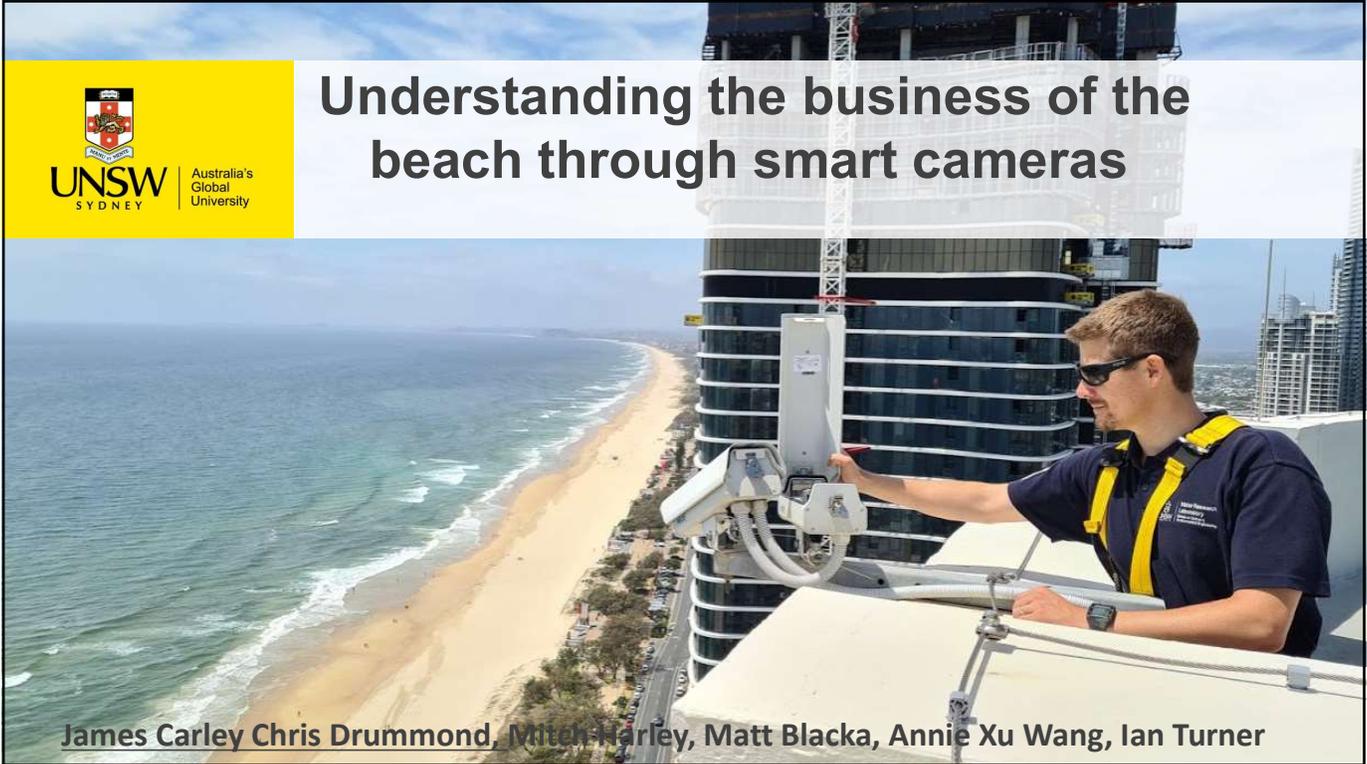


Understanding the business of the beach through smart cameras

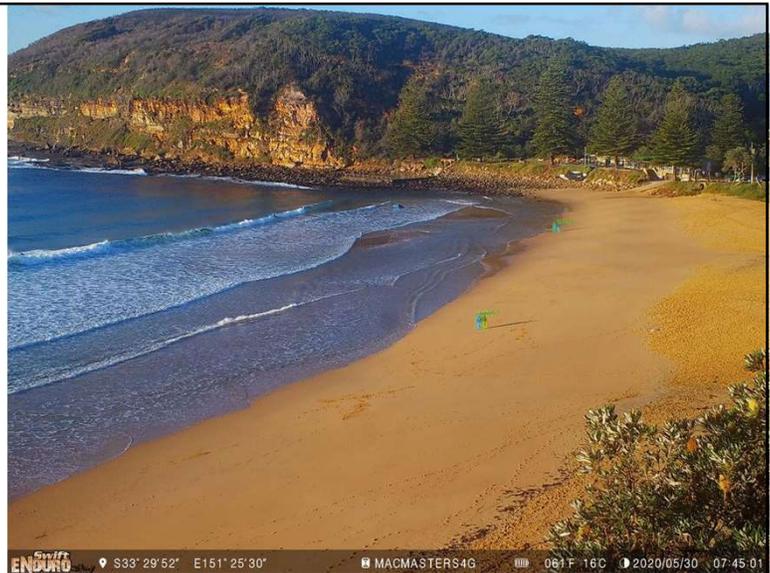


James Carley Chris Drummond, Mitch Harley, Matt Blacka, Annie Xu Wang, Ian Turner

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Overview

1. Gold Coast coastal monitoring system
2. Low cost camera system
3. Machine learning for people counting
4. Applications and results



MacMasters Beach

1

Smart camera systems

Economical, image based

Multiple cameras, video based, \$\$\$



WRLBeachStat



Coastal imaging station



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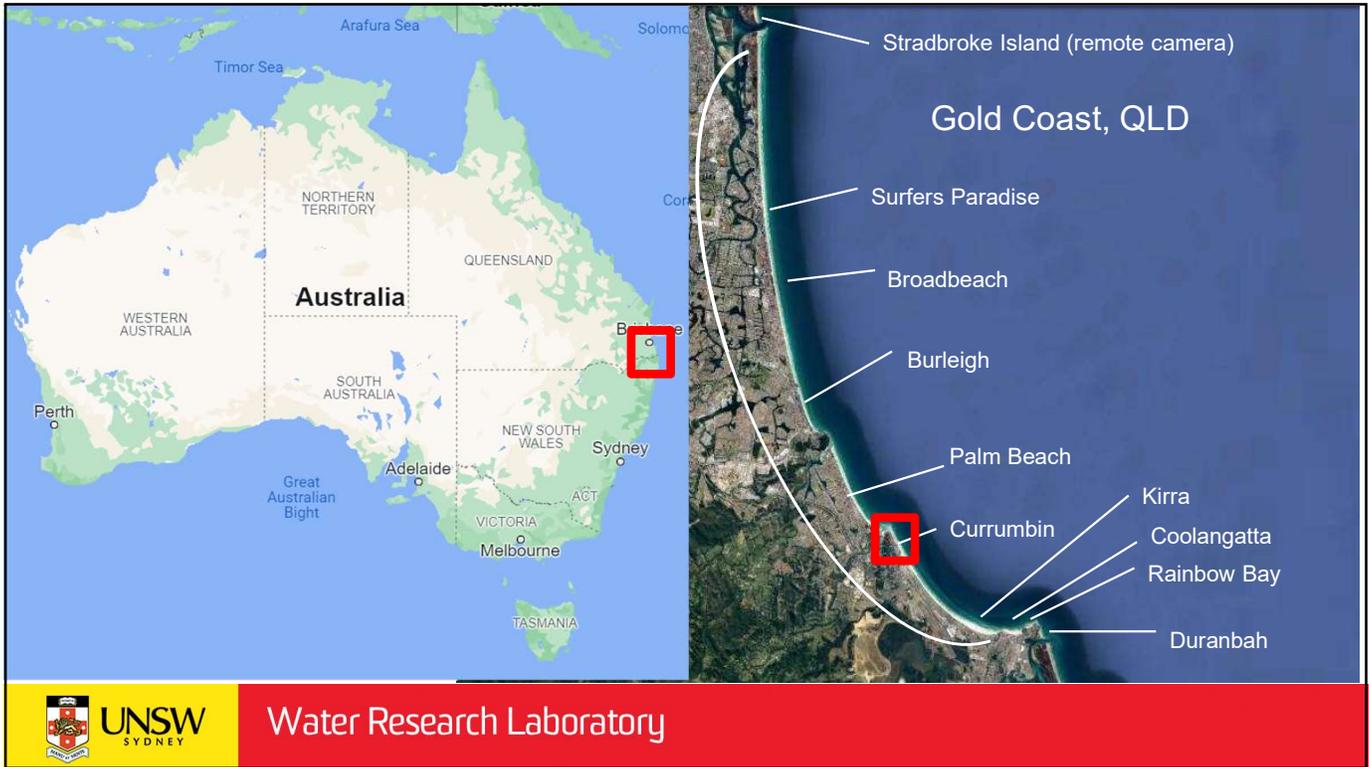
2

Gold Coast Monitoring System



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3



4

- First camera installed over 20 years ago by Professor Ian Turner
- 10 rooftop stations
- 44 cameras
- Complete coverage of 32 kms of coastline
- Largest CI network of its kind in the world!

Gold Coast, QLD

Stradbroke Island (remote camera)

Surfers Paradise

Broadbeach

Burleigh

Palm Beach

Currumbin

Kirra

Coolangatta

Rainbow Bay

Duranbah

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5



6



7

Data products



TAV- 10 min video

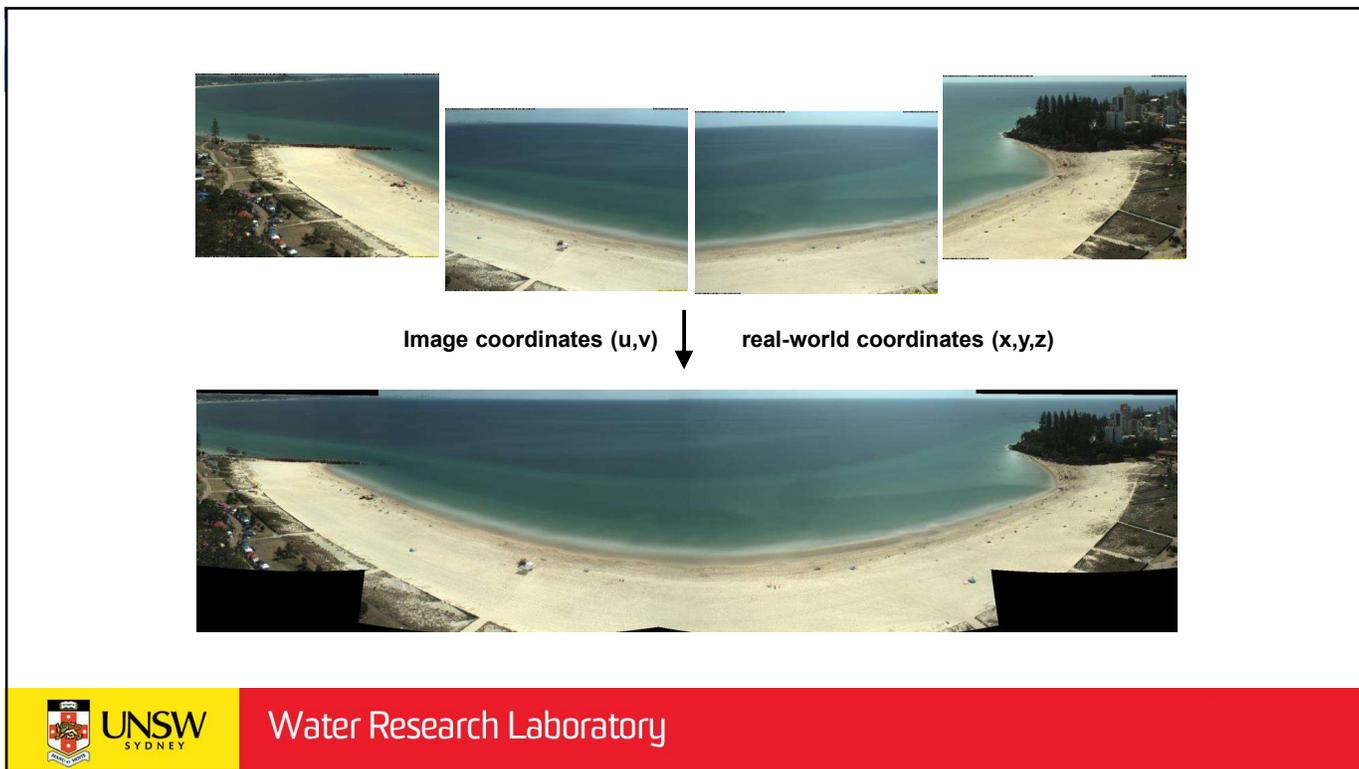


Timex image averaged over 10 mins

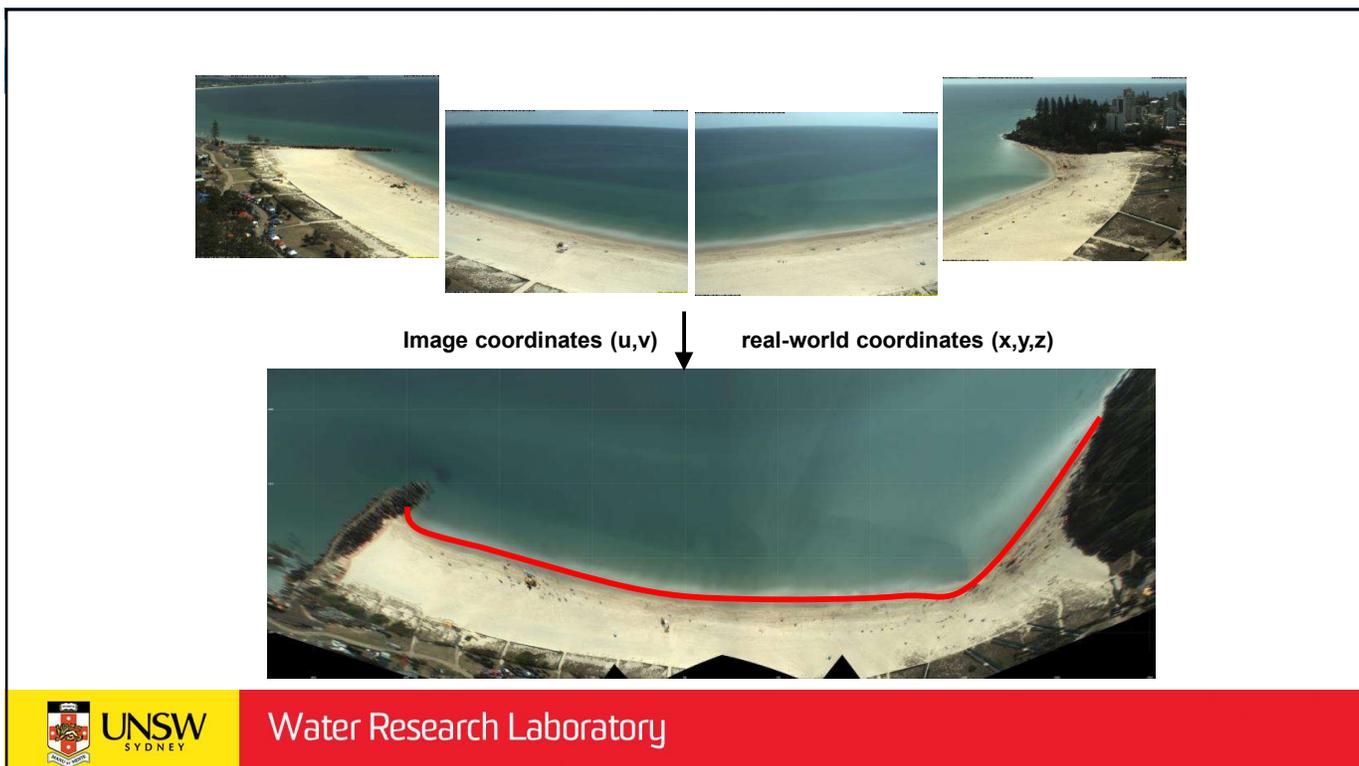
8

Shoreline monitoring

9



10



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Mega merge animation



12

shoreline-merge - 1626544301.Tue Jul 13, 12:45:01 AEST 2021 burleigh.v1.tmxm.jpg

File Edit View Help

File list

Search File name

shoreline-merge - 1626544301.Tue Jul 13, 12:45:01 AEST 2021 burleigh.v1.tmxm.jpg

Camera (green if QC shoreline available for week 30)

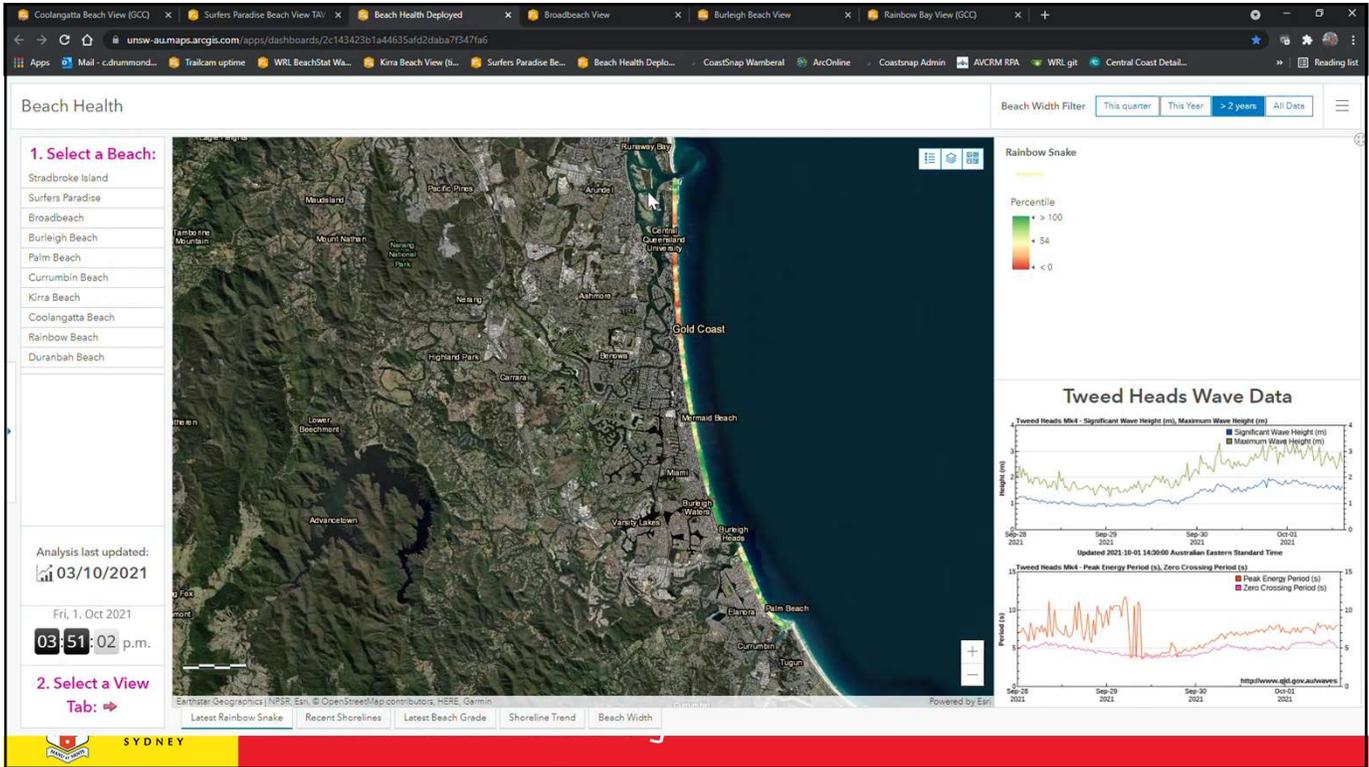
goldist	1	2	3	4	5	6
broadsch	1	2	3	4	5	6
burleigh	1	2	3	4	5	6
rainald	1	2	3	4	5	6
ooligatta	1	2	3	4	5	6
lora	1	2	3	4	5	6
rainbow	1	2	3	4	5	6
kurambah	1	2	3	4	5	6

Calendar

July, 2021						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
26	10	19	20	1	2	3
27	5	6	7	8	9	10
28	12	13	14	15	16	17
29	19	20	21	22	23	24
30	26	27	28	29	30	31
31	2	3	4	5	6	7

17°C Sunny 12:44 PM 6/7/2021

13



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Smart camera systems

Economical, image based

Multiple cameras, video based, \$\$\$



WRLBeachStat



Argus station



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WRL BeachStat system

- Low-cost camera system (AUD\$700)
- Solar powered
- Cellular 4G data transfer
- Transmit images and 10s video every ~15 minutes



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Coastal monitoring system

- Option that avoids need for power and coms
- Tool to understand the 'economy of the coast'
- People counts and shoreline monitoring



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Machine learning for people counting



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Basics of object detection

Annotate data



Train model



Run 'trained' model

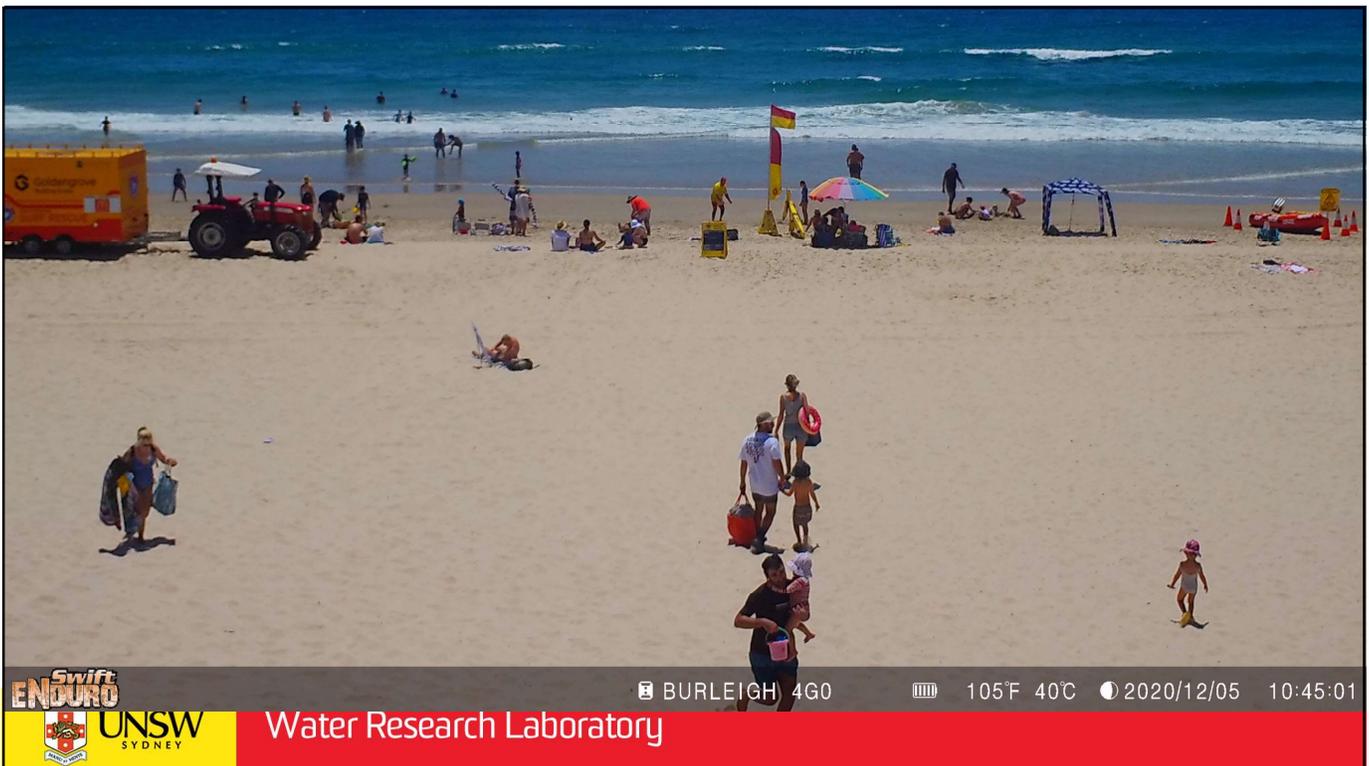


- Annotate data of each class
- Train model
- Run trained model to detect objects

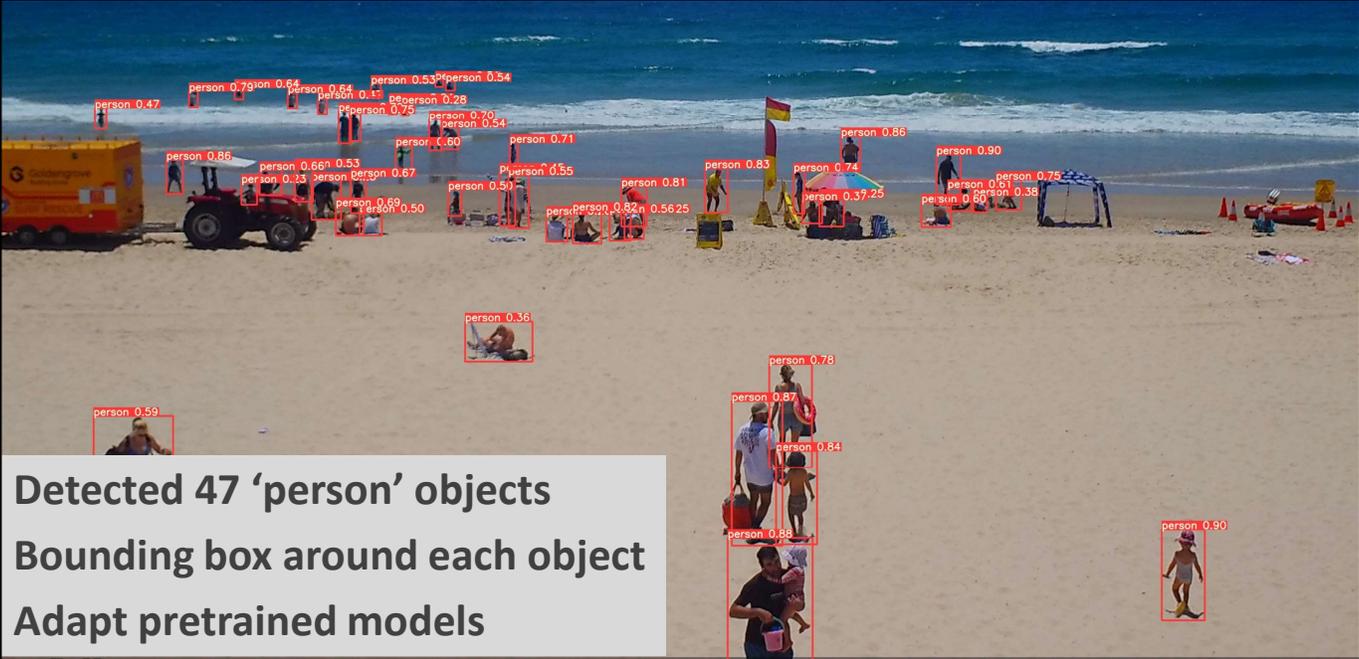


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Detected 47 'person' objects
Bounding box around each object
Adapt pretrained models

BURLEIGH 4G0 105°F 40°C 2020/12/05 10:45:01

Swift ENDURO UNSW SYDNEY Water Research Laboratory

22

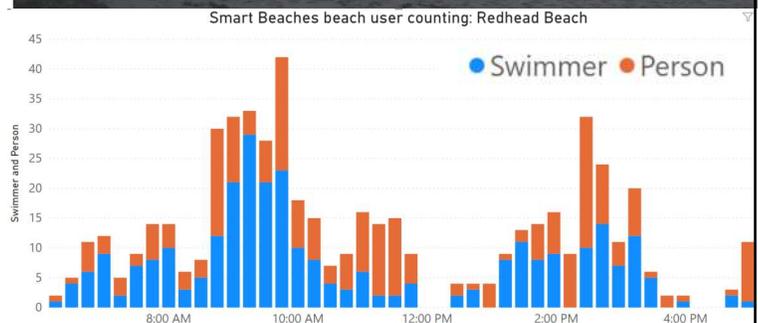
Detection Accuracy

How big (in pixels) are the people?

How big is my training dataset?

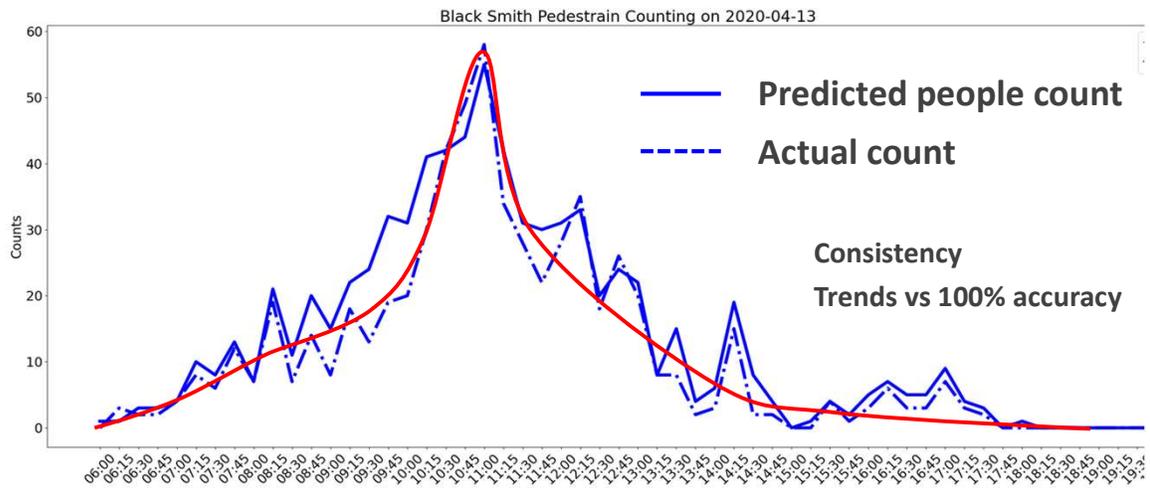
What is my model 'trained' to see?

- Sitting ✓
- standing, ✓
- swimming, ✓
- surfers



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What accuracy do I need?



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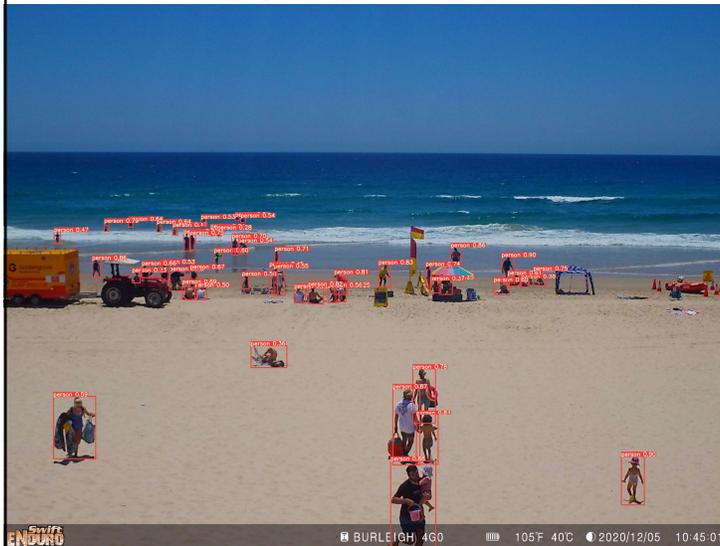
Smart Camera results



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Burleigh Beach, Gold Coast QLD



Project: People counting from lifeguard towers

Model type: Yolov5

Classes: Person only

Info: Camera installed for 2 years between 2020-2022

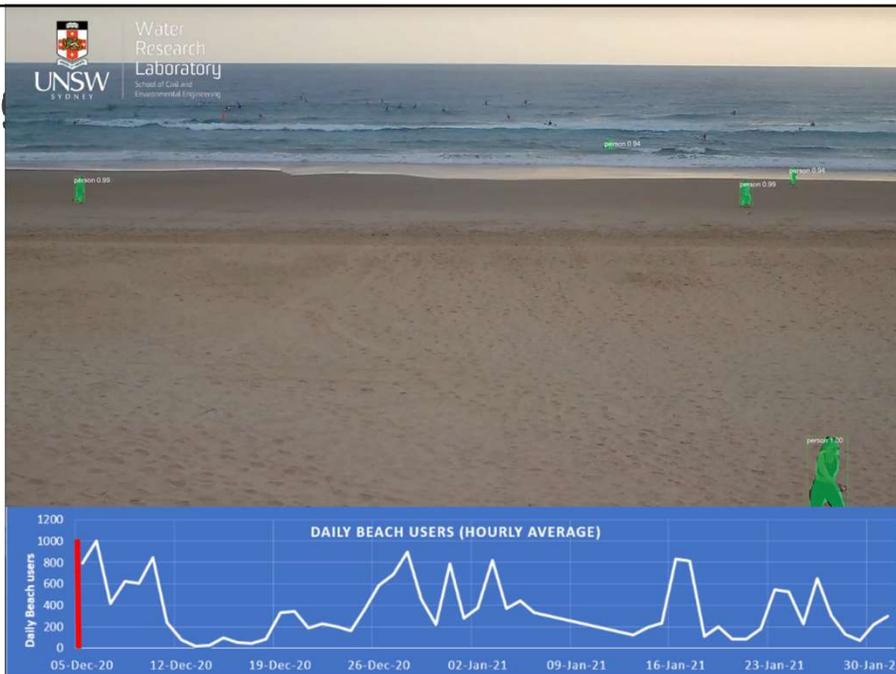
ENJOUR BURLEIGH 4G0 105°F 40°C 2020/12/05 10:45:01



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Burleigh



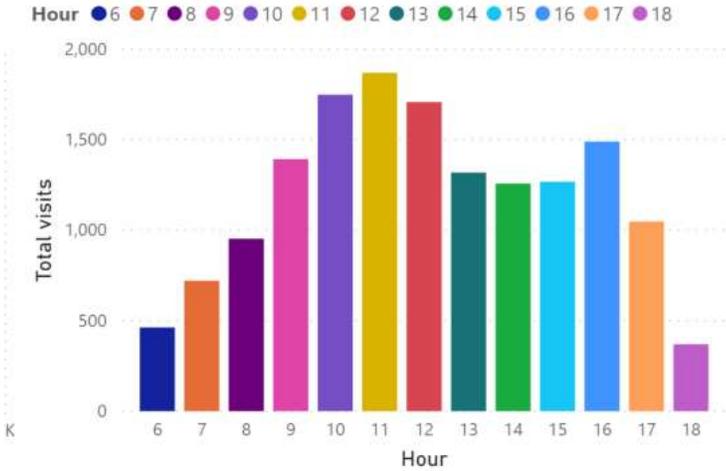
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Burleigh Beach, Gold Coast QLD

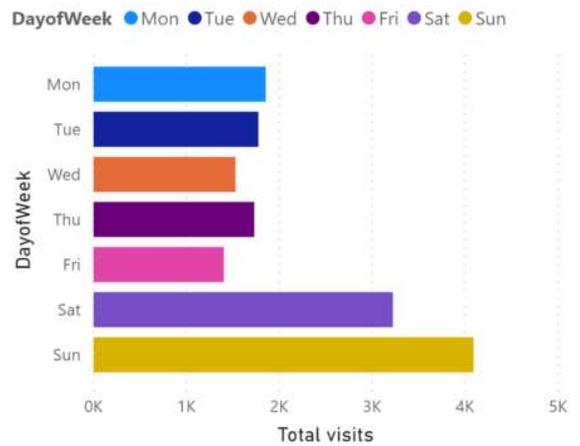
Time of the day

Visits by Hour of the day



Day of the week

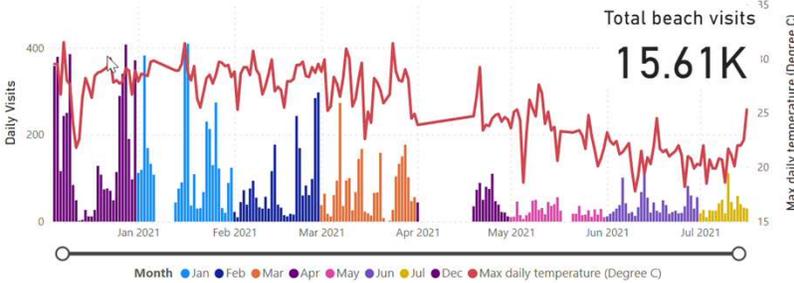
Visits by Day of Week



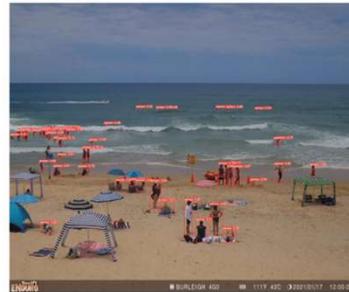
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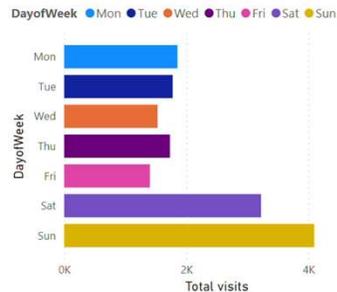
North Burleigh Beach Visitation Results



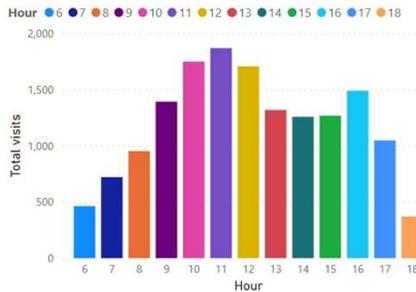
Busiest Day - 17 Jan 2021



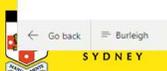
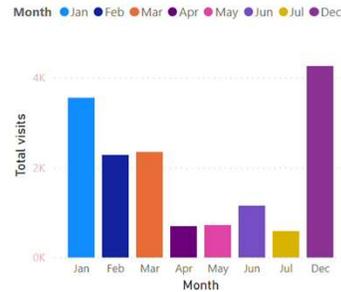
Visits by Day of Week



Visits by Hour of the day

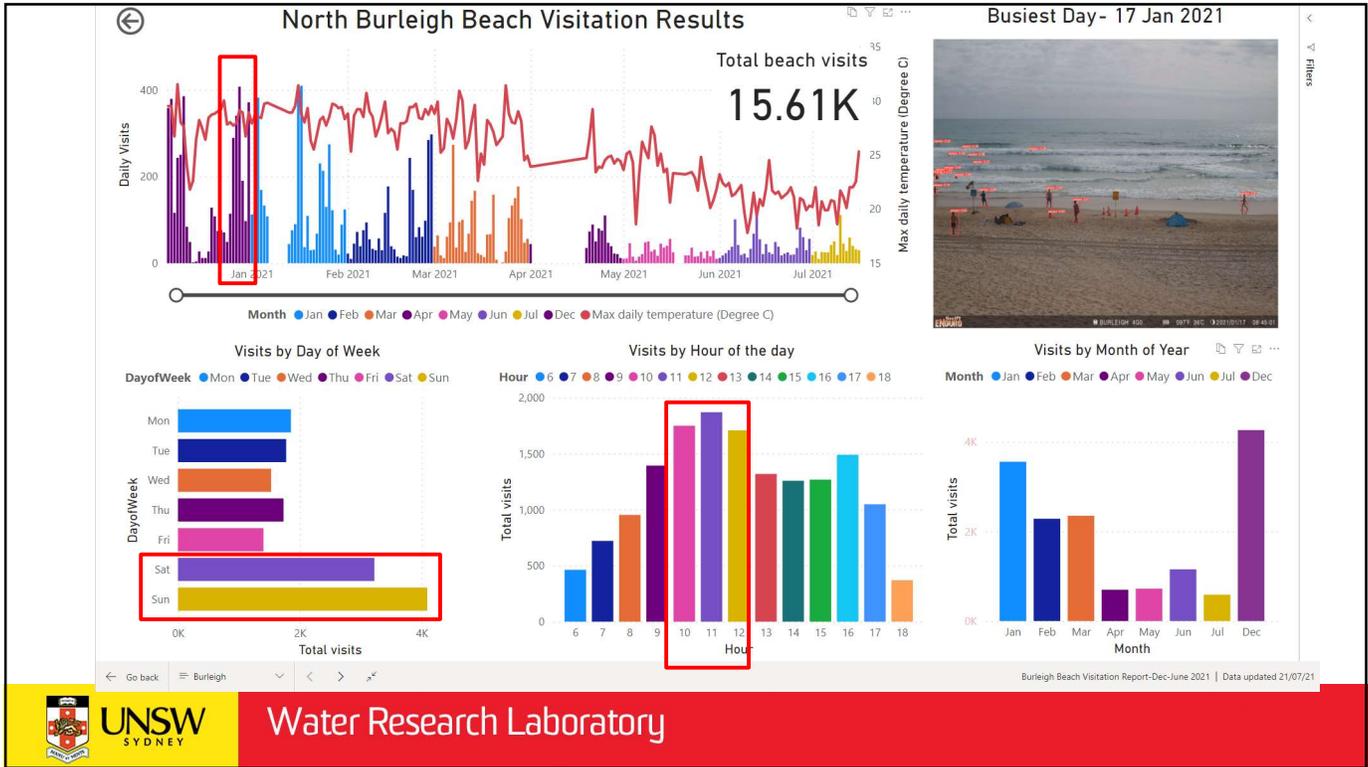


Visits by Month of Year



Burleigh Beach Visitation Report-Dec-June 2021 | Data updated 21/07/21

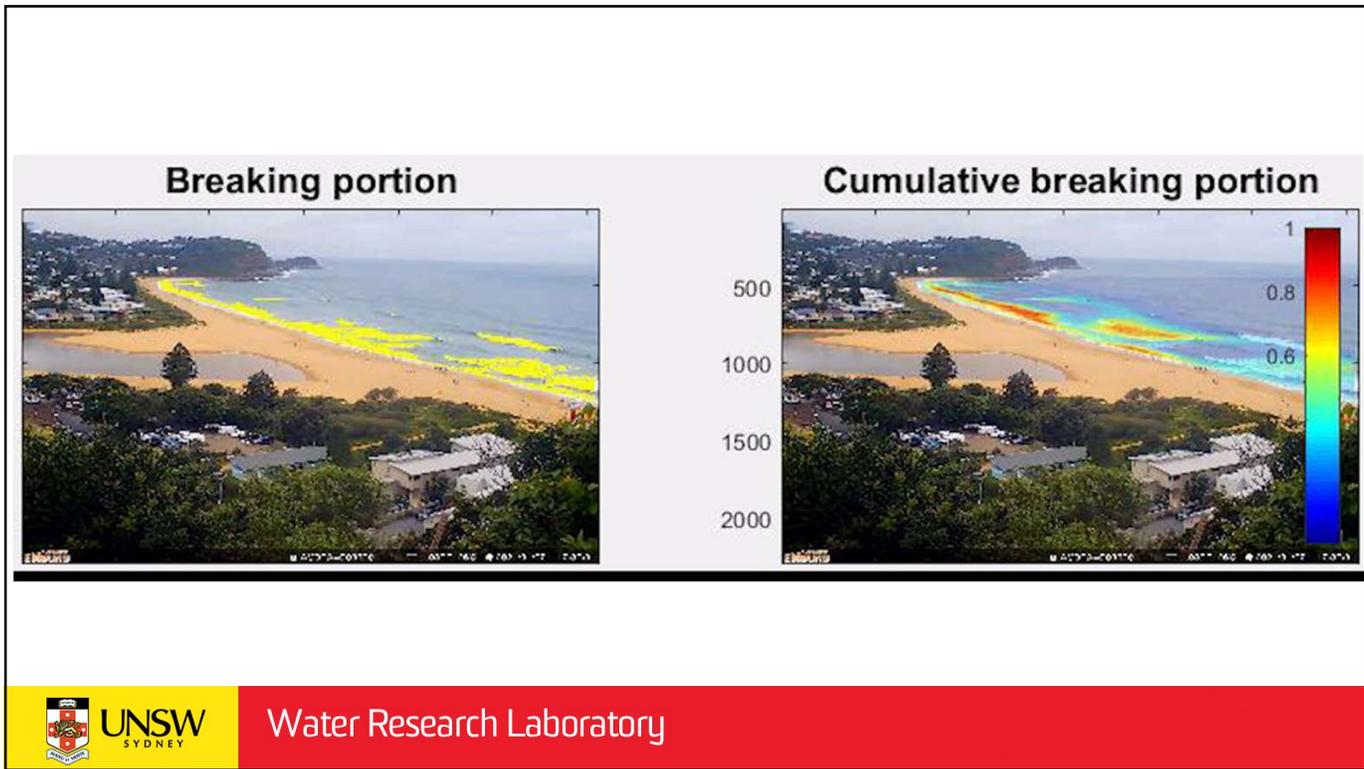
29



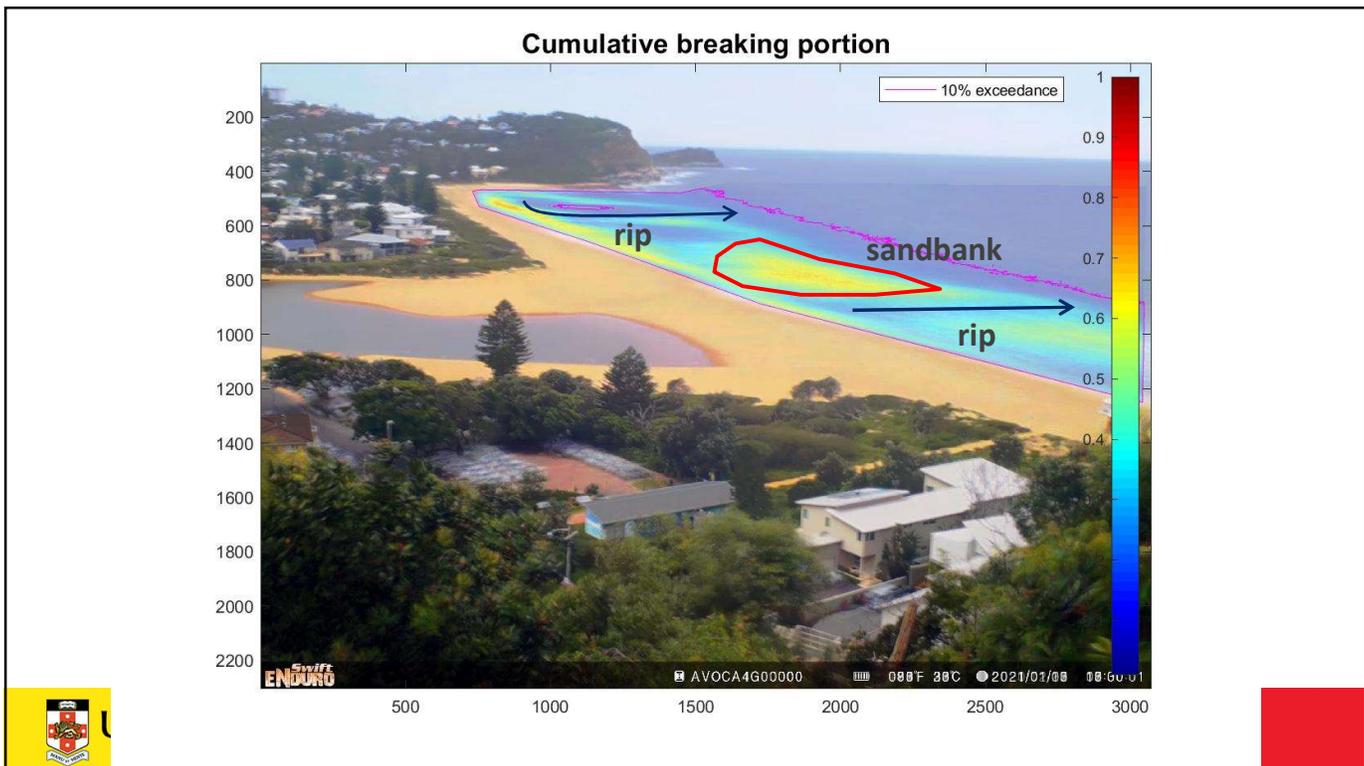
30



31



32



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UNSW SYDNEY Water Research Laboratory School of Civil and Environmental Engineering WRL BeachStat Dashboard

Camera Locations

- The Entrance North 2
- The Entrance North 1
- The Entrance Channel
- Wamberal lagoon
- Wamberal South
- Terrigal
- Avoca
- Copacabana Beach
- MacMasters Beach

UNSW SYDNEY Water Research Laboratory School of Civil and Environmental Engineering

Developed by Chris Drummond cdrummond@wrl.unsw.edu.au

Wamberal lagoon [Link to image archive](#)

Manly Hydraulics Laboratory

Wamberal Lagoon (212450) **SITE INFO**

MAP VIEW

Latest values:

Water Level (m)(Latest)		
Site	Latest Value	Timestamp
Wamberal Lagoon (Level 1)	2.169	3:15PM 10/03/2021

Water Level

Weather Windy Forecast Tides Wave Water level

Wed, 10. Mar 2021 04:20:44 p.m.

WAMBERAL4G00 083F 28C 2021/03/10 16:00:00

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Questions?

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c.drummond@wrl.unsw.edu.au



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