

SafelySail

(Onboard AI)



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A solution aimed at improving Recreational Marine Safety





1. Dangers of Dinghy Sailing

Recreational sailing is generally safe. However, the following factors contribute to deaths during dinghy sailing

- **1. Entrapment after capsizing**

Usually due to being tangled in the rigging with the trapeze



- **2. Blown Offshore**

Offshore wind causes sailors to not be able to return to shore

- **3. Lost at sea without anyone noticing**

can have serious consequences as a person is much harder to find at sea compared to a boat



Difficult to return to shore



April 12, 2022

1 minute reading

World Sailing is devastated to learn of the death of Eya Guezquez on Sunday 10 April 2022, whilst training with her sister Sarra on her 49erFX.

April 10th 2022 - Tunisia - Olympic Sailor Entrapment (Type 1)

與友人大尾鷺揚帆出事
滑浪風帆健兒失蹤屍體尋回

【本報訊】大埔昨揭發一宗滑浪風帆健兒失蹤死亡事件，一名男子前日與友人在大尾鷺揚帆出海後失蹤，至昨友人才揭發事件報警，水警輪巡至搜索，稍後在大尾鷺離岸一千四百米海面一個荒島上尋獲事主屍體，其滑浪風帆則隨水漂浮。警方初步相信事件極可疑，然後剖屍檢驗原因。



無人察覺事主失蹤

生死兩茫茫子絕聲（二十一字）：無知察覺當日傷逝其身失的謬言，絕地紅塵十世冤孽。

竟無一人察覺事主仍未回來，
。

2005 Aug 29 - Hong Kong - Loss at Sea without anyone knowing (Type 3)

法籍男疑因被繩索纏繞，因而未能及時逃生，被困於船艙



Aug 9th 2021 - Hong Kong - Man Overboard (Type 3)

#1 發表於 2010-10-17 19:06

只看該作者 | 大 中 小 | 繁體

一名四十七歲男子在赤柱正灘對開，玩滑浪風帆時懷疑遇溺死亡。
下午兩時許，有泳客發現事主浮在赤柱正灘對開海面，由救生員報警。
他送往東區醫院證實不治。



Macau - unable to return to shore (Type 2)

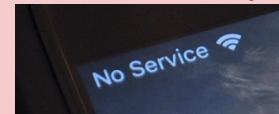
Oct 7th 2021 - Hong Kong - Man Overboard + Late Discovery (Type 3)

Traditional Safety Measures

Traditional Solutions



Problems

- | | | | |
|---|--|--|--|
| <ul style="list-style-type: none">- Requires Consciousness- No one near you to hear it | <ul style="list-style-type: none">- Requires Consciousness- Expensive investment- Banned in races- License needed | <ul style="list-style-type: none">- Requires Consciousness- No Signal- Not Always Waterproof | <ul style="list-style-type: none">- Can't see everyone at the same time -> delayed rescue- Won't find you if you are out of the standard search area |
|---|--|--|--|
- 
- 

Solution

A Smart Box with Cellular connection that provides:

- AI Human detection (eg: YOLO) using the camera
- AI Posture detection using the camera
- IMU Data
- GPS data

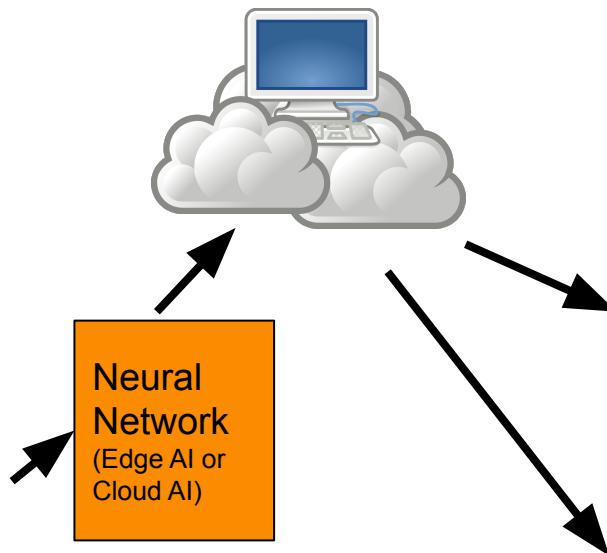
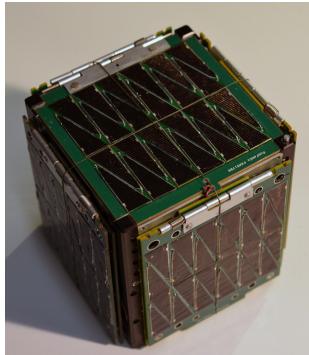
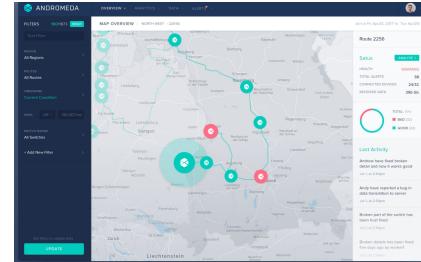


Image Source: https://zh.wikipedia.org/zh-hk/File:Cloud_computing_icon.svg

Notification to family and friends



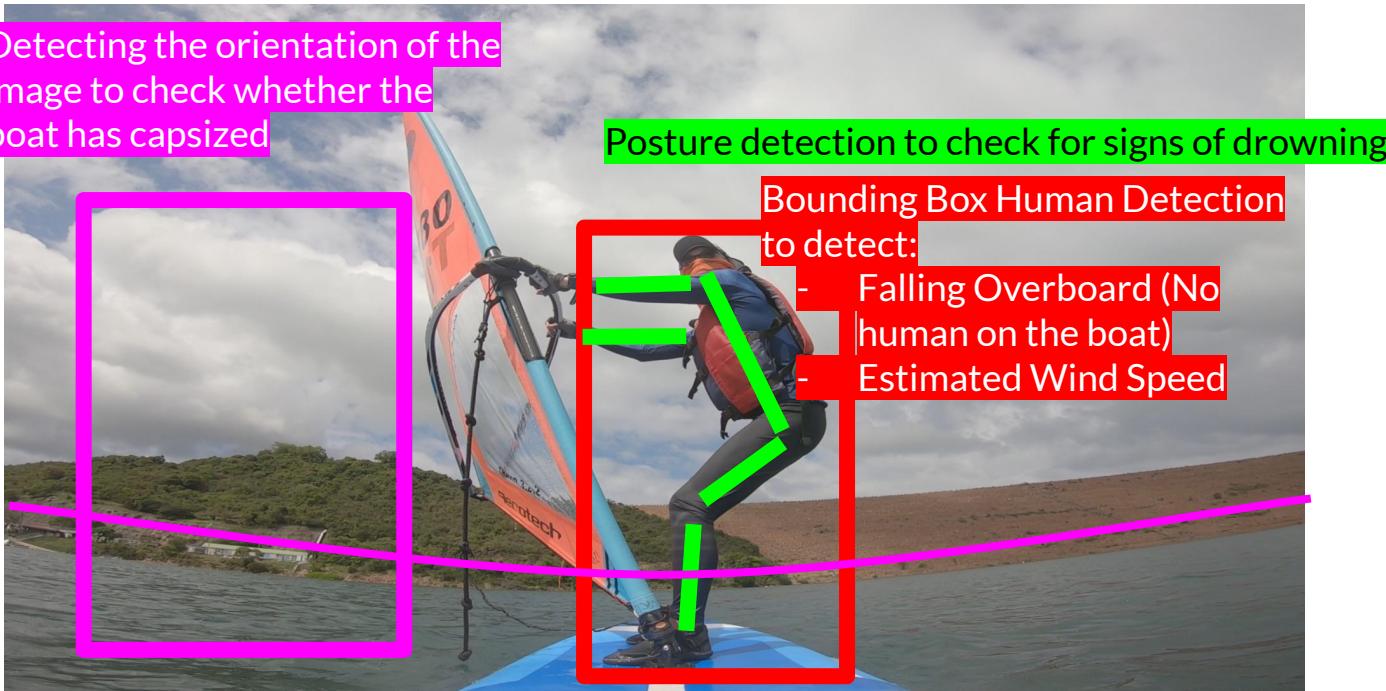
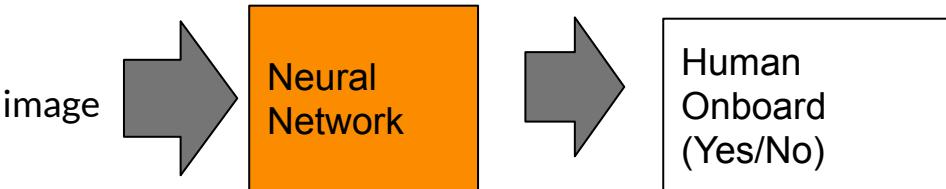
Marine Department / Control Centre



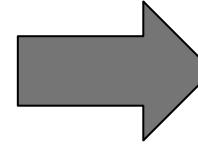
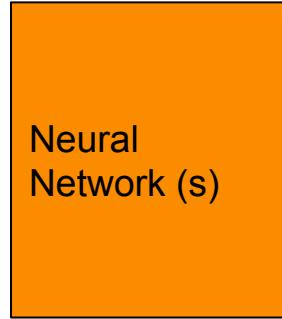
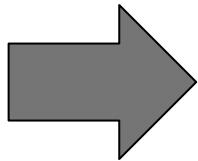
Main Objective

- Detecting Emergency situations and Man Overboards (MOBs)

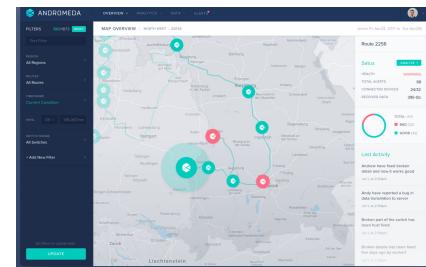
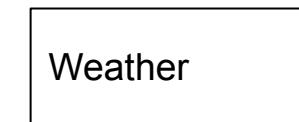
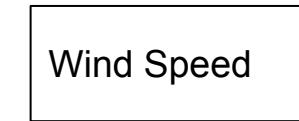
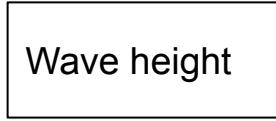
- Detecting the orientation of the image to check whether the boat has capsized

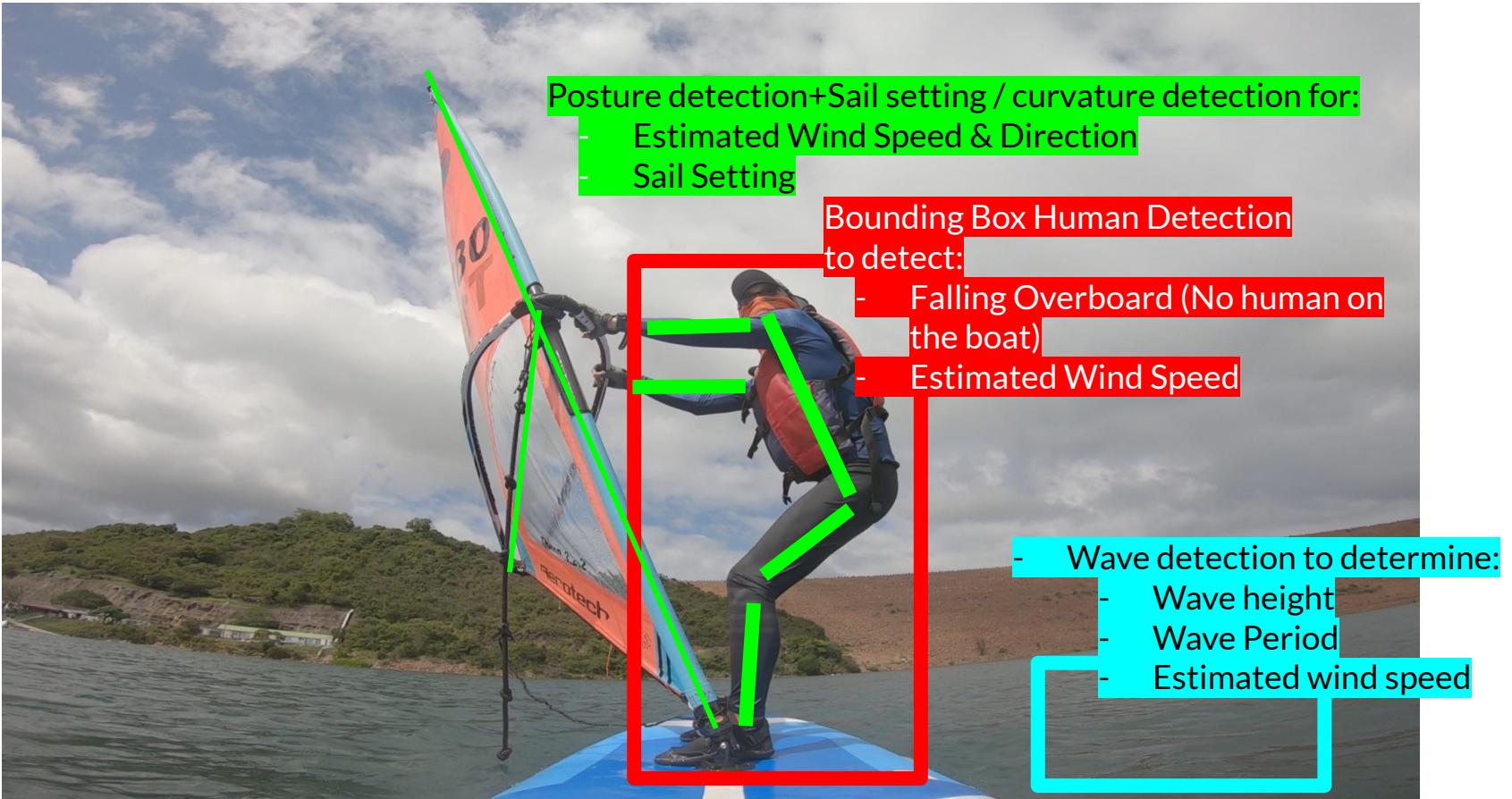


Secondary Objectives



Output for other sailors to understand the weather conditions in more detail





Anti-Clockwise Moment = Clockwise Moment

Boat and human
posture detection

d_1

F_1

Machine Learning can be used
to detect the boat and human
postures

With the use of basic Physics,
the system can estimate the:

- wind speed
- Whether the sailboat is
moving optimally / whether
there is likely a technical
issue

Why not use a mobile app on smartphones to accomplish the same task?

	Smartphones	Safely Sail Dedicated Hardware
Salt Water Proof		
Rugged (Not easily damaged by Violent Motions on the water)		
Unlimited Battery Life		 (Solar Powered)
Overheating / Too Cold to operate		 (Designed to withstand the elements)

Cloud AI vs Onboard AI



Initial Cost:



Cloud computation costs:



Cellular Data costs / signal strength requirements:

To be explored in further detail

Recap:

- **Improved chance of rescue**
 - Peace of mind
- **Opportunities for additional services like:**
 - detailed weather monitoring across the sailing area
 - to inform other sailors before they go in the water
 - Posture data
 - for analysis by coaches



Image Source: HKWA

Target Market:



Note: *Most sailors only register with world sailing when they have reached an advanced level and start to compete in international regattas (races). So there are a lot more dinghy sailors in the world than this number

Business Case



Options:	Cloud AI	Onboard AI
Initial Device Cost	300	700
Recurring Costs: Cellular Connection (100 MB per month), China Mobile Local IOT 4G Plan)	12	12
Supposing 12 month Return on Investment		
12 month total cost	444	844
Suppose the boats are rented for 150 days per year:		
Cost Per day: (HKD per day)	2.96	5.6266666667

Cost Estimation:

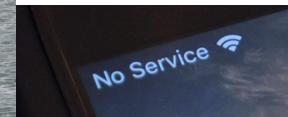
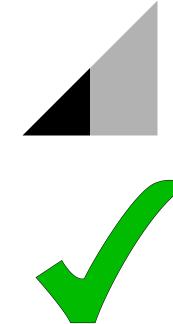
- If the return on investment is 12 months:
- The Cost per day is around 3-5 HKD/rental
(very insignificant compared to the cost of sailing)
- Dinghy rentals range from 85-180 dollars a day at government sites to 200 - 500 dollars at private yacht clubs
- Mandatory classes range from 100 HKD/day at LCSD to 1000+ HKD/day at private clubs
- Therefore, most sailors can afford the small increase in rental price for added safety (+3HKD/day)

Details:

<https://docs.google.com/spreadsheets/d/1Eip79ps-LxsV5X25X92rWSJ5-YqRrZRafNxwUgpYcD4/edit?usp=sharing>

Expected Challenges

- **Cellular signal does not penetrate the water**
 - Consider lower frequency bands like NB-IOT for slightly better penetration
 - Servers in the cloud need to register an unexpected loss of signal as a capsize
 - Speedy SOS message to be spent before the boat fully capsizes (the device will be submerged after a capsize)
- **Limited Power available**
 - Solar panels to be used to decrease the amount of maintenance required (No need to charge)
 - However, this means power consumption needs to be monitored closely during the project (<5W)
 - Consider using FPGA/Low powered embedded controllers like the K210 or offloading the computation to the cloud



Timeline:

