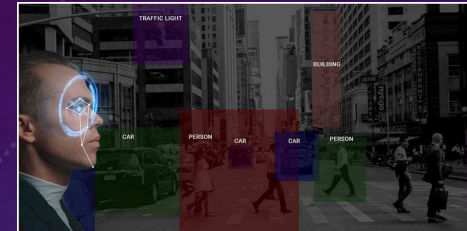


DEEP LEARNING IN COMPUTER VISION APPLICATIONS & TIME SERIES ANALYSIS

6-Nov- 2020

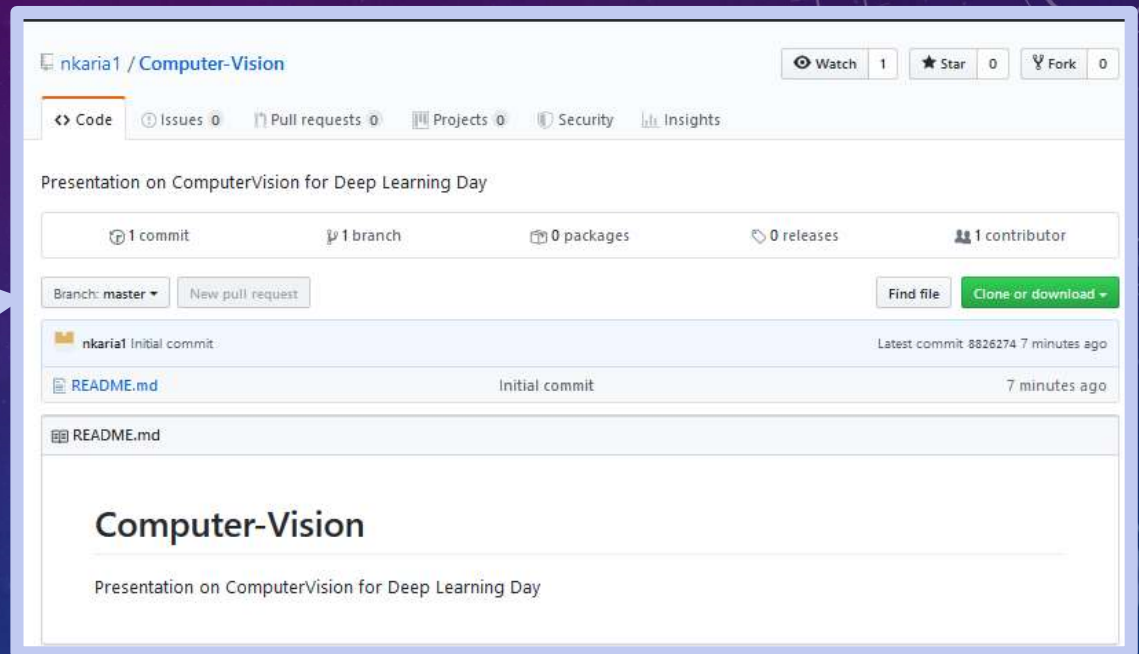


NIHARIKA KARIA

DATA SCIENTIST



Cameras out



Breaking Down Computer Vision Application

1. Input

- Photo sensor

2. Digitization

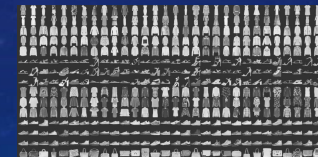
- Binary / Decimal

3. Transformation

Rule Based
Computer Science Application



Example Based
Machine Learning Application



Computer Vision Applications

Computer Vision is a field of deep learning that enables machines to see, identify and process images like humans.

Fiction in '90s is Fact Today

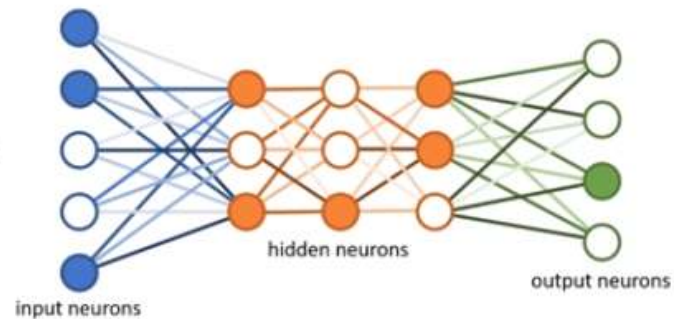
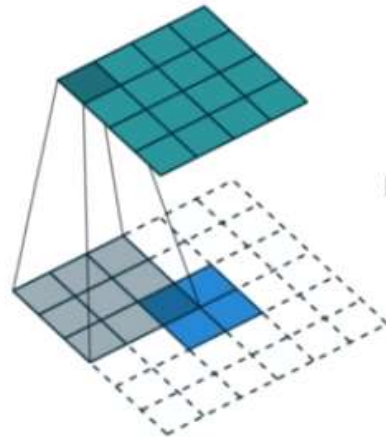


Computer Vision Capabilities

- Identify
- Classify
- Measure
- Track
- Annotate

Convolutional Neural Network

CNN = Convolution + Neural Networks



Computer Vision For Identification

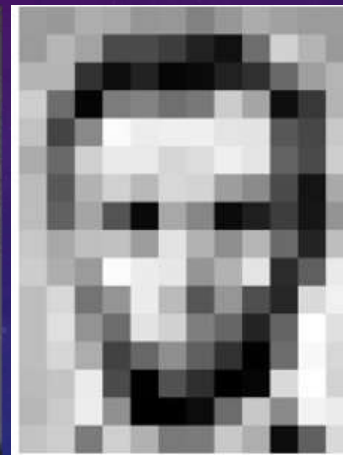
Grey scale



Convolution



Pooling



167	163	174	168	162	129	163	172	163	168	168	
155	182	163	74	75	62	35	17	130	210	180	154
180	180	80	34	34	6	10	33	48	106	169	181
206	106	5	124	131	111	120	204	165	15	56	180
194	68	157	251	237	239	236	228	227	67	71	201
172	106	207	239	239	214	220	239	238	98	74	206
188	88	179	209	185	215	211	158	139	75	20	169
189	97	165	84	16	168	134	11	31	62	22	148
199	168	191	193	158	227	178	143	182	106	36	190
205	174	165	252	236	231	149	178	228	43	95	234
190	216	116	149	236	187	86	160	79	38	218	241
190	224	147	108	227	210	127	103	36	101	355	224
190	214	173	94	103	143	96	90	2	109	249	215
187	186	235	75	1	81	47	0	6	217	265	211
183	202	237	145	0	0	12	108	200	138	243	236
195	206	123	207	177	121	123	200	175	13	94	218

Flattening

167
155
180
206
194
172
188
189
199
205
190
190
190
187
183
195
157
155
180
206
194
172
188
189
199
205
190
190
190

Convolution

1 _{x1}	1 _{x0}	1 _{x1}	0	0
0 _{x0}	1 _{x1}	1 _{x0}	1	0
0 _{x1}	0 _{x0}	1 _{x1}	1	1
0	0	1	1	0
0	1	1	0	0

Image

4		

Convolved
Feature

Pooling

5	3	3	1
0	2	8	5
1	4	4	2
0	9	2	7

→
Max
pooling

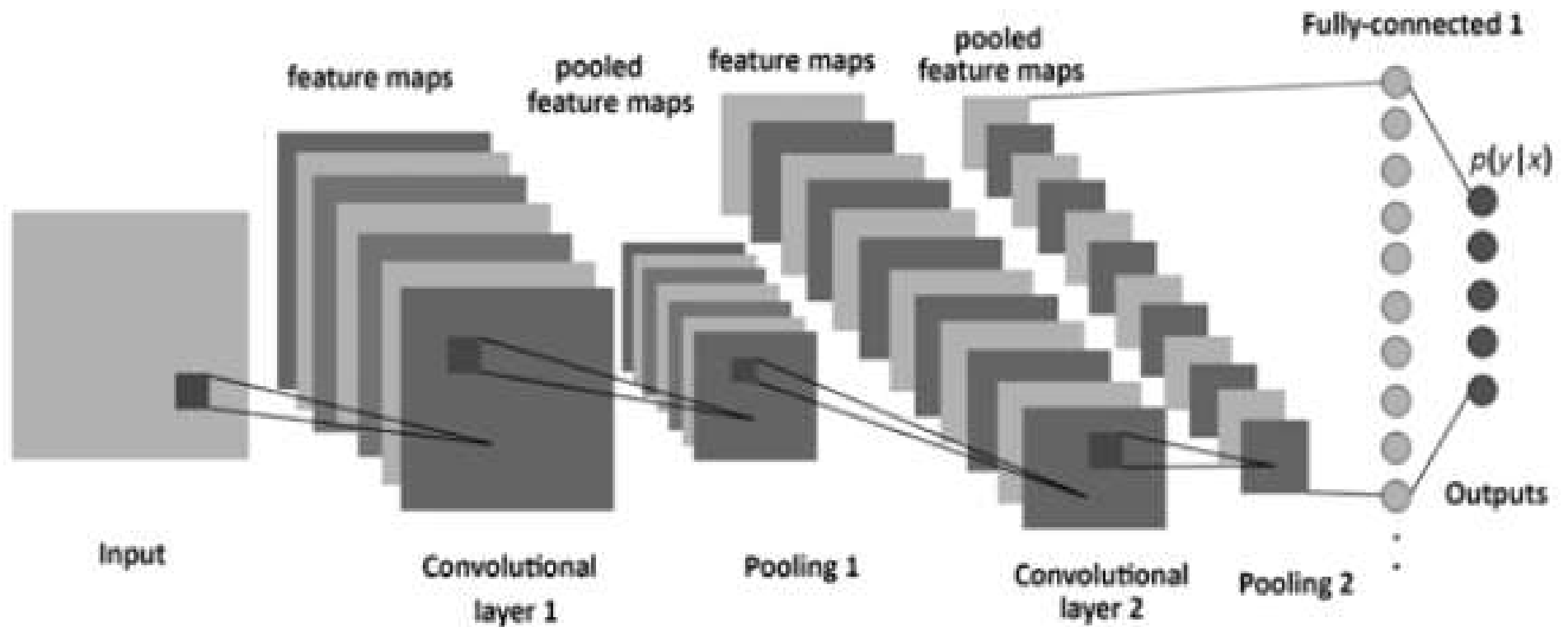
5	8
9	7

5	3	3	1
0	2	8	5
1	4	4	2
0	9	2	7

→
Average
pooling

2.5	4.25
3.5	3.75

Bringing it all Together



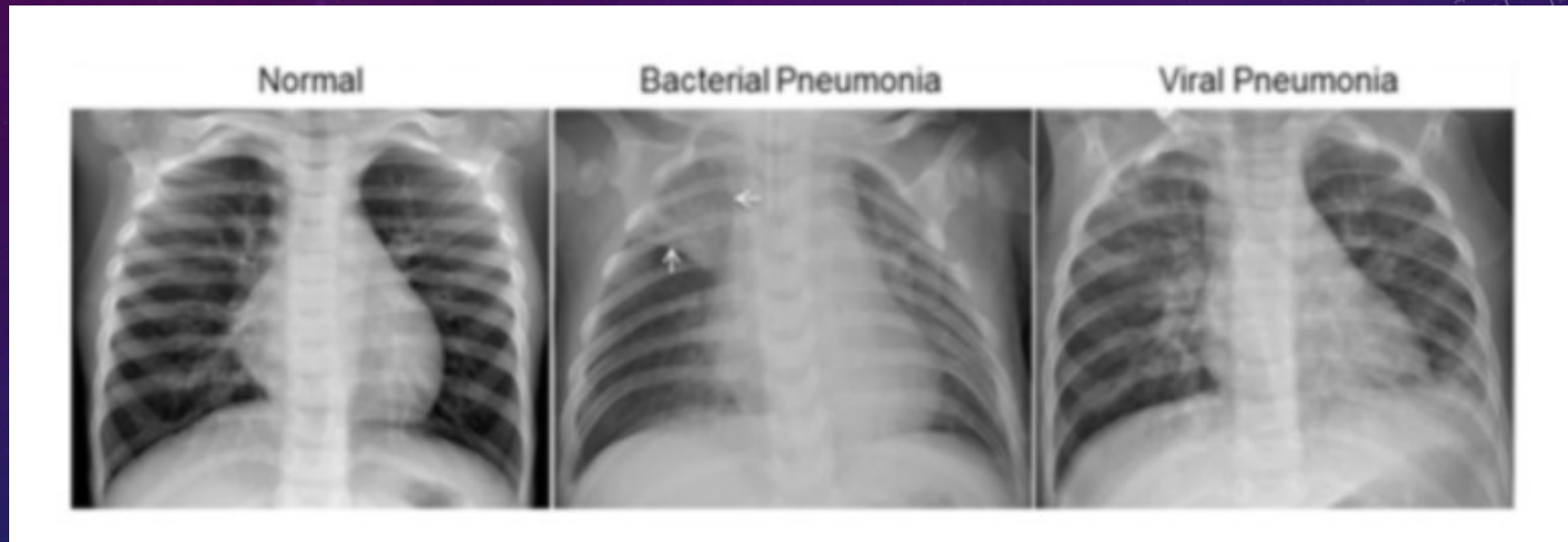
The Building Blocks



The background is a dark blue gradient with a subtle pattern of white dots. On the left side, there are several concentric circles and a scale. The scale is a semi-circular arc with tick marks and numbers ranging from 140 to 260. There are also some dashed lines and arrows pointing in different directions, creating a technical or scientific feel.

Jupyter Notebook Demo

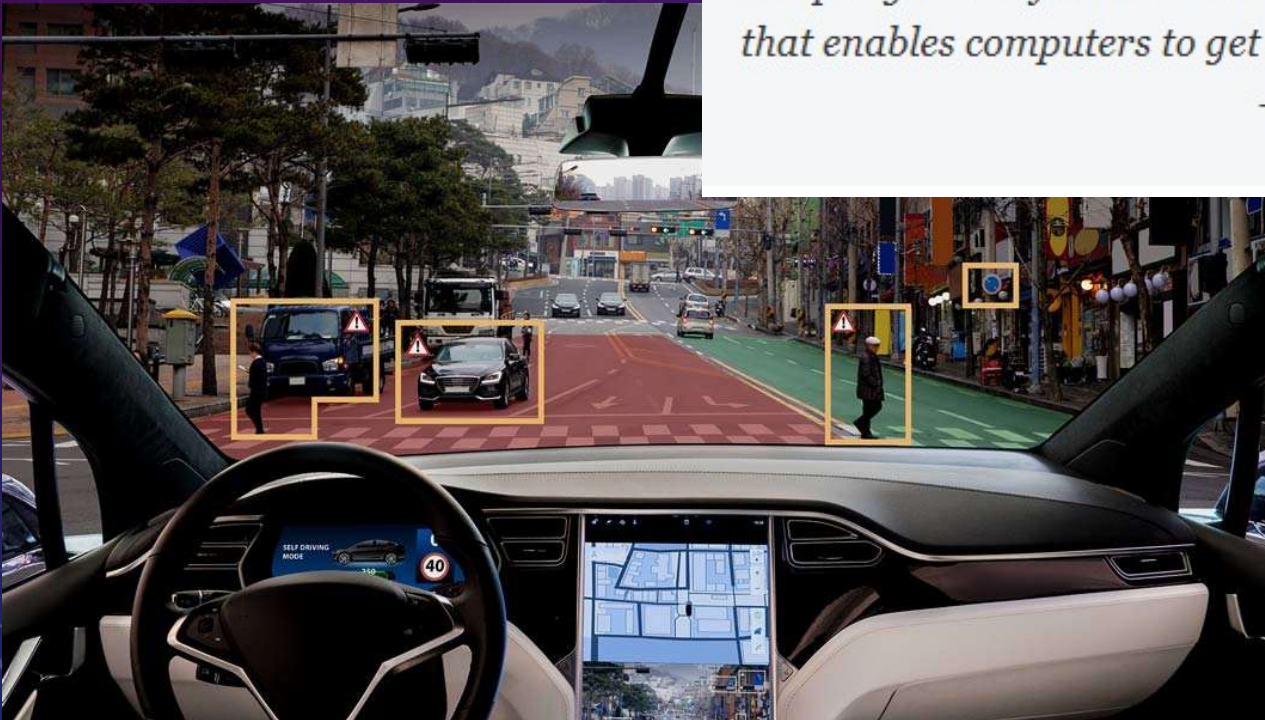
Medical Application



Real Future is Machine Learning

Google's self-driving cars and robots get a lot of press, but the company's real future is in machine learning, the technology that enables computers to get smarter and more personal.

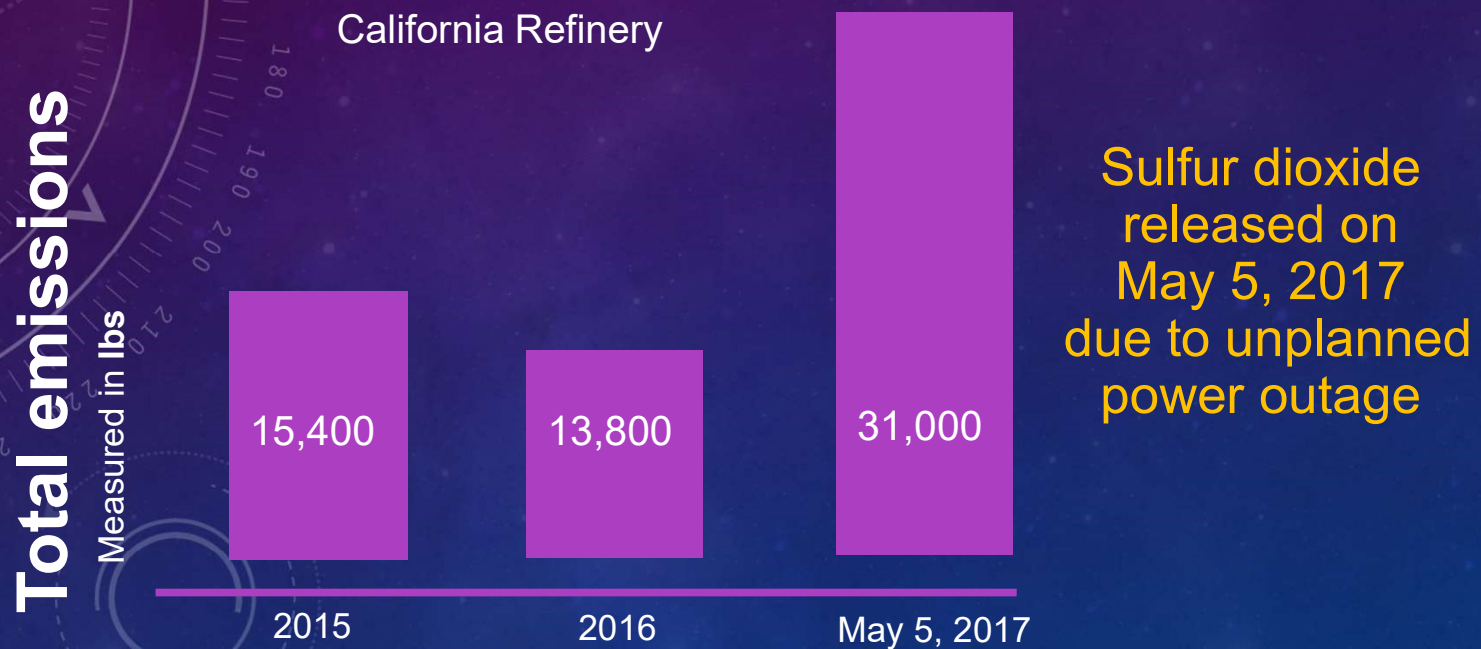
– Eric Schmidt (Google Chairman)



Real Challenges



Unplanned Downtime And The Environment



Availability Losses in Refining



1700 shutdowns
at refineries
between
2006 and 2017

46% were due to
mechanical
breakdown

U.S. Department of Energy

Unplanned Shutdowns

cost oil and gas
companies an average
of **\$42 million a
year** and up to \$88
million a year in the
worst case scenarios

McKinsey

The Gap In Equipment Monitoring

85% equipment fails in spite
of calendar maintenance - *Boeing*

63% scheduled maintenance
is unnecessary — *Automation Vendor*

The spend is in
wear-and-tear

vs

The problem is
process-induced

Equipment Monitoring with Machine Learning



Challenges With Time Series Data

Temporal correlations

Row order matters

Feature selection

Data Cleaning

Difficulty in visually identification

Model deterioration over time

Challenges With Time Series Data



Solutions to Questions of Process Engineers

When?

Why?

What?



has
answers.



Success Stories

A European petrochemical producer has used predictive analytics solution provided by Aspen to develop a data driven approach to maintenance planning. With the new plan in place, they eliminated two days of shutdown per year on each piece of equipment and saved \$1.8 million .

At a leading pulp and paper manufacturing site, Aspen Tech software alerted to a major fire with 9 days of advance warning which gave the operators an opportunity to take corrective actions to improved the safety.

A refinery with 300,000 barrels per day capacity has been able to predict failures with significant lead time, and has done so without false positives.

Three Simultaneous Benefits



The diagram features three large green arrows arranged horizontally. The left arrow points upwards and contains the text 'Increase Safety'. The middle arrow points downwards and contains the text 'Reduce GHG Emissions'. The right arrow points upwards and contains the text 'Increase Asset Availability'. The background is a dark blue gradient with faint, stylized circular patterns and numerical scales.

Increase
Safety

Reduce GHG
Emissions

Increase Asset
Availability

Questions ?

FAQ:

Q: Can we get slides?

A: Yes, scan this code.



SCAN ME