

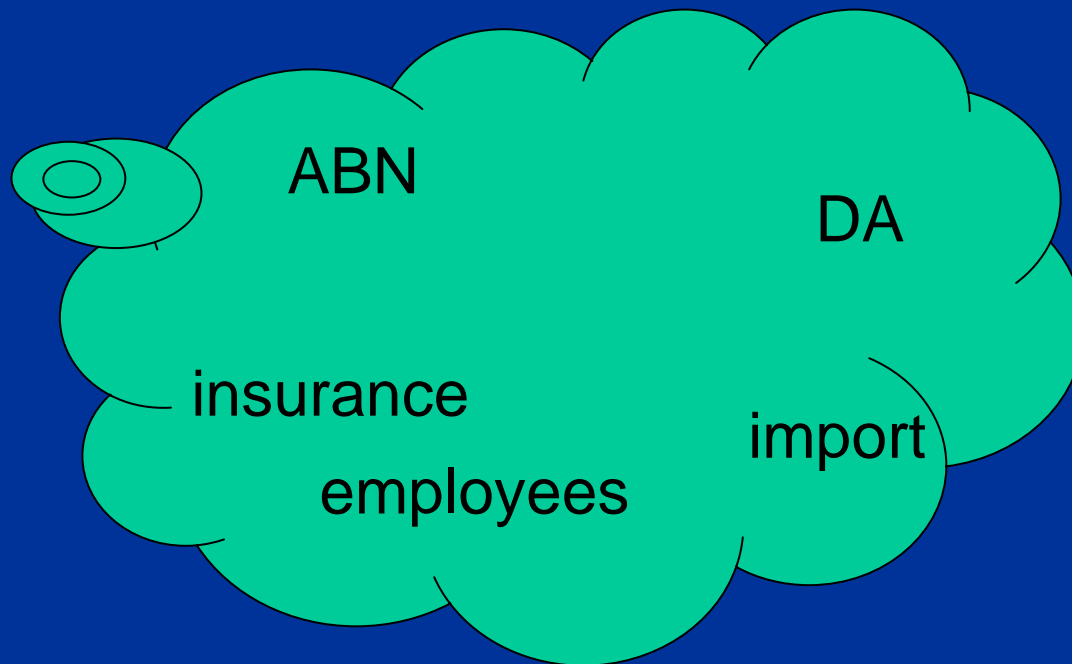


information
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How to know what you need to know in order to set up a coffee shop

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Imagine you want to open a coffee shop in Brisbane....



Coffee shop - some of what is actually needed....

ABN registration

Advertising signage - Brisbane

Training contract (apprenticeship)

Workers compensation

Workplace registration

FBT requirements

Music Performance/ Broadcast Licence (APRA)

Music Public Performance Licence (PPCA)

Music Video Public Exhibition Licence

Trade Mark registration

Vehicle Registration (commercial vehicles)

Development permit (IDAS) - Brisbane

Food business licence to conduct

Food operator Brisbane

Food sales (Premises, place or vehicle)

Food sales (place or vehicle)- Brisbane

Footpath usage/obstruction - Brisbane

Outdoor dining - Brisbane

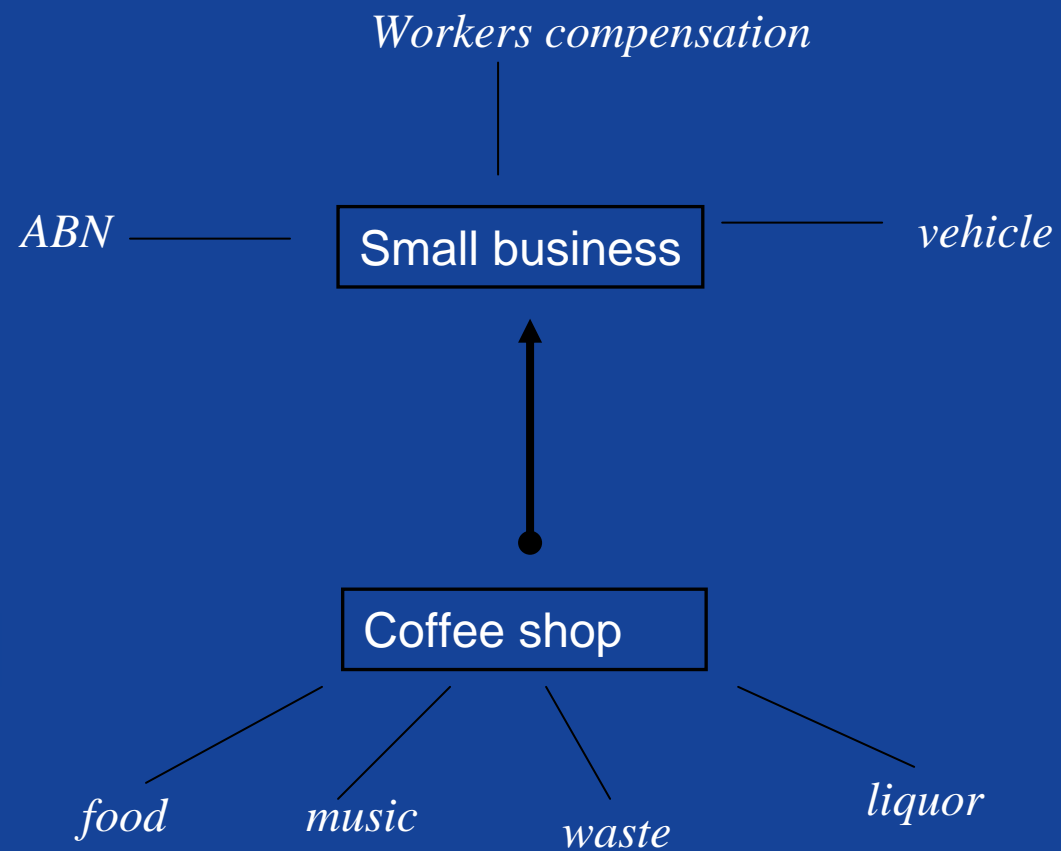
Trade waste - Brisbane

Initial observations

- You, the agent, have a complex agenda, comprising sub-agendas, which need to be addressed in a certain order
- “Epistemically challenged”- you don’t know what you need to know, but you also need to “get it right”

A map of the problem space would help... can technology assist in providing it?

Abduction: the power of suggestion





How to get technology to be usefully suggestive?

Abduction has its roots in cognition...we need cognitively motivated knowledge representation...

Semantics space models are computational models of knowledge representation which correlate with human information processing

Example input: Normative

<DOC>
<TEXT>
Queensland

Regulatory Impact Statement for SL 2003 No. 235 Workplace Health and
Safety Act
1995

WORKPLACE HEALTH AND SAFETY AMENDMENT REGULATION (No. 4)
2003

*Under the Statutory Instruments Act 1992 a regulatory impact statement (RIS) need not be prepared for proposed subordinate legislation if-- (a) it only provides for, or to the extent it only provides for, a matter arising under legislation that is substantially uniform or complementary with legislation of the Commonwealth or another State (section 41(1)(g)); or (b) it concerns a matter involving ...

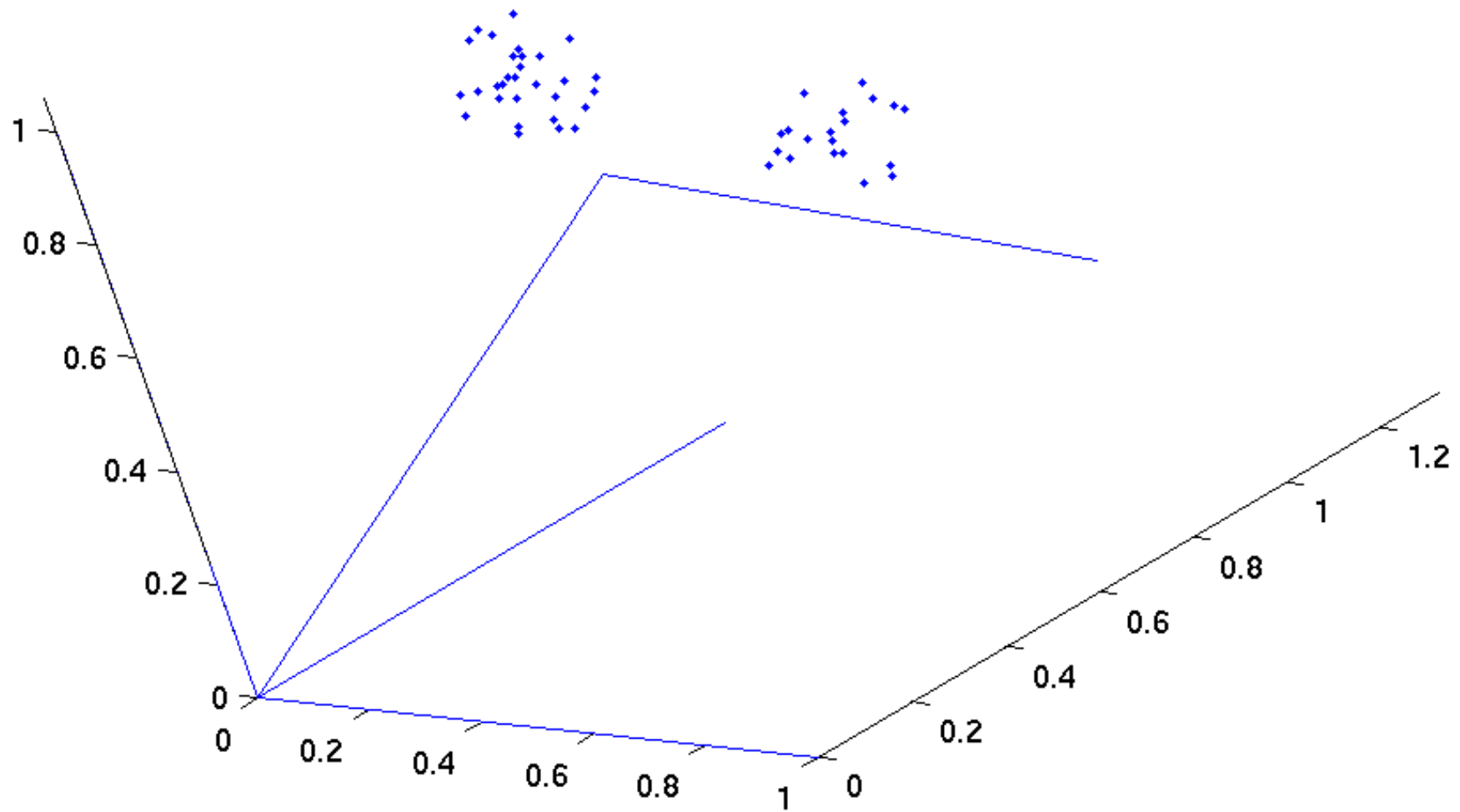


Example input: Prescriptive

Employees

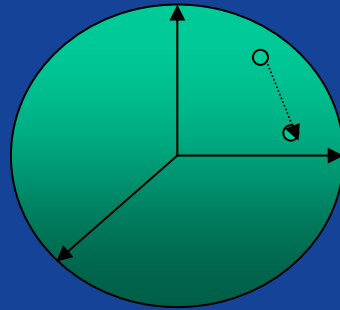
Wageline: The Department of Industrial Relations provides information on State and Federal awards and agreements, public holidays and trading hours, and investigates complaints and disputes instituting legal proceedings if necessary. Anti-Discrimination Commission (QLD): The AntiDiscrimination Act of Queensland aims to promote equality of opportunity for everyone by protecting people from unfair discrimination in various areas of public life, from racial and religious vilification and sexual harassment. The Commission has two broad functions:...

Semantic Space



“Abstract Concept” = eigenvector (intrinsic semantic space)

Abductive inferences: Computing “suggestions” from semantic space



$$\vec{i} \bullet \vec{j}$$

$$\cos(\vec{i}, \vec{j})$$

$$\text{minkowski}(\vec{i}, \vec{j}) \quad r = 1, 2$$

$$\text{iflow}(\vec{i}, \vec{j})$$

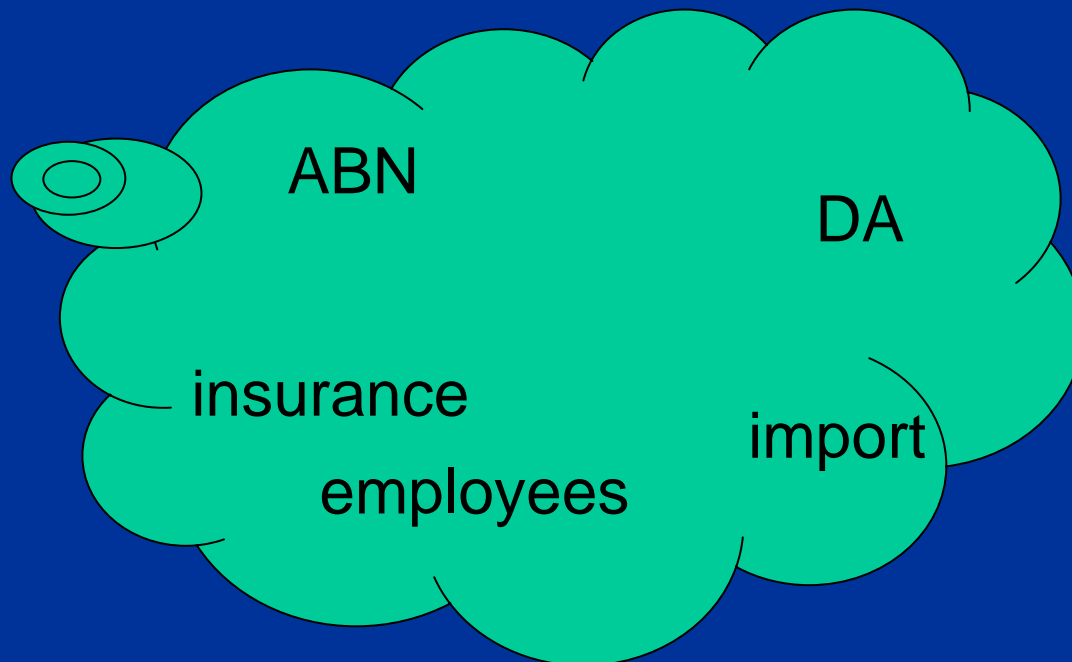
$$i \text{ NOT } j \equiv \vec{i} - \frac{\vec{i} \cdot \vec{j}}{\|\vec{j}\|^2} \vec{j}$$

$$S_k = \sum_{l=1}^k u_l \sigma_l v_l^T$$

$$S_k[i, j] = \sum_{l=1}^k U[i, l] D[l, l] V[j, l]$$

Spectral decomposition

Imagine you want to open a coffee shop in Brisbane....

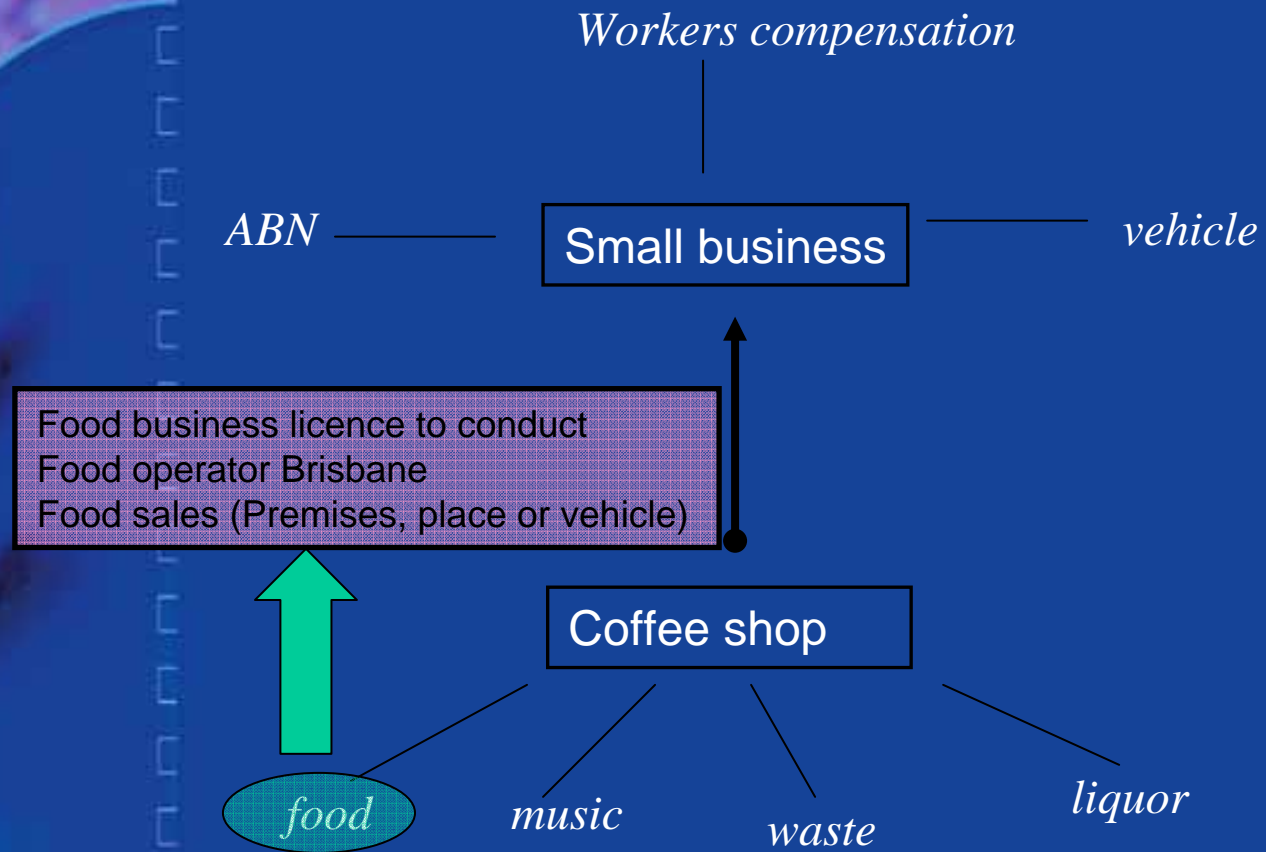


Abductive inferences in relation to “Employee”: suggestions computed by semantic association

entitlements:	0.73
terminations:	0.70
antidiscrimination:	0.62
hiring:	0.62
awards:	0.61
wageline:	0.58
det:	0.55
quarterly:	0.55
dismissals:	0.55
legislation:	0.54
recognise:	0.53
employee:	0.53
safety:	0.49
agreements:	0.48
withholding:	0.47
pay:	0.45
workplace:	0.44

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Back to web service discovery



Closing remarks

- Service discovery in ecosystems goes beyond the information retrieval problem (think Google), and places more demands on what the technology has to do from the user side
- Models emerging from cognitive science open the door for technology to compute with meanings and replicate human pragmatic inference (such as abduction) This is exciting....



Why Abduction?

Abduction is practically oriented form of inference - agents engaged in web service discovery are practically motivated

“It [abduction] is the only logical operation which introduces anynew idea; for induction does nothing but determine a value and deduction merely evolves the necessary consequences of a pure hypothesis”

(C.S. Peirce “The nature of meaning”)

Abduction is a creative form of inference. The goal of operational abduction is to compute useful and at times “creative” suggestions to help close the agent’s agenda

Why cognitive semantics?

Cognitive economy- abductive inferences are formed below the symbolic level of cognition

symbolic

*Cognition=computation=
symbol manipulation=Turing
machine*

conceptual

*Geometric
representation* (Semantic space
models)

sub-conceptual

*Connectionist
representation*

Abductive inferences in relation to “Business insurance”

business:	0.73
insurance:	0.73
singular:	0.71
fleets:	0.69
uninsured:	0.69
talk:	0.68
succession:	0.68
vehicles:	0.68
insured:	0.66
clarify:	0.65
bear:	0.65
householders:	0.64
taking:	0.64
choices:	0.61
restoring:	0.60
policy:	0.60
valuation:	0.59
food:	0.58

Geometric representation of “Raynaud”

nifedipine	0.44
scleroderma	0.36
ketanserin	0.22
synthetase	0.22
sclerosis	0.22
thromboxane	0.22
prostaglandin	0.22
dazoxobin	0.21
....	
fish	0.0

This example demonstrates how a word is represented as a weighted vector where dimensions comprise other words.

The weights represent the strengths of association between “Raynaud” and other words seen in the same context(s)

111,603 MEDLINEcore journal titles
titles 1980-85

Remarks

Associations trigger recognition of potential issues in relation to his/her agenda “hey I might need to do something about this”... In this way the agent can start forming a “map” of the problem space.

Relevant associations can be used as the basis of queries for associated web services.

The topology of the “map” can possibly serve as the skeleton of how the services should be orchestrated.

Architecture

Sem space
slide



Abduction: discovery + composition

