Bayesian Networks for Dementia Risk Factors

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Dementia is a major international public health concern; in 2019, 50 million people worldwide were estimated to be living with dementia, which is set to reach 152 million by 2050 [1]. The cost of dementia to governments, social services and individuals has reached staggering figures, with £34.7 billion reported in the UK in 2019 [2]. In the absence of a cure, effective prevention strategies become critical to reduce dementia risk and lessen the burden of dementia at all levels of society. This requires a deep understanding of factors associated with higher dementia risk and particularly, of modifiable risk factors that are amenable to interventions.

Dementia modifiable risk factors identified in literature include education, hearing loss, traumatic brain injury, hypertension, alcohol consumption, smoking, obesity, physical activity, depression, social isolation, diabetes, and air pollution [3]. Such risk factors are often regarded as independent and static, despite evidence suggesting they are interrelated and change over time. Literature also suggests significant differences in behaviours between older men and women. The aim of this project is to quantify the relations and dynamics of modifiable risk factors for dementia and explore sex and age specific differences, generating knowledge to inform the development of lifestyle interventions for dementia risk reduction.

To do so, we will focus on Bayesian networks, which employ directed acyclic graphs to characterize the direct relationships between variables [4]. We will use the bnlearn R package for structural learning of the Bayesian network of dementia and potential risk factors. Data is available from SHARE, a European survey of Health, Ageing, and Retirement, containing information on dementia and various potential risk factors. In addition, the survey contains longitudinal data across multiple European countries and other relevant covariate information, such gender, allowing for the possibility to explore differences in the networks across countries, gender, time, and other factors.

References:

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