**VirtualEye - Life Guard for Swimming Pools to Detect Active Drowning**

**IBM NALAIYATHIRAN**

PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

**A PROJECT REPORT**

***Submitted by***

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# 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.

## 1.1.Project Overview

Swimming pools are found larger in number in hotels, and weekend tourist spots and barely

people have them in their house backyard. Beginners, especially, often feel it difficult to breathe underwater which causes breathing trouble which in turn causes a drowning accident. By studying body movement patterns and connecting cameras to artificial intelligence (AI) systems 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 analyzing the video feeds to detect any anomalies.

## 1.2.Purpose

It helps the lifeguard to detect the underwater situation where they can't easily observe.

1. Establish and outline what is known on Drowning Detection Systems.
2. Evaluate the current literature on Drowning Detection Systems, including their use in indoor pool environments along with interaction with traditional lifeguarding.
3. Better understand where DDS are positioned in the health and safety

landscape of indoor swimming pools.

# 2.LITERATURE SURVEY

## 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

<https://www.angeleye.tech/us/us-lifeguard/><https://swimeye.com/>

<https://www.thewirh.com/blog/dds-how-do-they-work>

## 2.3.Problem Statement Definition

# 3.IDEATION & PROPOSED SOLUTION

## 3.1.Empathy Map Canvas

## 3.2.Ideation & Brainstorming

## 3.3.Proposed Solution

**3.4.Problem Solution fit**

# 4.REQUIREMENT ANALYSIS

**4.1.Functional requirement**

**4.2.Non-Functional requirements**

# 5.PROJECT DESIGN

## 5.1.Data Flow Diagrams

## 5.2.Solution & Technical Architecture

## 5.3.User Stories

# 6.PROJECT PLANNING & SCHEDULING

## 6.1.Sprint Planning & Estimation

**6.2.Reports from JIRA**

# 7.CODING &SOLUTIONING (Explain the features added in the project along with code)

## 7.1.Feature 1

Humans have always had the innate ability to recognize and distinguish between faces. Now

computers are able to do the same. This opens up tons of applications.Face detection and recognition is a heavily researched topic and there are tons of resources online. We have tried multiple open source to find the ones that are simplest to implement while being accurate. We have also created a pipeline for detection, recognition and emotion understanding on any input image with just 8 lines of code after the images have been loaded!

## 7.2.Feature 2

Most strokes involve rhythmic and coordinated movements of all major body parts — torso,

arms, legs, hands, feet, and head.

# 8.TESTING

## 8.1.Test Cases

**8.2.User Acceptance Testing**

# 9.ADVANTAGES & DISADVANTAGES

1. The Approach detected human drifting and drowning up to a range of 5m in water bodies. The final result achieved an average of 82.10% accuracy.
2. Identifies drowning victims in a minimum amount of time and dispatches an automated drone to save them

û Too much air bubbles generated by the drowning swimmer in the water will also occur. There is a chance that the action cannot be captured by the computer

# 10.CONCLUSION

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”.

# 11.APPENDIX

## Source Code: Index.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" />

<style>

\* { margin: 0; padding: 0; box-sizing: border-box;

} body {

font-family: cursive;

} a { text-decoration: none;

} li {

list-style: none;

}

.navbar { display: flex; align-items: center; justify-content: space-between; padding: 20px; background-color: #7ec5fd; color: #fff;

}

.nav-links a { color: #fff;

}

/\* LOGO \*/

.logo { font-size: 32px;

}

/\* NAVBAR MENU \*/

.menu { display: flex; gap: 1em; font-size: 18px; }

.menu li:hover { background-color: #4c9e9e; border-radius: 5px; transition: 0.3s ease;

}

.menu li { padding: 5px 14px;

}

.services { position: relative;

}

.dropdown { background-color: rgb(1, 139, 139); padding: 1em 0; position: absolute; /\*WITH RESPECT TO PARENT\*/ display: none; border-radius: 8px; top: 35px;

}

.dropdown li + li { margin-top: 10px;

}

.dropdown li { padding: 0.5em 1em; width: 8em; text-align: center;

}

.dropdown li:hover { background-color: #4c9e9e;

}

.services:hover .dropdown { display: block;

}

#example1 { background: url('swimin.jpg');

}

#swim

{ height: 220px; width: 70%;

}

</style>

<title>VirtualEye</title>

</head>

<body>

<nav class="navbar">

<div class="logo">VIRTUAL EYE</div>

<ulclass="nav-links">

<div class="menu">

<li><a href="/static/.html">Home</a></li>

<li><a href="/static/.html">About</a></li>

<li class="services"><a href="/">Services</a></li>

<li><a href="/static/register.html">Register</a></li>

<li><a href="/static/login.html">Login</a></li>

</div>

</ul>

</nav>

<form action="index.html" method="post">

<div class="">

<img style="height:500px; width:1500px"src="E:\IBM Project\Project\static\background.jpg">

<a href="/result.html"><button style = "position:absolute; right:60px; bottom:45px; height:40px;

width:500px; color:cyan; background:black;">TRY THIS PROJECT IN DEMO VERSION (CLICK HERE)</button></a>

</div>

</form>

</body></html>

## Prediction.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-

KJ3o2DKtIkvYIK3UENzmM7KCkRr/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>

</ul>

</div>

</section>

</header><!-- dataset/Training/metal/metal326.jpg --></br>

<section id="prediction"><h2 class="title text-muted">Virtual Eye- Life Guard for Swimming 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>

<center>

<div class="center">

<div class="prediction-input"><img class="d-block w-100" src="../static/img/second.jpg"

alt="Second slide"></br>

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

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

</form>

</div>

<style color="red"><h5>{prediction}</h5></style>

</div>

</center>

</div>

</section></br></br>

<section id="footer"><p>Copyright Â© 2021. All Rights Reserved</p></section>

</body>

</html>

## register.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+Conde nsed:300' rel='stylesheet' type='text/css'>

<link href="{{ url\_for('static', filename='css/style.css') }}" rel='stylesheet'>

<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: 200px 200px;

}

body{

background-image: url('E:\images.jpeg'); background-position: 0px 0px;}

.login{margin-top:100px; } form { border: 3px solid #f1f1f1; margin-right:200px; margin- right:200px;

} 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: 100%; }

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" >

<a href="{{ url\_for('home')}}">Home</a>

<a href="{{ url\_for('login')}}">Login</a>

<a class="active" href="{{ url\_for('register')}}">Register</a>

</div>

</div>

<div id="login" class="login">

<center>

<form action="{{url\_for('afterreg')}}" method="post"><div class="imgcontainer">

<img style="" src="E:\Virtual Eye.jpg" alt="Avatar" class="avatar">

</div>

<div class="container">

<input type="text" placeholder="Enter Name" name="name" required><br>

<input type="email" placeholder="Enter Email ID" name="\_id" required><br>

<input type="password" placeholder="Enter Password" name="psw" required>

<button type="submit">Register</button><br>

</div>

<div class="container" style="background- color:#f1f1f1">

<div class="psw">

Already have an account?&nbsp; &nbsp;

<a href="{{ url\_for('login') }}">Login</a></div >

</div>

</form>

</center>

</div>

</body>

</html>

**GitHub & Project Demo Link**

**GitHub Link :**

[https://github.com/IBM-EPBL/IBM-Project-45267-](https://github.com/IBM-EPBL/IBM-Project-45267-1660729134)

**Demo Link:** <https://drive.google.com/file/d/1MBE0oc1NceYmzXG6msCTtejELbt1N6GW/view?usp=drivesdk>