



UNIVERSAL

Vidya Vikas Education Trust's

Universal College of Engineering

Approved by AICTE, DTE, Maharashtra State Government and Affiliated to University of Mumbai

Accredited with 'B+' grade by NAAC | Recognised as Linguistic (Gujarati) Minority Institution

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Coffee & Code ;

An Initiative by the Department of Computer Engineering

VISION

To be recognized as a department that provides quality technical education and research opportunities that eventually caters to helping and serving the community.

MISSION

- To groom the students to participate in curricular and co-curricular activities by providing efficient resources.
- To motivate the students to solve real world problems to help the society grow.
- To provide a learning ambience to enhance innovations, team spirit and leadership qualities for students.

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In Association with



(Computer Engineering Student Association)

Direct Second Year Orientation



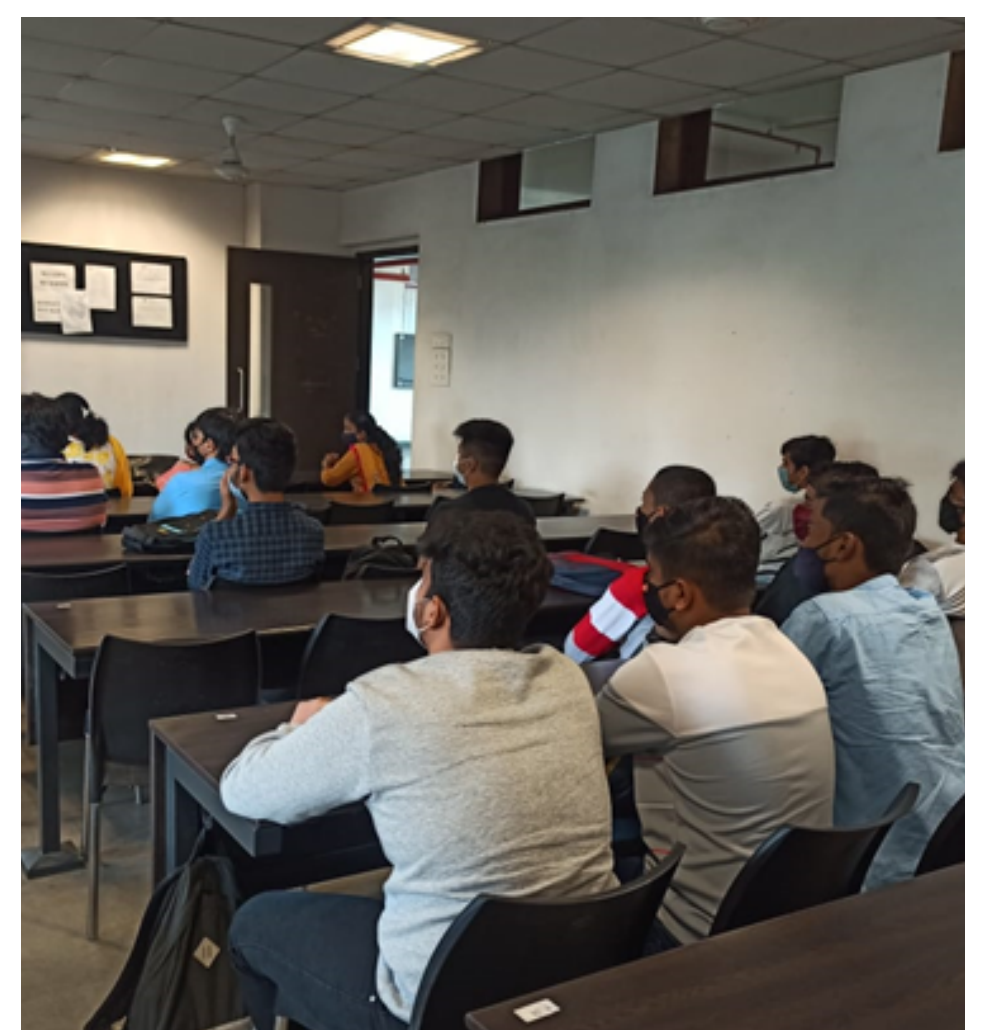
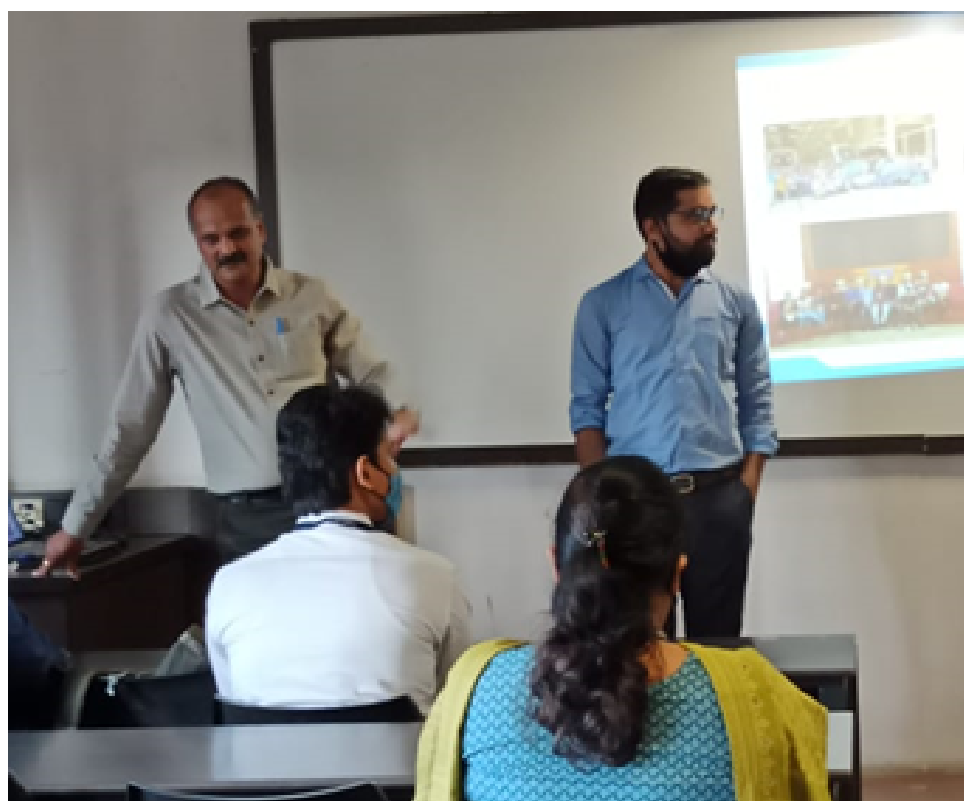
ORIENTATION PROGRAM FOR DIRECT SECOND-YEAR COMPUTER ENGINEERING ADMITTED STUDENTS WAS CONDUCTED ON 06/02/2021 FROM 10 AM TO 12 NOON. TOTAL 21 STUDENTS AND DEPARTMENT TEACHING AND NONTEACHING STAFF WERE PRESENT FOR THE ORIENTATION PROGRAM. MRS. KANCHAN DABRE, ASSISTANT PROFESSOR WELCOMED THE STUDENTS AND INTRODUCED DR. JITENDRA SATURWAR THE HEAD OF THE DEPARTMENT.

DR. JITENDRA SATURWAR, HEAD OF THE COMPUTER ENGINEERING DEPARTMENT ADDRESSED THE STUDENTS IN THE ORIENTATION PROGRAM. HE EXPLAINED THE DEPARTMENT VISION AND MISSION TO STUDENTS. HE GAVE A BRIEF INTRODUCTION OF FACULTIES, THEIR RESEARCH DOMAINS. HE GAVE AN INTRODUCTION OF DEPARTMENT NONTEACHING STAFF ALSO.

HE SHARED THE 2019-20 COMPUTER DEPARTMENT STUDENTS' ACHIEVEMENTS IN TECHNICAL, SPORTS, AND CULTURAL. THE DEPARTMENT OF COMPUTER ENGINEERING IS COMMITTED TO SUPPORTING THE STUDENTS FOR CURRICULAR AND EXTRACURRICULAR ACTIVITIES. HIS PRESENTATION INCLUDED THE RULES AND REGULATIONS TO BE FOLLOWED BY STUDENTS DURING THE ONLINE CLASSES. HE TALKED ABOUT THE DEPARTMENT QUALITY INITIATIVES LIKE PROJECT-BASED LEARNING, EYIC PARTICIPATION, SIH PARTICIPATION. ORACLE ACADEMY, ICT ACADEMY, AND COURSERA ASSOCIATION. HE ALSO INFORMED STUDENTS THAT THE DEPARTMENT PROVIDES INTERNSHIPS FOR STUDENTS.

STUDENTS WERE ENCOURAGED TO PARTICIPATE IN ACTIVITIES LIKE TEACHING ASSISTANT(TA), RESEARCH ASSISTANT(RA), AND MIS IMPLEMENTATION INTERNSHIPS. STUDENTS WERE HAPPY TO KNOW ALL THE INFORMATION ABOUT THE DEPARTMENT, FACULTIES, ACHIEVEMENTS. STUDENTS WERE ASKED TO ASK ANY QUERY RELATED TO THE ACADEMICS OR REGARDING THEIR LECTURE SCHEDULES. DEPARTMENT FACULTIES GAVE A WALKTHROUGH OF THE COLLEGE CAMPUS.

CAMPUS DIRECTOR DR.JITENDRA PATIL ENLIGHTENED THE EVENT BY ADDRESSING THE STUDENTS IN THE ORIENTATION PROGRAM. SIR WELCOME STUDENTS IN UCOE AND GIVE BRIEF ABOUT THE COLLEGE DISCIPLINE, INFRASTRUCTURE, LOCKER FACILITIES, WELL-EQUIPPED LABORATORY, AND LIBRARY FACILITIES. SIR GUIDED STUDENTS REGARDING THEIR ACADEMIC PLANNING FOR SEMESTERS 3 AND 4. HE GAVE CONFIDENCE TO STUDENTS THAT DEPARTMENT FACULTY WILL DEFINITELY SUPPORT STUDENTS FOR THIS PARALLEL SYLLABUS COMPLETION AND SCHEDULE. HE TOLD STUDENTS THAT THEY CAN TAKE HELP FROM HEADS OF ADMIN, EXAMS, ACADEMICS FOR ANY QUERY. UCOE IS COMMITTED TO DELIVERING QUALITY EDUCATION TO STUDENTS. MRS. HEZAL LOPES PRESENTED A VOTE OF THANKS TO MANAGEMENT, TEACHING, NONTEACHING FACULTIES, AND ALL PARTICIPANTS AND WISH THEM ALL THE BEST FOR THEIR FUTURE IN UCOE.



Upcoming Courses by Faculty

**CISCO NETWORKING ACADEMY-UCOE PARTNER:
PCAP - PROGRAMMING ESSENTIALS IN PYTHON
(ENGLISH - 1.10 - FOR PUBLIC CAMPAIGNS)
PROGRAMMING ESSENTIALS IN PYTHON
16 FEB - 16 MAY 2021**

Programming Essentials in Python
Universal College of Engineering



YOU'LL LEARN THESE CORE SKILLS:

- PROBLEM-SOLVE USING AN ALGORITHMIC APPROACH.
- UNDERSTAND PROGRAMMER'S WORK IN THE SOFTWARE DEVELOPMENT PROCESS.
- GAIN KNOWLEDGE ON HOW A PROGRAM IS EXECUTED IN A COMPUTER ENVIRONMENT.
- PREPARE FOR THE PCAP-PYTHON CERTIFIED ASSOCIATE PROGRAMMER CERTIFICATION.

[HTTPS://WWW.NETACAD.COM/PORTAL/WEB/SELF-ENROLL/M/COURSE-343044](https://www.netacad.com/portal/web/self-enroll/m/course-343044)



UCOE PALO ALTO NETWORKS ACADEMY PALO ALTO NETWORKS CYBERSECURITY ACADEMY - ESSENTIAL

THIS COURSE EVALUATES CYBERSECURITY PRINCIPLES AND DEMONSTRATES HOW TO SECURE A NETWORK COMPUTING ENVIRONMENT THROUGH THE APPLICATION OF SECURITY CONTROLS.

STUDENTS WILL LEARN THE NATURE AND SCOPE OF TODAY'S CYBERSECURITY CHALLENGES, STRATEGIES FOR NETWORK DEFENSE, AS WELL AS DETAILED INFORMATION ABOUT NEXT-GENERATION CYBERSECURITY SOLUTIONS.

STUDENTS WILL ALSO DEPLOY A VARIETY OF SECURITY METHODOLOGIES AS WELL AS TECHNOLOGIES AND CONCEPTS USED FOR IMPLEMENTING A SECURE NETWORK ENVIRONMENT.

COURSE URL:

[HTTPS://PALOALTONETWORKSACADEMY.NET/COURSE/VIEW.PHP?ID=991](https://paloaltonetworksacademy.net/course/view.php?id=991)

ENROLLMENT KEY:CYBERSEC@421

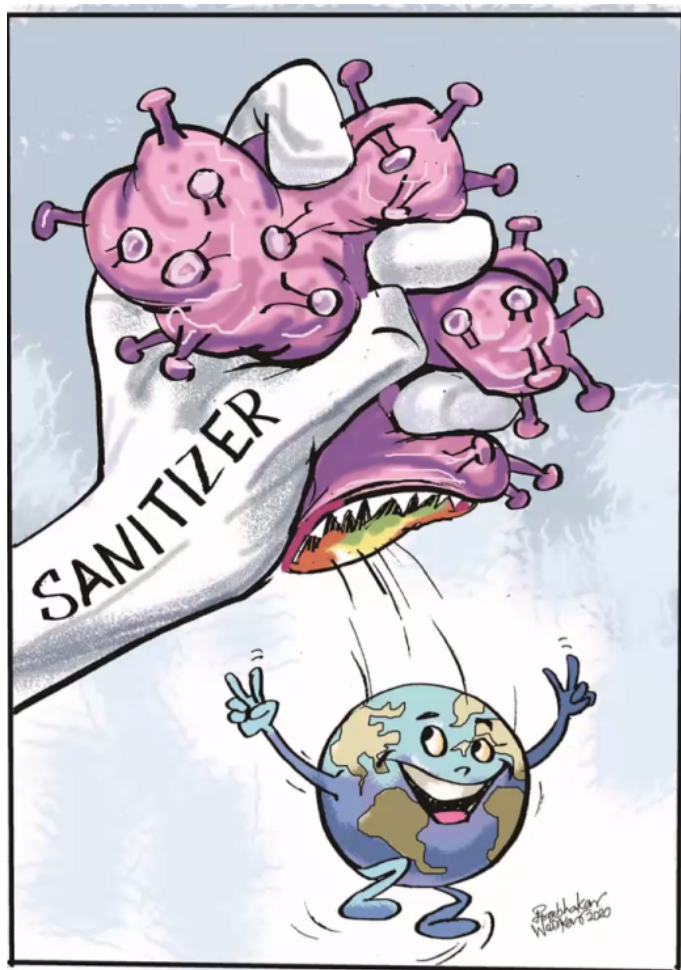
INSTRUCTORS: DR.JITENDRA SATURWAR

Cartooning Workshop

The University of Mumbai, in association with Balasaheb Thackeray Adhyasan Kendra, had organized an online cartooning workshop: Vyangachitranagari on the occasion of the birth anniversary of Hon'ble Balasaheb Thackeray.

Many renowned cartoonists and columnists such as Prabhakar Wairkar Sir were invited as resource persons who shared their experience working in the field of cartooning for decades. They gave very minute insights, tips, and tricks of sketching and drawing.

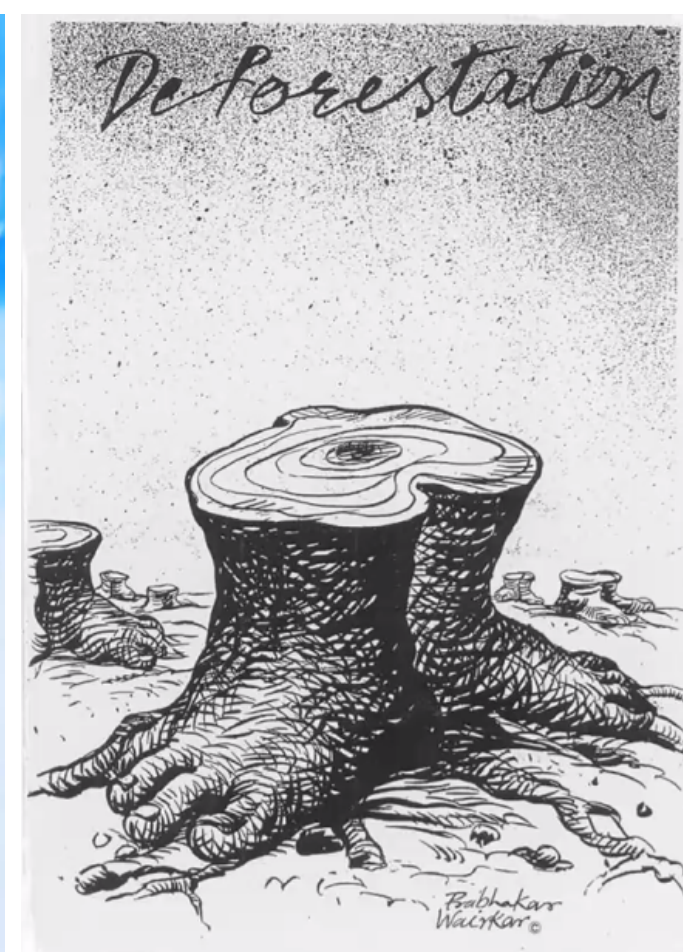
Many of our students and faculty members had attended the session and gained a lot of knowledge from the session. Some sample caricatures, cartoons and certificates are shown for reference.



University of Mumbai
Balasaheb Thackeray Adhyasan Kendra
Organizes
One Day Virtual Workshop on Cartooning: Vyangachitranagari
व्यंगचित्रनगरी
On the occasion of
Birth Anniversary of
Hon'ble Balasaheb Thackeray
Certificate of Participation

This is to certify that Vinay Panchal of Universal College Of Engineering has participated in the One Day Workshop on Cartooning: Vyangachitranagari organized by Balasaheb Thackeray Adhyasan Kendra, University of Mumbai on Saturday, January 23, 2021.

Co-ordinator
Balasaheb Thackeray
Adhyasan Kendra
Saturday, January 23, 2021
Mumbai



The COVID-19 pandemic has changed education forever.

This is how

WHILE COUNTRIES ARE AT DIFFERENT POINTS IN THEIR COVID-19 INFECTION RATES, WORLDWIDE THERE ARE CURRENTLY MORE THAN 1.2 BILLION CHILDREN IN 186 COUNTRIES AFFECTED BY SCHOOL CLOSURES DUE TO THE PANDEMIC. IN DENMARK, CHILDREN UP TO THE AGE OF 11 ARE RETURNING TO NURSERIES AND SCHOOLS AFTER INITIALLY CLOSING ON 12 MARCH, BUT IN SOUTH KOREA STUDENTS ARE RESPONDING TO ROLL CALLS FROM THEIR TEACHERS ONLINE.

WITH THIS SUDDEN SHIFT AWAY FROM THE CLASSROOM IN MANY PARTS OF THE GLOBE, SOME ARE WONDERING WHETHER THE ADOPTION OF ONLINE LEARNING WILL CONTINUE TO PERSIST POST-PANDEMIC, AND HOW SUCH A SHIFT WOULD IMPACT THE WORLDWIDE EDUCATION MARKET.

EVEN BEFORE COVID-19, THERE WAS ALREADY HIGH GROWTH AND ADOPTION IN EDUCATION TECHNOLOGY, WITH GLOBAL EDTECH INVESTMENTS REACHING US\$18.66 BILLION IN 2019 AND THE OVERALL MARKET FOR ONLINE EDUCATION PROJECTED TO REACH \$350 BILLION BY 2025. WHETHER IT IS LANGUAGE APPS, VIRTUAL TUTORING, VIDEO CONFERENCING TOOLS, OR ONLINE LEARNING SOFTWARE, THERE HAS BEEN A SIGNIFICANT SURGE IN USAGE SINCE COVID-19.

HOW IS THE EDUCATION SECTOR RESPONDING TO COVID-19?

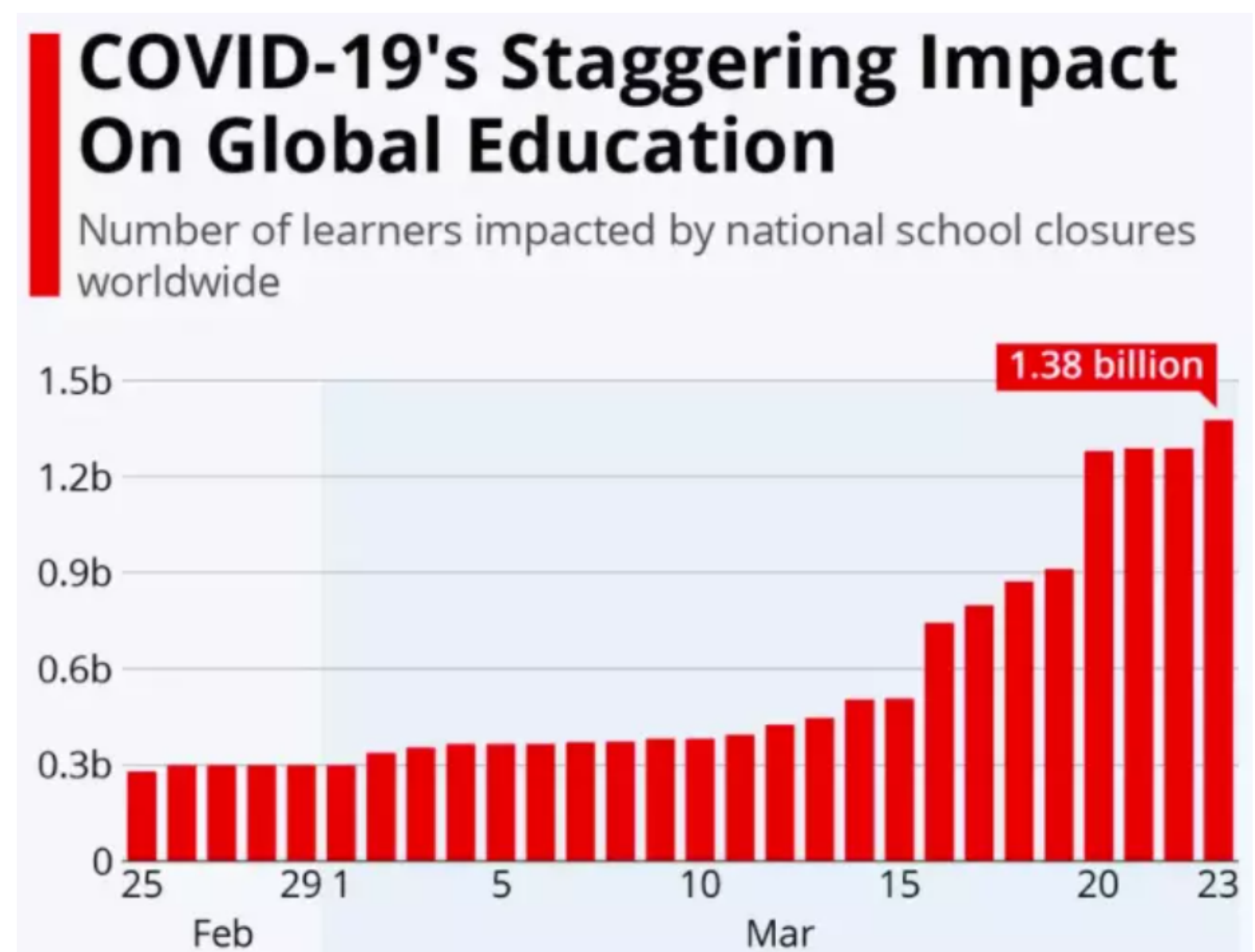
IN RESPONSE TO SIGNIFICANT DEMAND, MANY ONLINE LEARNING PLATFORMS ARE OFFERING FREE ACCESS TO THEIR SERVICES, INCLUDING PLATFORMS LIKE BYJU'S, A BANGALORE-BASED EDUCATIONAL TECHNOLOGY AND ONLINE TUTORING FIRM FOUNDED IN 2011, WHICH IS NOW THE WORLD'S MOST HIGHLY VALUED EDTECH COMPANY. SINCE ANNOUNCING FREE LIVE CLASSES ON ITS THINK AND LEARN APP, BYJU'S HAS SEEN A 200% INCREASE IN THE NUMBER OF NEW STUDENTS USING ITS PRODUCT, ACCORDING TO MRINAL MOHIT, THE COMPANY'S CHIEF OPERATING OFFICER.

TENCENT CLASSROOM, MEANWHILE, HAS BEEN USED EXTENSIVELY SINCE MID-FEBRUARY AFTER THE CHINESE GOVERNMENT INSTRUCTED A QUARTER OF A BILLION FULL-TIME STUDENTS TO RESUME THEIR STUDIES THROUGH ONLINE PLATFORMS. THIS RESULTED IN THE LARGEST "ONLINE MOVEMENT" IN THE HISTORY OF EDUCATION WITH APPROXIMATELY 730,000, OR 81% OF K-12 STUDENTS, ATTENDING CLASSES VIA THE TENCENT K-12 ONLINE SCHOOL IN WUHAN.

OTHER COMPANIES ARE BOLSTERING CAPABILITIES TO PROVIDE A ONE-STOP SHOP FOR TEACHERS AND STUDENTS. FOR EXAMPLE, LARK, A SINGAPORE-BASED COLLABORATION SUITE INITIALLY DEVELOPED BY BYTEDANCE AS AN INTERNAL TOOL TO MEET ITS OWN EXPONENTIAL GROWTH, BEGAN OFFERING TEACHERS AND STUDENTS UNLIMITED VIDEO CONFERENCING TIME, AUTO-TRANSLATION CAPABILITIES, REAL-TIME CO-EDITING OF PROJECT WORK, AND SMART CALENDAR SCHEDULING, AMONGST OTHER FEATURES. TO DO SO QUICKLY AND IN A TIME OF CRISIS, LARK RAMPED UP ITS GLOBAL SERVER INFRASTRUCTURE AND ENGINEERING CAPABILITIES TO ENSURE RELIABLE CONNECTIVITY.

ALIBABA'S DISTANCE LEARNING SOLUTION, DINGTALK, HAD TO PREPARE FOR A SIMILAR INFLUX: "TO SUPPORT LARGE-SCALE REMOTE WORK, THE PLATFORM TAPPED ALIBABA CLOUD TO DEPLOY MORE THAN 100,000 NEW CLOUD SERVERS IN JUST TWO HOURS LAST MONTH - SETTING A NEW RECORD FOR RAPID CAPACITY EXPANSION," ACCORDING TO DINGTALK CEO, CHEN HANG.

SOME SCHOOL DISTRICTS ARE FORMING UNIQUE PARTNERSHIPS, LIKE THE ONE BETWEEN THE LOS ANGELES UNIFIED SCHOOL DISTRICT AND PBS SOCAL/KCET TO OFFER LOCAL EDUCATIONAL BROADCASTS, WITH SEPARATE CHANNELS FOCUSED ON DIFFERENT AGES, AND A RANGE OF DIGITAL OPTIONS. MEDIA ORGANIZATIONS SUCH AS THE BBC ARE ALSO POWERING VIRTUAL LEARNING; BITESIZE DAILY, LAUNCHED ON 20 APRIL, IS OFFERING 14 WEEKS OF CURRICULUM-BASED LEARNING FOR KIDS ACROSS THE UK WITH CELEBRITIES LIKE MANCHESTER CITY FOOTBALLER SERGIO AGUERO TEACHING SOME OF THE CONTENT.



THE CHALLENGES OF ONLINE LEARNING

THERE ARE, HOWEVER, CHALLENGES TO OVERCOME. SOME STUDENTS WITHOUT RELIABLE INTERNET ACCESS AND/OR TECHNOLOGY STRUGGLE TO PARTICIPATE IN DIGITAL LEARNING; THIS GAP IS SEEN ACROSS COUNTRIES AND BETWEEN INCOME BRACKETS WITHIN COUNTRIES. FOR EXAMPLE, WHILST 95% OF STUDENTS IN SWITZERLAND, NORWAY, AND AUSTRIA HAVE A COMPUTER TO USE FOR THEIR SCHOOLWORK, ONLY 34% IN INDONESIA DO, ACCORDING TO OECD DATA.

IN THE US, THERE IS A SIGNIFICANT GAP BETWEEN THOSE FROM PRIVILEGED AND DISADVANTAGED BACKGROUNDS: WHILST VIRTUALLY ALL 15-YEAR-OLDS FROM A PRIVILEGED BACKGROUND SAID THEY HAD A COMPUTER TO WORK ON, NEARLY 25% OF THOSE FROM DISADVANTAGED BACKGROUNDS DID NOT. WHILE SOME SCHOOLS AND GOVERNMENTS HAVE BEEN PROVIDING DIGITAL EQUIPMENT TO STUDENTS IN NEED, SUCH AS IN NEW SOUTH WALES, AUSTRALIA, MANY ARE STILL CONCERNED THAT THE PANDEMIC WILL WIDEN THE DIGITAL DIVIDE.

THE IMPORTANCE OF DISSEMINATING KNOWLEDGE IS HIGHLIGHTED THROUGH COVID-19 MAJOR WORLD EVENTS ARE OFTEN AN INFLECTION POINT FOR RAPID INNOVATION - A CLEAR EXAMPLE IS THE RISE OF E-COMMERCE POST-SARS. WHILE WE HAVE YET TO SEE WHETHER THIS WILL APPLY TO E-LEARNING POST-COVID-19, IT IS ONE OF THE FEW SECTORS WHERE INVESTMENT HAS NOT DRIED UP. WHAT HAS BEEN MADE CLEAR THROUGH THIS PANDEMIC IS THE IMPORTANCE OF DISSEMINATING KNOWLEDGE ACROSS BORDERS, COMPANIES, AND ALL PARTS OF SOCIETY. IF ONLINE LEARNING TECHNOLOGY CAN PLAY A ROLE HERE, IT IS INCUMBENT UPON ALL OF US TO EXPLORE ITS FULL POTENTIAL.

SOURCE: <https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/>

Deep Learning: Predicting Skin Cancer

BUILD A CONVOLUTIONAL NEURAL NETWORK ON PYTHON TO RECOGNIZE BENIGN/MALIGNANT MELANOMA CELLS.

THERE ARE 4 STEPS INVOLVED IN BUILDING A CNN:

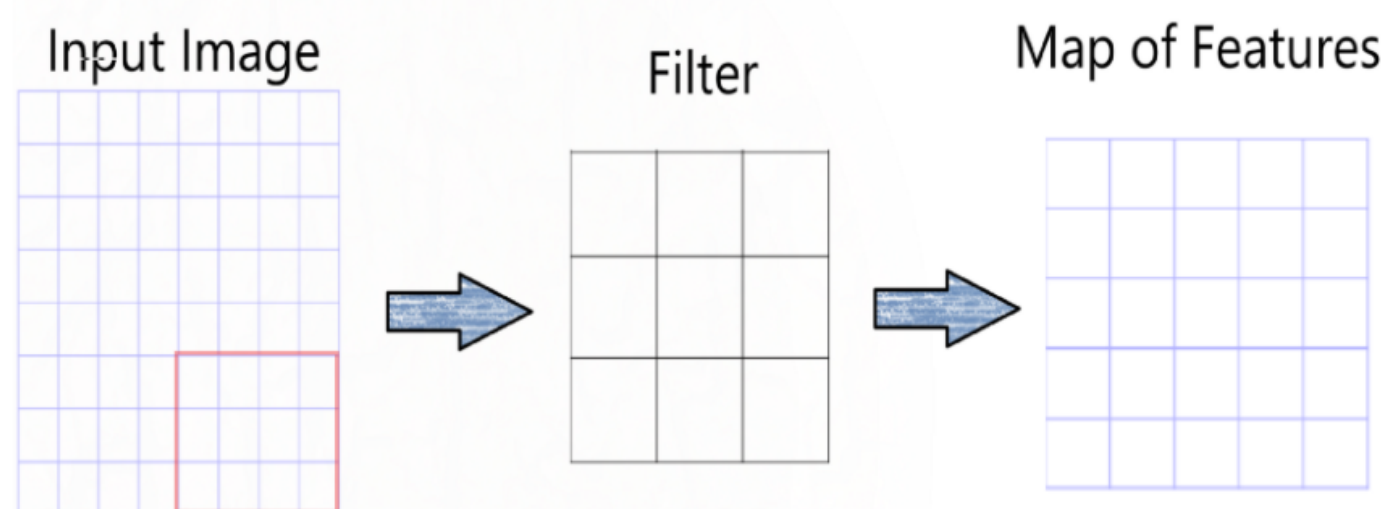
I. || INTRODUCTION ||

STEP 1- CONVOLUTION:

A FUNCTION DERIVED FROM TWO GIVEN FUNCTIONS BY INTEGRATION WHICH EXPRESSES HOW THE SHAPE OF ONE IS MODIFIED BY THE OTHER. THERE ARE 3 MAIN ELEMENTS OF THE CONVOLUTION OPERATION:

INPUT IMAGE: THE ACTUAL IMAGE IN PIXELS (BASICALLY OUR INPUT DATA)

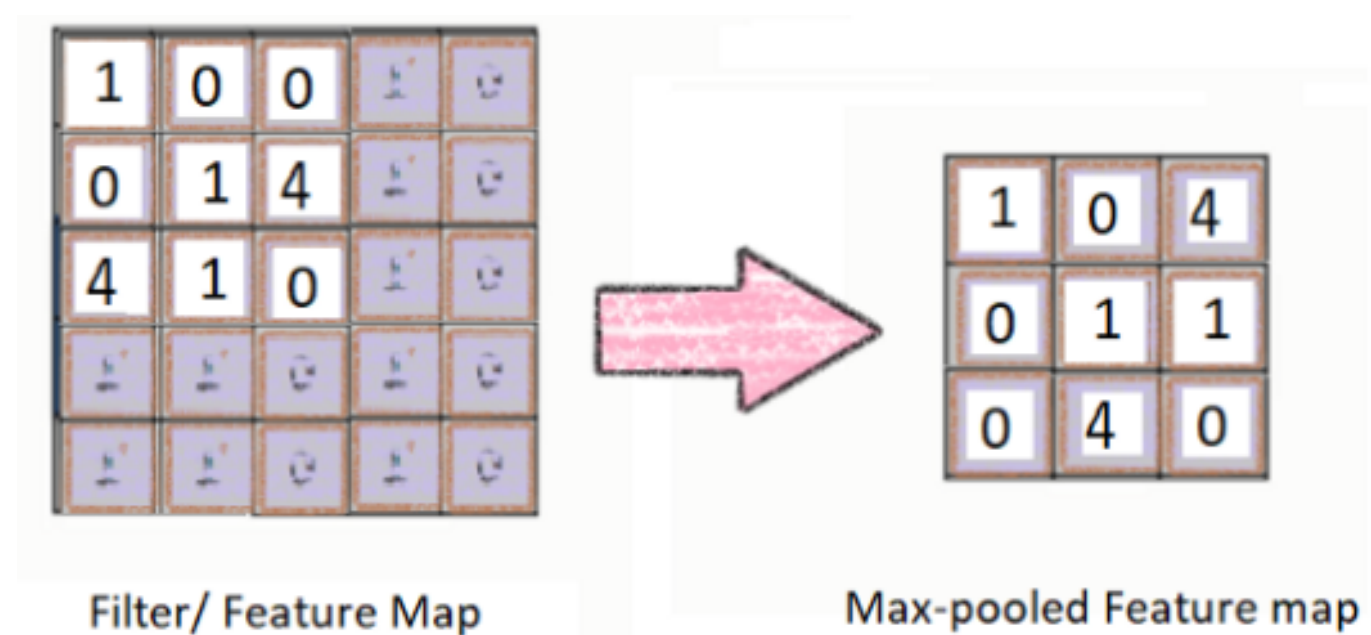
FEATURE DETECTOR: THESE CAN EVEN BE CALLED FILTERS. THEY BASICALLY DETECT CERTAIN FEATURES IN THE INPUT IMAGE. FEATURE DETECTORS ARE PLACED OVER THE INPUT IMAGE (THOUGH ARE MUCH SMALLER IN SIZE) AND COUNT THE NUMBER OF CELLS IN WHICH THE FEATURE DETECTOR MATCHES A SUBSET OF THE INPUT IMAGE. THE FEATURE DETECTOR THEN MOVES ALONG THE INPUT IMAGE TO COVER ALL OF ITS AREAS AND THE DISTANCES IT MOVES CAN BE REFERRED TO AS "STRIDES".



STEP 2- MAX POOLING:

THE PURPOSE OF MAX-POOLING IS TO ENABLE THE CNN TO DETECT AN IMAGE WHEN PRESENTED WITH BASIC MODIFICATION (FLIPPED, MIRRORED, UPSIDE-DOWN). IN THIS STEP, WE DETERMINE A POOLED FEATURE MAP.

MAX POOLING IS CONCERNED WITH TEACHING THE CONVOLUTIONAL NEURAL NETWORK TO RECOGNIZE THAT DESPITE ALL OF THESE DIFFERENCES, THEY ARE ALL IMAGES OF THE SAME THING. IN ORDER TO DO THAT, THE NETWORK NEEDS TO ACQUIRE A PROPERTY THAT IS KNOWN AS "SPATIAL VARIANCE.", SO IT CAN RECOGNIZE AN OBJECT IN AN IMAGE EVEN IF IT IS SPATIALLY DIFFERENT FROM ANOTHER IMAGE OF THE SAME OBJECT. THERE ARE ALSO OTHER POOLING TECHNIQUES SUCH AS MEAN POOLING (TAKES THE AVERAGE), AND SUM POOLING (TAKES THE SUM).

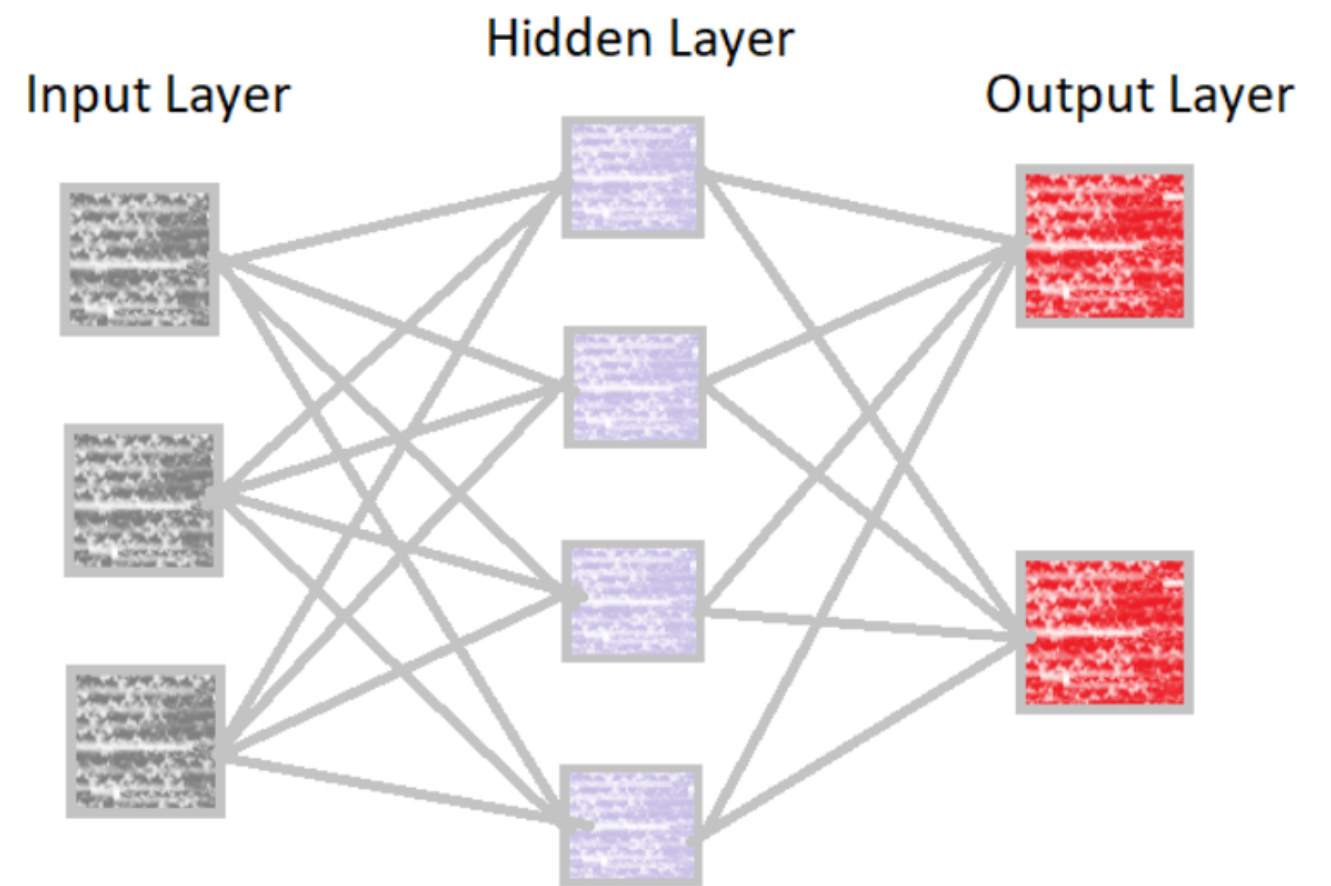


STEP 3 – FLATTENING:

BY THE TIME WE REACH THIS STEP, WE HAVE A POOLED FEATURE MAP BY NOW. AS THE NAME OF THIS STEP IMPLIES, WE ARE LITERALLY GOING TO FLATTEN OUR POOLED FEATURE MAP INTO THE SHAPE OF A COLUMN. SO INSTEAD OF LOOKING LIKE A BOX SQUARED MATRIX, OUR POOLED FEATURE MAP NOW LOOKS LIKE A VERTICAL COLUMN. AFTER FLATTENING IS THAT WE END UP WITH A LONG VECTOR OF INPUT DATA THAT WE THEN PASS THROUGH THE ARTIFICIAL NEURAL NETWORK TO HAVE IT PROCESSED FURTHER. IF WE DIDN'T DO THIS STEP, IT WOULD BE HARD FOR THE NEURAL NETWORK TO READ OUR DATA.

STEP 4 - FULL CONNECTION:

THE FULLY CONNECTED LAYER IN THE CNN IS THE SAME AS A HIDDEN LAYER IN AN ANN. THE ROLE OF THE ARTIFICIAL NEURAL NETWORK IS TO TAKE THIS DATA AND COMBINE THE FEATURES INTO A WIDER VARIETY OF ATTRIBUTES THAT MAKE THE CONVOLUTIONAL NETWORK MORE CAPABLE OF CLASSIFYING IMAGES.



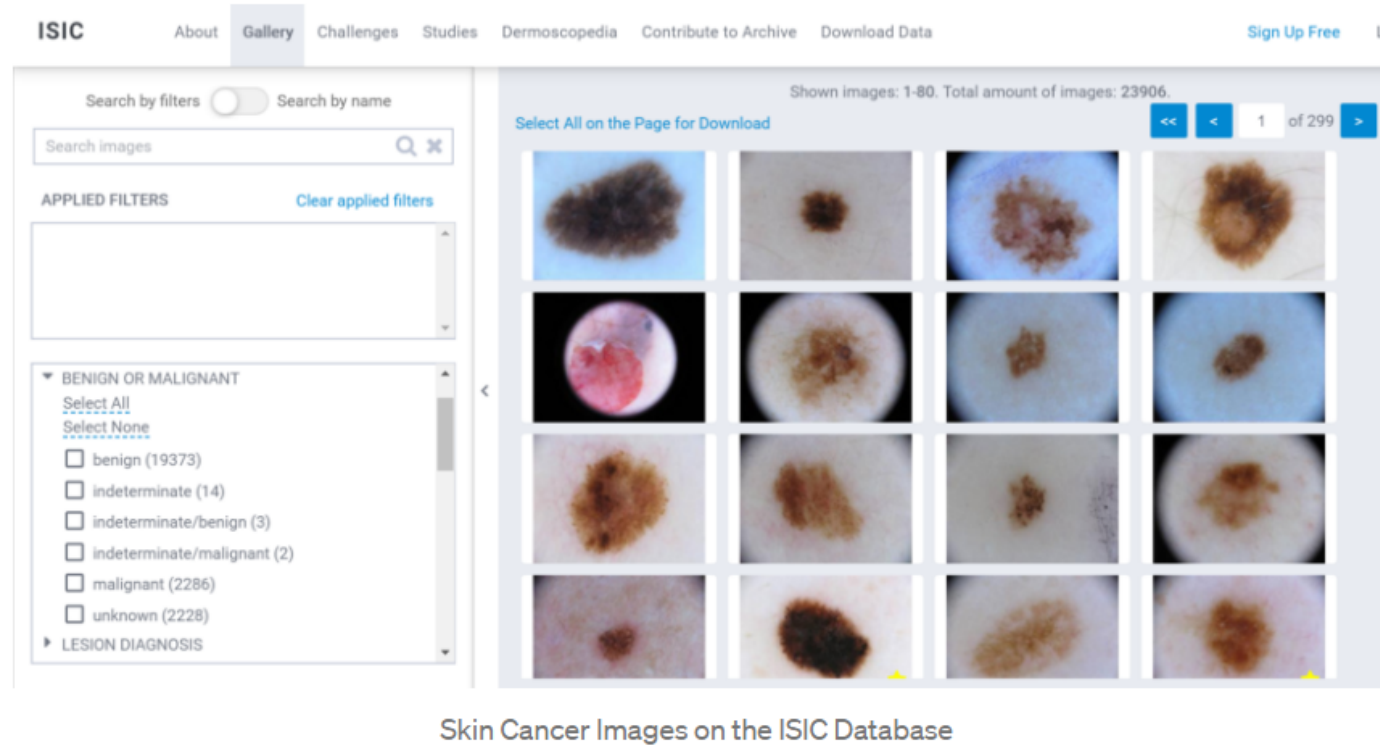
THIS ALSO THE STEP WHERE WE CALCULATE THE ERROR FUNCTION THAT OUR NETWORK TAKES INTO ACCOUNT BEFORE MAKING PREDICTIONS. IN AN ANN, IT WAS CALLED THE LOSS FUNCTION. THE MACHINE CAN NOW PLACE WEIGHTS ON EACH OF THE FULLY-CONNECTED LAYERS TO DETERMINE THE BINARY OUTCOME OF OUR INDEPENDENT VARIABLE.

II. || WORKFLOW SUMMARY ||

1. WE START WITH AN INPUT IMAGE. IN OUR CASE, WE WOULD USE A SINGLE IMAGE FROM OUR DATASET OF 1000 IMAGES, AND LATER WE WOULD LOOP THE FUNCTION OVER THE OTHER IMAGES.
2. WE APPLY FILTERS OR FEATURE MAPS TO THE INPUT IMAGE, WHICH GIVES US A CONVOLUTIONAL LAYER.
3. WE THEN BREAK UP THE LINEARITY OF THAT IMAGE USING THE RECTIFIER FUNCTION.
4. THE IMAGE BECOMES READY FOR POOLING, THE PURPOSE OF WHICH IS TO PROVIDE OUR CNN WITH "SPATIAL INVARIANCE". YOU'LL SEE IT EXPLAINED IN MORE DETAIL IN THE POOLING TUTORIAL. AFTER POOLING, WE END UP WITH A POOLED FEATURE MAP.
5. WE THEN FLATTEN OUR POOLED FEATURE MAP BEFORE INSERTING IT INTO AN ARTIFICIAL NEURAL NETWORK. THROUGHOUT THIS ENTIRE PROCESS, THE NETWORK'S BUILDING BLOCKS, LIKE THE WEIGHTS AND THE FEATURE MAPS, ARE TRAINED AND REPEATEDLY ALTERED IN ORDER FOR THE NETWORK TO REACH THE OPTIMAL PERFORMANCE THAT WILL MAKE IT ABLE TO CLASSIFY IMAGES AND OBJECTS AS ACCURATELY AS POSSIBLE.

III. || DEFINING THE PROBLEM ||

THE DATASET I AM USING ARE IMAGES FROM THE ISIC DATABASE. THESE ARE MICROSCOPIC IMAGES OF BENIGN & MALIGNANT SKIN CANCER CELLS. THE MAIN ISSUE IS THAT THE IMAGES ARE QUITE LARGE, AND THEREFORE I WOULD REQUIRE A GPU OR BETTER CPU TO PROCESS ALL THESE IMAGES WITHOUT JUPYTER CRASHING CONSTANTLY. FOR THE PURPOSE OF THIS PROJECT, I AM USING 1000 IMAGES IN MY TRAINING DATASET (500 BENIGN AND 500 MALIGNANT), AND 400 IMAGES IN MY TEST DATASET (200 BENIGN AND 200 MALIGNANT).



ESSENTIALLY, I AM TEACHING THE MACHINE TO DIFFERENTIATE BETWEEN BENIGN AND MALIGNANT CANCER CELLS. THIS CAN BE A DIFFICULT TASK, EVEN FOR HUMANS, AS BENIGN AND MALIGNANT CELLS WILL OFTEN LOOK ALIKE. THERE ARE CERTAIN CASES WHERE IT IS ALMOST IMPOSSIBLE TO DIFFERENTIATE. LET'S SEE HOW WELL OUR CNN MODEL DOES.

IV. || MODEL PIPELINE ||

TO BUILD THE CNN MODEL, WE GO THROUGH THE FOLLOWING PIPELINE PROCESS:

1. IMPORT KERAS PACKAGES AND LIBRARIES
2. INITIALIZING THE CNN
3. ADDING THE CONVOLUTION LAYER
4. ADDING THE POOLING LAYER
5. ADDING FLATTENING TO THE LAYER
6. ADDING THE FULLY CONNECTED LAYER
7. COMPILING THE CNN
8. FITTING THE CNN TO MY IMAGE DATASET

V. || BUILDING THE CNN MODEL ||

WE START BY IMPORT THE KERAS PACKAGES REQUIRED FOR THIS PIPELINE. THERE ARE 5 CLASSES OF KERAS EXPLAINED BELOW, YOU CAN READ THROUGH TO UNDERSTAND HOW EACH IS GOING TO BE UTILIZED IN THE MODEL:

1. SEQUENTIAL: THIS CLASS IS USED TO INITIALIZE OUR CNN. THERE ARE 2 WAYS OF INITIALIZING A CLASS: FIRSTLY USING SEQUENTIAL, AND SECONDLY USING A GRAPH.

2. CONVOLUTION2D: THIS IS THE CLASS FOR OUR CONVOLUTION OPERATION. AS MENTIONED ABOVE, THE CONVOLUTION OPERATION IS ONE OF THE MOST CRUCIAL STEPS IN BUILDING A CNN. THIS CLASS IS USED FOR 2D MODELS, WHICH IS WHAT WE HAVE.

3. MAXPOOLING2D: ANOTHER 2D CLASS, WHICH RUNS THE MAX POOLING OPERATION ON OUR CNN, GIVEN A FEW PARAMETERS REGARDING OUR DATA. AS MENTIONED EARLIER, MAX POOLING IS A NECESSARY STEP IN BUILDING A CNN AS IT MAKES THE MODEL MORE RIGID AND SUSCEPTIBLE TO CHANGES SUCH AS FLIPPING, MIRRORING THE IMAGE, ETC.

4. FLATTEN: THIS CLASS IS INVOLVED IN THE NEXT STEP IN BUILDING OUR MODEL. IN ORDER FOR OUR MACHINE TO UNDERSTAND THE DATA, WE MUST CONVERT IT FROM A MATRIX TO A COLUMN, WHICH CAN BE DONE BY FLATTENING THE DATA.

5. DENSE: IT IS THE MOST ESSENTIAL CLASS SINCE IT CREATES AN OUTPUT LAYER FOR THE ANN, WHICH WILL BE IMPORTANT IN OPTIMIZING OUR WEIGHTS FOR THE MODEL, AND ASSIGNING A LOSS/ERROR FUNCTION TO EVALUATE THE EFFECTIVENESS OF THE MODEL.

V.I ~ INITIALIZING THE CNN

I CREATED AN OBJECT CALLED CLASSIFIER, WHICH IS ESSENTIALLY THE CNN CLASSIFICATION MODEL I'LL BE BUILDING THROUGHOUT THIS PROJECT. I ATTACHED THIS OBJECT TO THE SEQUENTIAL CLASS TO INITIALIZE THE CNN MODEL AS A SEQUENCE OF LAYERS.

V.II ~ ADDING THE CONVOLUTION LAYER

THE NEXT STEP IS TO ADD A CONVOLUTION LAYER. AS I HAD MENTIONED ABOVE, THE CONVOLUTION LAYER APPLIES A FILTER OR A FEATURE DETECTOR TO THE INPUT IMAGE AND CREATES A FEATURE MAP FOR THE IMAGES. I USED THE CONVOLUTION 2D CLASS, FOR WHICH I EXPLAIN THE PARAMETERS BELOW:

- THE FIRST PARAMETER REFERS TO THE NUMBER OF FEATURE DETECTORS. THE DEFAULT VALUE FOR THIS IS 64, BUT SINCE I'M USING A CPU AND NOT A GPU, I CHOSE TO GO WITH 32 FEATURE DETECTORS TO SAVE TIME AND BE MORE RESOURCEFUL SINCE I HAVE 1000 TRAINING IMAGES, AND 400 TEST IMAGES. HOWEVER, 64 FEATURE DETECTORS COULD MAKE THIS MODEL A LOT MORE ACCURATE.
- THE SECOND AND THIRD PARAMETERS REFER TO THE SIZE OR DIMENSIONS OF OUR FEATURE DETECTORS, WHICH WOULD BE A 3 X 3 MATRIX, THUS I INPUT (3, 3).
- THE THIRD PARAMETER IS THE INPUT SHAPE, WHICH IS THE SHAPE & SIZE OF THE INPUT IMAGE. SINCE ALL MY IMAGES ARE OF DIFFERENT SIZES, I WILL LATER CONVERT THEM INTO 32 X 32 PIXELS. I SPECIFIED 3 FOR THE NUMBER OF COLOR CHANNELS, AS THESE ARE COLORED IMAGES AND USE 3 CHANNELS (RGB). IF IT WERE BLACK & WHITE, I WOULD INPUT 1 INSTEAD OF 3.
- THE FINAL PARAMETER IS THE ACTIVATION FUNCTION, WHICH WE USE TO ACTIVATE NEURONS IN THE NEURAL NETWORK. I'M USING THE RECTIFIER ACTIVATION FUNCTION AS THIS IS A NON-LINEAR MODEL, THUS WE INPUT 'RELU'

V.III ~ ADDING THE POOLING LAYER

THE NEXT STEP CONSISTS OF ADDING THE POOLING LAYER TO THE CNN MODEL. USING THE ADD METHOD AGAIN, I ADD THE MAXPOOLING2D CLASS AND SPECIFY THE POOL SIZE, WHICH WILL SLIDE OVER THE FEATURE MAP TO CREATE A POOLED FEATURE MAP. IN THIS CASE, I WILL USE A 2 X 2 POOL SIZE. THIS STEP IS IMPORTANT IN REDUCING THE SIZE OF OUR FEATURE MAP, MAKING THE MODEL LESS COMPLEX AND COMPUTATIONAL.

V.IV ~ ADDING FLATTENING TO THE LAYER

BELOW, I USED THE ADD FUNCTION AGAIN TO ADD THE FLATTEN CLASS TO OUR OBJECT, CLASSIFIER. THIS, AS I HAD MENTIONED BEFORE, CREATES A COLUMN SHAPE FROM THE POOLED FEATURE MATRIX BY FLATTENING IT. THERE ARE NO PARAMETERS REQUIRED FOR THIS CLASS, SO I LEAVE THE BRACKETS EMPTY.

V.V ~ ADDING THE FULLY-CONNECTED LAYER & OUTPUT LAYER.

THE NEXT STEP IS THE FINAL PART OF BUILDING THE CNN MODEL. I BUILD THE FULLY-CONNECTED LAYER IN THIS MODEL, WHICH IS SIMILAR TO THE HIDDEN LAYERS I HAD IN MY ANN MODEL. SO THE FIRST LINE OF CODE BELOW CREATES THE HIDDEN LAYER. USING THE ADD METHOD, I UTILIZE THE DENSE FUNCTION WHICH HAS 2 PARAMETERS:

THE FIRST IS THE NUMBER OF NODES FOR THE OUTPUT LAYER. IN MY ANN MODEL, I HAD TAKEN THE AVERAGE OF THE SUM OF INPUT AND OUTPUT LAYERS, HOWEVER, IN THIS CASE, EVEN THAT NUMBER WOULD BE TOO BIG. THUS, I DID SOME RESEARCH AND DISCOVERED THAT WE SHOULDN'T BE USING A NUMBER TOO SMALL EITHER. I LEARNED THAT HAVING AT LEAST 128 NODES IS A GOOD WAY TO START. THE SECOND PARAMETER IS THE ACTIVATION FUNCTION, WHICH WILL AGAIN BE RELU AS I'M USING THE RECTIFIER FUNCTION FOR THIS NON-LINEAR MODEL. THEN I CREATED THE OUTPUT LAYER WITH A SIMILAR LINE OF CODE. SINCE THE OUTPUT IS A BINARY VARIABLE, IT WILL HAVE 1 NODE AND SINCE I WANT TO KNOW THE PROBABILITY THAT THIS MODEL WILL PREDICT WHETHER A CELL IS BENIGN OR MALIGNANT, I USE THE SIGMOID ACTIVATION FUNCTION.

THIS IS SEPARATE FROM THE IPYKERNEL PACKAGE SO WE CAN AVOID DOING IMPORTS UNTIL LATER.

VI. || FITTING THE CNN MODEL TO THE DATASET ||

V.VI ~ COMPILING THE CNN

NOW THAT I HAVE BUILT THE CNN MODEL, I NEED TO COMPILE IT AND OPTIMIZE THE WEIGHTS AND THE LOSS FUNCTION TO EVALUATE THE MODEL. TO DO THIS, I USE THE COMPILE METHOD IN MY CLASSIFIER OBJECT AND INPUT THE FOLLOWING PARAMETERS:

NOW THAT THE MODEL IS BUILT AND COMPILED, THE NEXT STEP IS TO FIT THE CNN MODEL TO THE IMAGE DATASET. THE CODE BELOW SEEMS MUCH MORE DIFFICULT THAN WHAT I HAD TO DO TO BUILD AND COMPILE THE MODEL. HOWEVER, THE KERAS WEBSITE PROVIDES THIS CODE WITHIN ITS DOCUMENTATION, AS IMAGE AUGMENTATION IS A COMMON PRACTICE USING KERAS.

SOURCE: <https://medium.com/swlh/deep-learning-predicting-skin-cancer-379084c33573>

Faculty Activities



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