Machine learning methods for rooftop segmentation

Curtin University

Associate Professor Jianhong(Cecilia) Xia

School of Earth and Planetary Sciences, c.xia@curtin.edu.au

Content

- Research areas
- Research capacities
- Machine Learning Methods for Rooftop Segmentation
- High Water Mark Determination
- Thoughts on Future Collaboration

Cecilia's Research Areas

- Human mobility

  - Air travel

  - Car sharing

  - Traffic congestion study

  - Land use and transport integration

  - Urban planning and development

Research Capacities

- Spatial and temporal analysis and modelling
- Survey research and design in psychology
- Machine learning and pattern recognition

Machine learning methods for rooftop segmentation

- The aim of this study is to develop methods to systematically evaluate the evolution of sustainable urban sprawl in the Perth and peel regions from 2010 to 2020 using deep neural networks.

AI, Machine Learning and Deep Learning

Trump's Mood Swings

...ours

$\sin(\textcolor{red}{A}x)$
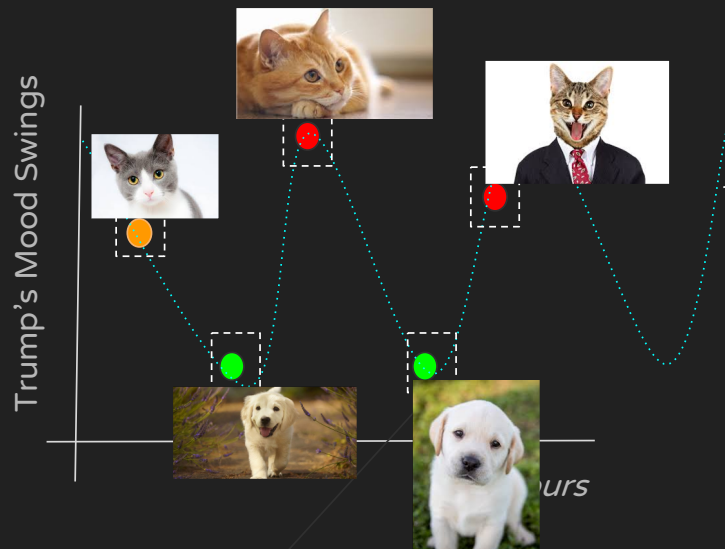
becomes

$e^{-(\textcolor{red}{A}*(1\text{st pixel})+\textcolor{orange}{B}(2\text{nd pixel})+\textcolor{red}{C}...e^\wedge...)}$
A simple neural network!!

repeat this several times, and the equation becomes complicated/**deep**er enough to be computed on a standard PC.

❗ **feature engineering is pivotal in shallow networks**

Zhang, Wei (1988). "Shift-invariant pattern recognition neural network and its optical architecture". *Proceedings of annual conference of the Japan Society of Applied Physics*.

S Lawrence et al., "Face recognition: A convolutional neural-network approach",IEEE Trans. on Neural networks, Jan 1997.

Results
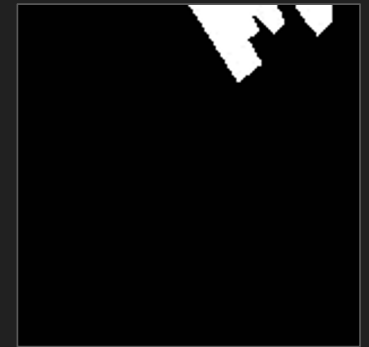
- <Accuracy> is around 94% by area
- Proof of concept
- Scope for improvement in edge segmentation
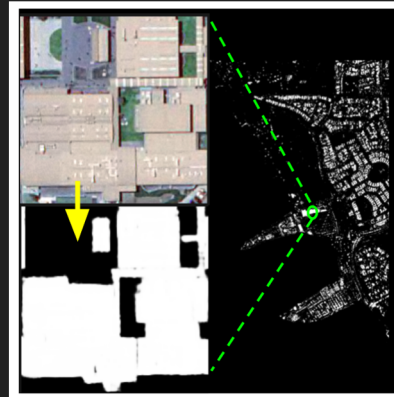
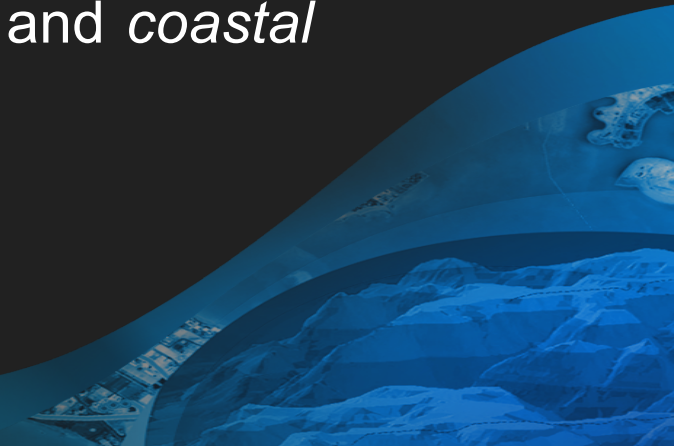Segmented aerial view of a portion of W Joondalup
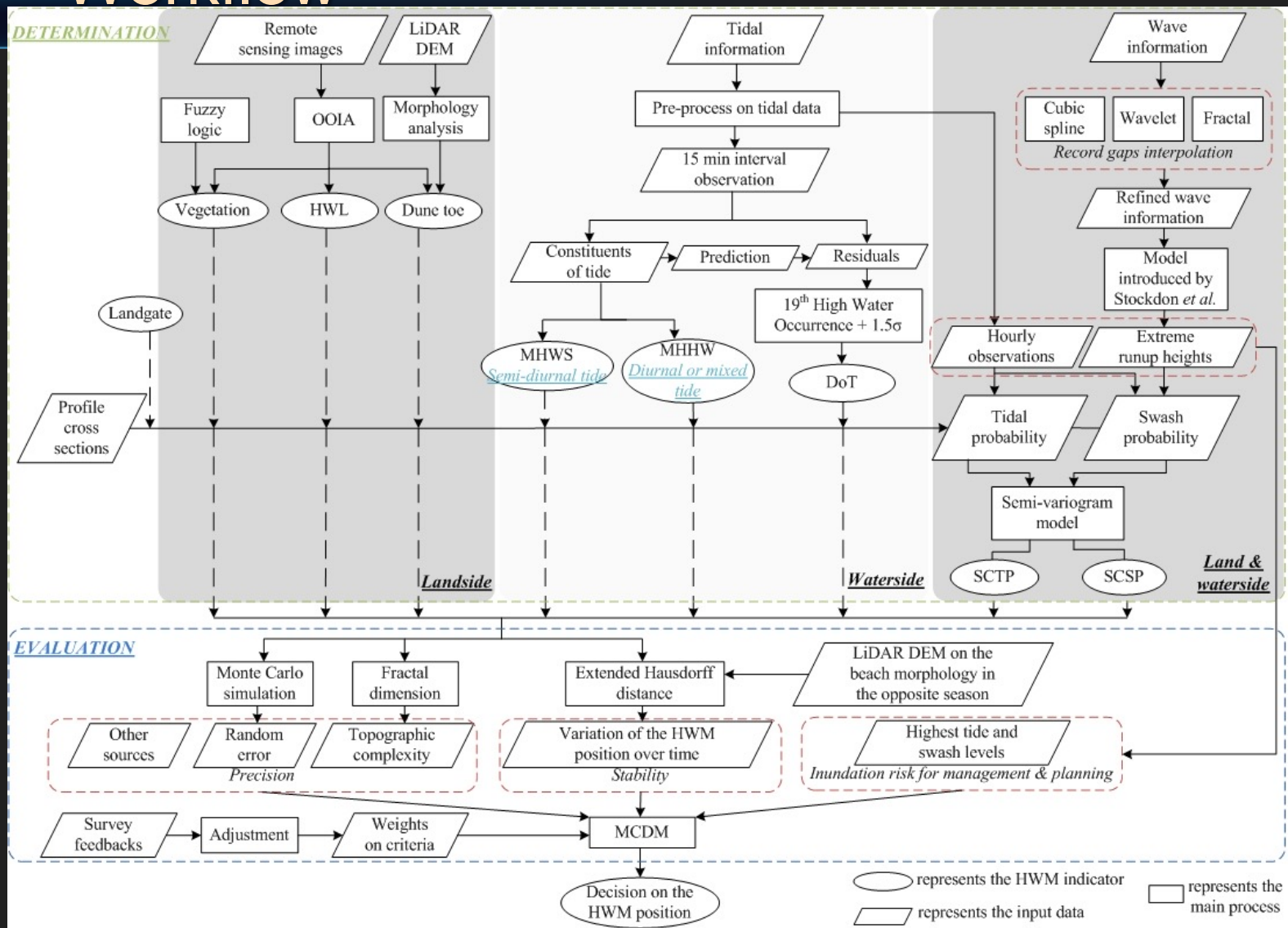
Section of Joondalup

Determination of High Water Mark (HWM) and its Location Along a Coastline

Dr Xin Liu

To develop a model integrating both land and water information to determine the position of 'high' water mark for both *costal property management* and *coastal hazard planning* purposes.
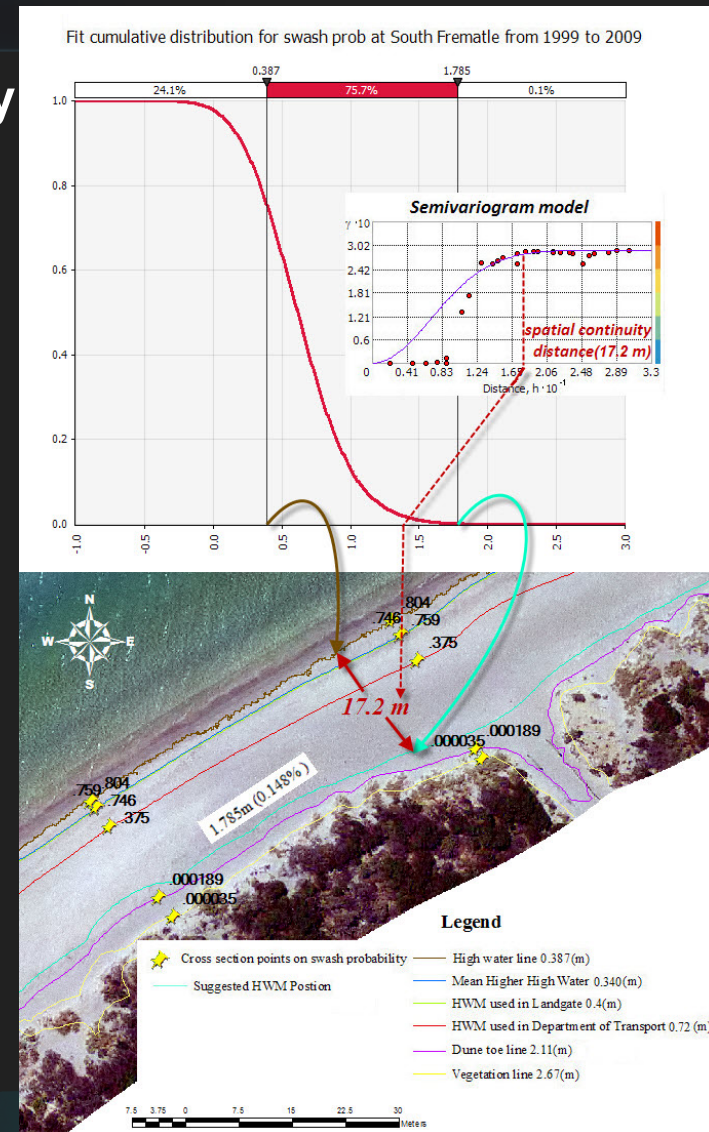
Workflow

Results

Spatial continuity of swash probability
(Spatial analysis and Geostatistics)

Green line indicates the
position of HWM in an
extreme situation,
which is for the coastal
hazard planning
purpose.

Thoughts on Our Collaboration Opportunities

- Data-driven Prediction of Urban Flooding and its Impact on Property Values: A Digital Twins Approach
- Predicting coastal flooding due to Climate changes

Thanks very much

Questions?