



Understanding Healthy Aging: Canadian Longitudinal Study on Aging:

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Global Population Aging

Population pyramid: A thing of the past?

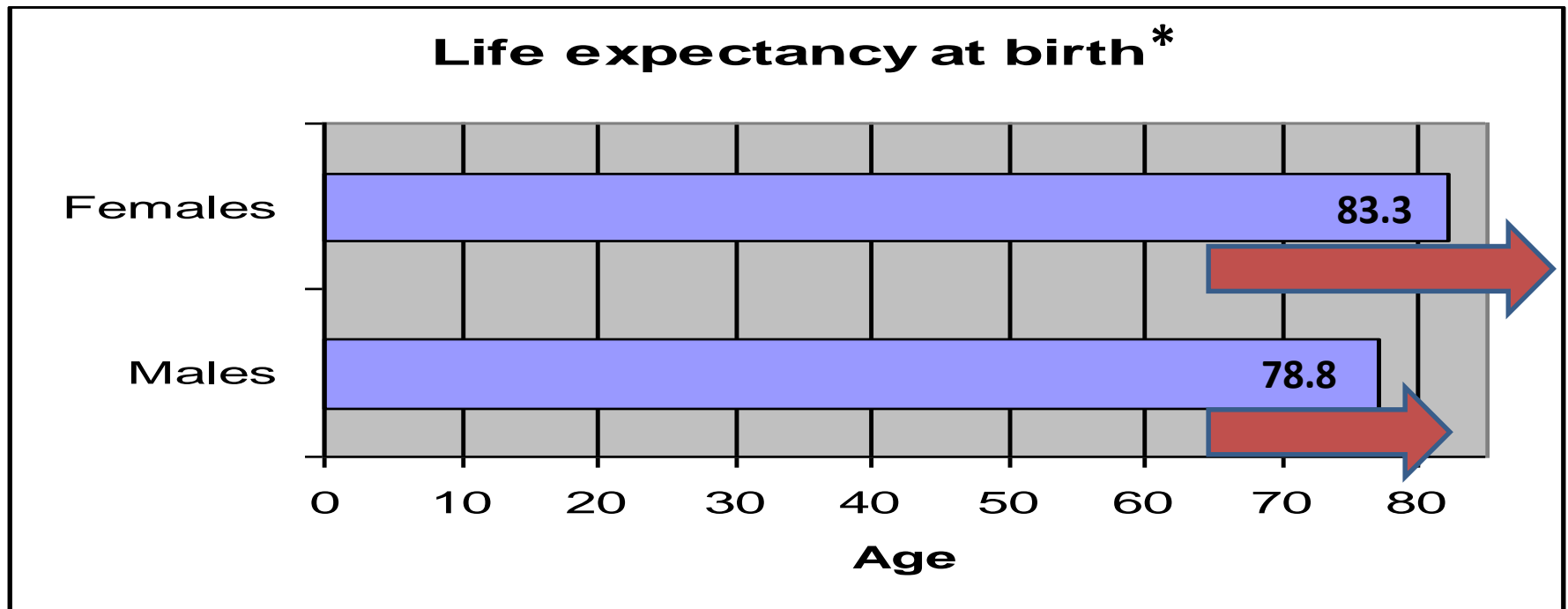
(Global population, % of total)



Sources: World Population Prospects: The 2012 Revision, Medium Variant.

Life expectancy in Canada

Statistics Canada



At age 65: Women 21.6 years (86.6)
At age 65: Men 18.5 years (83.5)

* If born in 2007-2009

Source: CANSIM

Challenge: Live long AND well

Need to shift our focus:

- Mortality
 - Morbidity
 - Longevity
-
- Function
 - Ability/Disability
 - Well being
 - Quality of life
 - Autonomy/Independence



We require high quality data in order to understand and address evolving needs

CLSA!

CLSA Questionnaire Modules at Baseline

51,338 participants

Demographic/Lifestyle

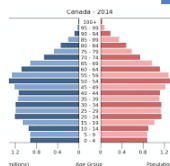
- Age
- Gender
- Education
- Marital status
- Sexual orientation
- Language
- Ethnicity
- Wealth/income
- Veteran Identifier
- Smoking, alcohol
- Nutritional risk
- Physical activity
- Health care utilization
- Medication use
- Supplement use

Health

- General health
- Women's health
- Chronic conditions
- Disease symptoms
- Sleep
- Oral health
- Injuries, falls
- Mobility
- Pain, discomfort
- Functional status
- ADL, IADL
- Cognition
- Depression
- PTSD
- Life Satisfaction

Social

- Social
 - networks
 - support
 - participation
 - inequality
- Online communication
- Care receiving
- Care giving
- Retirement status
- Labour force participation
- Retirement planning
- Transportation
- Mobility, Migration
- Built environments
- Home ownership

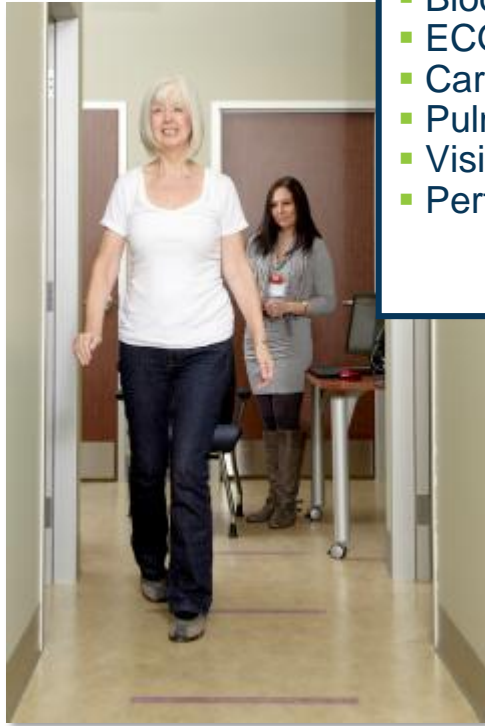


CLSA Data Collection

30,000 visit a Data Collection Site

Physical Assessments:

- Height, Weight, BMI
- Bone Density, Body Composition, Aortic Calcification
- Blood Pressure
- ECG
- Carotid Intimal-Medial Thickness
- Pulmonary Function
- Vision & Hearing
- Performance testing



Biospecimen Collection:

- Blood
- Urine



Cognitive Assessments:

- Neuropsychological Battery
 - Memory
 - Executive function
 - Reaction time

Only one open-ended question...



- All CLSA Participants asked:
 - *“I have talked with many adults and learned something from each of them about what they think promotes healthy aging. What do you think makes people live long and keep well?”*
- Answers recorded verbatim
- Presents a unique and unprecedented opportunity to advance our understanding of ‘healthy aging’ in the Canadian population.

Healthy Aging in the scientific literature

Successful aging
Optimal aging
Productive aging



- 1) Low probability of disease
 - 2) High cognitive and physical capacity
 - 3) Active engagement with life
- Shifts from negative to positive aspects of aging
 - CLSA: “Healthy aging

Lay definitions of healthy aging

- A growing body of evidence indicates that lay perspectives are an important aspect of 'healthy aging'
- What people value or need for their own health
- Individual lay perspectives on 'healthy aging' are more diverse and multidimensional than researcher-driven definitions
- Use of lay definitions in research will help to advance theory and knowledge about 'healthy aging'

But how can we make use this data?

- Shortest response: 1 word
- Longest response: 319 words
- Average length of response: 13 words
- Over 50,000 responses



Example Responses

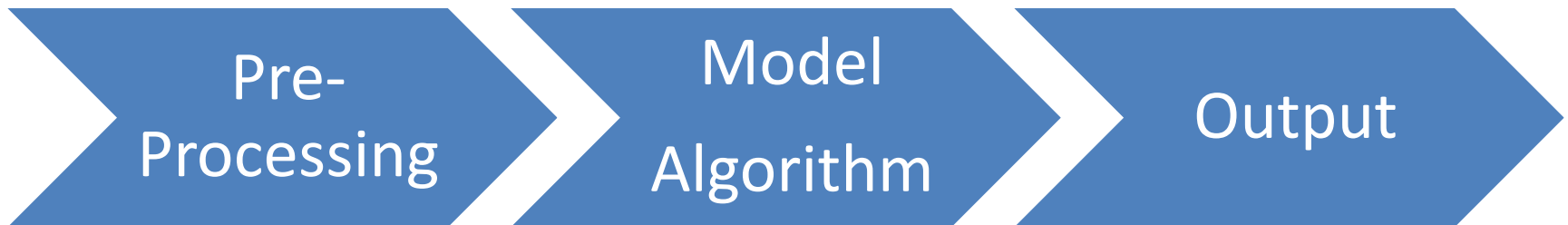
- *Eating well and keeping busy and active*
- *Having things to do and look forward to*
- *Look after your body eat well exercise have people who love you dog*
- *Accepting challenges ministering to other people staying current and up to date with news trends children not dwelling on the rough stuff accepting help when necessary and having a real contingent of girlfriends*
- *Its a mystery to me don't have a clue*

Novel Methods in Text Mining

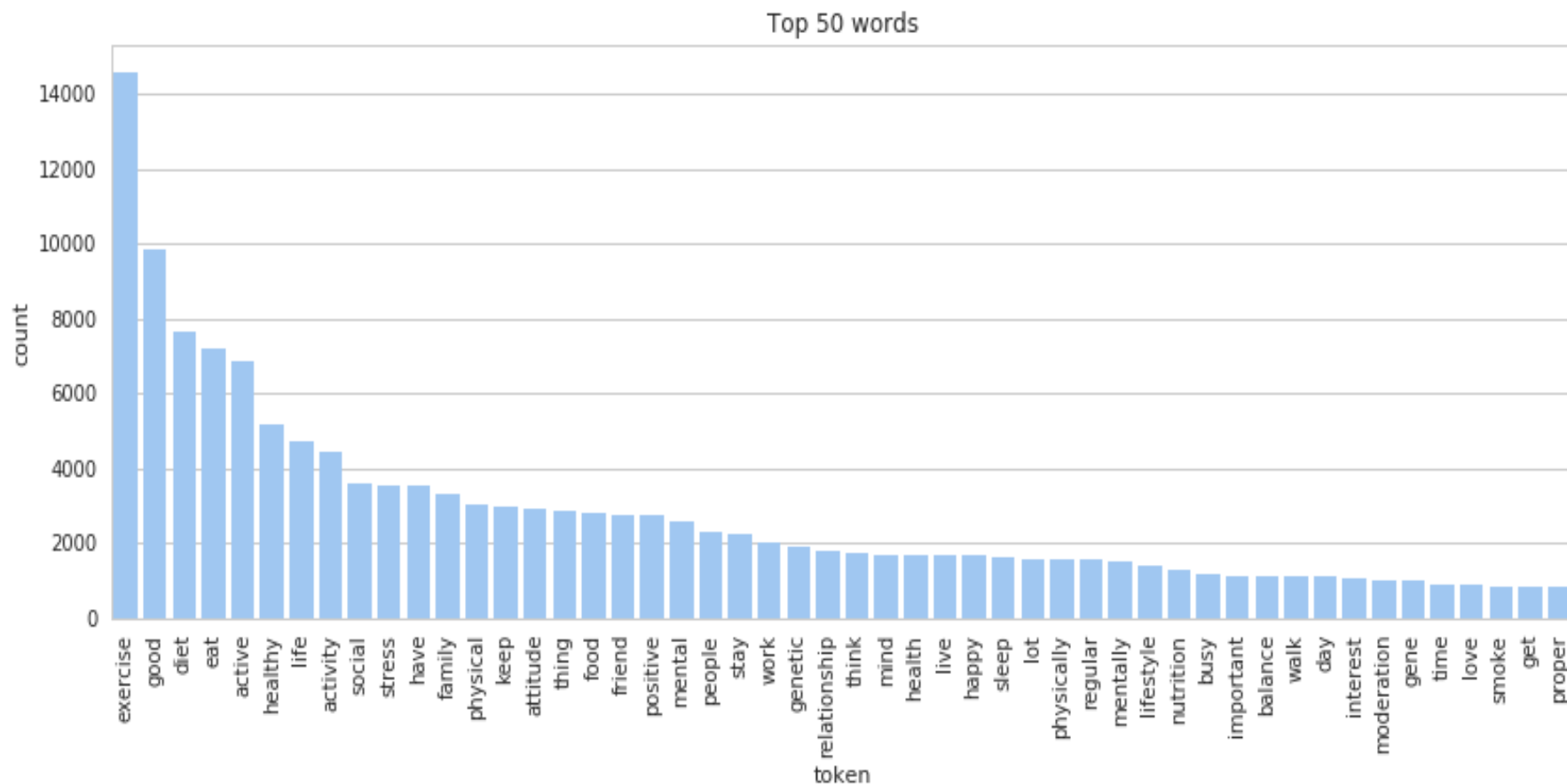
- Machine learning techniques can handle the enormous amount of unstructured text data
- Opportunity to explore the use of novel natural language processing (text mining) techniques to characterize lay perspectives on healthy aging
- Interdisciplinary team of epidemiologists, gerontologists, and computer scientists

General Analytic Method

- Considers the data for recurring, co-occurring patterns and topic distributions
- Input is unstructured text
- Output is topics – a topic is a collection of words which have semantic relatedness
- Multiple approaches explored: LDA, TKM, ngrams.....

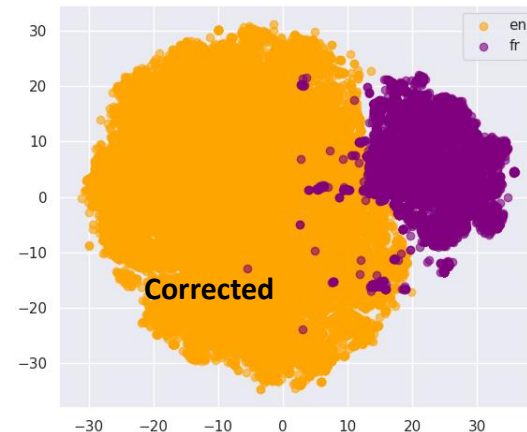
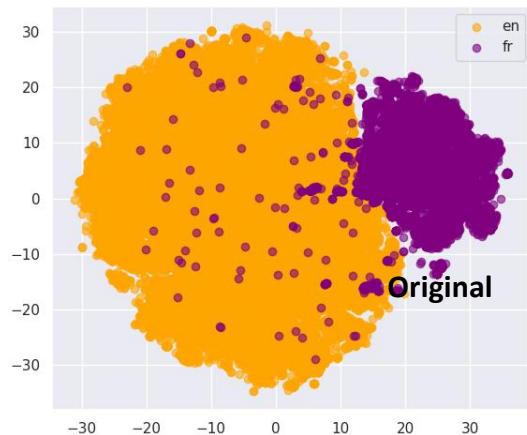


Top 50 words



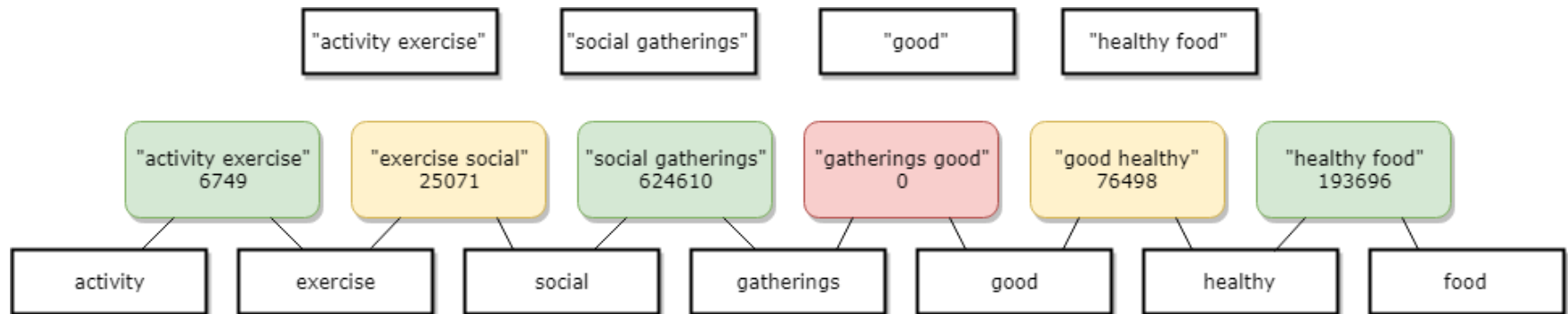
Language label correction

- Label correction results (used provided manual corrections instead of automatic clustering approach)



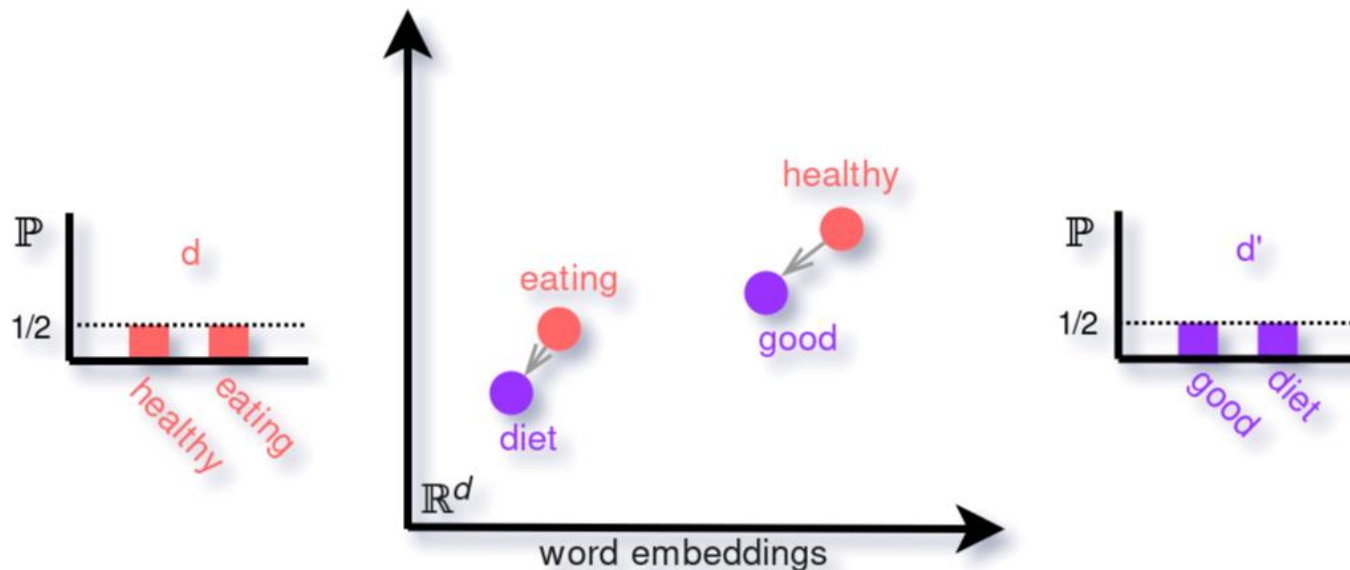
Phrase segmentation

- Using bi-gram frequency information to segment samples into phrases
- Most probable neighbouring words merge into bigrams



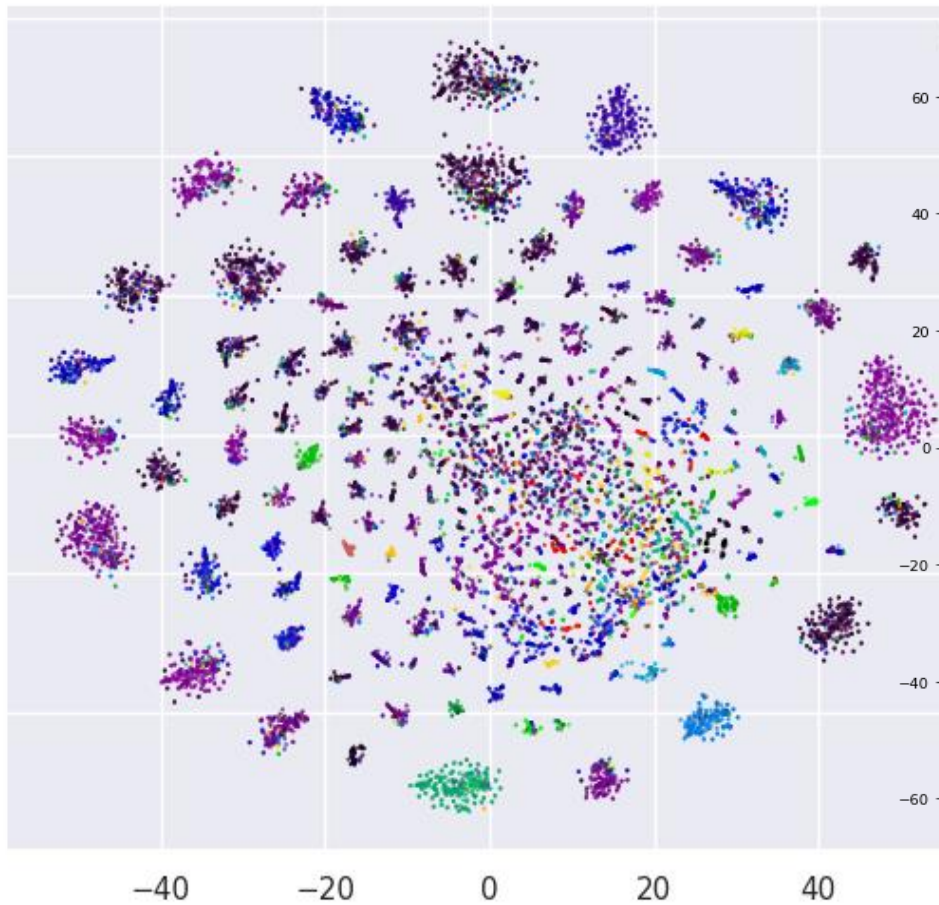
Phrase clustering using Word Mover's Distance

- Word Mover's Distance is a method that allows to assess the "distance" between two documents in a meaningful way.

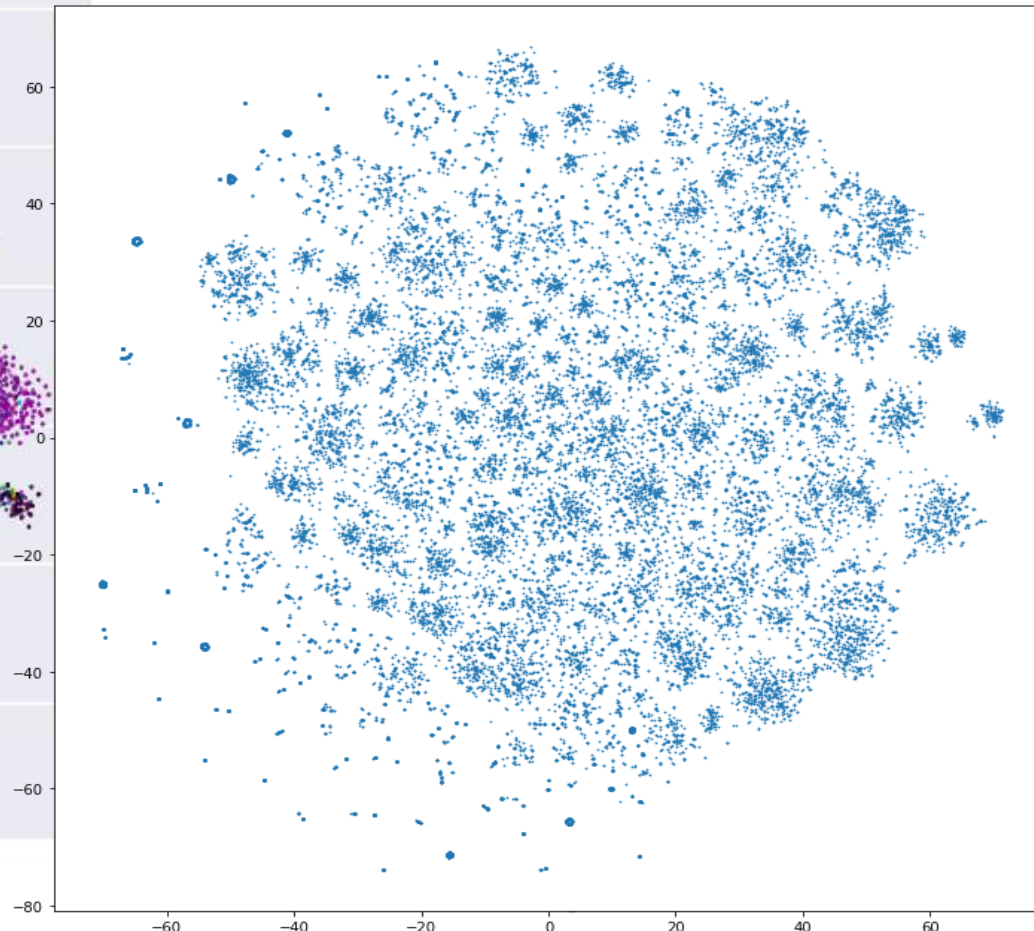


Preliminary results on clustering

- Phrase clustering



Concept clustering



Preliminary Results:

Lay perspectives on healthy aging

- Topic 1: Being engaged/active in the community
- Topic 2: Exercise habits/lifestyle
- Topic 3: Taking care of self/luck/genes
- Topic 4: Positive outlook/happiness
- Topic 5: Social relationships/positive attitude
- Topic 6: Valuing what is most important/living in the present
- Topic 7: Social interaction/mental stimulation
- Topic 8: Keeping busy - mind/body active
- Topic 9: Living well/keeping young
- Topic 10: Eating healthy (veg/fruit)/environmental factors)

Remaining Challenges, Next Steps

- Demonstrated that machine learning techniques will work with the data.
- Not yet convinced that we have arrived at a technique that adequately classifies lay perspectives of healthy aging.
- Exploratory - little to no existing literature on the most appropriate method.
- Lots of potential, but lots more work to be done.
- Stay tuned!

CLSA Research Team

Operations Committee and Scientific Leads



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Canadian Longitudinal Study on Aging
Étude longitudinale canadienne sur le vieillissement

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