

# COS 4807 Assignment 1

Adriaan Louw (53031377)

May 8, 2019

## Contents

<b>1</b>	<b>Abstract</b>	<b>1</b>
<b>2</b>	<b>Introduction</b>	<b>1</b>
<b>3</b>	<b>Literature Review</b>	<b>2</b>
3.1	?Grossman? . . . . .	2
3.2	Life expectancy projections . . . . .	2
3.3	Determinants of life expectancy . . . . .	2
3.3.1	Income . . . . .	2
3.3.2	Education attainment . . . . .	2
3.3.3	Per capita spending on health . . . . .	2
3.3.4	Access to safe drinking water . . . . .	2
3.3.5	Turmoil . . . . .	2
<b>4</b>	<b>Methodology/Procedure</b>	<b>2</b>
4.1	Choice of dataset . . . . .	2
4.2	Regression . . . . .	2
4.3	k-Nearest Neighbour . . . . .	2
4.4	Support Vector Machines . . . . .	2
4.5	Cross-validation . . . . .	2
<b>5</b>	<b>Analysis</b>	<b>2</b>
<b>6</b>	<b>Conclusion</b>	<b>2</b>
<b>7</b>	<b>Recommendations</b>	<b>2</b>
	<b>References</b>	<b>2</b>
<b>8</b>	<b>Appendices</b>	<b>3</b>

## List of Figures

## List of Tables

### 1 Abstract

hello

### 2 Introduction

Human attempts to mathematically predict life expectance is not a new endeavour. Gompertz (1825) introduced an equation to predict life expectancy, which was modified in Makeham (1860) to create the famous Gompertz–Makeham law.

life expectancy vs mortality rate?

Rajkomar et al. (2018) Google uses machine learning to predict in hospital medical events for patients.

## 3 Literature Review

Forecasting Mortality in Developed Countries Tableau 2001

### 3.1 ?Grossman?

2017 determinants of health: an economic perspective ???? 1972 The Demand for Health: A Theoretical and Empirical Investigation,  
Grossman (2000)

### 3.2 Life expectancy projections

The United Nations use a Bayesian model to predict future life expectancy (Raftery et al. 2014).  
Lee Carter method Shang et al. (2011)  
Bongaarts (2005)

### 3.3 Determinants of life expectancy

#### 3.3.1 Income

#### 3.3.2 Education attainment

#### 3.3.3 Per capita spending on health

Shaw et al. (2005) showed that pharmaceutical expenditures shows a positive correlation with life expectancy in OECD countries.

#### 3.3.4 Access to safe drinking water

#### 3.3.5 Turmoil

(Low et al. 2008) p211

## 4 Methodology/Procedure

segment data into groups where each group has the same amount of data points???

Unlike Shaw et al. (2005), this study will not take into account the age distribution of each country.

As for HDI from Bulled & Sosis (2010) Adult literacy rate

primary secondary and tertiary enrolment ratios

GDP per Capita (Purchasing power parity )

### 4.1 Choice of dataset

### 4.2 Regression

### 4.3 k-Nearest Neighbour

### 4.4 Support Vector Machines

### 4.5 Cross-validation

## 5 Analysis

## 6 Conclusion

## 7 Recommendations

## References

Bongaarts, J. (2005), Long-Range Trends in Adult Mortality: Models and Projection Methods, Technical Report 1.

**URL:** [https://0-www-jstor-org.oasis.unisa.ac.za/stable/pdf/1515175.pdf?ab\\_segments=0%252Fdefault-2%252Fcontrol&refreqid=excelsior%3Aa5dade979716032cde5211a40278cee8](https://0-www-jstor-org.oasis.unisa.ac.za/stable/pdf/1515175.pdf?ab_segments=0%252Fdefault-2%252Fcontrol&refreqid=excelsior%3Aa5dade979716032cde5211a40278cee8)

- Bulled, N. L. & Sosis, R. (2010), ‘Examining the Relationship between Life Expectancy, Reproduction, and Educational Attainment’, *Human Nature* **21**(3), 269–289.  
**URL:** <https://0-link-springer-com.oasis.unisa.ac.za/content/pdf/10.1007%2Fs12110-010-9092-2.pdf>
- Gompertz, B. (1825), ‘XXIV. On the nature of the function expressive of the law of human mortality, and on a new mode of determining the value of life contingencies. In a letter to Francis Baily, Esq. F. R. S. &c’, *Philosophical Transactions of the Royal Society of London* **115**, 513–583.
- Grossman, M. (2000), THE HUMAN CAPITAL MODEL, in ‘Handbook of Health Economics, Volume 1’, Vol. 1, pp. 348–407.  
**URL:** <https://pdfs.semanticscholar.org/ecb2/f4d54ef8c970bf2907cab8d684ede1e58a87.pdf>
- Low, B. S., Hazel, A., Parker, N. & Welch, K. B. (2008), ‘Influences on Women’s Reproductive Lives’, *Cross-Cultural Research* **42**(3), 201–219.  
**URL:** <http://ccr.sagepub.comhttp://online.sagepub.com>
- Makeham, W. M. (1860), ‘On the Law of Mortality and Construction of Annuity Tables’, *The Assurance Magazine and Journal of the Institute of Actuaries* **8**(06), 301–310.  
**URL:** [http://www.journals.cambridge.org/abstract\\_S204616580000126X](http://www.journals.cambridge.org/abstract_S204616580000126X) <https://ia801701.us.archive.org/21/items/jstor-41134925/41134925.pdf>
- Raftery, A. E., Alkema, L. & Gerland, P. (2014), ‘Bayesian Population Projections for the United Nations’, *Statistical Science* **29**(1), 58–68.  
**URL:** [https://0-www-jstor-org.oasis.unisa.ac.za/stable/pdf/43288451.pdf?ab\\_segments=0%252Fdefault-2%252Fcontrol&refreqid=excelsior%3Aabcd6ef78767127a832ba89f9bb2dd7f7](https://0-www-jstor-org.oasis.unisa.ac.za/stable/pdf/43288451.pdf?ab_segments=0%252Fdefault-2%252Fcontrol&refreqid=excelsior%3Aabcd6ef78767127a832ba89f9bb2dd7f7)
- Rajkomar, A., Oren, E., Chen, K., Dai, A. M., Hajaj, N., Liu, P. J., Liu, X., Sun, M., Sundberg, P., Yee, H., Zhang, K., Duggan, G. E., Flores, G., Hardt, M., Irvine, J., Le, Q., Litsch, K., Marcus, J., Mossin, A., Tansuwan, J., Wang, D., Wexler, J., Wilson, J., Ludwig, D., Volchenboum, S. L., Chou, K., Pearson, M., Madabushi, S., Shah, N. H., Butte, A. J., Howell, M., Cui, C., Corrado, G. & Dean, J. (2018), ‘Scalable and accurate deep learning for electronic health records’, *Digital Medicine* **1**, 18.  
**URL:** [www.nature.com/npjdigitalmed](http://arxiv.org/abs/1801.07860) <http://arxiv.org/abs/1801.07860> <http://dx.doi.org/10.1038/s41746-018-0029-1>
- Shang, H. L., Booth, H. & Hyndman, R. J. (2011), ‘Point and interval forecasts of mortality rates and life expectancy: A comparison of ten principal component methods’, *Demographic Research* **25**, 173–214.  
**URL:** [www.demographic-research.org](http://www.demographic-research.org)
- Shaw, J. W., Horrace, W. C. & Vogel, R. J. (2005), The Determinants of Life Expectancy: An Analysis of the OECD, Technical Report 4.  
**URL:** [https://0-www-jstor-org.oasis.unisa.ac.za/stable/pdf/20062079.pdf?ab\\_segments=0%2Fdefault-2%2Fcontrol&refreqid=search%3Aba83618dfd1073a89888d75df991a4ea](https://0-www-jstor-org.oasis.unisa.ac.za/stable/pdf/20062079.pdf?ab_segments=0%2Fdefault-2%2Fcontrol&refreqid=search%3Aba83618dfd1073a89888d75df991a4ea)

## 8 Appendices