

# FINAL DELIVERABLE PROJECT DOCUMENTATION

Date	15 November 2022
Team ID	PNT2022TMID25362
Project Name	VirtualEye-Lifeguard for Swimming Pools to Detect the Active Drowning

## CHAPTER-1 1. INTRODUCTION

Recently, there has been growing interest around the topic of drowning detection systems (DDS) in the sport and leisure industry both across the UK and globally. Advancements in technology, coupled with the importance of pool safety, has led to its growing prominence, with mention of DDS now in documents such as HSG179 - the latest UK standards document for health and safety in swimming pools (Health and Safety Executive, 2018). However, the topic is a debated area for various reasons explored in this review.

Whilst there are plenty of academic articles dedicated to the technology and design behind these products in the fields of biometrics, computer science and electronic engineering, there is limited academic research investigating their application to real-world scenarios. Furthermore, there is uncertainty around their use alongside traditional lifeguarding; whether international testing standards (ISO standards) are robust enough; and general risks affecting the effectiveness of these products. This includes factors such as water clarity, high pool occupancy, lighting, glare and attractions such as water slides and wave machines. These concerns alongside the lack of research and high installation costs have resulted in a reluctance by some operators to incorporate DDS into their pools. This signifies the importance of independent research into DDS. intends to support the move towards the shared goal of improved pool safety.

This piece will begin with an overview of the different definitions of DDS, followed by an explanation of the aims and methodology of this review. It will then discuss what the current DDS standards are alongside legislation and guidance available around DDS, and provide a summary of the shared responsibilities towards the effective operation of DDS. Following this, the literature review will examine the co-existence between DDS and traditional lifeguarding, provide an analysis of its impact so far, and conclude with recommendations on the direction of future DDS research.

## **1.2 Purpose**

>> Establish and outline what is known on Drowning Detection Systems. >> Evaluate the current literature on Drowning Detection Systems, including their use in indoor pool environments along with interaction with traditional lifeguarding.

>> Better understand where DDS are positioned in the health and safety landscape of indoor swimming pools.

The value that can be generated from these aims stem from the recognition that currently, there are no published documents drawing together all the current DDS research. The literature review aims to contribute as independent research in this field and hopes to signpost the potential future direction of DDS research.

## **CHAPTER-2**

### **2. LITERATURE SURVEY**

Of the differing definitions of DDS, most outline three defining elements:

- 1) surveillance,
- 2) detection of a pool user in difficulty, and
- 3) raising an alarm

For example, ISO\_20380 (the document published by the International Organisation for Standardization (2017) outlining the international safety requirements and test standards for DDS) defines the technology as an ‘automated system including means for digitizing series of images of people in the pool basin, means for comparing and analysing digitized images and decision means for setting off and sending an alarm to trained staff when a detection occurs’. In comparison, there are broader definitions that are inclusive of other technologies that focus on the surveillance aspect, for example, ‘DDS is used to describe various electronic systems that are designed to assist with the surveillance of swimmers within the water of a swimming pool’ (Sport England, 2011). This definition would include CCTV that helps give lifeguards an underwater view but does not have the capacity to detect a pool user in difficulty or raise an alarm. For this to be effective, staff would have to make sure the CCTV is being monitored at all times, making the staff experience with this very different to the experience of using a DDS falling under the first definition. It is important to distinguish what exactly constitutes a DDS as there are different areas of responsibility required from different actors involved in the effective operation of DDS, which will be examined in chapter 4. For this literature review, research has focused on the definition used by the ISO and other sources that incorporate all three elements of surveillance, detection and alarm raising.

## 2.1 Existing Problem

Whilst literature on DDS mostly agrees on areas such as the risks and issues associated with DDS performance, there are other areas where sources offer differing points of view, for example, DDS and their co-existence with lifeguards. There is debate around whether DDS can be helpful or harmful towards lifeguarding practices and how DDS may change the landscape of traditional lifeguarding, as well as some disagreement on whether they serve as justification for reducing lifeguard numbers. The term ‘blended lifeguarding’ or ‘modern lifeguarding’ has been newly coined to describe the concept of traditional lifeguarding practices being blended with technology for drowning detection (Swimming Pool Scene, 2017). Currently, there is little qualitative or quantitative research analysing the experiences of lifeguards themselves relating to this concept.

## 2.2 References

- [1] AngelEye. (2019). AngelEye – Distributors. Retrieved from: <https://www.angeleye.it/news.php?id=28&newscat=10>
- [2] Aquatics International. (2007). Traumatic Experiences – Should we make our youngest lifeguards come face to face with death? Retrieved from: [https://www.aquaticsintl.com/facilities/traumaticexperiences\\_o](https://www.aquaticsintl.com/facilities/traumaticexperiences_o)
- [3] British Standards Institution. (2018). BS EN 15288-1, Swimming pools for public use. Safety requirements for design. Retrieved from: <https://shop.bsigroup.com/ProductDetail/?pid=000000000030360254>
- [4] British Standards Institution 1. (2018). BS EN 15288-2, Swimming pools for public use. Safety requirements for operation. Retrieved from: <https://shop.bsigroup.com/ProductDetail/?pid=000000000030360257>
- [5] Drowning Prevention. (2017). The Need. Retrieved from: <https://www.drowningprevention.com.au/>

[6] German Institute for Standardization. (2019). German national guideline DGfDB R 94.15 “Test methods for camera-based drowning detection systems under operational conditions” (German Association for Public Swimming Pools).

[7] Haizhou Li, Haizhou Li, Kar-Ann Toh and Liyuan Li. (2012). Advanced Topics in Biometrics, World Scientific Publishing Co. Pte. Ltd., ISBN-13 978-981-4287-84-5

[8] Health and Safety Executive. (2018). HSG179, Health and safety in swimming pools (Fourth edition).

[9] ISO (2017) ISO\_20380, First edition, Public swimming pools — Computer vision systems for the detection of drowning accidents in swimming pools — Safety requirements and test methods.

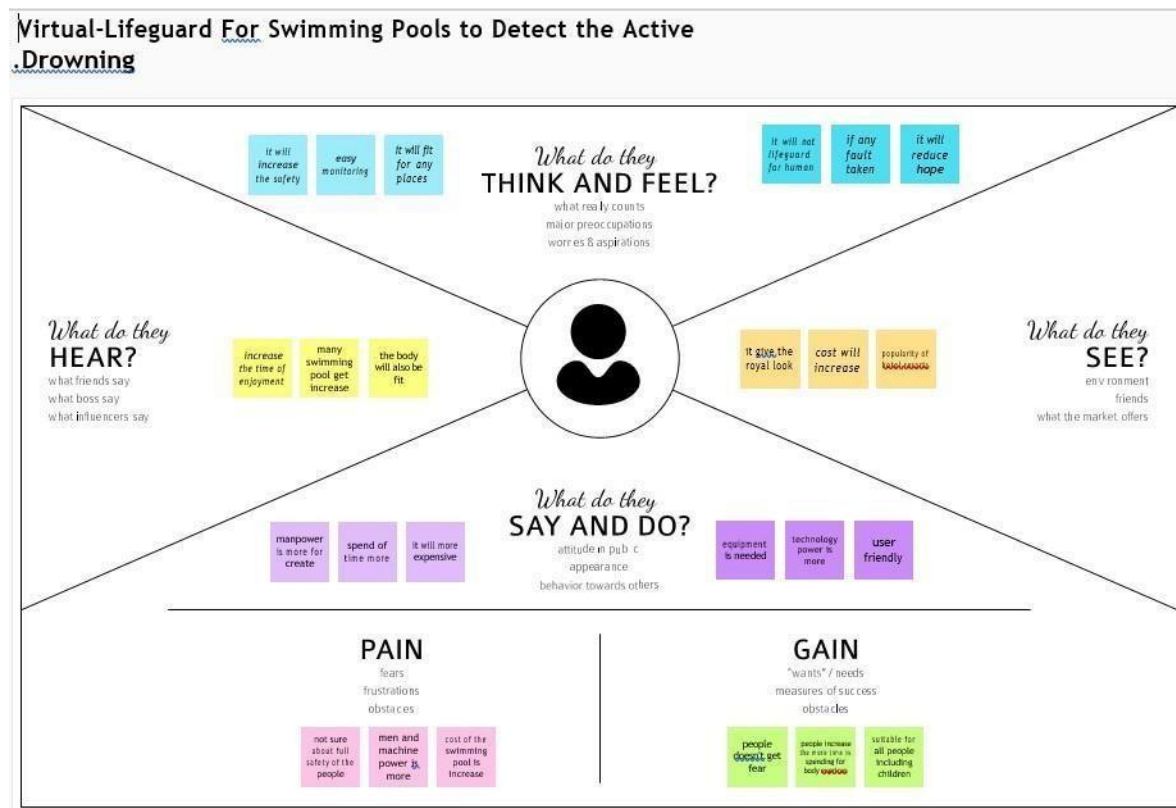
## **2.3 PROBLEM STATEMENT DEFINITION**

1. Swimming is one of the best exercises that helps people to reduce stress in this urban lifestyle. Swimming pools are found larger in number in hotels.
2. Applying the CNN algorithm to the dataset. Beginners, especially, often feel it difficult to breathe underwater which causes breathing trouble which in turn causes a drowning accident.
3. To overcome this conflict, a meticulous system is to be implemented along the swimming pools to save human life.

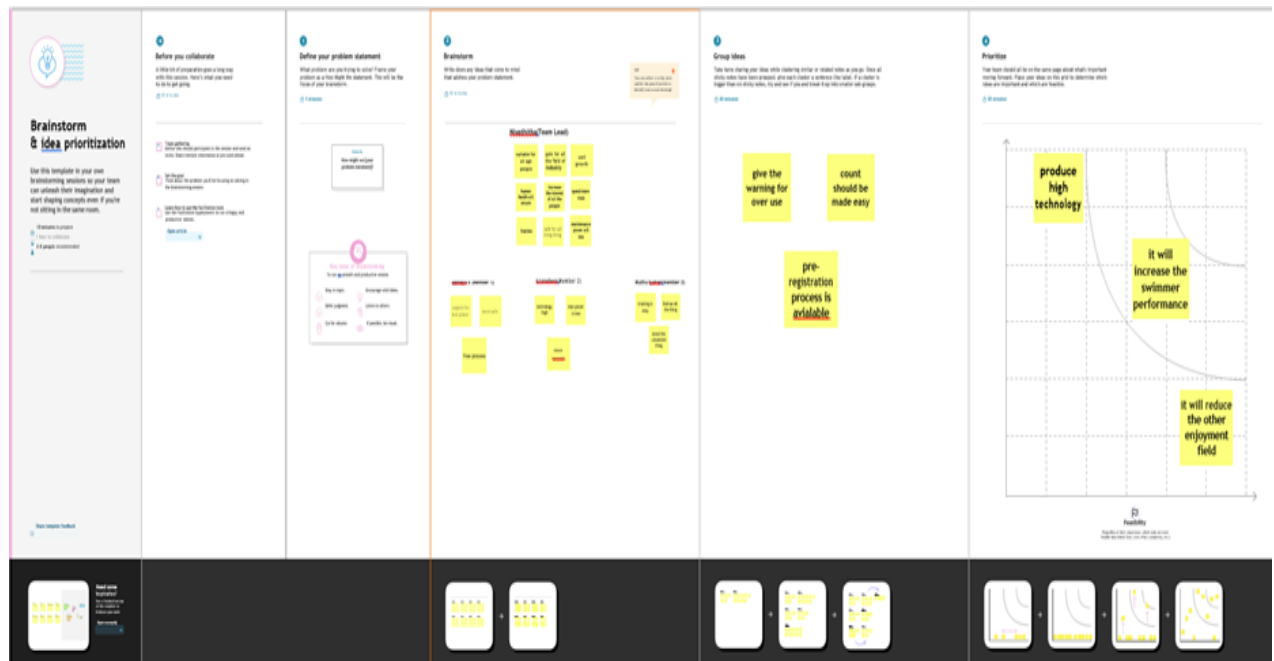
## CHAPTER-3

### 3.IDEATION & PROPOSED SOLUTION

#### 3.1 EMPATHY MAP CANVAS



#### 3.2 IDEATION & BRAINSTORMING



### 3.3 PROPOSED SOLUTION

Proposed Solution Template:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	People use the swimming for enjoyment, health Exercise but for all age of the people pool is really dangerous we need lifeguard, in duty swimming pools are very dangerous in the underwater.
2.	Idea / Solution description	In this project, using Artificial intelligence technology, using the camera help we can detect the people action and positions and also we check breathing level of the people inside the underwater and use of any alarms system we can detect the some of them are in the problem

3.	Novelty / Uniqueness	The uniqueness of the our system is track the people position and body condition in the drowning using YOLO Algorithm. It is fast and very speed in the detection
4.	Social Impact / Customer Satisfaction	In world most of them are unexcepted cause very serious death in the underwater not only in the city but most occurs in the rural area in the public places (well, lakes) we should avoid the accident in the underwater drowning
5.	Business Model (Revenue Model)	In the software field this well increase good income. Safety innovation in the swimming related issues this makes attractive for end users to use our software product
6.	Scalability of the Solution	IBM cloud server will collect all the data and stored in the server. This will more safe and secure

### 3.4 PROBLEM SOLUTION FIT



Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> Who is your customer? i.e. working parents of 0-5 y.o. kids  The main customers for our project are: <ul style="list-style-type: none"> <li>Private Swimming Pool Owners</li> <li>Home Owners who own a Swimming Pool</li> <li>Life-Guards hired at the Swimming Pool</li> </ul>	<b>6. CUSTOMER CONSTRAINTS</b> What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices. <ul style="list-style-type: none"> <li>Customers could be skeptical about the accuracy of the detection.</li> <li>They can harbor security concerns.</li> </ul>	<b>5. AVAILABLE SOLUTIONS</b> Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking  Prediction process takes place only after drowning but proposed solution uses Deep Learning Algorithm for detection so that there is a chance for detecting drowning accident at earlier stage (i.e., model could also detect partially drowned subjects).  <b>Pros:</b> Detect before the subject has completely drowned. <b>Cons:</b> If the video feed is broken or obstructed it does not give a result.	Explore AS, differentiate
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides. <ul style="list-style-type: none"> <li>Detect potential drowning subjects in the Swimming Pool.</li> <li>Alert life-guards when a subject is drowning.</li> </ul>	<b>9. PROBLEM ROOT CAUSE</b> What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations. <ul style="list-style-type: none"> <li>Life-guard is alerted only when a person has partially/completely drowned.</li> <li>Cannot save the person until they have partially drowned.</li> </ul>	<b>7. BEHAVIOUR</b> What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace) <ul style="list-style-type: none"> <li>Saving people's life.</li> <li>Taking effective action in case of an emergency.</li> <li>Being attentive and quick in responding to emergencies.</li> </ul>	
Focus on J&P, tap into BE, understand RC	<b>3. TRIGGERS</b> What triggers customers to act? i.e. seeing their neighbour installing solar panels, receiving a notification from a friend... Potential subject drowning match in the video frame based on the sample images the model is trained on	<b>10. YOUR SOLUTION</b> If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.  The model uses advanced YOLO v5 Algorithm to detect potential drowning subjects which yields higher accuracy and performance compared to existing solutions.  Upon a positive detection an alert would be sent to the Web Application.	<b>8. CHANNELS of BEHAVIOUR</b> <b>8.1 ONLINE</b> What kind of actions do customers take online? Extract online channels from #7  Monitoring active swimmers via Web Application.  <b>8.2 OFFLINE</b> What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.  Be on the look for potential drowning and responding to emergencies.	Extract online & offline CH of BE
	<b>4. EMOTIONS: BEFORE / AFTER</b> How do customers feel when they face a problem or a job and afterwards? <b>Before:</b> Subject being anxious about their safety in swimming pool. <b>After:</b> With the device planted, the subject would feel safer as it would alert life-guards in case of an active drowning.			



Problem-Solution fit canvas is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 license  
 Created by Daria Nepriakhina / Amaltama.com



## CHAPTER-4

### 4. REQUIREMENT ANALYSIS

#### 4.1 FUNCTIONAL REQUIREMENT

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
--------	-------------------------------	------------------------------------

FR-1	Installation	Install the camera inside the underwater, connect necessary app in the phone or other device
FR-2	Detection	Near swimming pool area use detection room for monitor or use IBM cloud for storage purpose of the details
FR-3	Audio	Give the alert signal for the people enter into the underwater and leaving into underwater
FR-4	Support	Extra support from the lifeguard if any person pulse rate will decrease inside the water
FR-5	Prior alert	Extreme level problem should be occur give the alert signal for the entire pool

## 4.2 NON-FUNCTIONAL REQUIREMENT

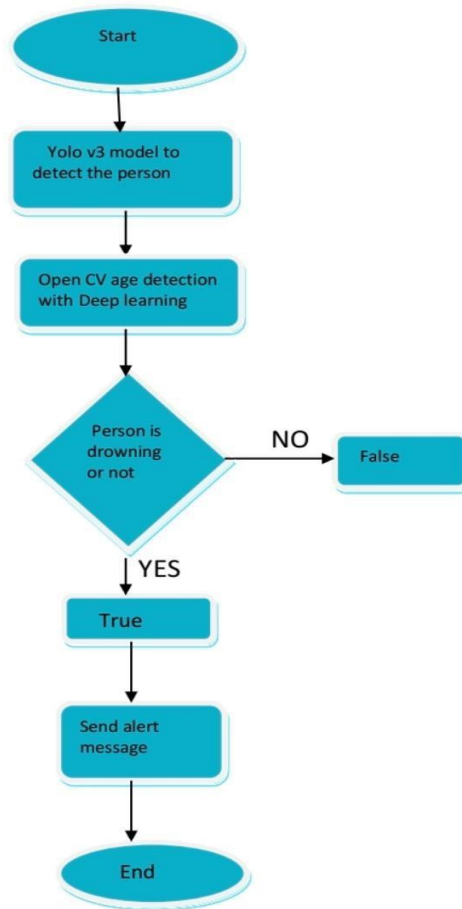
FR No.	Non-Functional Requirement	Description
NFR-1	<b>Usability</b>	A Lifeguard should be present in all the time near pool
NFR-2	<b>Security</b>	Alert message or signal should be give by the lifeguard of swimmer
NFR-3	<b>Reliability</b>	Triggers if any immediate needs of the swimmer inside the pool
NFR-4	<b>Performance</b>	If any unwanted position changes and the pulse rate will decrease this will detect it.
NFR-5	<b>Availability</b>	Equipment and other requirement should be checked by the lifeguards
NFR-6	<b>Scalability</b>	Virtual eye lifeguard detects potential drownings and it should be notifies you.

## **CHAPTER-5 5. PROJECT DESIGN**

### **5.1 DATAFLOW DIAGRAMS**

#### **Data Flow Diagrams:**

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored



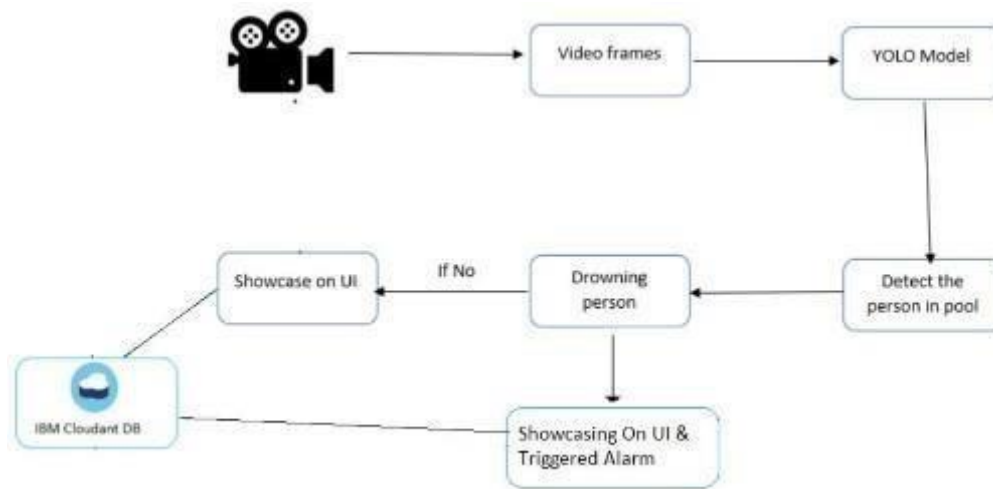
## 5.2 SOLUTION & TECHNICAL ARCHITECTURE

Solution Architecture:

- ✚ To find underwater movement while person is drowning they have any

Problem or anything else we will find the solution using the Artificial Intelligence (AI) detection technology.

- ✚ Usually, such systems can be developed by installing more than 16 cameras underwater and ceiling and analyzing the video feeds to detect any anomalies. AS a POC we make use of one camera that streams the video underwater and analyses the positionof swimmers to assess the probability of drowning, if it is higher then an alert will be generated to attract lifeguards' attention.



## 5.3 USER STORIES

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
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Customer (Pool owner)	Installation	USN-1	Install the camera inside the underwater, connect necessary app in the phone or other device	I can cameras to the IBM cloud DB	High	Sprint-1
Customer (Lifeguard	Secure thepeople	USN-2	As a user, I can secure the drowning personsfrom the pool	I can save the drowning person	High	Sprint-1
Customer (swimmers)	safety	USN-3	As a user, I can swim inside the underwater without fear of the Drowning	I can swim safely	medium	Sprint-2
Customer care (Executive)	Contact	USN-4	As a user, I Can resolve if any problem occurs with any device technically	I can contact the customer care executiveto resolve any issues	Medium	Sprint-3
Administrator	Dashboard	USN-5	Management of the drowning detection systemand database management	I can access the system's logs and any other data instantly	High	Sprint-4

## CHAPTER-6

### 6.1 SPRINT PLANNING & ESTIMATION

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date(Actual)
Sprint-1	8	6 Days	24 Oct 2022	29 Oct 2022	6	29 Oct 2022
Sprint-2	14	6 Days	31 Oct 2022	05 Nov 2022	12	05 Nov 2022
Sprint-3	16	6 Days	07 Nov 2022	12 Nov 2022	11	12 Nov 2022
Sprint-4	12	6 Days	14 Nov 2022	19 Nov 2022	12	19 Nov 2022

## CHAPTER-7

### 7.1Code

```
import cvlib as cv
import os
from cvlib.object_detection import draw_bbox
import cv2
import time
import numpy as np
from playsound import playsound
import requests
from flask import Flask, request, render_template, redirect, url_for
from cloudant.client import Cloudant
client=Cloudant.iam("eebf1e69-3eb8-4997-8323-01a9ad425481-
bluemix","sK070EEK13hRZ_hfXKUa-2LcvdzbTkEfezkG3Zn4Xyuw",connect=True)
my_database=client.create_database("my_database")

app=Flask(__name__)
@app.route('/')
def index():
```

```

        return render_template("index.html")

@app.route('/index.html')
def home():
    return render_template("index.html")

@app.route('/register.html')
def register():
    return render_template("register.html")

@app.route('/afterreg', methods=['POST'])
def afterreg():
    x = [x for x in request.form.values()]
    print(x)
    data={'_id': x[1], 'name': x[0], 'psw': x[2]}
    print(data)

    query = {'_id': {'$eq': data['id']}}

    docs = my_database.get_query_result(query)
    print(docs)

    print(len(docs.all()))

    if(len(docs.all())--0):
        url = my_database.create_document (data)

        return render_template('register.html', pred="Registration Successful, please
login using your details")
    else:

        return render_template("register.html", pred="You are already a member,
please login using your details")

@app.route('/login')
def login():
    return render_template('login.html')

```



```

@app.route('/afterlogin',methods=['POST'])
def afterlogin():
    user = request.form['_id']
    passw = request.form['psw']
    print(user,passw)
    query ={'_id':{'Seq':user}}
    docs =my_database.get_query_result(query)
    print(docs)
    print(len(docs.all()))
    if(len(docs.all())==0):
        return render_template('login.html',pred='The username is not found.')
    else:
        if((user==docs[0][0]['_id']and passw==docs[0][0]['psw'])):
            return redirect(url_for('prediction'))
        else:
            print('Invalid User')

def logout():
    return render_template('Logout.html')

@app.route('/result',methods=["GET","POST"])
def res():
    webcam=cv2.VideoCapture('drowning.mp4')
    if not webcam.isOpened():
        print("Could not open webcam")
        exit()
    t0=time.time()
    centre0 = np.zeros(2)
    isDrowning =False
    frame=webcam.read()
    while webcam.isOpened():
        status,frame=webcam.read()
        bbox,label,conf= cv.detect_common_objects(frame)
        if(len(bbox)>0):
            bbox0=bbox[0]
            centre =[0,0]
            centre=[(bbox0[0]+bbox[2])/2,(bbox0[1]+bbox[3])/2]
            hmov=abs(centre[0]-centre0[0])

```

```

        vmov=abs(centre[1]-centre0[1])
x=time.time()
thershold=10
if(hmov>thershold or vmov>thershold):
    print(x-t0,'s')
    t0=time.time()
    isDrowning = False
else:
    print(x-t0,'s')
    if((time.time()-t0)>10):
        isDrowning=True
print('bb0x: ',bbox,'centre:',centre,'centre0:',centre0)
print('Is he drowning:',isDrowning)
centre0=centre
out=draw_bbox(frame,bbox,label,conf,isDrowning)
cv2.imshow("Real-time object detection".out)
if(isDrowning == True):
    playsound('alarm.mp3')
    webcam.release()
    cv2.destroyAllWindows()
    return render_template('prediction.html',prediction="Emergency !!! The
person is drowning")
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break
    webcam.release()
    cv2.destroyAllWindows()
if __name__=="__main__":
    app.run(host="localhost",port=8000,debug=False)

```

## CHAPTER-8

### 8. RESULT

#### 8.1 PERFORMANCE METRICS

```
<html lang="en">
```

```
<head>
```

```
  <meta charset="UTF-8">
```

```
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
```

```
  <meta http-equiv="X-UA-Compatible" content="ie=edge">
```

```
  <title>High Quality Facial Recognition</title>
```

```
  <link href="https://cdn.bootcss.com/bootstrap/4.0.0/css/bootstrap.min.  css"
  rel="stylesheet">
```

```
  <script src="https://cdn.bootcss.com/popper.js/1.12.9/umd/popper.min.js">
```

```
</script>
```

```
  <script src="https://cdn.bootcss.com/jquery/3.3.1/jquery.min.js">
```

```
</script>
```

```
  <script src="https://cdn.bootcss.com/bootstrap/4.0.0/js/bootstrap.min.js">
```

```
</script>
```

```
<link href="{ { url_for('static', filename='css/main.css') } }"rel="stylesheet">
```

```

<style>
.bg-dark      {      background-color:
                #42678c!important;
    }
#result      {      color:
                #0a1c4ed1;
    }
</style>
</head>

<body style="background-color:black;">
<header id="head" class="header">
    <section id="navbar">
        <h1 class="nav-heading"></i>Virtual Eye</h1>
        <div class="nav--items">
            <ul>
                <li><a href="{{ url_for('index')}}">Home</a></li>
                    <li><a
href="{{ url_for('logout')}}">Logout</a></li>
                <!-- <li><a href="#about">About</a></li>
                <li><a href="#services">Services</a></li> -->

            </ul>
        </div>
    </section>
    </header>
    <div class="container">
        <div id="content" style="margin-top:2em">
            <div class="container">
                <div class="row">
                    <div class="col-sm-6 bd" >
                        <h2><em style="color:white;">High Quality Facial

```

Recognition</em></h2>

<br>

<p><h5><i style="color:white;">Emotion Detection Through Facial Feature Recognition</i></h5></p>



</div>

<div class="col-sm-6">

<div>

<h4 style="color:white;">Upload

Image Here</h4>

<form action = "http://localhost:5000/" id="upload-file" method="post" enctype="multipart/form-data">

<label for="imageUpload" class="upload-label">

Choose Image

</label>

<input type="file" name="image" id="imageUpload" accept=".png, .jpg, .jpeg,.pdf">

</form>

<div class="image-section" style="display:none;">

<div class="img-preview">

<div id="imagePreview">

</div>

</div>

<div>

<button type="button" class="btn btn-info btn-lg " id="btn-predict">Analyse</button>



<meta http-equiv="X-UA-Compatible" content="IE=edge">  
<meta name="viewport" content="width=device-width, initial-scale=1.0">

<!--Bootstrap -->

<link rel="stylesheet"  
href="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/boo  
tstrap.min.css" integrity="sha384-  
Gn5384xqQ1aoWXA+058RXPxPg6fy4IWvTNh0E263XmFcJlSAwiGg  
FAW/dAiS6JXm" crossorigin="anonymous">  
<script src="https://code.jquery.com/jquery-3.2.1.slim.min.js" integrity="sha384-  
KJ3o2DKtkvYIK3UENzmM7KCkRr/rE9/Qpg6aAZGJwFDMVNA/GpG  
FF93hXpG5KkN" crossorigin="anonymous"></script>  
<script src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.12.9/umd/  
popper.min.js" integrity="sha384-  
ApNbgh9B+Y1QKtv3Rn7W3mgPxhU9K/ScQsAP7hUibX39j7fakFPsk  
vXusvfa0b4Q" crossorigin="anonymous"></script>  
<script src="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/js/bootst rap.min.js"  
integrity="sha384-  
JZR6Spejh4U02d8jOt6vLEHfe/JQGiRRSQQxSfFWpi1MquVdAyjUar5  
+76PVCmYl" crossorigin="anonymous"></script>

<script src="https://kit.fontawesome.com/8b9cdc2059.js"  
crossorigin="anonymous"></script>

<link href="https://fonts.googleapis.com/css2?family=Akronim&family=  
Roboto&display=swap" rel="stylesheet">

<link rel="stylesheet" href="../static/style.css">

<!-- <script defer src="../static/js/main.js"></script> -->

<title>Virtual Eye</title>

</head>

<body>

<header id="head" class="header">

```
<section id="navbar">
    <h1 class="nav-heading"></i>Virtual Eye</h1>
    <div class="nav--items">
        <ul>
            <li><a
href="{{ url_for('index')}}">Home</a></li>
            <li><a
href="{{ url_for('login')}}">Login</a></li>
            <li><a
href="{{ url_for('register')}}">Register</a></li>
            <li><a href="{{
url_for('login')}}">Demo</a></li> </ul> </div>
</section>
<section id="slider">
<div id="carouselExampleIndicators" class="carousel" data-ride="carousel">
    <ol class="carousel-indicators">
        <li data-target="#carouselExampleIndicators" data-slide- to="0"
class="active"></li>
        <li data-target="#carouselExampleIndicators" data-slide-to="1"></li>
        <li data-target="#carouselExampleIndicators" data-slide-to="2"></li>
    </ol>
    <div class="carousel-inner">

        <div class="carousel-item active">
            
            </div>
            <div class="carousel-item">
                
            </div>
            <div class="carousel-item">
```



```

        
      </div>
    </div>
    <a      class="carousel-control-prev"      href="#carouselExampleIndicators"
role="button" data-slide="prev">
      <span      class="carousel-control-prev-icon"      aria- hidden="true"></span>
      <span class="sr-only">Previous</span>
    </a>
    <a      class="carousel-control-next"      href="#carouselExampleIndicators"
role="button" data-slide="next">
      <span      class="carousel-control-next-icon"      aria- hidden="true"></span>
      <span class="sr-only">Next</span>
    </a>
  </div>

```

```

  </section>
</header>
<section id="about">
  <div class="top">
    <h3      class="title text-muted">
      ABOUT PROJECT
    </h3>
    <div class="line"></div>
  </div>
  <div class="body">
    <div class="left">
      <h2>Problem:</h2>
      <p>

```

Swimming is one of the best exercises that helps people to reduce stress in this urban lifestyle. Swimming pools are found larger in number in the hotels, weekend tourist spots and barely people have in their house backyard. Beginners, especially often feel it difficult to breathe under water and causes breathing

trouble which in turn cause a drowning accident. Worldwide, drowning produces a higher rate of mortality without causing injury to children. Children under six of their age are found to be suffering the highest drowning mortality rates worldwide..Such kinds of deaths account for the third cause of unplanned death globally, with about 1.2 million cases yearly.

</p>

</div>

<div class="left">

<h2>Solution:</h2>

<p>

To overcome the conflict, a meticulous system is to be implemented along the swimming pools to save the human life. By studying body movement patterns and connecting cameras to an artificial intelligence (AI) system we can devise an underwater pool safety system that reduces the risk of drowning. Usually such systems can be developed by installing more than 16 cameras underwater and ceiling and analysing the video feeds to detect any anomalies . but AS a POC we make use of one camera that streams the video underwater and analyses the position of swimmers to assess the probability of drowning ,if it is higher than an alert will be generated to attract lifeguards attention.

</p>

</div>

</div>

<div class="bottom">

<p ><b>

Note : The system is not designed to replace a lifeguard or other human monitor, but to act as an additional tool. It helps the lifeguard to detect the underwater situation where they can't easily observe.

</b></p>

</div>  
</section>

<section id="footer">  
 <p>Copyright Â© 2022. All Rights Reserved</p>  
 <div class="social">  
 <a href="#" target="\_blank"><i class="fab fa-2x fa-twitter-square"></i></a>  
 <a href="#" target="\_blank">  
 <i class="fab fa-2x fa-linkedin"></i></a>  
 <a href="#">  
 <i class="#"></i>  
 </a>  
</div>  
</section>  
</body>  
</html>

## Logout.html

<!DOCTYPE html>  
<html >  
  
 <head>  
 <meta charset="UTF-8">  
 <meta name="viewport" content="width=device-width, initial-scale=1">  
 <title>Virtual Eye</title>  
 <link href='https://fonts.googleapis.com/css?family=Pacifico' rel='stylesheet'  
type='text/css'>  
 <link href='https://fonts.googleapis.com/css?family=Arimo' rel='stylesheet'  
type='text/css'>  
 <link href='https://fonts.googleapis.com/css?family=Hind:300' rel='stylesheet'  
type='text/css'>

```
<link href='https://fonts.googleapis.com/css?family=Open+Sans+Condensed:300'
rel='stylesheet' type='text/css'>
```

```
<link href='https://fonts.googleapis.com/css?family=Merriweather'
rel='stylesheet'>
```

```
<link href='https://fonts.googleapis.com/css?family=Josefin Sans'
rel='stylesheet'>
```

```
<link href='https://fonts.googleapis.com/css?family=Montserrat'
rel='stylesheet'>
```

```
<style> .header
{
```

```
    top:0; margin:0px;
        left: 0px; right:
        0px; position:
        fixed;
        background-color:    #28272c;
    color: white; box-shadow: 0px 8px 4px
        grey; overflow: hidden; padding-
        left:20px; font-family: 'Josefin Sans';
        font-size: 2vw;
        width: 100%;
        height:8%; text-
        align: center;
    }
```

```
        .topnav { overflow:
hidden;
background-color: #333;
```

```
}
```

```

.topnav-right a { float:
left; color:
#f2f2f2;
text-align: center; padding:
14px 16px; text-decoration:
none; font-size: 18px;
}

.topnav-right a:hover { background-color: #ddd;
color: black;
}

.topnav-right a.active { background-color: #565961;
color: white;
}

.topnav-right { float:
right; padding-
right:100px;
}

.login{
margin-top:-70px;
} body
{
background-color:#ffffff; background-repeat:
no-repeat; background-size:cover;
background-position: 0px 0px;
}
.main{
margin-top:100px; text-
align:center;

```

```
} form { margin-left:400px;margin-right:400px;}
```

```
input[type=text], input[type=email],input[type=number],input[type=password] {  
width: 100%; padding: 12px 20px; display: inline-block; margin-bottom:18px;  
border: 1px solid #ccc;  
    box-sizing: border-box;  
}
```

```
button { background-color:  
    #28272c;  
color: white; padding:  
14px 20px; margin-  
bottom:8px; border:  
none; cursor:  
pointer; width: 20%;  
}
```

```
button:hover {  
    opacity: 0.8;  
}
```

```
.cancelbtn { width:  
    auto;  
padding: 10px 18px;  
background-color: #f44336;  
}
```

```
.imgcontainer { text-  
align: center; margin:  
24px 0 12px 0;  
}
```

```

    img.avatar {
      width: 30%; border-radius:
      50%;
    }
    .container { padding:
      16px;
    }

    span.psw {
      float: right;
      padding-top:
      16px;
    }

    /* Change styles for span and cancel button on extra small screens */
    @media screen and (max-width: 300px) { span.psw {
      display: block; float:
      none;
    }
    .cancelbtn { width:
      100%;
    }
  }

</style>
</head>

<body style="font-family:Montserrat;">

<div class="header">

```

```

<div style="width:50%;float:left;font-size:2vw;text-align:left;color:white; padding-top:1%">Virtual eye</div>
    <div class="topnav-right" style="padding-top:0.5%;">

        <a href="{{ url_for('home')}}">Home</a>
        <a href="{{ url_for('login')}}">Login</a>
        <a href="{{ url_for('register')}}">Register</a>
    </div>
</div>
<div class="main">
<h1>Successfully Logged Out!</h1>
<h3 style="color:#4CAF50">Login for more information</h3>

    <a href="{{ url_for('login')}}"><button
type="submit">Login</button></a>
</form>
</div>

</body>
</html>

```

## Prediction.html

```

<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0"> <!--
    Bootstrap -->

    <link rel="stylesheet"
        href="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/boo
tstrap.min.css"
        integrity="sha384-

```



Gn5384xqQ1aoWXA+058RXPxPg6fy4IWvTNh0E263XmFcJlSAwiGg  
FAW/dAiS6JXm" crossorigin="anonymous">  
<script src="https://code.jquery.com/jquery-3.2.1.slim.min.js" integrity="sha384-  
KJ3o2DKtIkVYIK3UENzmM7KChRr/rE9/Qpg6aAZGJwFDMVNA/GpG  
FF93hXpG5KkN" crossorigin="anonymous"></script>  
<script src="https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.12.9/umd/  
popper.min.js" integrity="sha384-  
ApNbgh9B+Y1QKtv3Rn7W3mgPxhU9K/ScQsAP7hUibX39j7fakFPsk  
vXusvfa0b4Q" crossorigin="anonymous"></script>  
<script src="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0/js/bootst rap.min.js"  
integrity="sha384-  
JZR6Spejh4U02d8jOt6vLEHfe/JQGiRRSQQxSfFWpi1MquVdAyjUar5  
+76PVCmYl" crossorigin="anonymous"></script>

<script src="https://kit.fontawesome.com/8b9cdc2059.js"  
crossorigin="anonymous"></script>  
<link href="https://fonts.googleapis.com/css2?family=Akronim&family=  
Roboto&display=swap" rel="stylesheet">  
<link rel="stylesheet" href="../static/style.css">

<script defer src="../static/js/JScript.js"></script>  
<title>Prediction</title>  
</head>  
<body>  
<header id="head" class="header">  
<section id="navbar">  
<h1 class="nav-heading"></i>Virtual Eye</h1>  
<div class="nav--items">  
<ul>  
<li><a href="{ { url\_for('index') } }">Home</a></li>  
<li><a

```

href="{ { url_for('logout') } }">Logout</a></li>
    <!-- <li><a href="#about">About</a></li>
    <li><a href="#services">Services</a></li> -->

</ul>
</div>
</section>
</header>
<!-- dataset/Training/metal/metal326.jpg -->
</br>
<section id="prediction">
<h2 class="title text-muted">Virtual Eye- Life Guard forSwimming Pools to
Detect Active Drowning</h1>
<div class="line" style="width: 900px;"></div>
</section>
</br>
<section id="about">

<div class="body"> <div
class="left">
    <p>
        Swimming is one of the best exercises that helps people to reduce stress in
        this urban lifestyle. Swimming pools are found larger in number in the hotels,
        weekend tourist spots and barely people have in their house backyard. Beginners,
        especially often feel it difficult to breathe under water and causes breathing
        trouble which in turn cause a drowning accident. Worldwide, drowning produces
        a higher rate of mortality without causing injury to children. Children under six
        of their age are found to be suffering the highest drowning mortality rates
        worldwide..Such kinds of deaths account for the third cause of unplanned death
        globally, with about 1.2 million cases yearly.

    </p>

```

</div>

<div class="left">

<div class="prediction-input">



</br>

<form id="form" action="/result" method="post"  
enctype="multipart/form-data">

<input type="submit" class="submitbtn" value="ClickMe! For a  
Demo">

</form>

</div>

<h5 style="text-color:Red">

<b style="text-color:Red">{{ prediction }}<b>

</div>

</h5>

</div>

</section>

</br></br>

<section id="footer">

<p>Copyright Â© 2021. All Rights Reserved</p>

</section>

</body>

</html>

[Login](#)

## ABOUT PROJECT

### Problem:

Swimming is one of the best exercises that helps people to reduce stress in this urban lifestyle. Swimming pools are found larger in number in the hotels, weekend tourist spots and barely people have in their house backyard. Beginners, especially often feel it difficult to breathe under water and causes breathing trouble which in turn cause a drowning accident. Worldwide, drowning produces a higher rate of mortality without causing injury to children.

### Solution:

To overcome the conflict, a meticulous system is to be implemented along the swimming pools to save the human life. By studying body movement patterns and connecting cameras to an artificial intelligence (AI) system we can devise an underwater pool safety system that reduces the risk of drowning. Usually such systems can be developed by installing more than 16 cameras underwater and ceiling and analysing the video feeds to detect any anomalies.

## Virtual Eye- Life Guard for Swimming Pools to Detect Active Drowning

Swimming is one of the best exercises that helps people to reduce stress in this urban lifestyle. Swimming pools are found larger in number in the hotels, weekend tourist spots and barely people have in their house backyard. Beginners, especially often feel it difficult to breathe under water and causes breathing trouble which in turn cause a drowning accident. Worldwide, drowning produces a higher rate of mortality without causing injury to children. Children under six of their age are found to be suffering the highest drowning mortality rates worldwide. Such kinds of deaths account for the third cause of unplanned death globally, with about 1.2 million cases yearly.



[Click Me! For a Demo](#)

## Virtual Eye- Life Guard for Swimming Pools to Detect Active Drowning

Swimming is one of the best exercises that helps people to reduce stress in this urban lifestyle. Swimming pools are found larger in number in the hotels, weekend tourist spots and barely people have in their house backyard. Beginners, especially often feel it difficult to breathe under water and causes breathing trouble which in turn cause a drowning accident. Worldwide, drowning produces a higher rate of mortality without causing injury to children. Children under six of their age are found to be suffering the highest drowning mortality rates worldwide. Such kinds of deaths account for the third cause of unplanned death globally, with about 1.2 million cases yearly.



[Click Me! For a Demo](#)

**Emergency !!! The Person is drowning**

## **CHAPTER-9**

### **9. ADVANTAGES & DISADVANTAGES**

#### **\*ADVANTAGES:**

- (i) user feel comfortable and more secure
- (ii) Children, adult, pet animal , old age people are used
- (iii) spending more time for family, freedom for safety guards near the Swimming pool
- (iv) Swimmers, resort are gain in the financial
- (v) drowning should be monitored

#### **\*DISADVANTAGE:**

- (i) For uneducated people will suffer from this technology
- (ii) Electricity will be required
- (iii) Software and hardware requirement will need

## CHAPTER-10

### 1. CONCLUSION

This section will draw from three core documents: ISO\_20380, HSG179, and the recently published German guideline, DGfDB R 94.15. A summary of each is given, outlining the key messages they disseminate and what this means for those involved with DDS.

ISO\_20380 This document focuses on the requirements for the installation, operation, maintenance and performance of DDS, the testing methods, and the information required from the supplier in the operating manual. These international standards do not apply to systems used in domestic pools or pools smaller than 150m<sup>2</sup>.

Prior to the installation of any DDS, 'a technical study shall be carried out by the supplier in consultation with or based on information provided by the swimming pool's owner/operator'. This is to establish the quantity and positioning of the equipment making up the system such as cameras, central processing unit, alarm tools, and other related equipment. The technical study must also provide a technical drawing of the pool basin, showing areas of 'coverage' and 'non-coverage', as well as the minimum lighting levels required above and below the water surface for the DDS to operate within performance requirements. To carry out the study, a list of factors to consider are given, outlining the variables that make each pool unique such as the architecture, and alarm reception coverage area of mobile devices to be used with the system. With this information all in one document, the technical study can be used to help optimise performance of the system, and forms part of the contract between the supplier and the pool operator. The next area of the standard is the performance requirements. This outlines the requirements needed to pass the regular maintenance testing and performance requirements for normal operation. This section covers the alarm set off time for operational performance, which is to be 15 seconds or less and displayed on the system interface. It also states that the alarm set off time must be built-in and shall not be changeable by staff. The section also discusses the areas covered by the DDS and highlights that each trained staff member must be aware of these areas. Another coverage-related requirement is that the DDS must be able to temporarily create areas where detection is disabled, to manage specific activities such as rescue drills.

**Github Link:**

[Link- Github](#)

