




# **COURSERA IBM APPLIED DATA SCIENCE CAPSTONE PROJECT**

**ALZHEIMER'S DISEASE BURDEN, GEOGRAPHICAL LOCATION and HOSPITALS IN  
AUSTRALIA**

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# Background

- Alzheimer's disease (AD) is a neurodegenerative disease
- Can be early or late onset
- Associated with a high morbidity and mortality
- No cure
- Risk factors: smoking, low education, genetics, and others
- Paucity of data on geography
- Primarily aim. To determine the association of geographical location with dementia burden
- Secondary aim. To determine the relationship between hospital presence and dementia burden

# Data Description and Source

## ■ The data used include

- *Geographical coordinates: latitudes and longitudes*
- *Prevalence and burden of dementia by Australian state*
- *Selected hospitals in Australia*

## ■ Sources of data

- *Webpages/websites*
  - Dementia Australia
  - LatLong.net
- *Foursquare API*

# Methodology (1) – Design

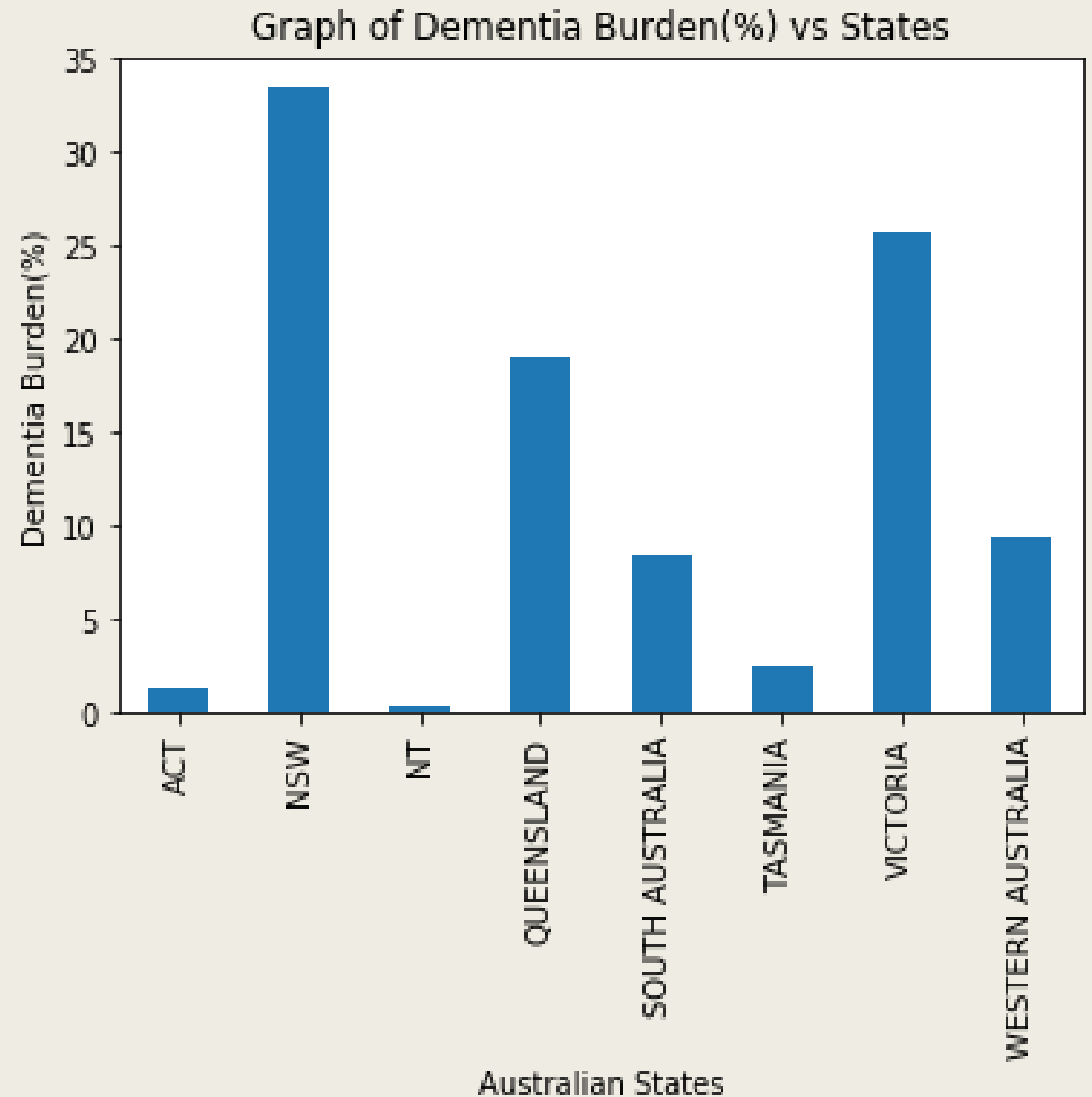
- Study design: ecological retrospective study
- Setting: Australian states, cities and hospitals
- Dates: August to September 2019
- Variables
  - *Predictor: hospitals, latitudes, longitudes*
  - *Dependent: dementia burden (%)*

# Methodology (2) – Statistical analysis

- Statistical software: Python (Python Software Foundation, version 3.7)
- Descriptive statistics: means, standard deviations, frequencies/percentages, tables
- Data visualization: graphs, plots, maps
- Machine learning algorithm: supervised – linear regression (simple and multiple)
- Measures: correlation coefficients,  $\beta$ -coefficients with standard errors, p-values and  $R^2$  –scores/values

# Results (1)

- All 8 Australian States were considered
- The dementia burden is highest in NSW and lowest in NT (see the figure opposite)
- Mean dementia burden is 12.50%



# Results (2)

- 28 major cities were considered
- Mean dementia burden is 12.50%
- Cities are mainly located around coastal regions (see the opposite figure)
- DBSCAN returns 28 cluster using a minimum sample of 1



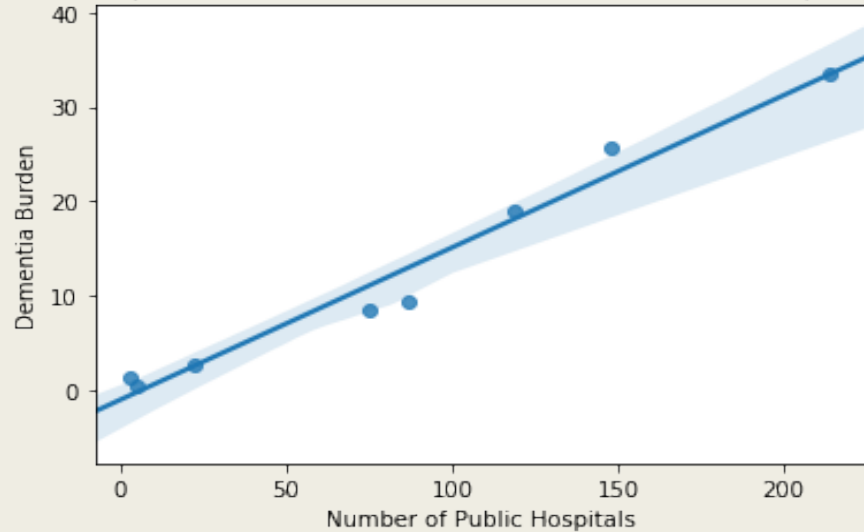
# Results(3)

- Hospital numbers are positively correlated with dementia burden
- The association and/or correlation between hospital number and dementia burden is strongest with public psychiatric hospitals (Figures on the next slide)
- Including latitudes and longitudes significantly changes the  $R^2$  –scores/values of this relationship, not other hospitals (0.782 to 0.851)
- Latitudes are not associated with dementia burden
- Longitudes are weakly correlated with dementia burden ( $r = 0.259$ ,  $p = 0.535$ )

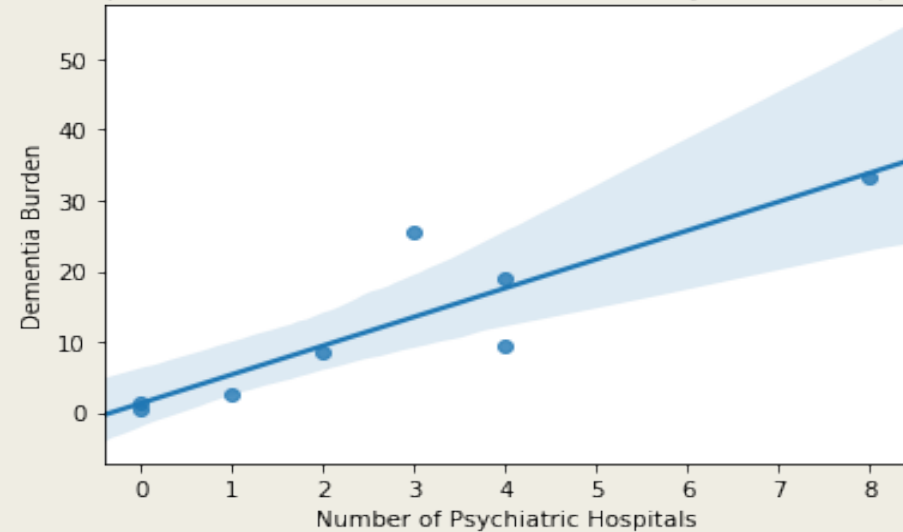


# Correlation between hospitals and dementia burden

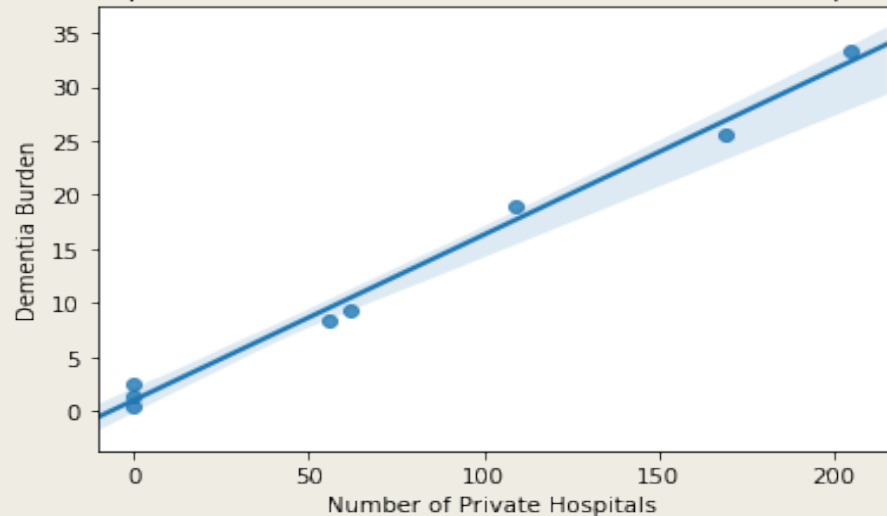
Graph of Dementia Burden vs Number of Public Hospitals



Graph of Dementia Burden vs Number of Psychiatric Hospitals



Graph of Dementia Burden vs Number of Private Hospitals



# Discussion

- Hospitals seem to have been built to match disease burden
- Dementia burden is likely to be population-related
- Longitudes and not latitudes are, associated with dementia burden
- Recommendation and practical components. Results can be used in:
  - *Research – location for dementia research*
  - *Business – hospital business is mainly in densely populated areas*
  - *Public health policy*
    - More psychiatric hospitals may be required
    - There is need for greater human resource capacity to handle dementia

# Conclusion

- Hospital numbers are associated with dementia burden in Australia
- Geographical coordinates may affect this association
- Longitudes, not latitudes are correlated with dementia burden
- Further research is required in this area. The project may affect research, businesses and public health policy