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in collaboration with **GDHP**  
16 – 19 Oct 2019 | Hong Kong Science Park

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# Prediction of Dementia Risk with Community Health Data using Machine Learning Approaches

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(ITF MRP/018/18)

# Background

- Despite being a global health problem, people with dementia are **largely unnoticed**, while **early detection of dementia** is important for timely diagnosis and intervention.
- Other than hospital-based data which usually record information of dementia at a later stage, **community health data in primary care settings** has the potential to render signs or hints of dementia to alert healthcare providers and the elderly.

# The study

- The machine learning techniques of k-nearest neighbours (**KNN**) and support vector machine (**SVM**) were applied to community health profile to classify between **normal versus non-normal cases**.

# Methods

- Data
  - A set of health data of 298 community-dwelling elderly people, collected during primary healthcare services in different districts of Hong Kong from 2008 to 2018

# Methods

- Features
  - Demographic information
  - Bio-measurements
  - Data collected with questionnaires on mobility, nutrition assessment, depression assessment, happiness assessment, pain assessment, etc.
  - Total: 217 features

# Methods

- Model training
  - Scores of mini-mental state examination (MMSE) as benchmark for model output
  - Normal: 24 – 30 points
  - Not normal: 0 – 23 points
  - Normalization to [0,1]
  - Training-to-testing ratio: 7: 3

# Results

- Results after 100 runs

Model	Accuracy
kNN	$0.81 \pm 0.033$
SVM	$0.67 \pm 0.046$

# Discussion

- Machine learning algorithms can be applied to community health profile to predict dementia risk
- Advanced algorithms will be explored to improve classification performance.
- As the data are collected in primary care settings, the proposed approach has the potential to detect dementia at early stage.



# Discussion

- Nevertheless, the issue of data imbalance with the dataset may affect the performance since the proportion of the cases of normal cognition is larger.
- Future work will be conducted to counteract the issue with appropriate computational algorithms.

# Acknowledgement

- This work was supported by the Innovation Technology Fund, under the Midstream Research Program for Universities (Project No. MRP/018/18)