convert('RGB')
25
26     # define transforms
27     t = transforms.Compose([transforms.ToTensor(), transforms.Resize(224),
28                             transforms.Normalize([0.485, 0.456, 0.406], [0.225, 0.224, 0.225])])
29
30     # apply transforms and turn image into batch
31     batch = torch.unsqueeze(t(img), 0)
32
33     # load model
34     model = load_model(save_path)
35
36     # predict
37     out = model(batch)
38     preds = torch.max(out, 1) # gives us the final label
39
40     with torch.no_grad(): # gives us a probability
41         prob = nn.functional.softmax(out, dim=1)[0] * 100
42
43     # define map
44     m = {0: 'COVID-19 Negativo', 1: 'COVID-19 Positivo'}

```

# Perspectivas futuras

- Melhorar a rede
- Mais classes (pneumonia, tuberculose...)
- Severidade da doença
- Colocar o site no ar

# Extra:

## XCOVID

In this project we created a transfer learning based COVID-19 lung x-ray classifier WebApp for the [Scitek - POATEK Datathon!](#)

In order to run it, just follow these instructions:

1. Clone the repository with `git clone https://github.com/gfc-fiscomp/xcovid.git`.
2. Get into the repository directory with `cd xcovid`.
3. Type `streamlit run app.py` on the terminal. A localhost instance should then open up in your browser! (note: the website is entirely in Brazilian Portuguese)

The model used for image classification is a ResNet50 pre-trained with ImageNet weights that was finetuned using the images provided in [this](#) dataset (given to us by the datathon organizers). In order to learn more about how the model was trained, check out the `rede.ipynb` file over [here](#). We had to deal with a very imbalanced dataset! The communication between the WebApp and the model is made possible by `call_model.py`, which can be seen over [here](#).

Here is the classifier's confusion matrix on test data:

<https://github.com/gfc-fiscomp/xcovid>

# Referências

- Apostolopoulos, I.D., Mpesiana, T.A.: COVID-19: automatic detection from X-ray images utilizing transfer learning with convolutional neural networks. *Phys. Eng. Sci. Med.* 43(2), 635–640 (2020)
- Azemin, C., Zulfaezal, M., Hassan, R., Tamrin, M., Izzuddin, M., Ali, M., Adli, M.: Covid-19 deep learning prediction model using publicly available radiologist-adjudicated chest x-ray images as training data: Preliminary findings. *Int. J. Biomed. Imaging* 2020, 8828855 (2020)
- Charmaine B., Jagpal G., David C., Benson A.B.. Deep learning system to screen coronavirus disease 2019 pneumonia. *Appl Intell*, pages 1–7 (2020) PMC7175452[pmcid]
- Sethy, P.K., Behera, S.K., Ratha, Pradyumna K., Biswas, P.: Detection of coronavirus disease (COVID-19) based on deep features and SVM. *Int. J. Math. Eng.. Manag. Sci.* 5(4), 643–651 (2020)
- Shuai W., Bo K., Jinlu M., Xianjun Z., Mingming X., Jia G., Mengjiao C., Jingyi Y., Yaodong L., Xiangfei M., Bo X.: A deep learning algorithm using CT images to screen for Corona Virus Disease (COVID-19). *medRxiv* (2020)
- Madaan, V., Roy, A., Gupta, C. et al. XCOVNet: Chest X-ray Image Classification for COVID-19 Early Detection Using Convolutional Neural Networks. *New Gener. Comput.* (2021).
- Oh, Y., Park, S., Ye, J.C.: Deep learning covid-19 features on cxr using limited training data sets. *IEEE Trans. Med. Imaging* 39(8), 2688–2700 (2020)
- Umer, M., Ashraf, I., Ullah, S. et al. COVINet: a convolutional neural network approach for predicting COVID-19 from chest X-ray images. *J Ambient Intell Human Comput* (2021).

[What does covid-19 do to your lungs?](#)

[What coronavirus does to the lungs.](#)



Menu

Página Inicial

## Página Inicial:

WebApp criado para o primeiro SCITEK +  
Datathon 2021

Projeto de diagnóstico de COVID-19 através de Raio-X Pulmonar  
usando Redes Neurais Convolucionais.

Navegue pelas abas na seção à esquerda.

Oferecimento:



Fonte: <https://media.giphy.com/media/4MXP8s6bSQC9LmMwme/giphy.gif>



Fonte: <https://poatek.com/scitek/>





Menu

Teste

# Classificação de imagens usando Redes Neurais Convolucionais

## Diagnóstico de COVID a partir de Raio-X pulmonar

Envie aqui o raio-x:



Drag and drop file here  
Limit 200MB per file • JPG, PNG

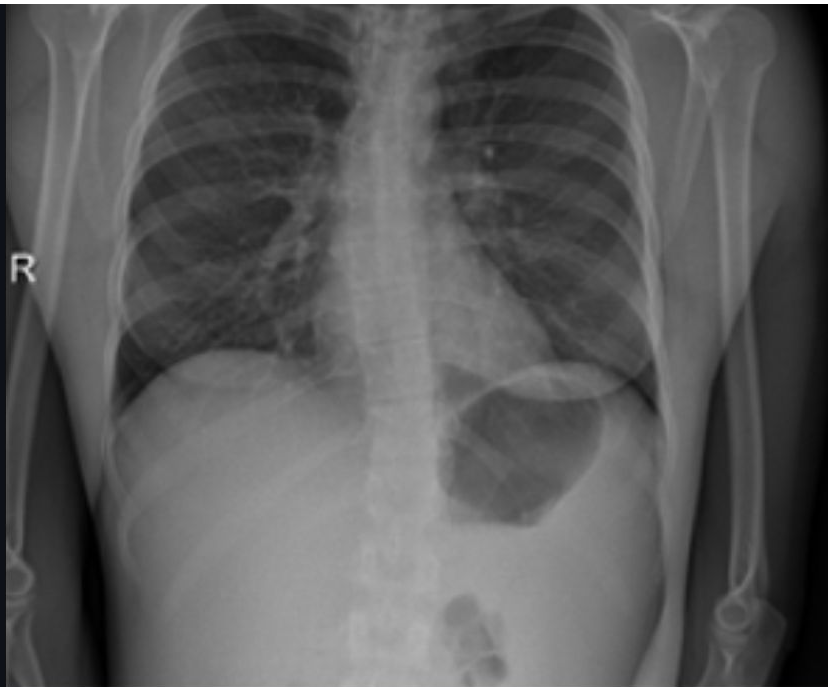
Browse files

Exame não enviado.



Menu

Teste



Arquivo enviado

Classificando...

Etapa 100/100

('COVID-19 Positivo', 99.9991455078125)



Menu

Sobre

## Sobre:

### Conheça o GFC:

Grupo de Física Computacional é um grupo de alunos de graduação em Física interessados na área de Física Computacional. Desenvolvem projetos, participam de competições e se reúnem semanalmente para discutir pesquisas e artigos.

#### GitHub:

Todos os arquivos usados no classificador quanto na produção e deploy do projeto estão disponíveis no nosso github.

<https://github.com/gfc-fiscomp/xcovid>

#### Email

Não hesite em mandar um email caso tenha alguma dúvida.

[gfc.fiscomp@gmail.com](mailto:gfc.fiscomp@gmail.com)