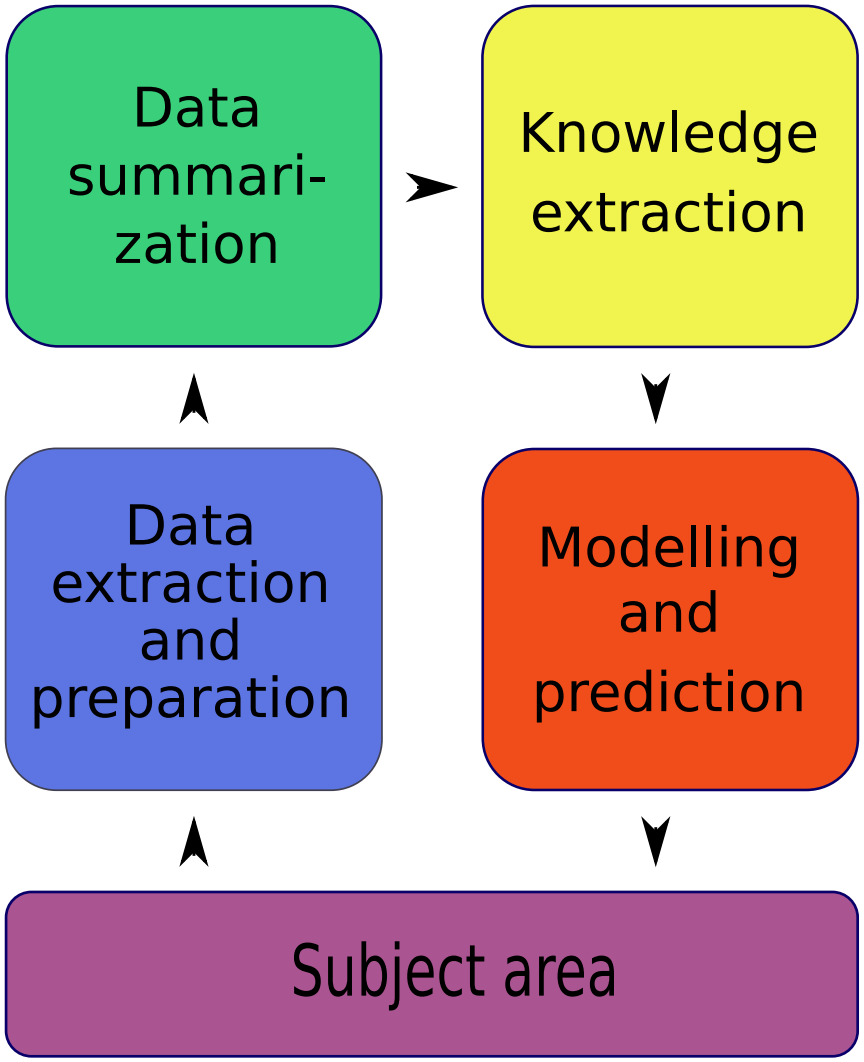
The data analysis cycle



Data Analysis: Special Topics

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Introduction The topics covered in this last session are each somewhat different from data analysis as we have studied it so far in this module:

- Text mining - unstructured data, with data preparation an important part of the process
- Social network analysis - data in the form of network topology information, including nodes and connections
- Web mining - a combination of three aspects
  - network topology (www structure)
  - text and media (www content)
  - usage and user behaviour (www log files)

Text mining

- Many and varied sources of data:
  - by type: business reports, business communication, online news, personal messaging, standards documents, specialist document archives, scientific literature etc.
  - by domain: law, science, medicine, business, finance etc.
  - by format: PDF files, MS Word files, XML files, text messages, tweets etc.
- Applications:
  - **marketing:**
    * 'social personas' clustering technique from customer communication, social media sources, blogs etc.
    * 'listening platform' for real-time gathering of customer sentiment
    * analysis of call centre conversations to understand performance and potential problems
  - **business operations:**
    * analysis of sentiment among employees

    - general understanding of consumer behaviour and its applications
  - **legal:**
    - e-discovery platforms that help to minimize risk when sharing documents
    - analysis of case histories and risk assessment
    - archive searches for help with case handling based on precedences etc.
  - **government and politics:**
    - assessment of general population or constituent sentiment
    - geopolitical security
- Text is unstructured data but we have to start somewhere when analysing it
  - Bag of words - in the first instance, a body of text is viewed as a grouping of words, which may be repeated
  - Every word is a possible attribute, but what value can we give it for a document?
    - 1 vs 0 - depending on whether the word is present in the document or not
    - count - representing the number of times the word appears in the document - results in a term-document-table:

	why	where	how	the
doc1	3	2	0	7
doc2	1	0	2	10
doc3	0	1	1	10

* normalization (lowercase, only roots, stopwords removed, division by number of words if multiple documents)

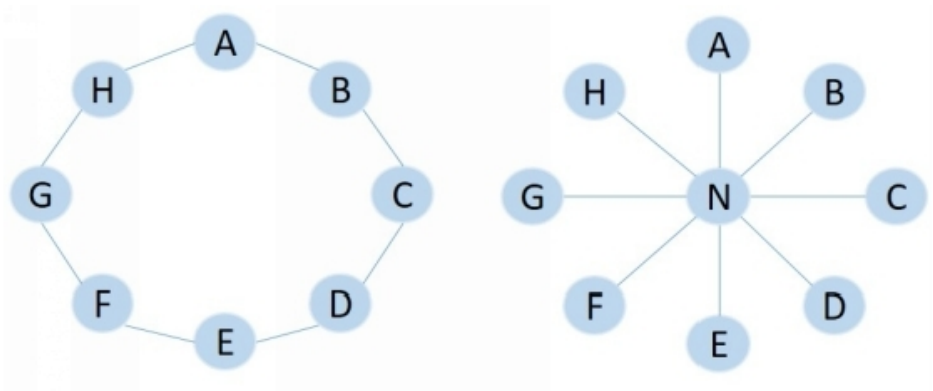
Table 10-3. Terms after normalization and stemming, ordered by frequency

Term	Count	Term	Count	Term	Count	Term	Count
skype	3	microsoft	3	agreement	2	global	1
approv	1	announc	1	acquir	1	lead	1
definit	1	lake	1	communic	1	internet	1
board	1	led	1	director	1	corp	1
compani	1	investor	1	silver	1	billion	1

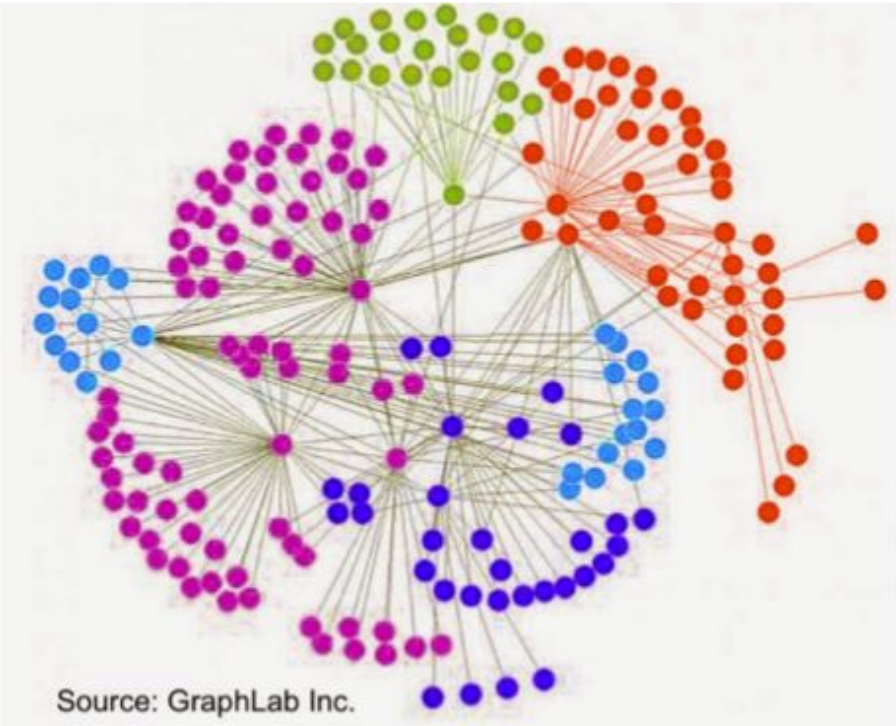
- What for?
  - incidence of words (e.g. word-cloud)
  - predicting chances of a document being liked based on comparison with previous documents (predictive modelling)
  - clustering for determining document type, sentiment etc.
  - association rule analysis e.g. word 'happy' occurs with what other words?

Social network analysis

- Applications:
  - study of communities
  - marketing
  - public health (disease spread)
  - human behaviour and self awareness
- Differs from data analysis in general because it is based around analysing network topologies and their properties:
  - ring / hub and spokes



- sparse / dense
- subnetworks



- node importance (+)

- Google page rank (85% importance and 15% Teleporting)

Web mining

- Content mining (HTML etc)
- Structure mining (hyperlinks resulting in network topology)
- Usage (site visits, clicks)