

AI assisted diagnosing: Predictive models for images

An introduction to when and how to apply
deep learning

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Machine Learning Engineer
LEO Innovation Lab



Practicalities

WiFi: leoilab-guest

Password: *****

Workshop ends 14:15 - *more AI on program later*





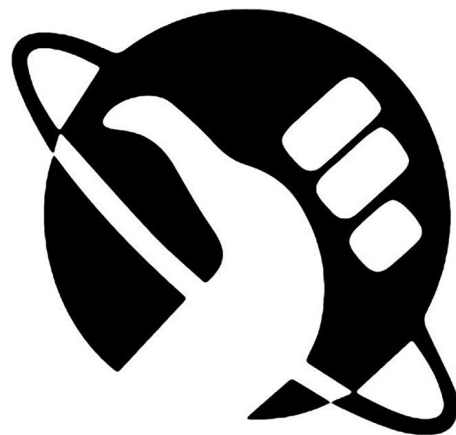
Overview

- Convolutional neural networks
- When are conditions right
- Transfer learning
- Work on examples

Basic introduction to CNNs

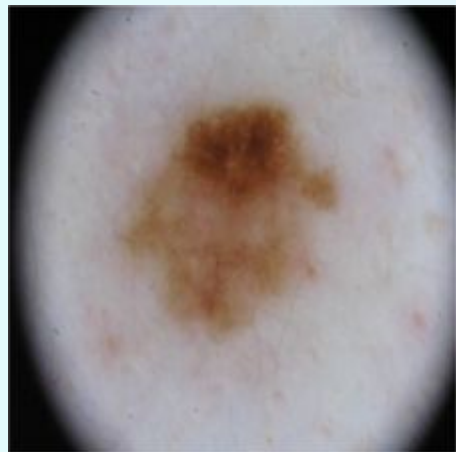
What are they

How do they learn



**DON'T
PANIC**

How convolutional neural networks work



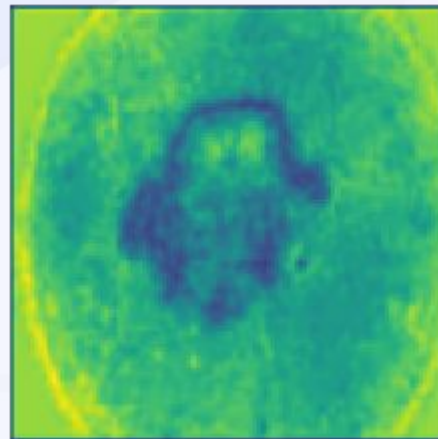
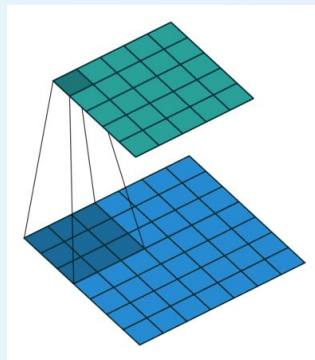
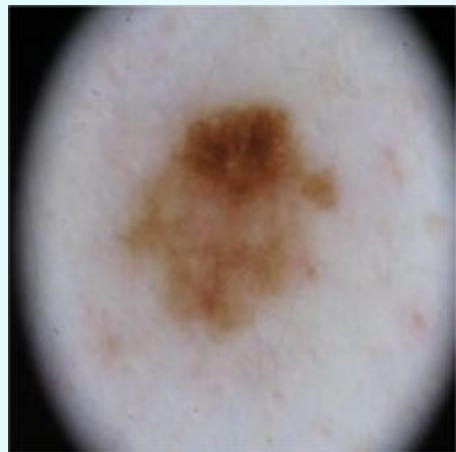
Malignant

Benign

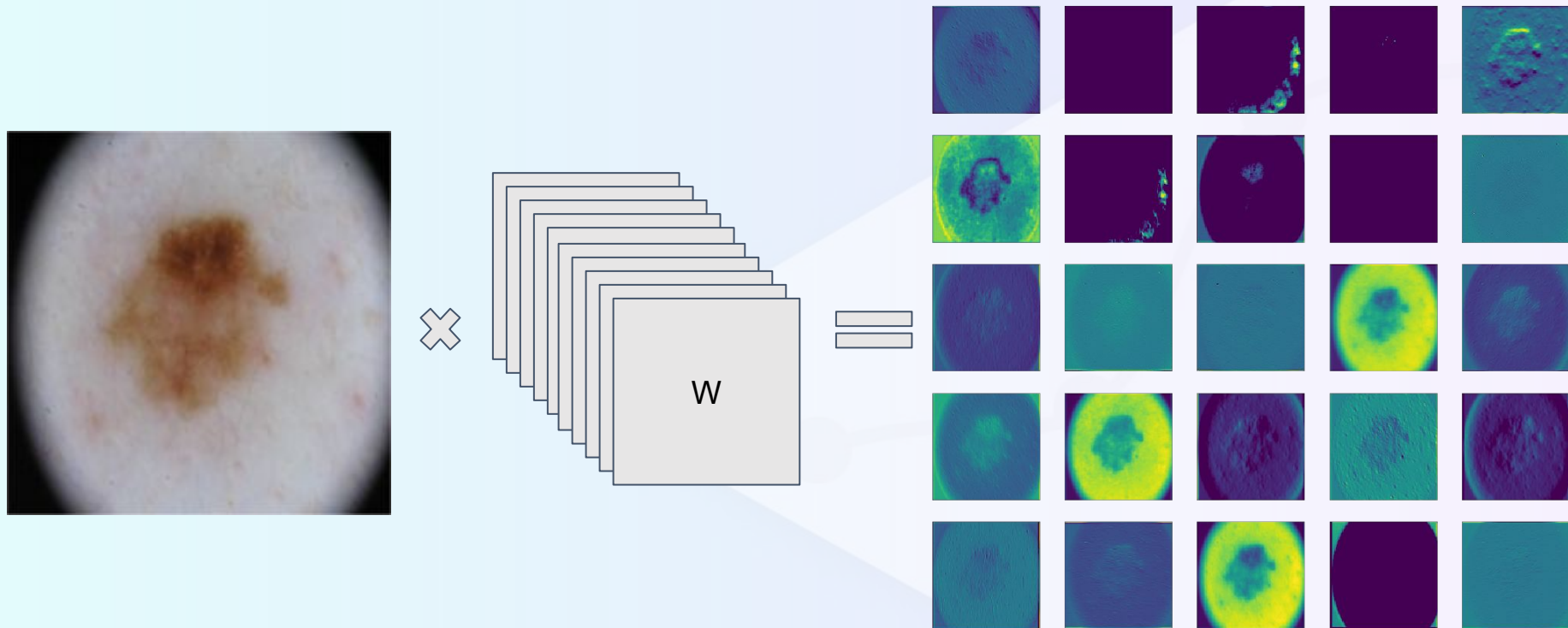
How convolutional neural networks work



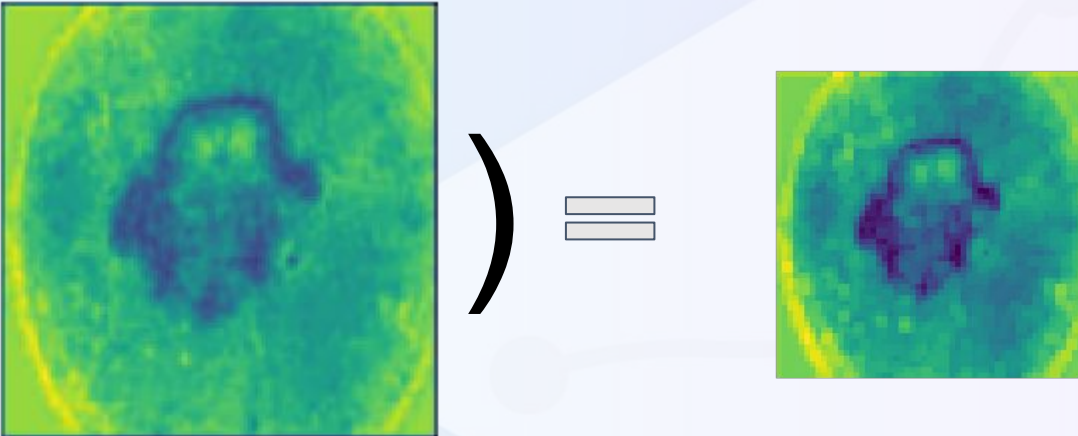
How convolutional neural networks work



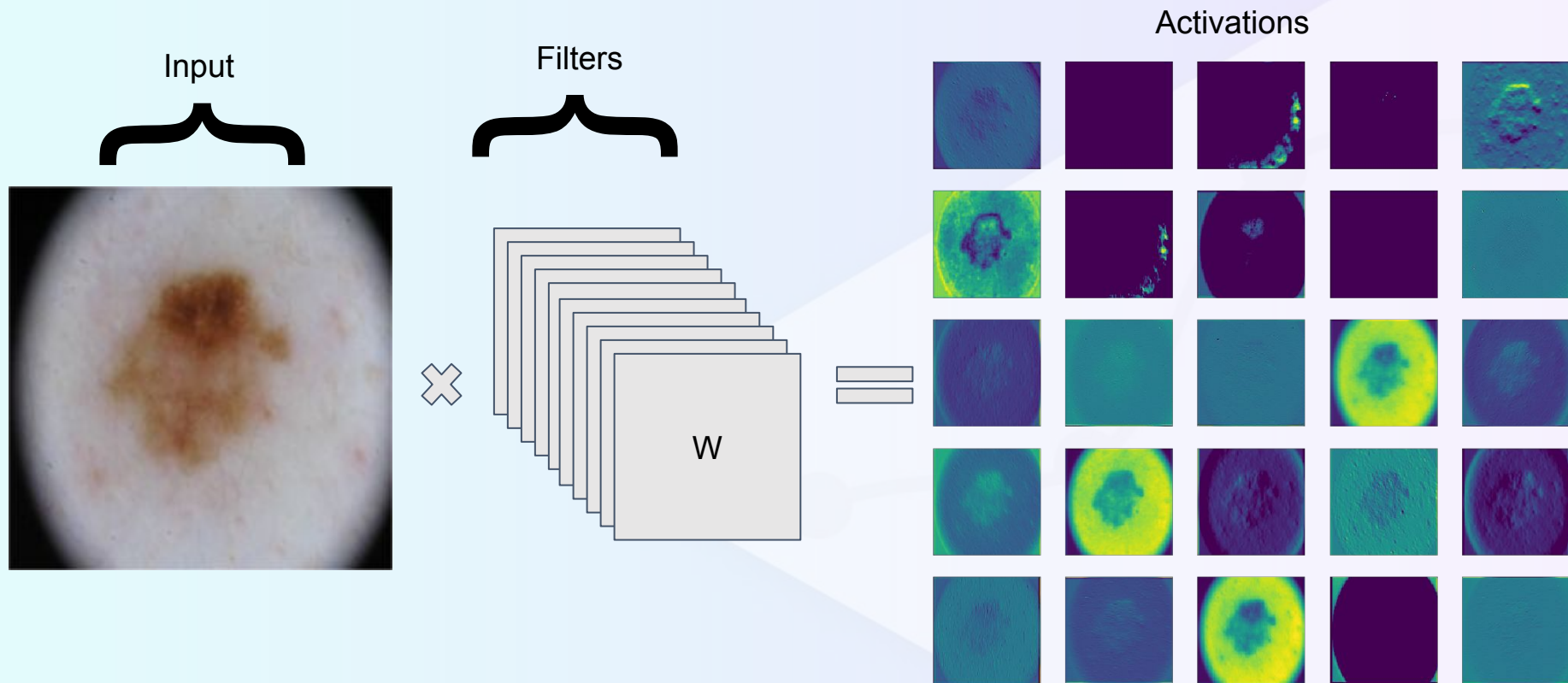
How convolutional neural networks work



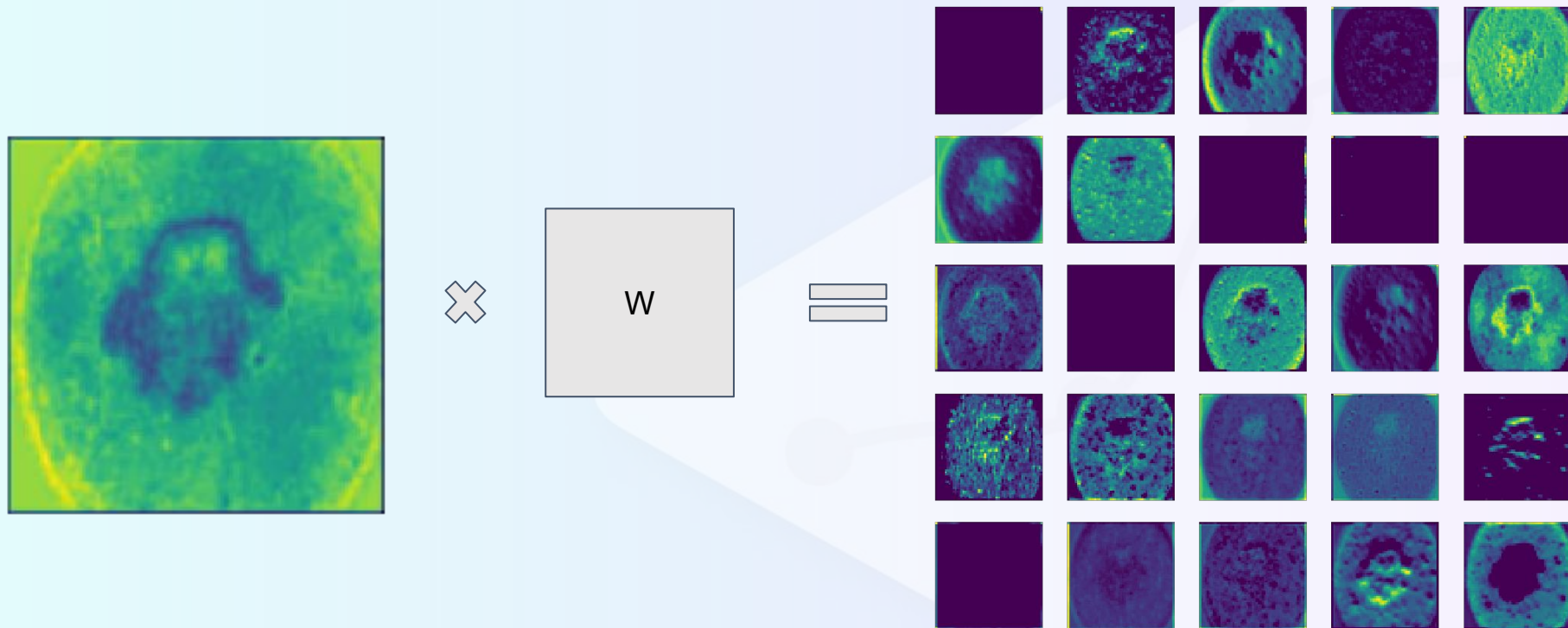
How convolutional neural networks work

$$\max(\text{[Heatmap of a car with a yellow circle]}) = \text{[Heatmap of a car with a yellow circle]}$$
The diagram illustrates the max operation in a convolutional neural network. It features a large heatmap on the left, which shows a car centered within a yellow circle. This heatmap is followed by a large closing parenthesis ')', an equals sign '=', and a smaller heatmap on the right. The smaller heatmap is a zoomed-in version of the central region of the larger heatmap, also showing the car and the yellow circle. The background of the slide is light blue with a faint, stylized network diagram on the right side.

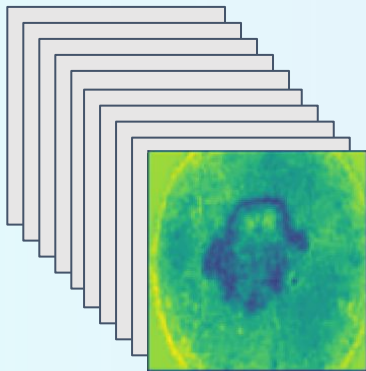
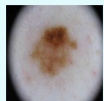
How convolutional neural networks work



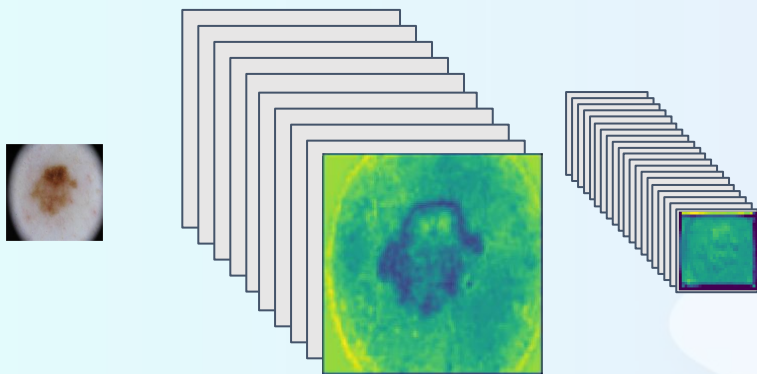
How convolutional neural networks work



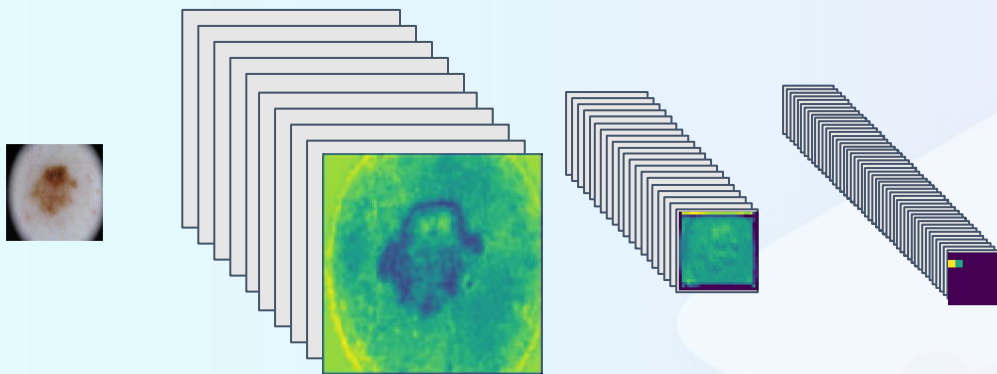
How convolutional neural networks work



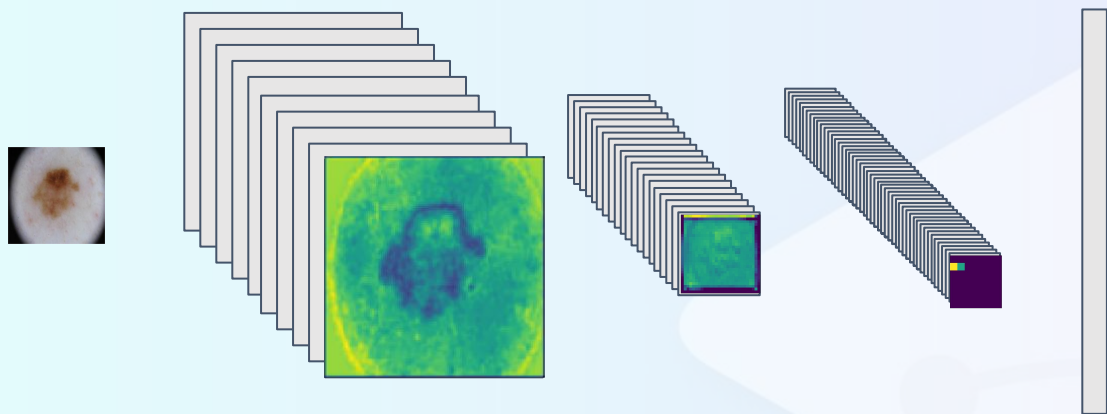
How convolutional neural networks work



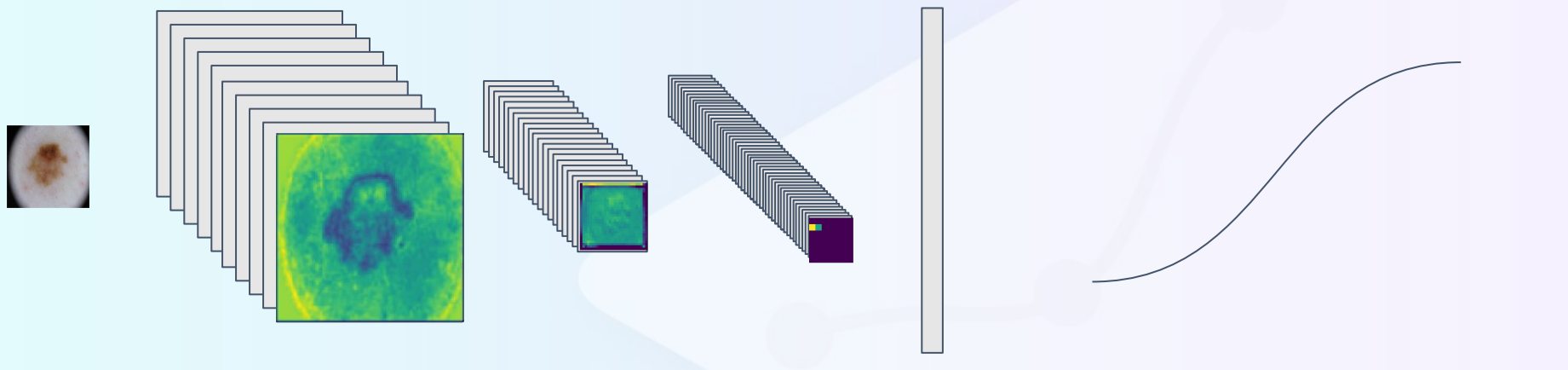
How convolutional neural networks work



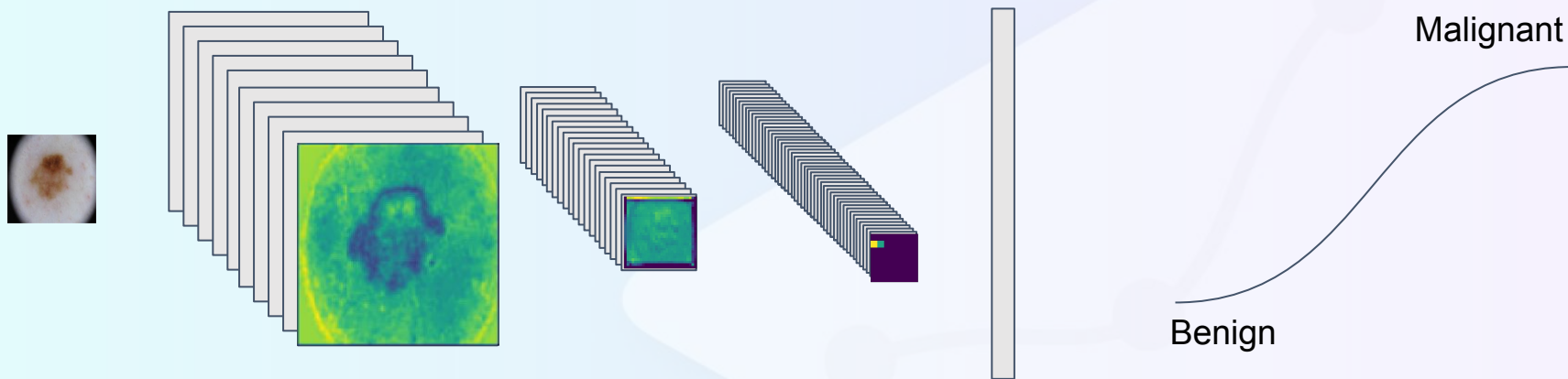
How convolutional neural networks work



How convolutional neural networks work

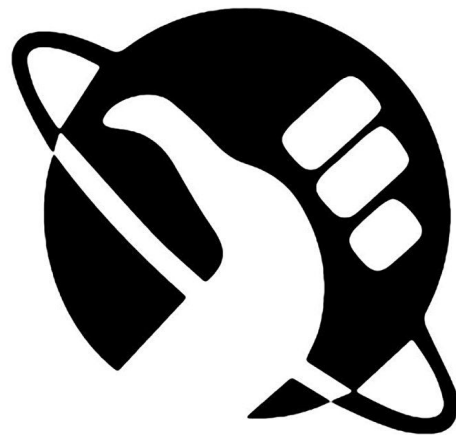


How convolutional neural networks work



Conditions for using deep learning

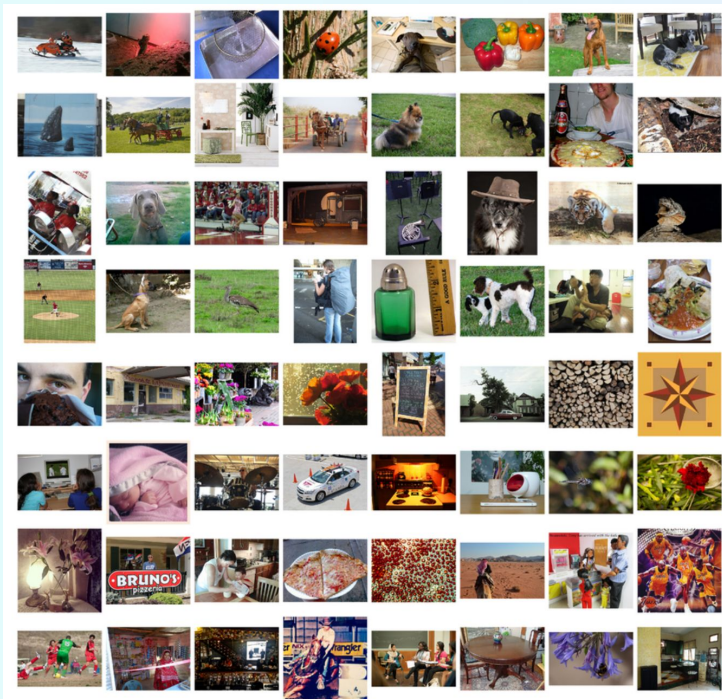
Do we need huge amounts of
data?



**DON'T
PANIC**

Transfer learning

ImageNet



Built from word syntax tree.

Total number of non-empty synsets: 21841

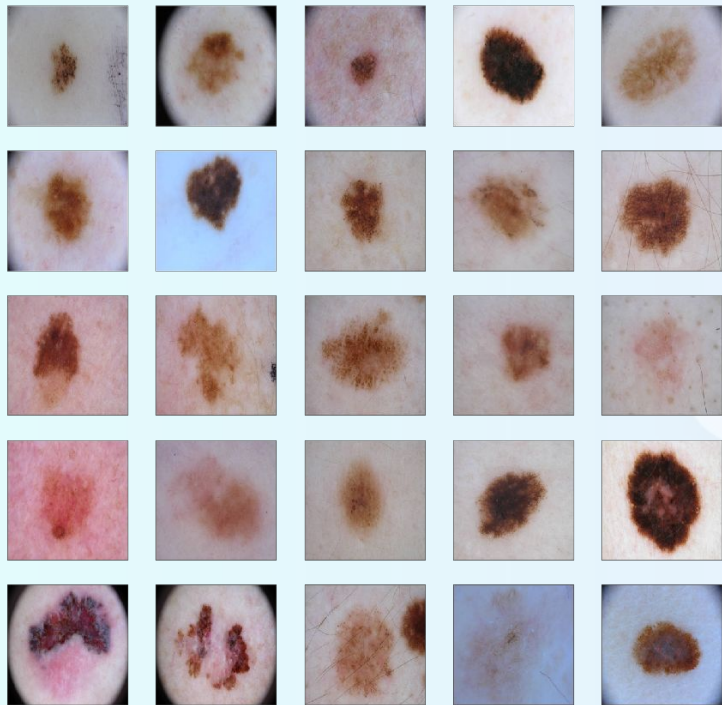
Typically split to 1000 classes

Total number of images: **14,197,122**

[ImageNet homepage](http://www.image-net.org/)

Transfer learning

ISIC



Notoriously collected from clinical settings

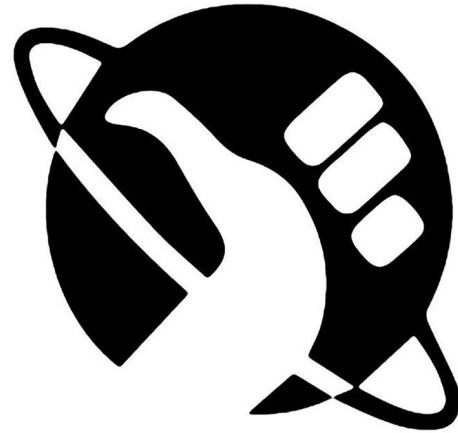
Two classes:

- Malignant
- Benign

Total number of images: **23,909**

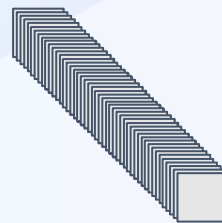
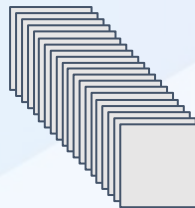
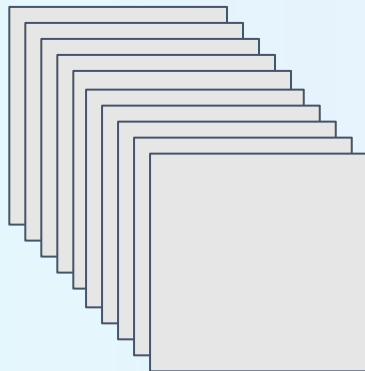
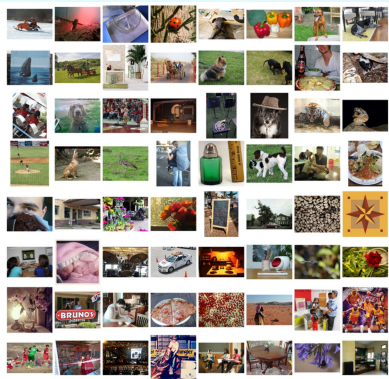
Transfer Learning

Recycling data



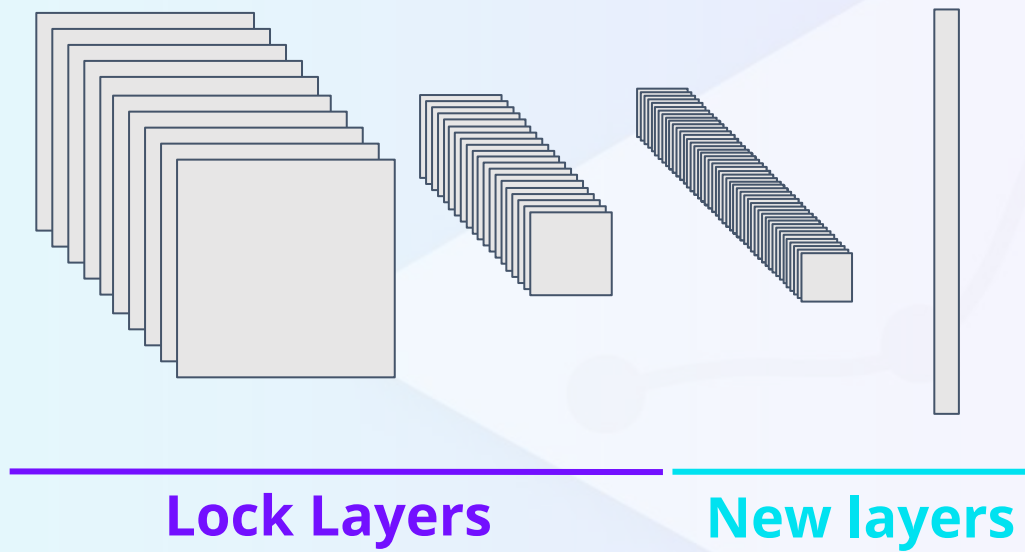
**DON'T
PANIC**

Transfer learning

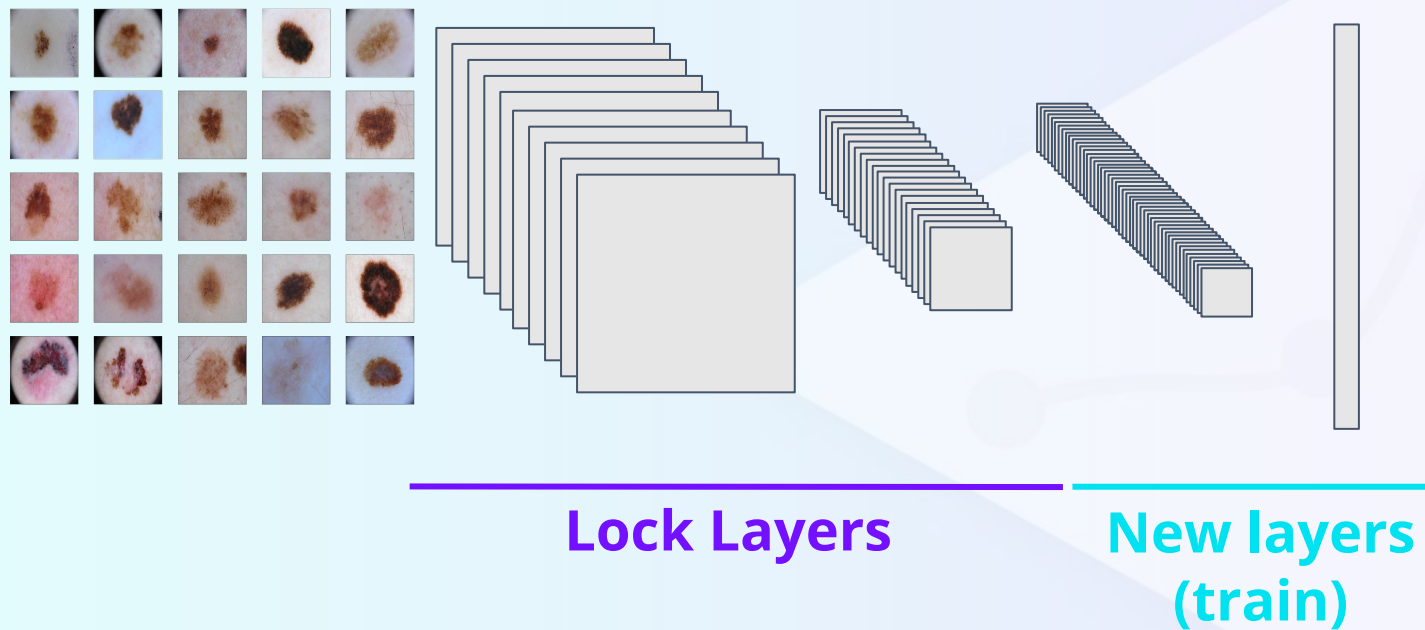


Plane
Pizza
Car
Snake
Carrot
Pyjamas
Violin
...

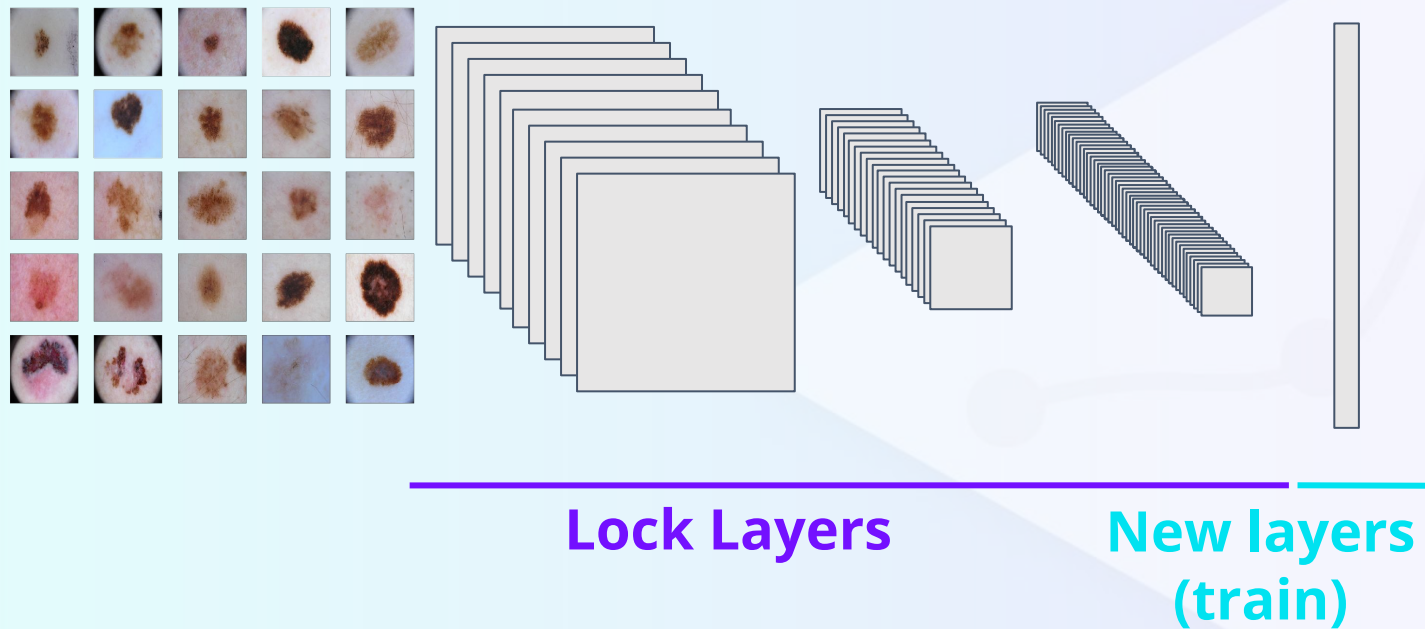
Transfer learning



Transfer learning



Transfer learning



Go work on exercises

<https://tinyurl.com/leo-workshop-#>

(NB! The server behind this is taken down)

Password: *****

Agenda:

- 14:45 - 15:00** Welcome from Kristian Hart and Christian Sejersen
- 15:00 - 15:15** Imagine Demo: An imaging platform that leverages artificial intelligence to track skin conditions
- 15:15 - 16:15** Panel discussion: The implications of black box models for patients: Explainability, ethics and democracy
- 16:20 - 16:50** Keynote Speech: How to be a doctor in 2025
- 17:00 - 19:00** Drinks and Networking: Beer on tap and tacos on hand

