

# 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

By: Sam Gu

[SamisITspecialist@gmail.com](mailto:SamisITspecialist@gmail.com)

May 2017

# Agenda

1

Deep Learning Basics for Image Analysis

2

Real World Image Analysis Needs

3

Idea of Transfer Learning

4

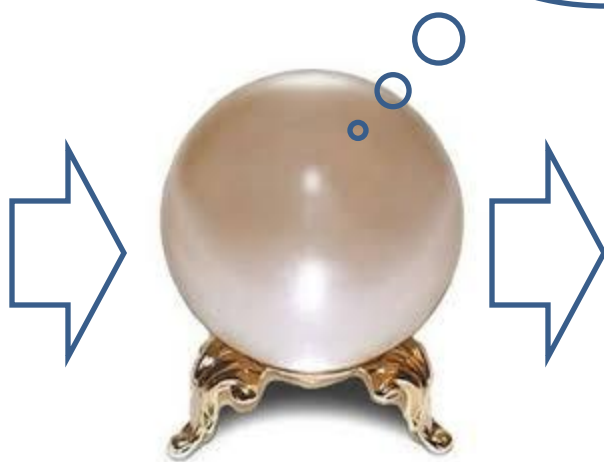
Architecture of Transfer Learning

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

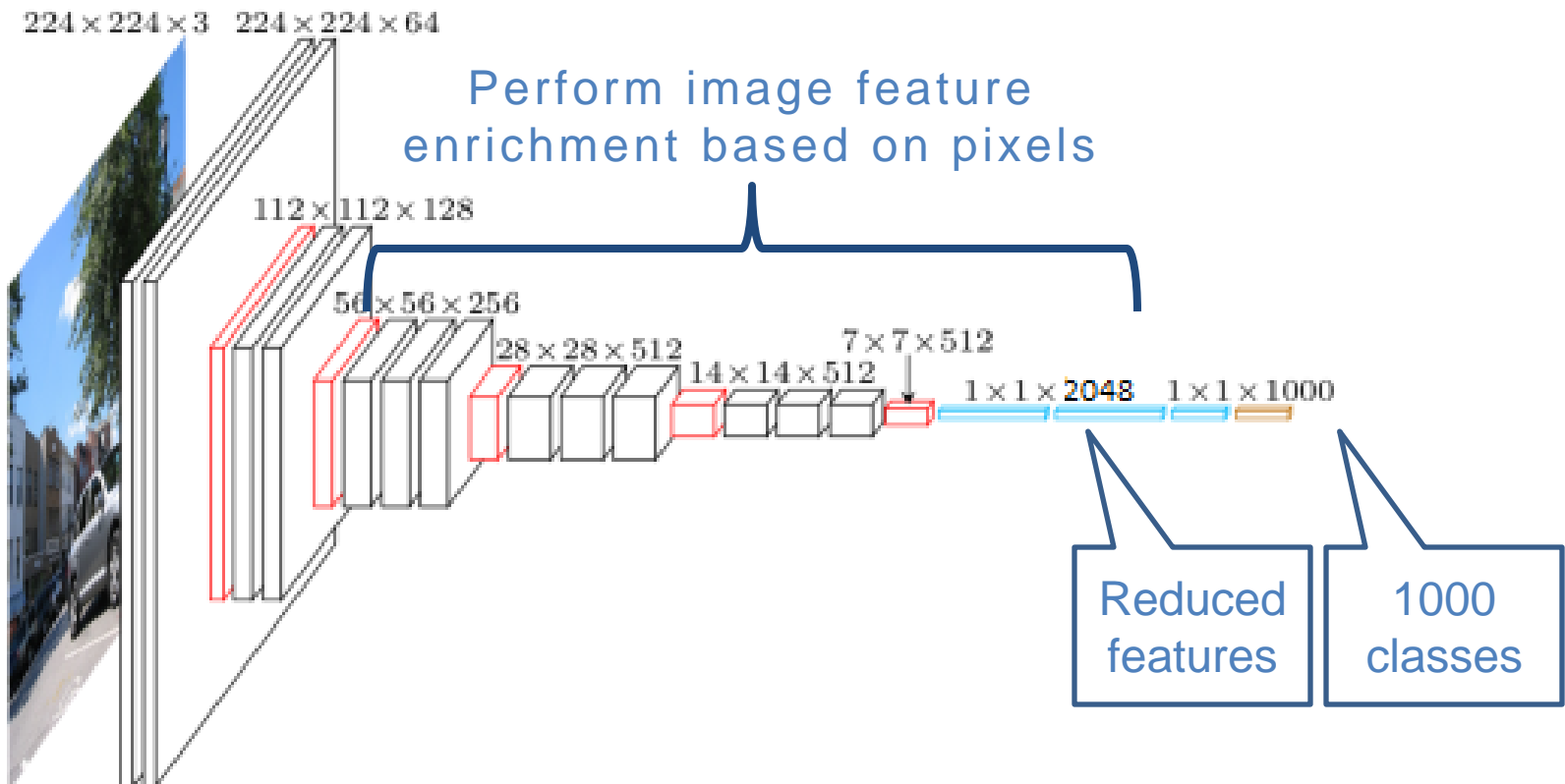
Very accurate  
predicted  
class  
(1000 classes)

## 1

# Deep Learning Basics for Image Analysis (2)



150,528 features per image  
( $224 \times 224$  pixels  $\times$  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 (around one hundred images)

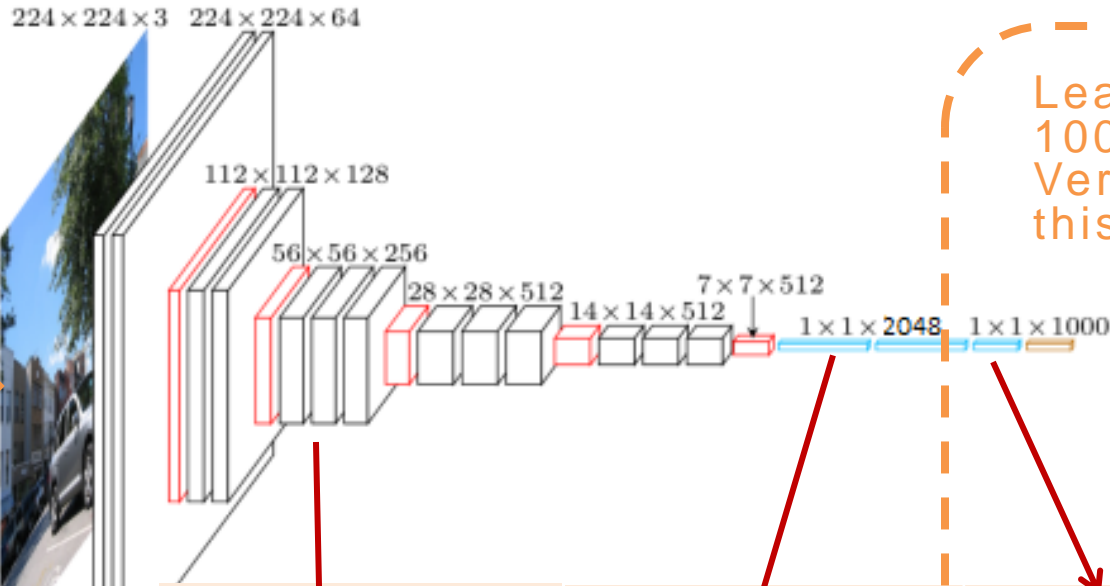
Is there a solution?

# 3

## Idea of Transfer Learning



Task of  
ImageNet

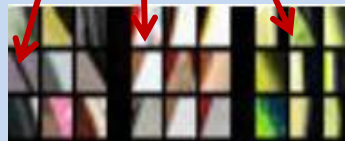


Learn and predict  
1000 classes:  
Very specific to  
this task

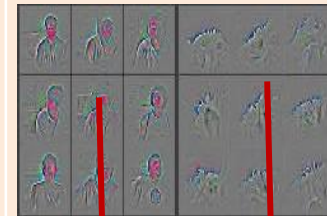
Example of  
detector learnt in  
deep neural net



Example of  
matched pattern  
from individual  
image



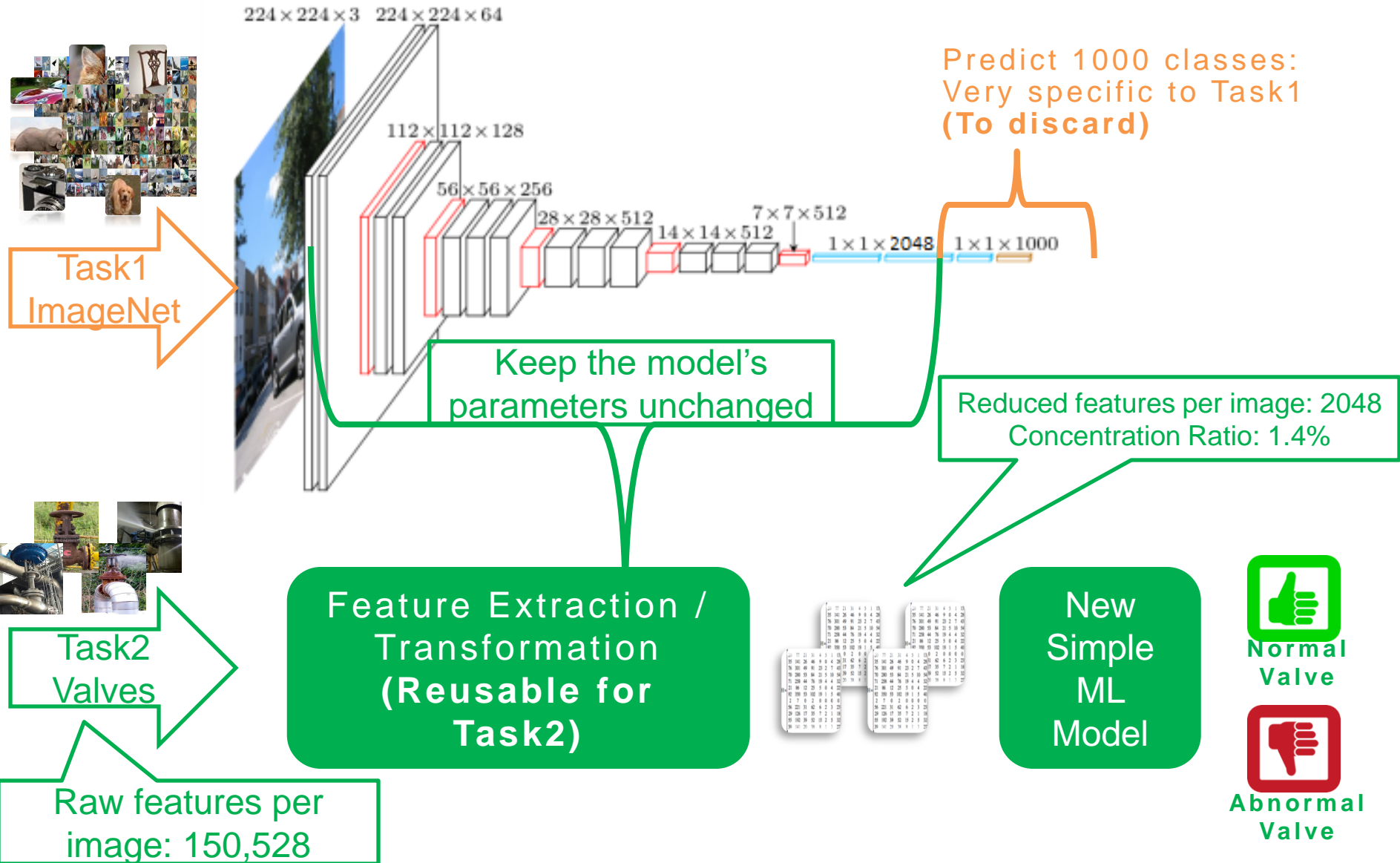
[Zeiler & Fergus]





## 4

## Architecture of Transfer Learning



# 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 simple machine learning model 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

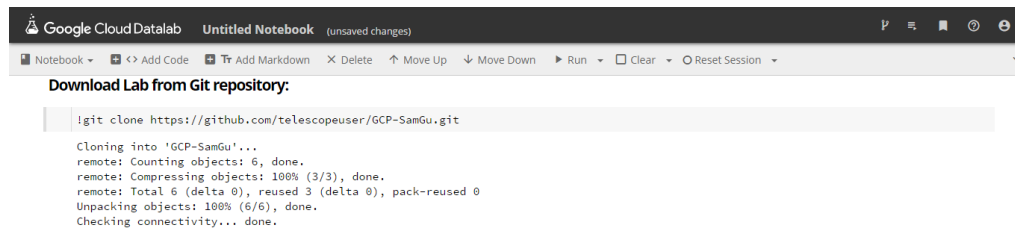


## 5

## 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**

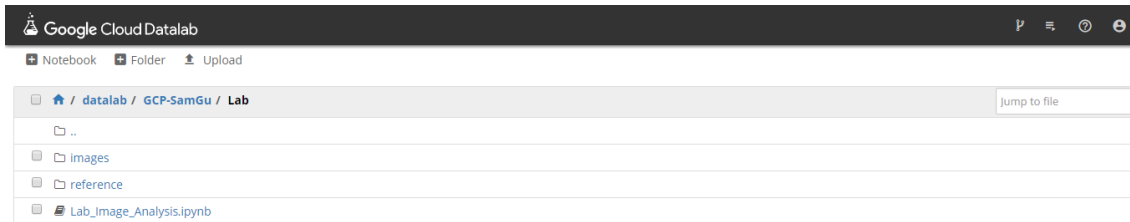


The screenshot shows the Google Cloud Datalab interface with a notebook titled 'Untitled Notebook'. The command `!git clone https://github.com/telescopeuser/GCP-SamGu.git` has been executed, and the output is displayed in a code cell. The output shows the cloning process, including counting, compressing, and unpacking objects, and checking connectivity.

```
!git clone https://github.com/telescopeuser/GCP-SamGu.git

Cloning into 'GCP-SamGu'...
remote: Counting objects: 6, done.
remote: Compressing objects: 100% (3/3), done.
remote: Total 6 (delta 0), reused 3 (delta 0), pack-reused 0
Unpacking objects: 100% (6/6), done.
Checking connectivity... done.
```

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!

By: Sam Gu  
[SamisITspecialist@gmail.com](mailto:SamisITspecialist@gmail.com)  
May 2017