Google Cloud Platform

Scaling Data Analysis:
Change how you compute with Google Cloud Platform

Google Cloud Platform Big Data and Machine Learning Fundamentals

Version #1.0

Training Evaluation Topic: Using Deep Learning and Transfer Learning to Conduct Customized Image Analysis

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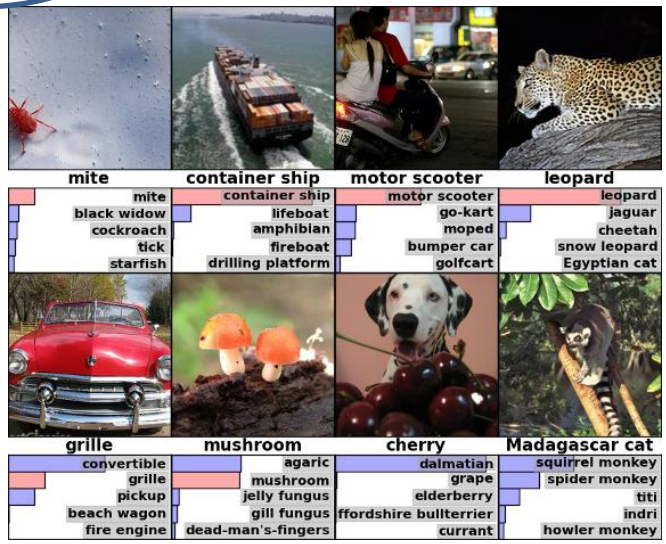
Agenda

1. Deep Learning Basics for Image Analysis
2. Real World Image Analysis Needs
3. Idea of Transfer Learning
4. Architecture of Transfer Learning
5. Hands-on Datalab Workshop on GCP

1 Deep Learning Basics for Image Analysis (1)

Please! Tell me the correct image category.
And how you did it?!



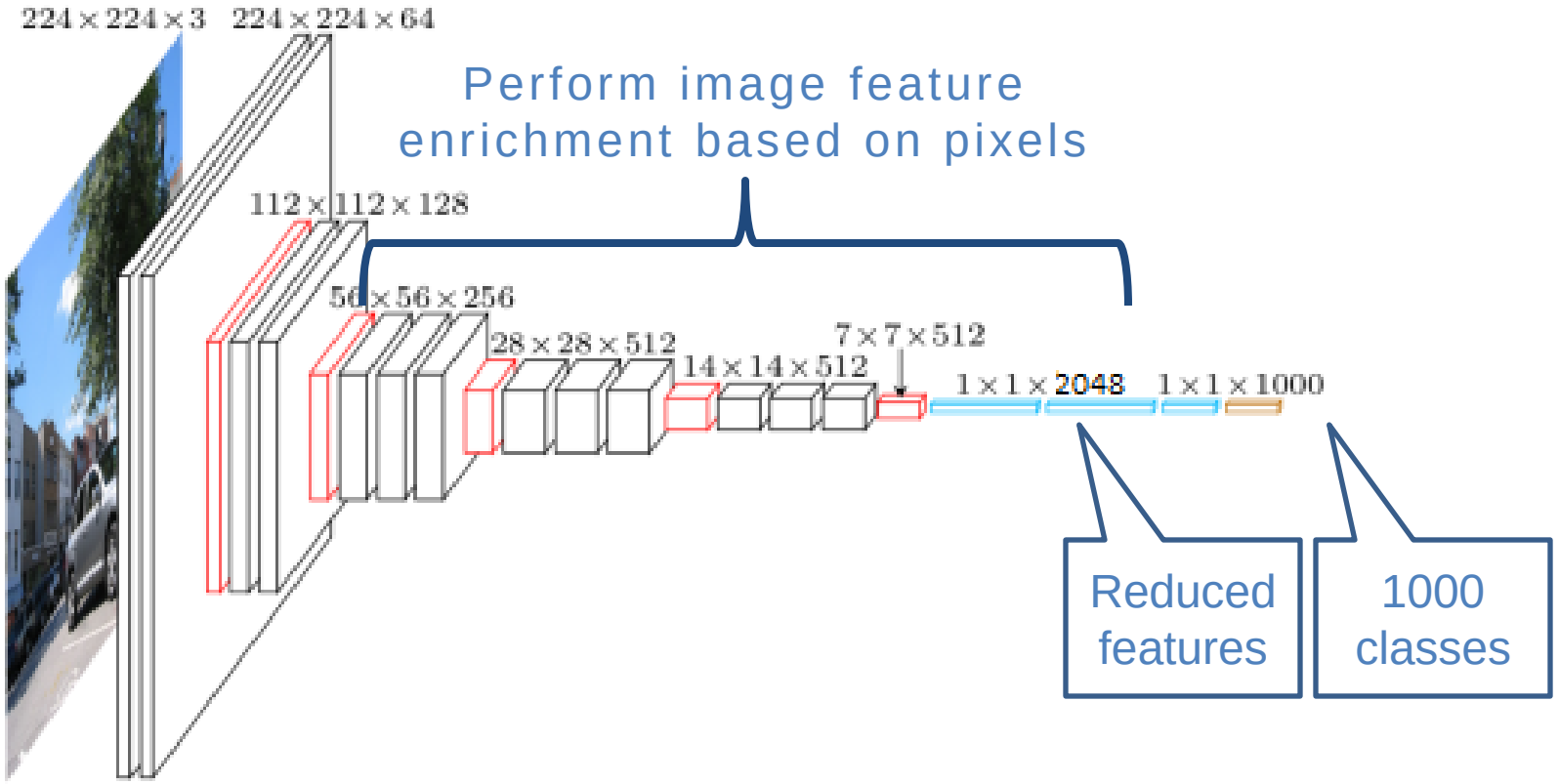
Huge images as learning inputs (millions)

Deep Learning Magic Crystal Ball

Very accurate predicted class (1000 classes)

1 Deep Learning Basics for Image Analysis (2)

150,528 features per image
(224 x 224 pixels x 3 RGB channels)



2 Real World Image Analysis Problem

In my workplace, I have some images of **healthy working valves** and **malfunctioned ones**. I'd like to explore the promising benefit of automatically monitor, classify and alert me if there is any anomaly happening in the industrial fields...



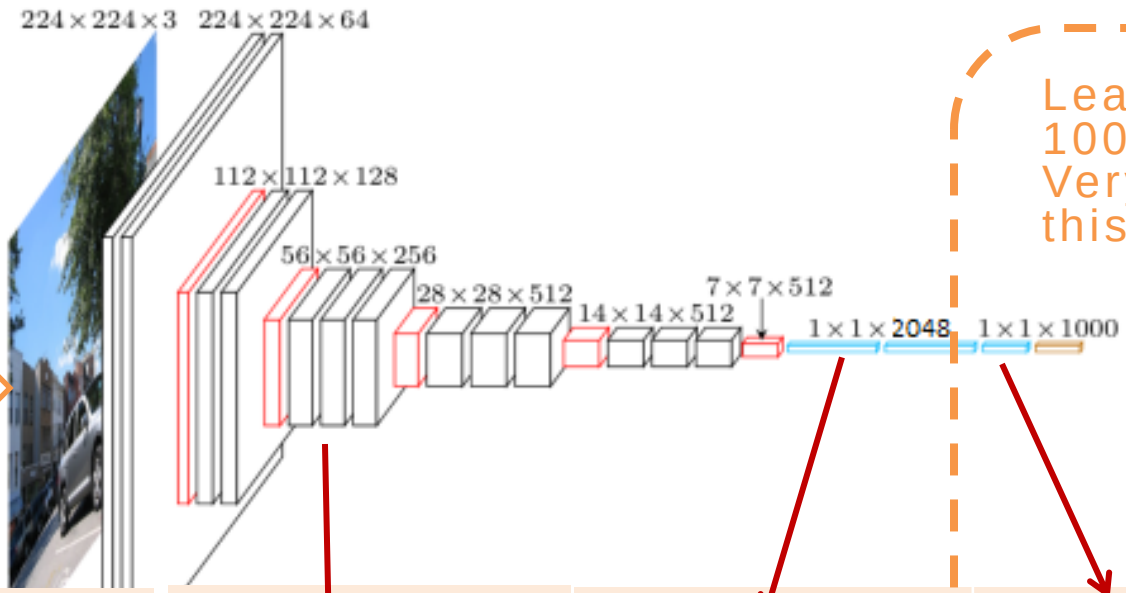

But I

- Lack of powerful computing resources --- Solved by no-ops Google Cloud Platform
- Difficulty to design network architecture and tune millions of hyper-parameters of deep neural network
- Lack of enough labeled images (only hundred plus images)

Is there a solution?

3 Idea of Transfer Learning

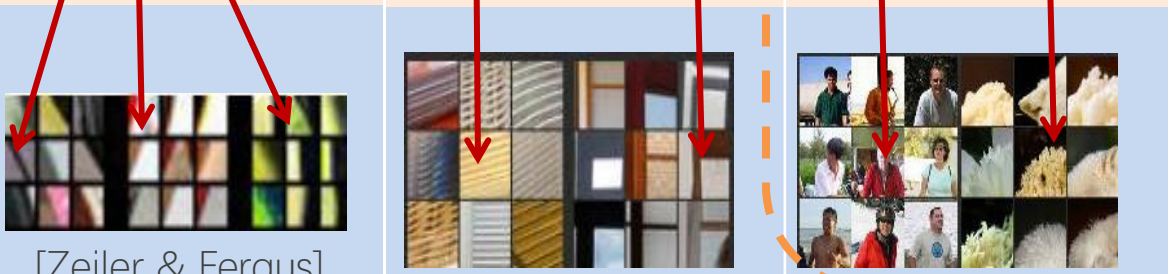
Task of ImageNet



Learn and predict 1000 classes: Very specific to this task

Example of detector learnt in deep neural net

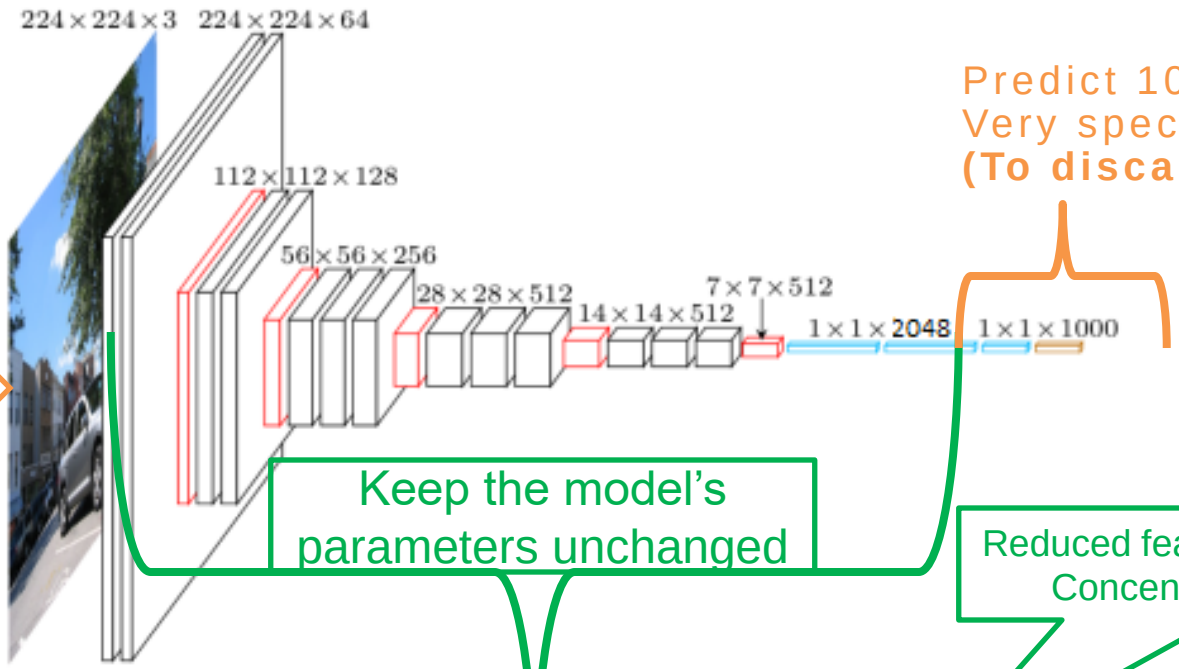
Example of matched pattern from individual image



[Zeiler & Fergus]

4 Architecture of Transfer Learning

Task1
ImageNet



Predict 1000 classes:
Very specific to Task1
(To discard)

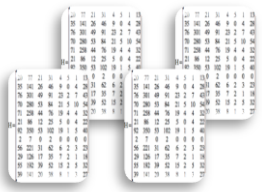
Keep the model's parameters unchanged

Reduced features per image: 2048
Concentration Ratio: 1.4%

Task2
Valves

Raw features per image: 150,528

Feature Extraction / Transformation **(Reusable for Task2)**



New Simple Model (SVM/LR)

Normal Valve

Abnormal Valve

5 Hands-on Datalab Workshop on GCP (1)

Overview: In this lab, you will carry out a transfer learning example based on Google Inception-v3 image recognition neural network.

You will learn:

1. Explore images in customer's industry.
2. Reposition a pre-trained deep neural net for new image recognition task.
3. Perform feature extraction.
4. Obtain deep feature representation of customer's original image.
5. Train a Support Vector Machine for new classification task.
6. Evaluate results of this transfer learning model.

Prerequisites:

- Google Cloud Platform Account
- Basic working knowledge of GCP, Datalab and Python

5 Hands-on Datalab Workshop on GCP (2)

Steps to access lab workshop:

1. Login Google Cloud Platform to start Datalab.
2. Create a new notebook to download this lab by running command: **!git clone https://github.com/telescopeuser/GCP-SamGu.git**

3. Go to folder **GCP-SamGu/Lab/**, then open notebook **Lab_Image_Analysis.ipynb** to follow.

Reference:

- https://github.com/telescopeuser/GCP-SamGu
- Google Cloud Platform Free Registration
- Google Datalab Quick Start

Q&A
Thank you!

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