

# Machine learning methods for rooftop segmentation

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#### 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
  - oTraffic congestion study
  - oLand use and transport integration
  - Urban planning and development

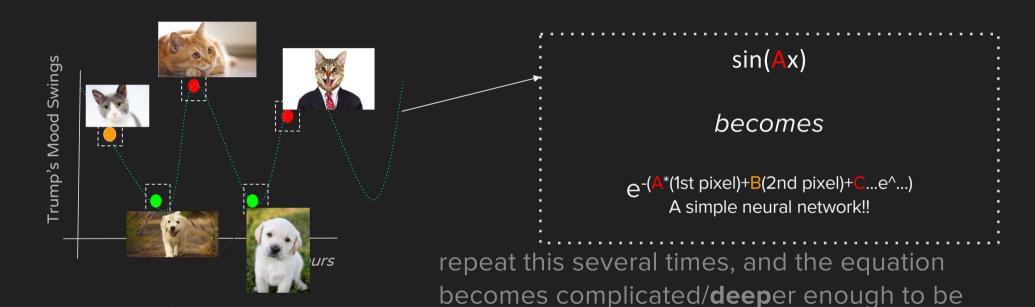
### Research Capacities

- 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



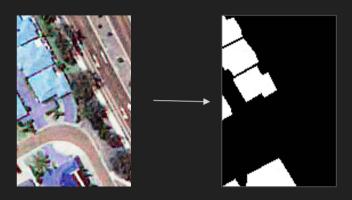
Zhang, Wei (1988). "Shift-invariant pattern recognition neural network and its optical architecture". *Proceedings of annual conference of the Japan Society of Applied Physics*.

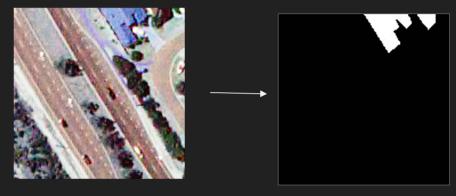
S Lawrence et al., "Face recognition: A convolutional neural-network approach", IEEE Trans. on Neural networks, Jan 1997.

! feature engineering is pivotal in shallow networks

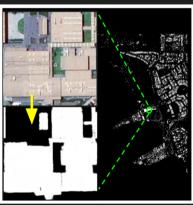
computed on a standard PC.

#### Results

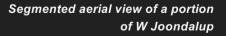




- <Accuracy> is around94% by area
- Proof of concept
- Scope for improvement in edge segmentation









Section of Joondalup

### Determination of High Water Mark (HWM) and its Location Along a Coastline Dr Xin Liu

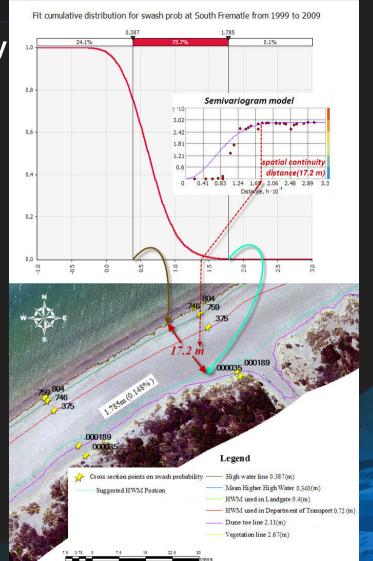
To develop a model integrating both land and water information to determine the position of 'high' water mark for both *costal property management* and *coastal hazard planning* purposes.

#### Workflow Wave Remote LiDAR Tidal DETERMINATION information DEM sensing images information Morphology Pre-process on tidal data Cubic Fuzzy Wavelet OOIA Fractal logic analysis spline Record gaps interpolation 15 min interval observation Refined wave Vegetation HWL Dune toe information Constituents Residuals Prediction Model of tide introduced by 19th High Water Stockdon et al. Landgate Occurrence $+1.5\sigma$ Hourly Extreme MHHW MHWS observations runup heights Diurnal or mixea mi-diurnal DoT Profile Swash Tidal cross probability probability sections Semi-variogram model Land & SCTP SCSP Waterside Landside waterside **EVALUATION** LiDAR DEM on the Monte Carlo Fractal Extended Hausdorff beach morphology in simulation dimension distance the opposite season +-Variation of the HWM Highest tide and Other Random Topographic swash levels position over time sources error complexity Inundation risk for management & planning Precision Stability Weights Survey MCDM Adjustment feedbacks on criteria represents the HWM indicator represents the Decision on the main process HWM position represents the input data

#### 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?