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Computational Approaches in Eating Behavior https://workshop.inrae.fr/florence2020/Program

12:30 - Exploring sustainable European gastronomy and recipes using Natural Language Processing

18th January 2021

Dr Christian Reynolds

Centre for Food Policy, City, University of London

@sartorialfoodie

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Educating, researching & influencing for integrated and inclusive food policy

Who am I? Christian Reynolds

Senior Lecturer at the Centre for Food Policy

wrap
STFC Food Network+
N8 AgriFood
University of South Australia
UNIVERSITY OF ABERDEEN
The University Of Sheffield. Institute for Sustainable Food.
UK Data Service

Focus: healthy sustainable diets and food consumption (including waste)

Contents lists available at ScienceDirect

Food Policy

journal homepage: www.elsevier.com/locate/foodpol

Review

Review: Consumption-stage food waste reduction interventions – What works and how to design better interventions

Christian Reynolds[a,b,*], Liam Goucher[c], Tom Quested[b], Sarah Bromley[b], Sam Gillick[b], Victoria K. Wells[d], David Evans[e], Lenny Koh[c], Annika Carlsson Kanyama[f], Cecilia Katzeff[g], Åsa Svenfelt[f], Peter Jackson[a]

Public Health Nutrition: 22(8), 1503–1517 doi:10.1017/S1368980018003774

Healthy and sustainable diets that meet greenhouse gas emission reduction targets and are affordable for different income groups in the UK

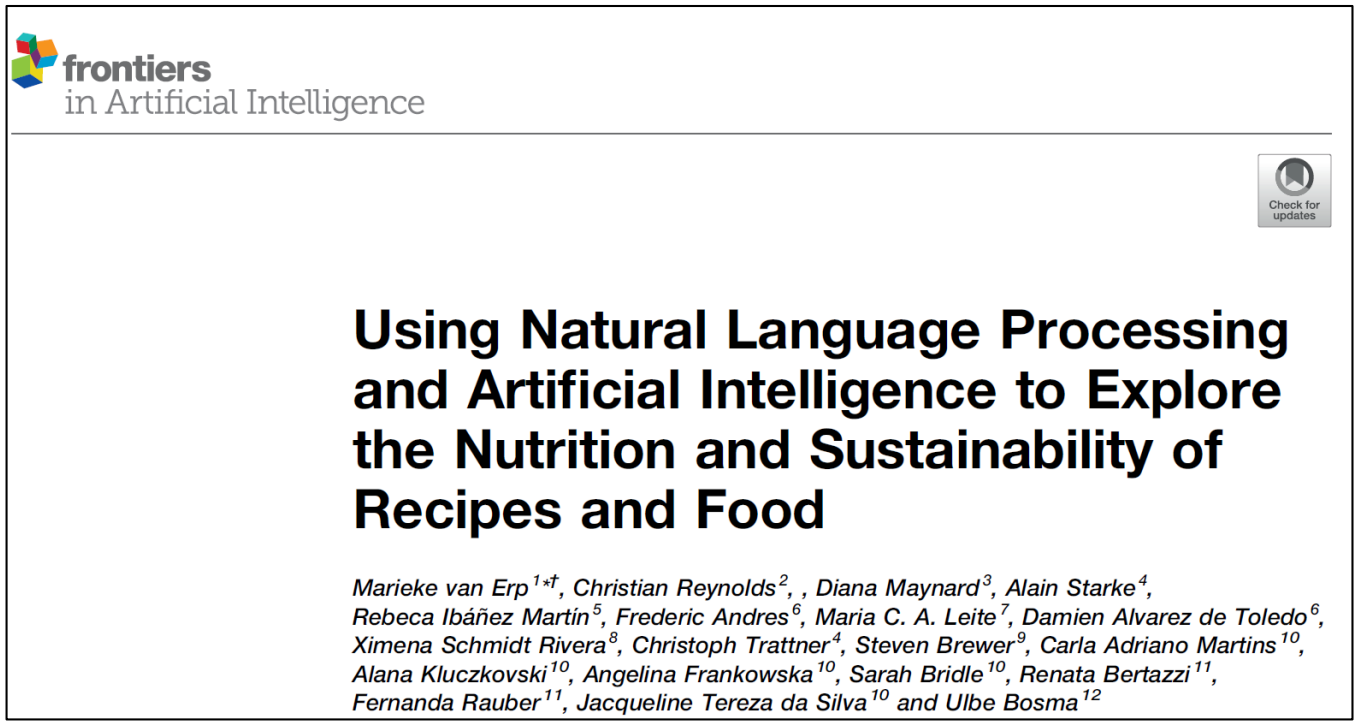
Christian J Reynolds[1], Graham W Horgan[2], Stephen Whybrow[1] and Jennie I Macdiarmid[1,*]
[1]The Rowett Institute University of Aberdeen, Aberdeen AB25 2ZD, UK: [2]Biomathematics & Statistics Scotland, Aberdeen, UK

Previously: Food waste politics/history, social sciences approaches

Just publish: Sustainability and cooking (16% of UK food GHGE!) 60%+ of some foods!

Context

- Project: Communicating the environmental impact of plant based recipes – funded by the Alpro foundation (2021).
- Article:



frontiers in Artificial Intelligence

Check for updates

Using Natural Language Processing and Artificial Intelligence to Explore the Nutrition and Sustainability of Recipes and Food

Marieke van Erp[1†], Christian Reynolds[2], , Diana Maynard[3], Alain Starke[4], Rebeca Ibáñez Martín[5], Frederic Andres[6], Maria C. A. Leite[7], Damien Alvarez de Toledo[6], Ximena Schmidt Rivera[8], Christoph Trattner[4], Steven Brewer[9], Carla Adriano Martins[10], Alana Kluczkovski[10], Angelina Frankowska[10], Sarah Bridle[10], Renata Bertazzi[11], Fernanda Rauber[11], Jacqueline Tereza da Silva[10] and Ulbe Bosma[12]*

Front. Artif. Intell. | doi: 10.3389/frai.2020.621577 Research Topic AI for Understanding Food and Nutrition

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Problem 1 – We need to shift towards sustainable dietary patters

- Current sustainable dietary guidance is given as ingredients
- No translation of sustainable diets into sustainable gastronomy

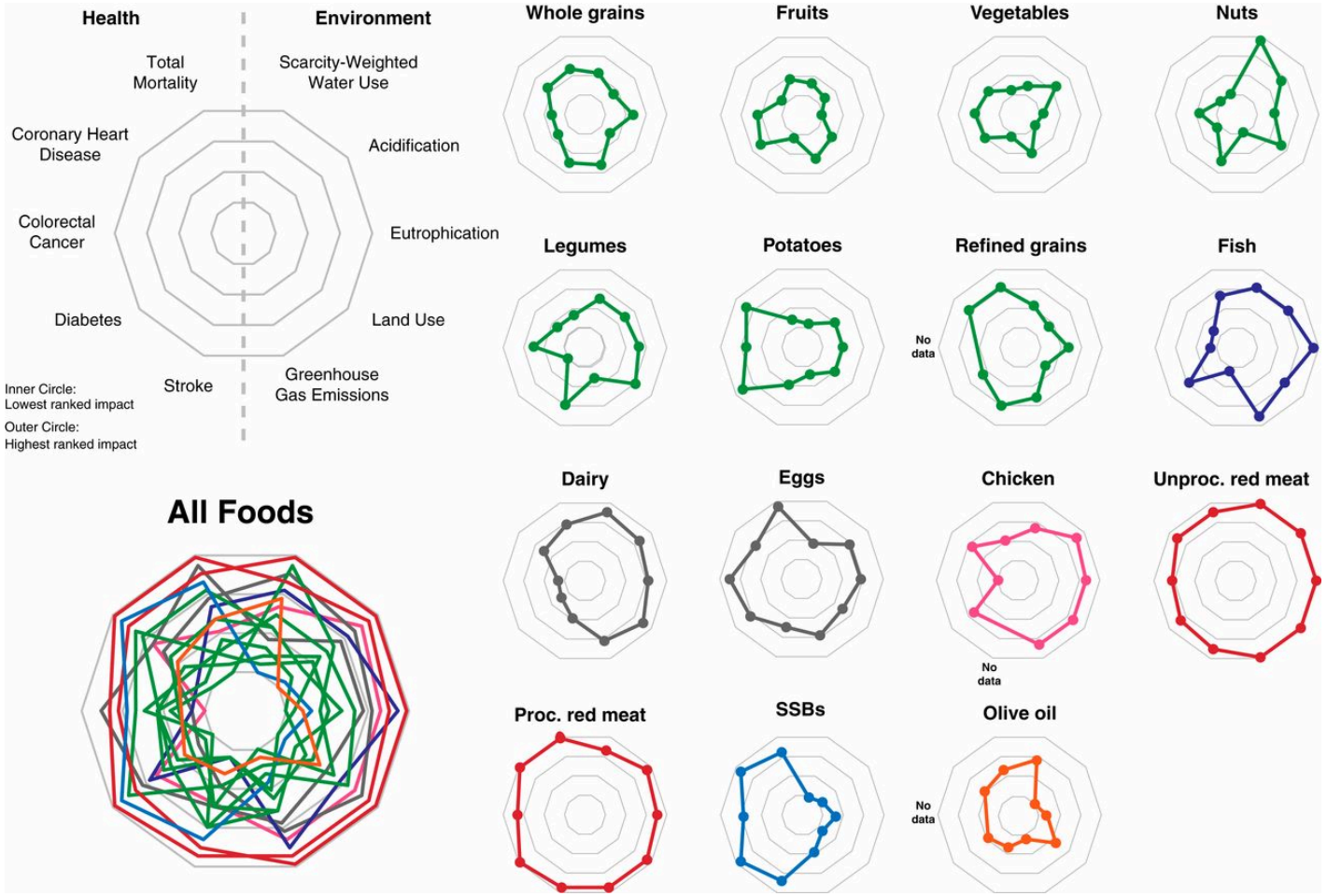
The Planetary Health Plate

#foodcanfixit #EATLancet

EAT

Problem 2 – People do not think in ingredients, they think in recipes

Each ingredient has different health and environmental impacts.



https://doi.org/10.1073/pnas.1906908116

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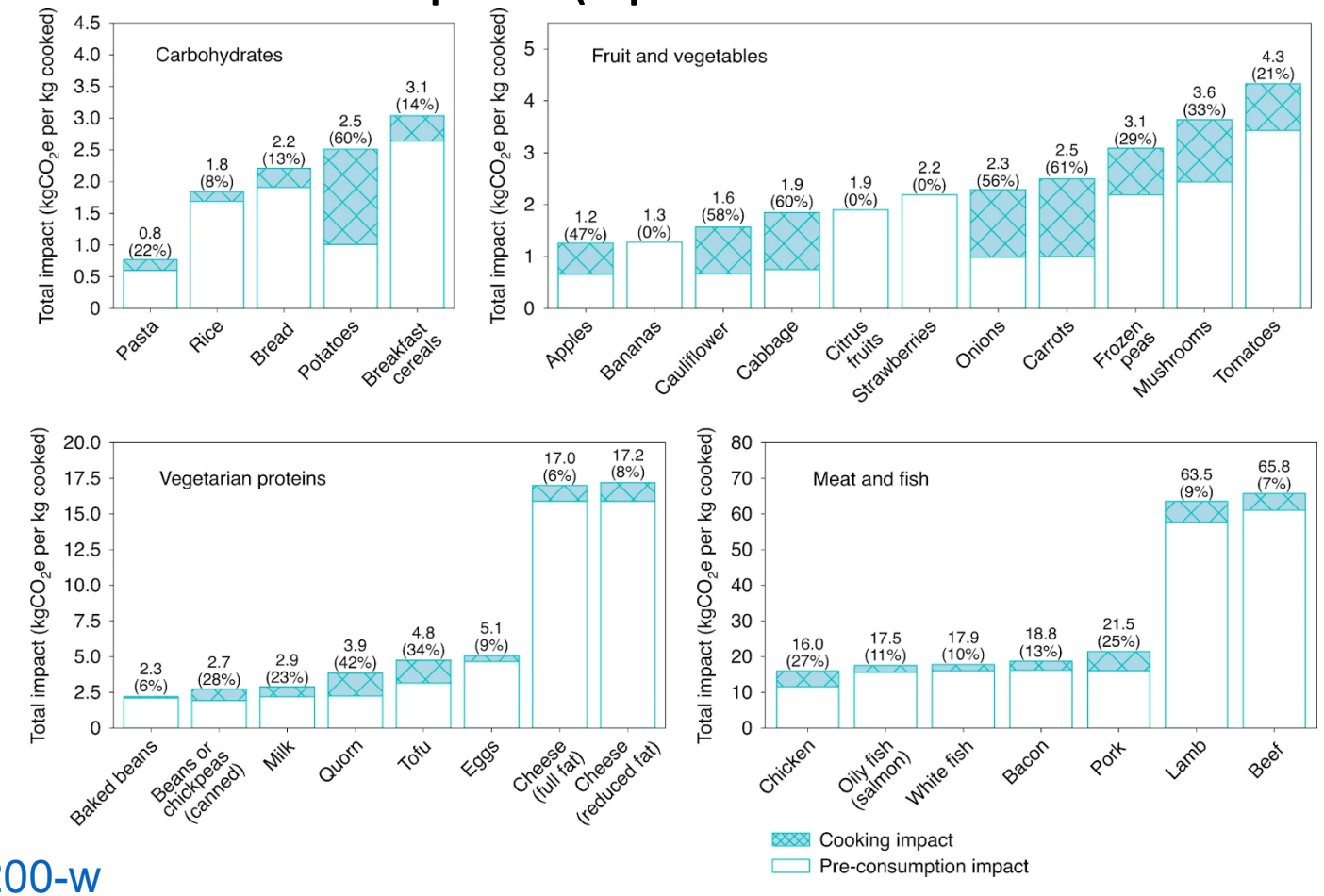
Solution – recipes to be analysed for sustainability. Use Natural Language Processing

Project proposal

- Analysis of ‘sustainable’, ‘plant based’, ‘vegan’ or ‘vegetarian’ recipes from different European gastronomic traditions or cultures (UK, Dutch, and German), assessing the ingredients used, and the methods of cooking.
- What are the differences between different cultures sustainable recipes?
- Add in cooking impacts.

Cooking, recipes and impact

- Cooking methods described in recipes have not been investigated – but recent research shows that cooking method can make a considerable environmental impact (up to 60% of some ingredients).



10.1038/s43016-020-00200-w

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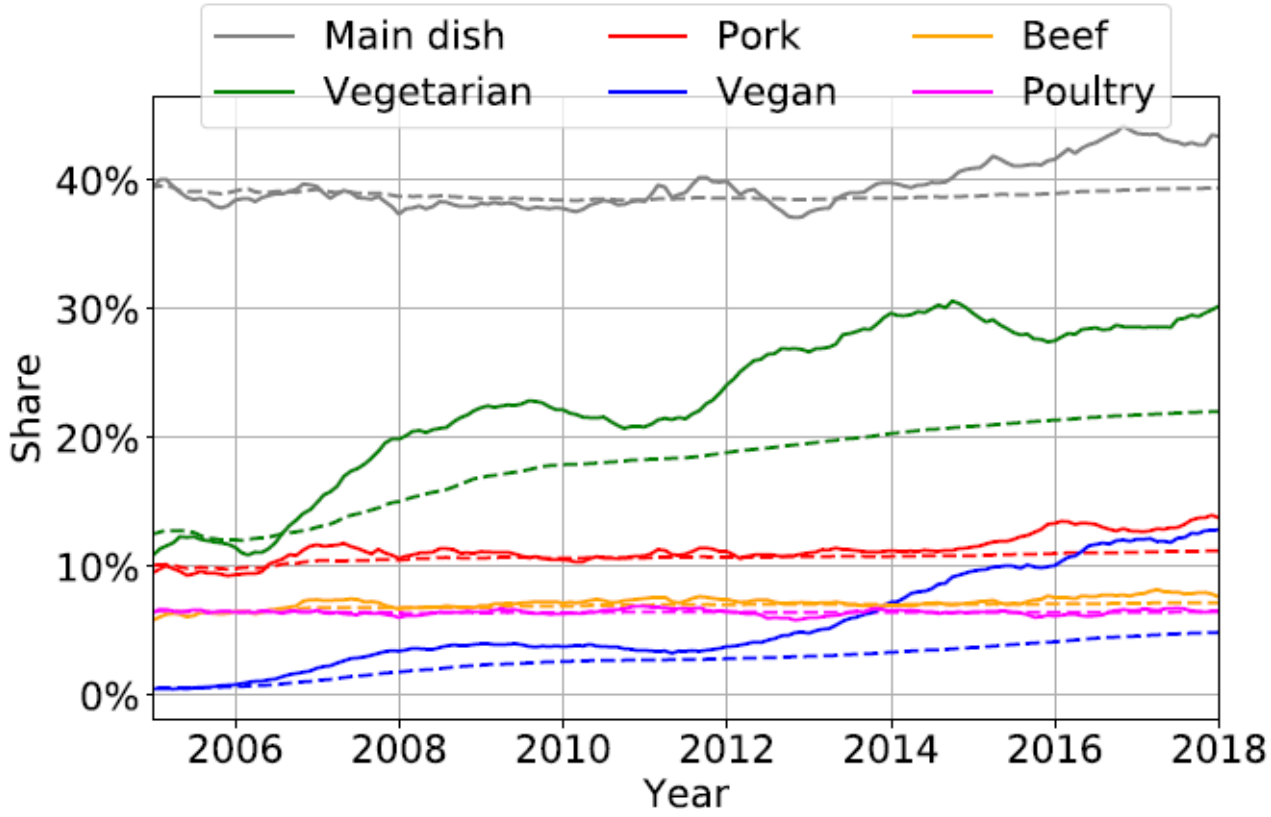
Recipe analysis and Natural Language Processing

Multiple uses already

- Nutritional and health studies (Reinivuo et al., 2009; Trattner et al., 2017)
- Computational linguistics (Jurafsky, 2015),
- Computational gastronomy (Jain et al.,2015)
- Online shopping recommendations (Aiello et al., 2019)
- Semantic web (Haussmann et al., 2019)

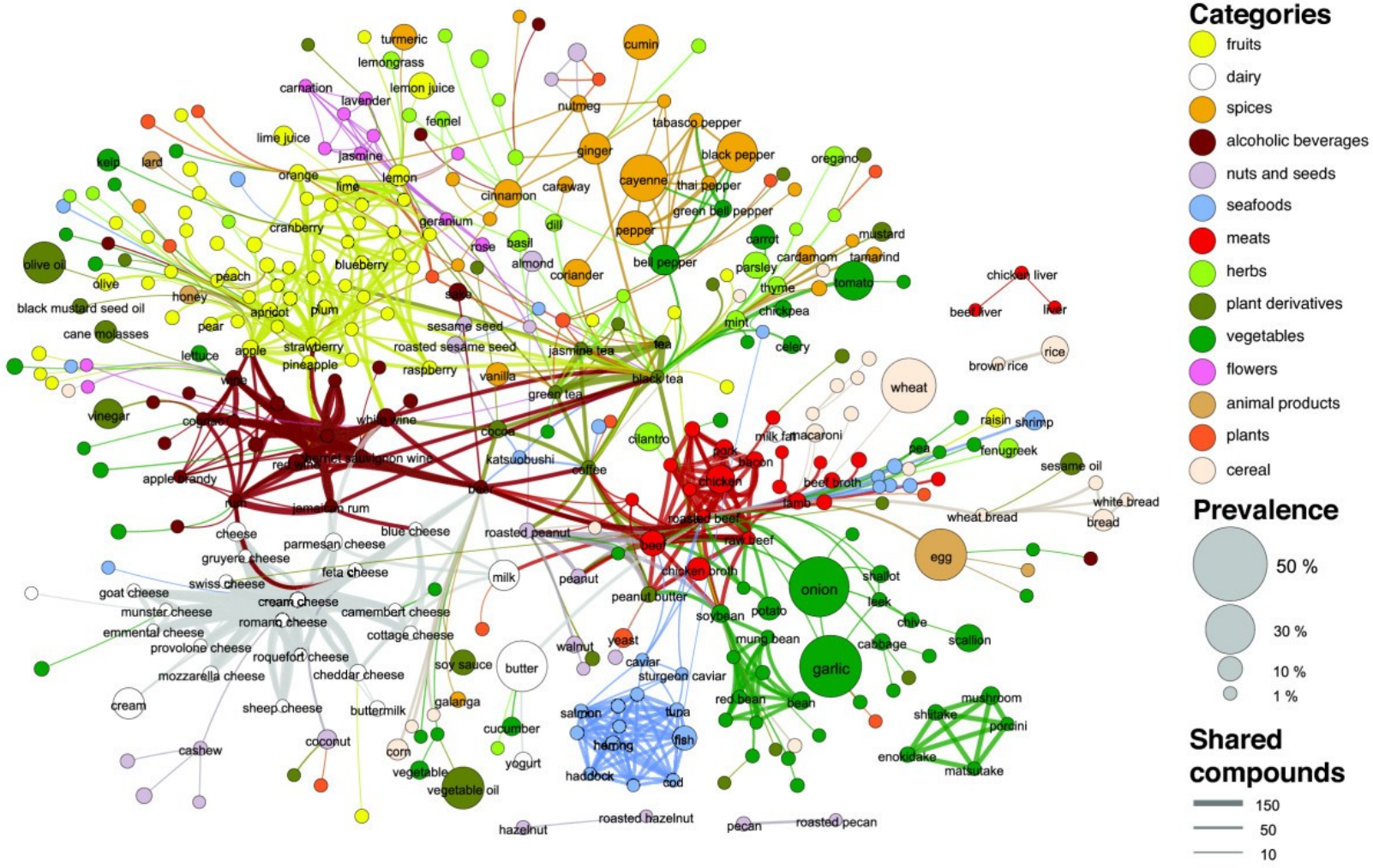
This is still a young field of investigation!

Analysis of submitted recipes (Asano and Biermann, 2019)



Share of submitted recipes containing different tags from 2005-2018 as a time-series. (Asano and Biermann, 2019), https://doi.org/10.1038/s41893-019-0316-0

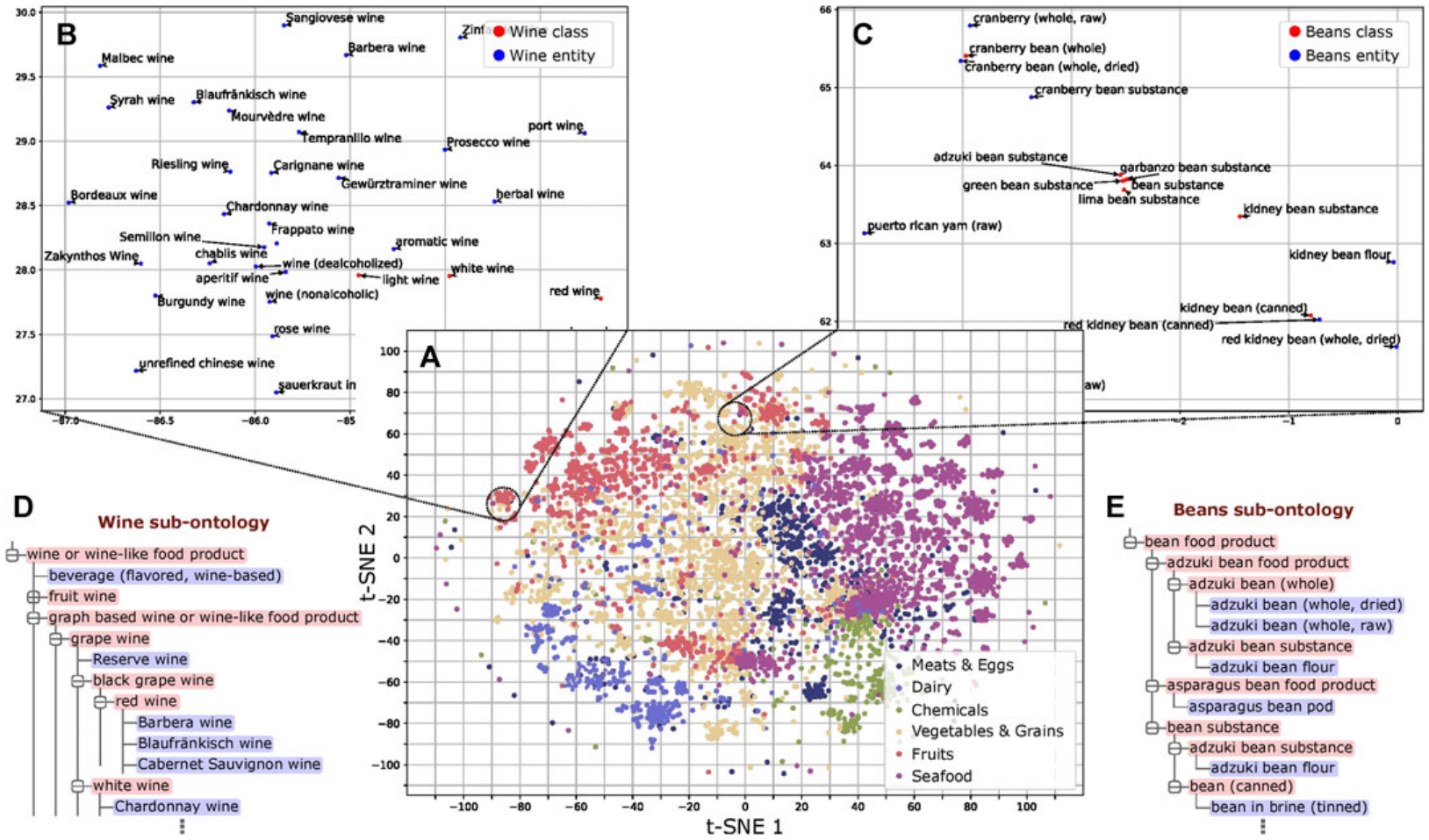
Flavour networks Ahnert 2013 10.1186/2044-7248-2-4



How would these differ by diet type and cuisine?

‘sustainable’, ‘plant based’, ‘vegan’ or ‘vegetarian’ recipes from different European gastronomic traditions or cultures (UK, Dutch, and German),

Existing food ontology groupings



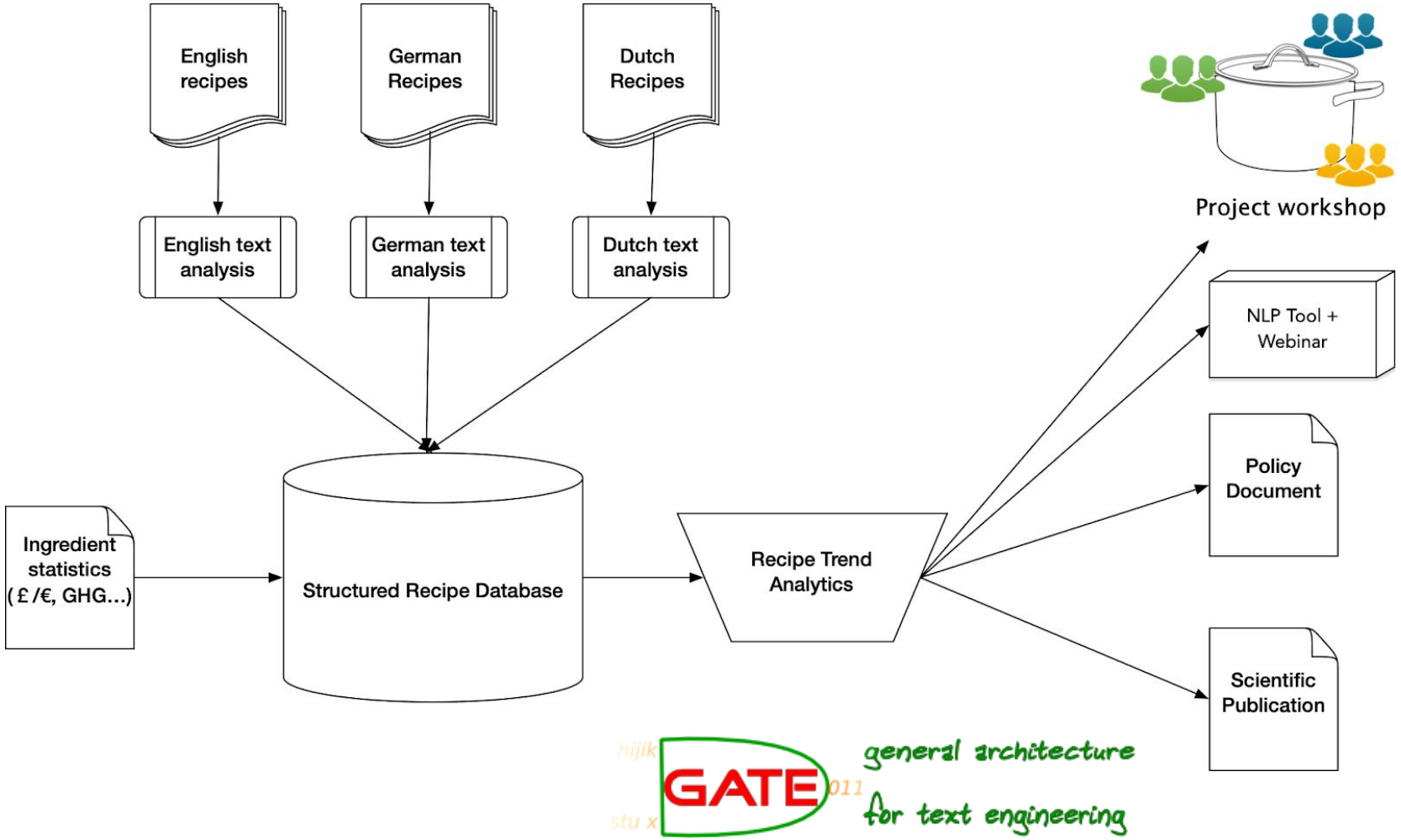
Using Word Embeddings to Learn a Better Food Ontology Front. Artif. Intell., 26 November 2020 | https://doi.org/10.3389/frai.2020.584784

How would these differ by diet type and cuisine?

'sustainable', 'plant based', 'vegan' or 'vegetarian' recipes from different European gastronomic traditions or cultures (UK, Dutch, and German),

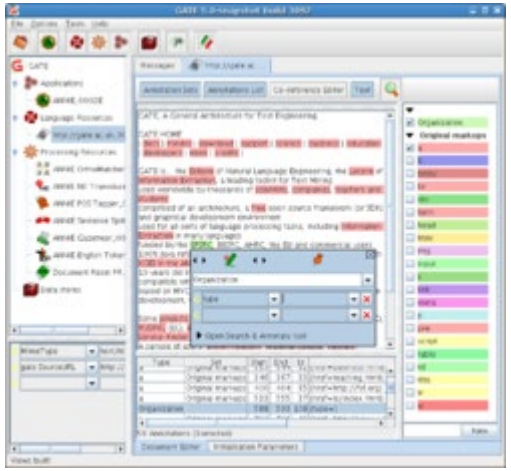
Project Plan

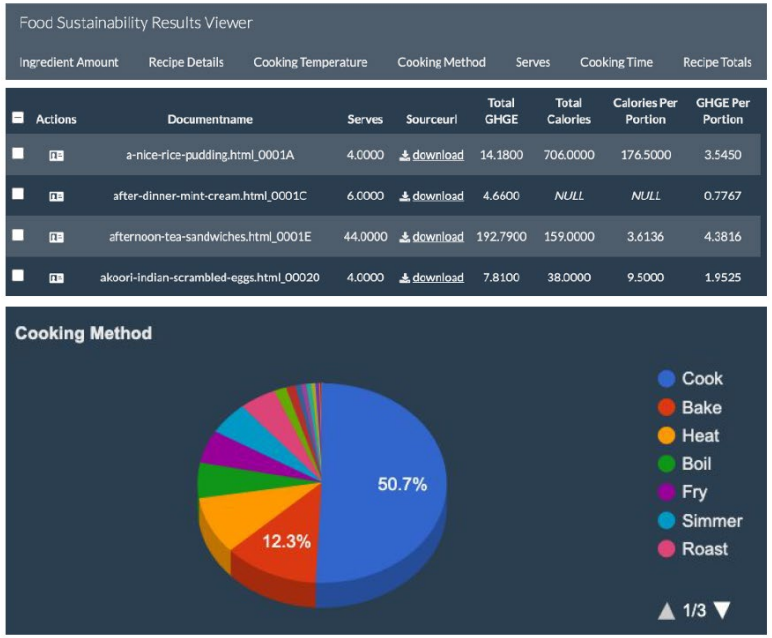
Allrecipes.com(n=4,900), Kochbar.de (n=~29,000), and Albert Heijn (n=~18,000)



GATE and NLP

- **General Architecture for Text Engineering** or **GATE** is a Java suite of tools



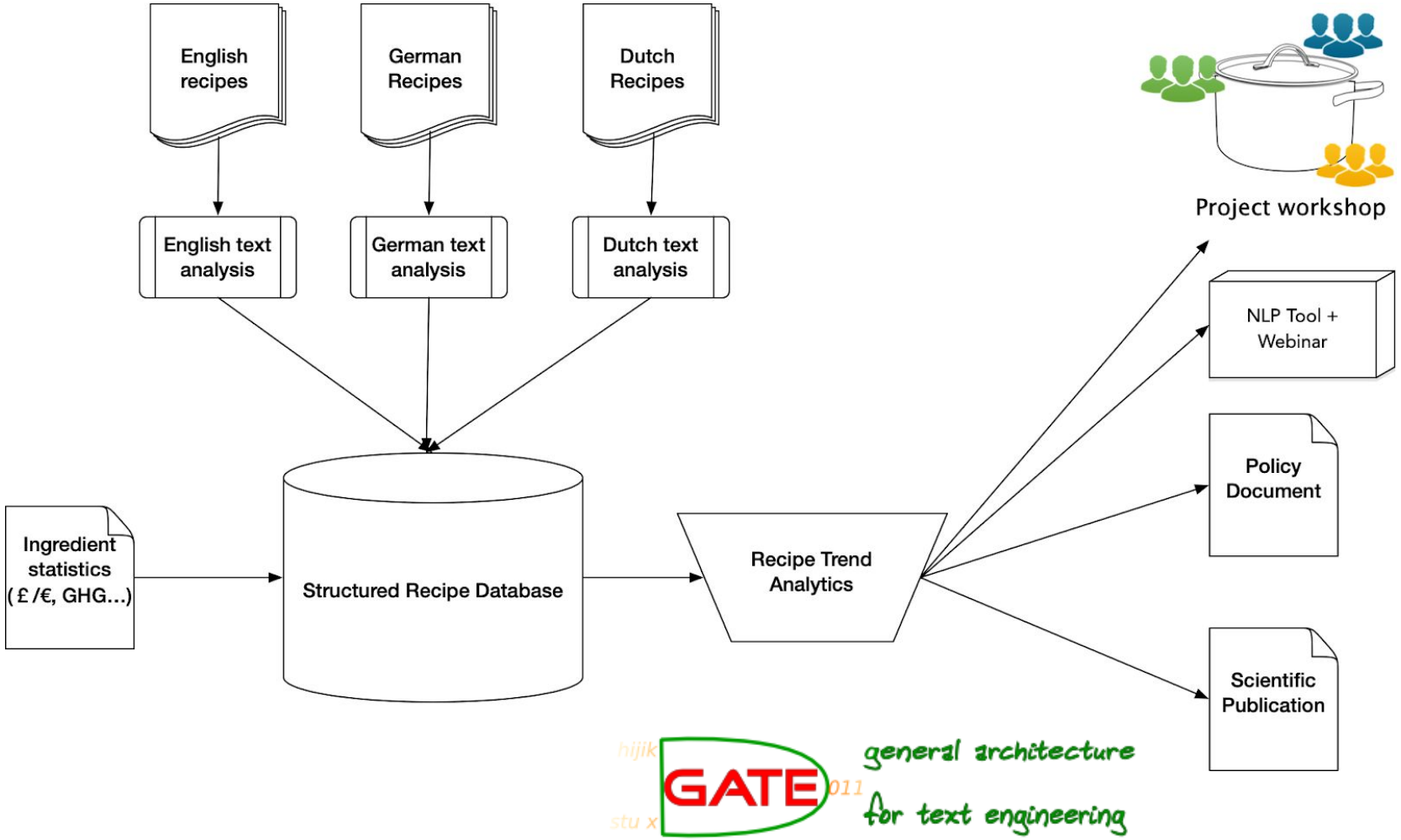


Recipe example – a potato soup

		Nutrient database		LCA database	
Mass (g)	Ingredient	Calories	Adjusted Calories	co2e	Adjusted GHGE
0.616125	1/8 teaspoon salt			0.42	0
0.616125	1/8 teaspoon chopped fresh parsley			0.42	0
110.1	1 onion	35	39	0.41	0.05
2	1 dash garlic powder	98	2	0.489	0
236.6	1 cup milk	46	109	2.572816	0.61
236.6	1 cup chopped carrots	34	80	0.4	0.09
4	2 potatoes	82	3	14.71	0.12
473.2	2 cups buttermilk	37	175	1.4	6.62
709.8001	3 cups water			0	0
				Total GHGE	**7.49**

Project Plan

Allrecipes.com(n=4,900), Kochbar.de (n=~29,000), and Albert Heijn (n=~18,000)



Can we integrate recipe optimisers and recommender systems?

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Comments?
Questions?

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Linking and analysis of Life Cycle Analysis data using NLP

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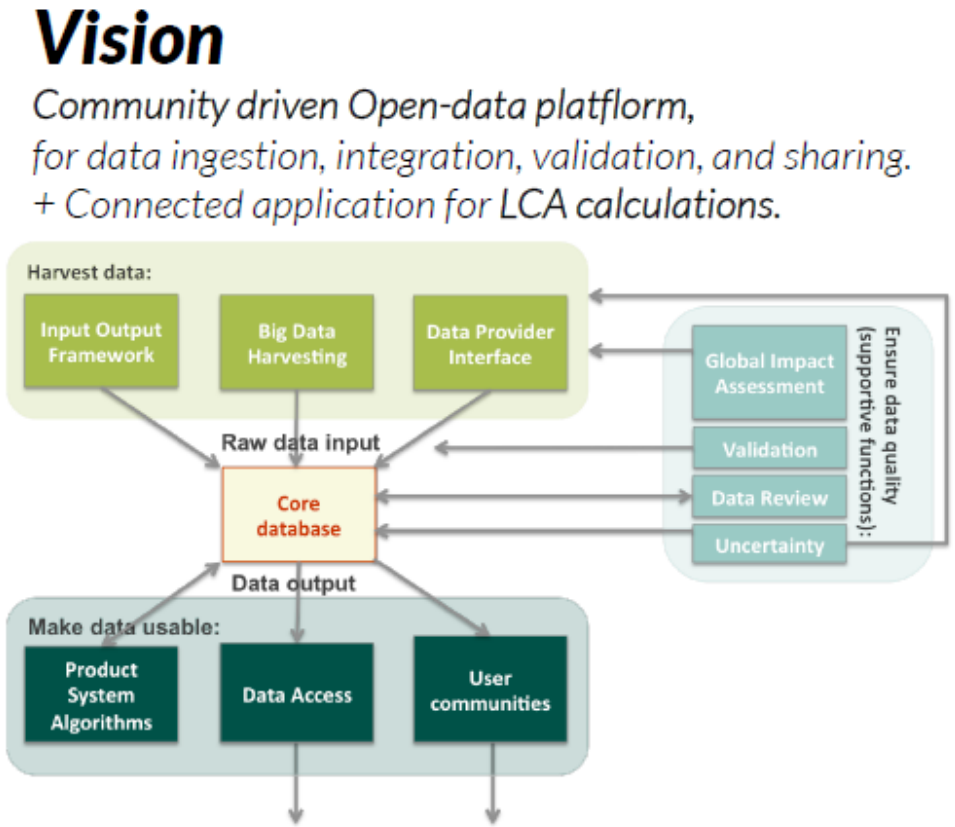
- Ghose et al., (2019) and Ghose (2020) proposed NLP methods for semantic investigation of LCA databases.