

# VALCRI

VISUAL ANALYTICS FOR SENSE-MAKING  
IN CRIMINAL INTELLIGENCE ANALYSIS

## From analytics to analytic reasoning: A description and demonstration of VALCRI

A new tool for assisting crime analysts

*Presentation to*

*The Operational Research Society • Criminal Justice Special  
Interest Group Meeting • Hamilton House • London •  
27 November 2017*

B.L. William Wong and Neesha Kodagoda



Ifan Shepherd, Chris Rooney, Neesha Kodagoda, Patrick Seidler, Aleksander Mazurov, Alexander Kachkaev, Christophe Vandenberghe, Jason Dykes, Jim Morrison, Jo Wood, Marcel Alcoverro, Martin Coulthurst, Roger Beecham, Ronny Paduschek, Stefan Lozovanu, Patrick Aichroth, Rani Pinchuk, Sebastian Mann, Alexander Nussbaumer, Alexandra Bielska, Andrea Halfpap, Andreas Schliske, Audry Delvaux, Barbara Korffer, Bruno Schneider, Cagatay Turkay, Carlisle George, Catherine De Bolle, Celeste Groenewald, Chris Pallaris, Christian Weigel, Craig Dunn, Cristina Viehmann, Daniel Keim, David De Weerd, Dietrich Albert, Dominik Sacha, Edith Appelmans, Esther Martin, Eva Blomqvist, Eva Schlehahn, Eva-Catherine Hillemann, Fanny Coudert, Florian Stoffel, Frank Verbruggen, Geoff Ellis, German Leon, Guy De Cock, Mark de Smit, Harald Zwingelberg, Henrik Eriksson, Ingrid Van Linden, Jan De Wachter, Jason Dykes, Esther Martin, Jenny Martin, Sam Todd, Chris Lowe, Jens Hasselbach, Johanna Haider, Junayed Islam, Kai Xu, Karel Gardas, Karl Hammar, Leishi Zhang, Luca Huszar, Marco Kuhlmann, Margit Pohl, Matylda Gerber, Michael Bedek, Michelle Smith, Nadeem Qazi, Nallini Selvaraj, Nathan Baker, Nick Evers, Pagona Tsormpatzoudi, Patrick Lambrix, Pedro Malaquias, Penny Duquenoy, Peter Passmore, Pragya Paudyal, Rani Pinchuk, Rick Adderley, Robby Van San, Robin Keskisarkka, Roger Beecham, Rudolf Schreiner, Sebastian Mann, Sebastian Mittelstädt, Simon Atfield, Sinne Engelen, Stanny De Vlieger, Suzanne Petrou, Thomas Marquenie, Els Kindt, Turki Al Jrees, Ulrich Lang, Uwe Kühhirt, Valentina Ivanova, Vicky Lodewijks, Vytenis Benetis, Wolfgang Jentner, Yanna Vogiazou, Zlatan Dragisic, ...

# VALCRI

VISUAL ANALYTICS FOR SENSE-MAKING  
IN CRIMINAL INTELLIGENCE ANALYSIS



FP7 Integrating Project: 18 organisations, 8 countries, 113 personnel, 44 months, €16.8mil (full cost)



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3 Professor B.L. William Wong, Middlesex University and partners.



# The Problem

- **Large volumes of data**
  - Multiple sources; missing, out of sequence, and deceptive; uncertain and ambiguous; mysteries vs. puzzles
- **Crimes are increasing and changing faster than we can keep up**
  - “...the planning of terrorist attacks have accelerated from weeks to handful of days” (Andrew Parker, Director MI5, 2017).
- **Fragmentary information**
  - “...we only ever have fragments of information, and we have to try to assemble a picture of what might happen, based on those fragments.” (Andrew Parker, Director MI5, 2017).
- **The failure of imagination**
  - The 9/11 Commission
  - This is the failure to figure out and explain how those fragments of information might be connected.

“MI5 boss Andrew Parker warns of 'intense' terror threat”, by Gordon Corera, Security Correspondent, BBC, 17 October 2017, <https://www.bbc.com/news/amp/uk-41655488>.

The 9/11 Commission. (2004). Final Report of the National Commission on Terrorist Attacks upon the United States (0160891809). Retrieved from <http://govinfo.library.unt.edu/911/report/index.htm>



## VALCRI: A next-generation system that facilitates human reasoning and sense making by ...

- **Encouraging the use of expert intuition and imagination**
  - to tentatively and playfully assemble the “dots” to create plausible scenarios that explain what might happen
- **That is quick and easy to**
  - analytically and rigorously test early hypotheses,
  - to rapidly discard those possibilities if proven wrong
  - re-formulate new ones to re-test
- **By tight coupling with analytics**

# Analytics and Analytic Reasoning

- **Visual Analytics**

- *the science of analytical reasoning* supported by automated [data] analysis techniques with interactive visualizations

James J. Thomas and Kristin A. Cook (Ed.) (2005). Illuminating the Path: The R&D Agenda for Visual Analytics  
National Visualization and Analytics Center. p.4

- **Analytic Reasoning**

- ... the thinking and reasoning associated with the process of intelligence analysis or tradecraft

Thomas, J. J., & Cook, K. (Eds.). (2004). Illuminating the path: A research and development agenda for Visual Analytics: IEEE CS Press.

- ... the conscious and deliberate process of manipulating problem elements to discover a solution

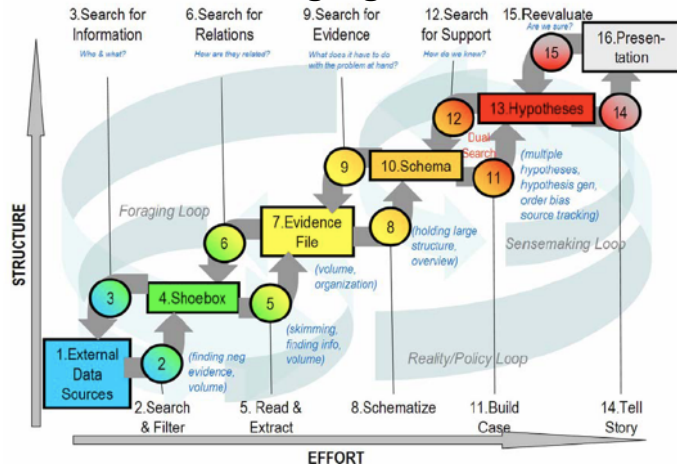
Steenburgh, J. J. v., Fleck, J. I., Beeman, M., & Kounios, J. (2012). Insight. In K. J. Holyoak & R. G. Morrison (Eds.), The Oxford Handbook of Thinking and Reasoning (pp. 475-491). Oxford: Oxford University Press.

- **How Analysts Think vs What Analysts Do**

# Key Principles underlying VALCRI design

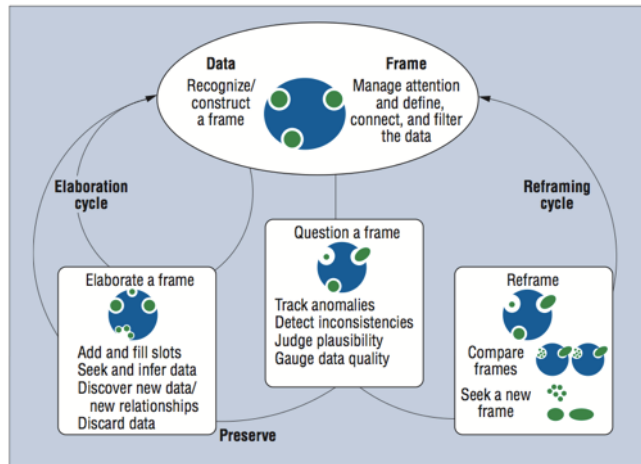
- **Analytic reasoning: Expert intuition to scientific method**
  - Imagination, insight, transparency, fluidity and rigour
- **Humans decide; machines do the heavy lifting**
  - Combine data from multiple sources into easy-to-digest information and charts
  - Given one, show me more like it: Semantic search
  - Show me what else / who else / where else / when else / why else / how else: Associative search
  - Encourage exploration and generate plausible explanations, & new leads
- **Storytelling**
  - Easy to assemble data into stories and re-assemble
- **Transparency**
  - Visibility, provenance, and security-ethics-privacy-legal

# Information Foraging Model



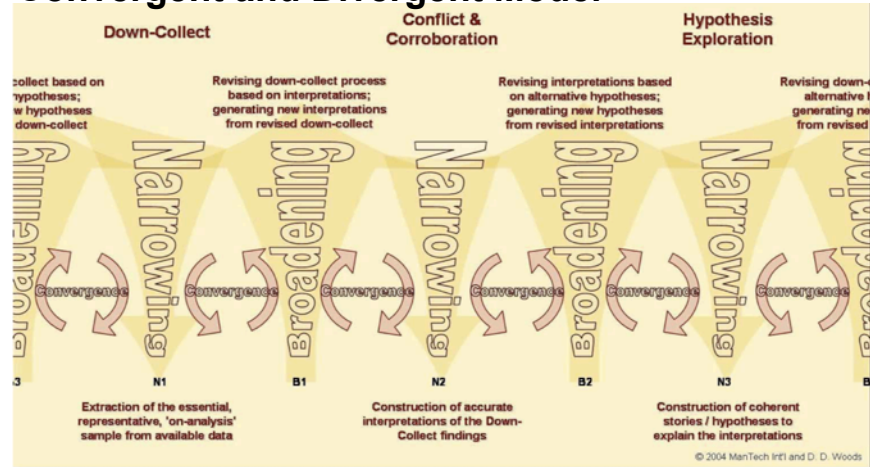
Pirolli, P., & Card, S. (1995). Information foraging in information access environments. Paper presented at the Human Factors in Computing Systems, CHI '95, Denver, CO.

# Data-Frame Model



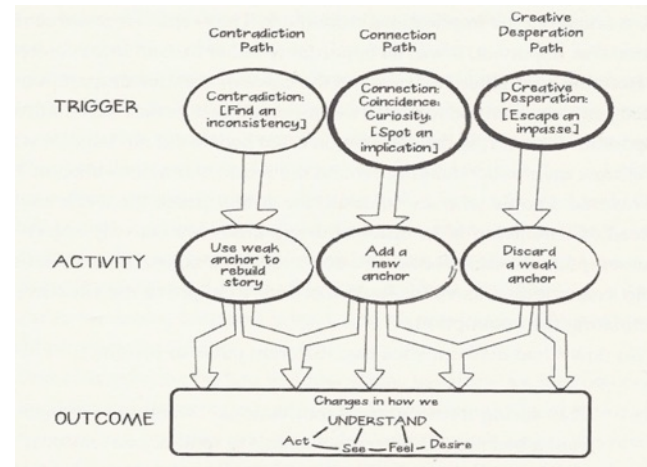
Klein, G., Philips, J. K., Rall, E. L., & Peluso, D. A. (2007). A data-frame theory of sense-making. In R. R. Hoffman (Ed.), Expertise Out of Context: Proceedings of the Sixth International Conference on Naturalistic Decision Making (pp. 113-155).

# Convergent and Divergent Model



Elm, W., Potter, S., Tittle, J., Woods, D., Grossman, J., & Patterson, E. (2005). Finding decision support requirements for effective intelligence analysis tools Proceedings of the Human Factors and Ergonomics Society Annual Meeting HFES 2005 (pp. 297-301).

# Triple Pathway Model of Insight



Klein, G. (2013). Seeing what others don't: The remarkable ways we gain insights. New York, NY: Public Affairs, a Member of the Perseus Book Group.



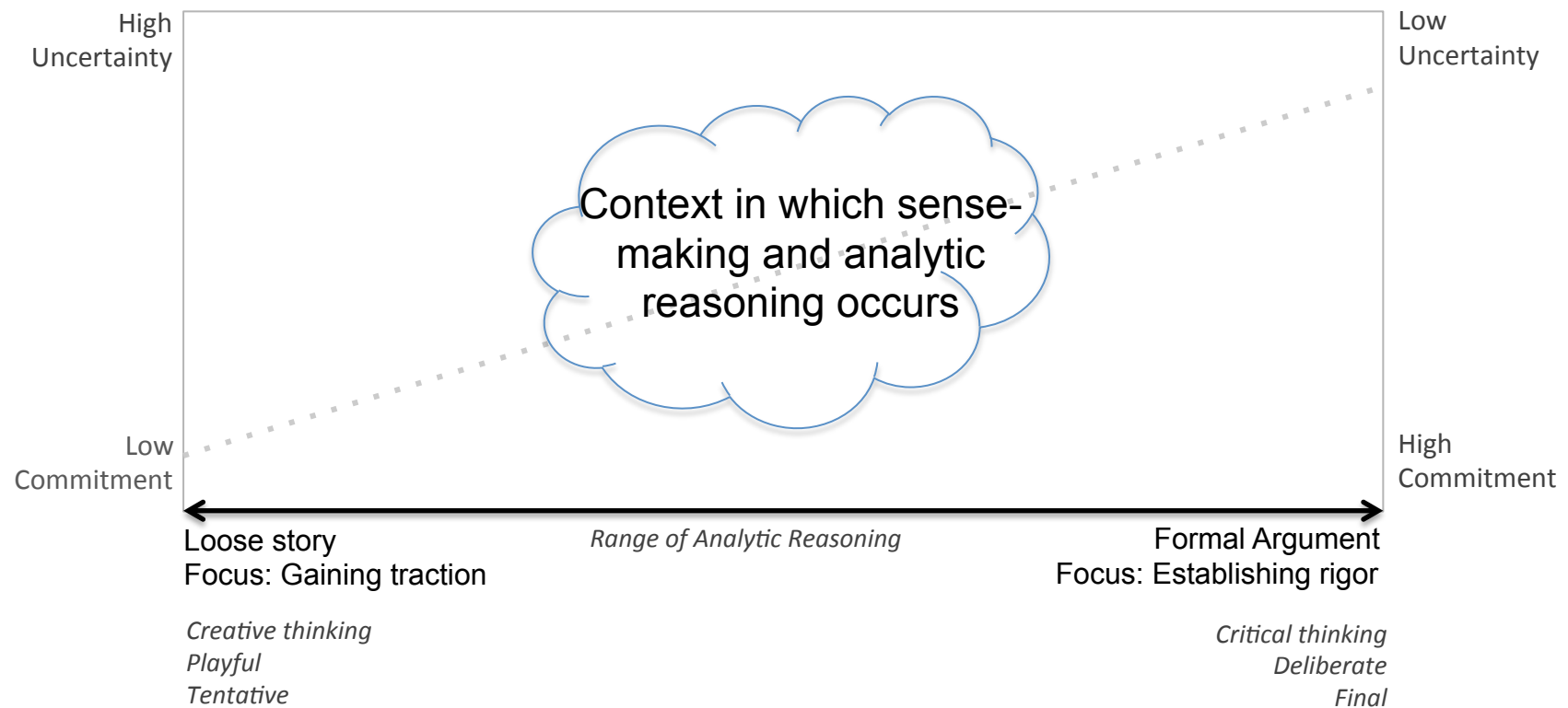
# How Analysts Think: Sense-making Triangle

## Dealing with Ambiguity, Missing, Out of sequence, Deceptive Data

Wong, B. L. W. (2016). Fluidity and Rigour: Addressing the Design Considerations for OSINT Tools and Processes. In B. Akhgar, P. S. Bayerl, & F. Sampson (Eds.), *Open Source Intelligence Investigation: From Strategy to Implementation* (pp. 167-189). Cham, Switzerland: Springer International Publishing AG.

Wong, B. L. W., & Kodagoda, N. (2016). How analysts think: Anchoring, Laddering and Associations *Proceedings of the Human Factors and Ergonomics Society 60th Annual Meeting, 19-23 September 2016, Washington, D.C., USA* (pp. 178-182): SAGE Publications.

Gerber, M., Wong, B. L. W., & Kodagoda, N. (2016). How analysts think: Intuition, Leap of Faith and Insight *Proceedings of the Human Factors and Ergonomics Society 60th Annual Meeting, 19-23 September 2016, Washington, D.C., USA* (pp. 173-177): SAGE Publications.



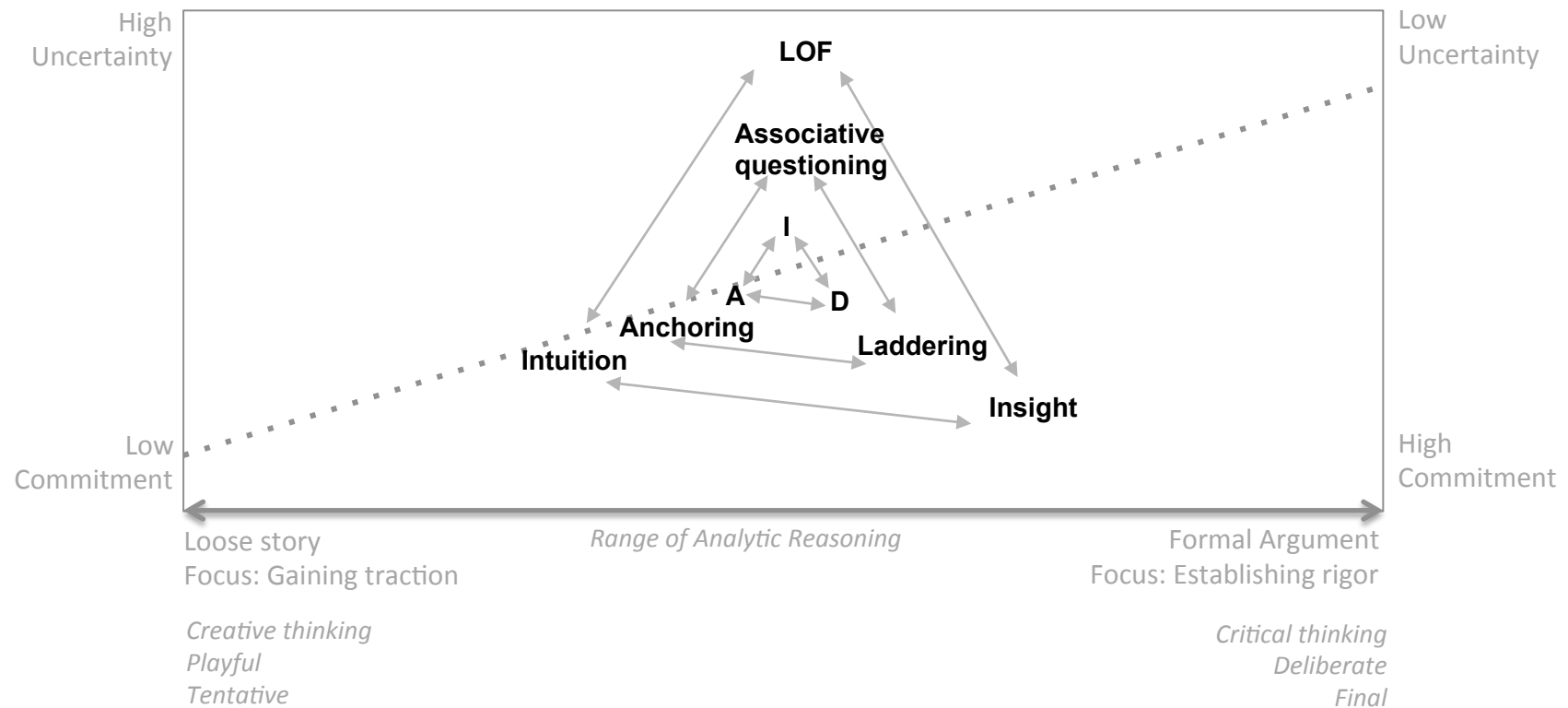
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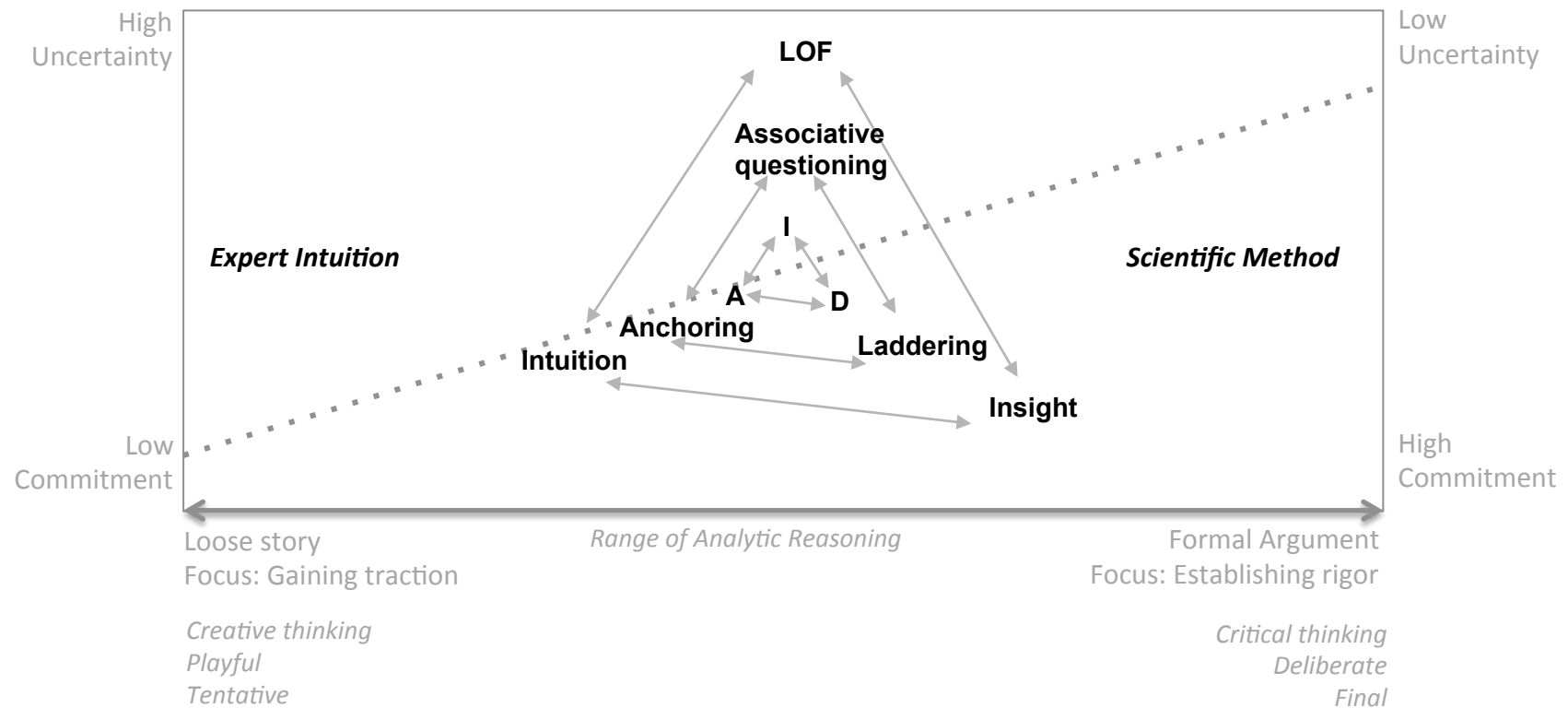
# How Analysts Think: Sense-making Triangle

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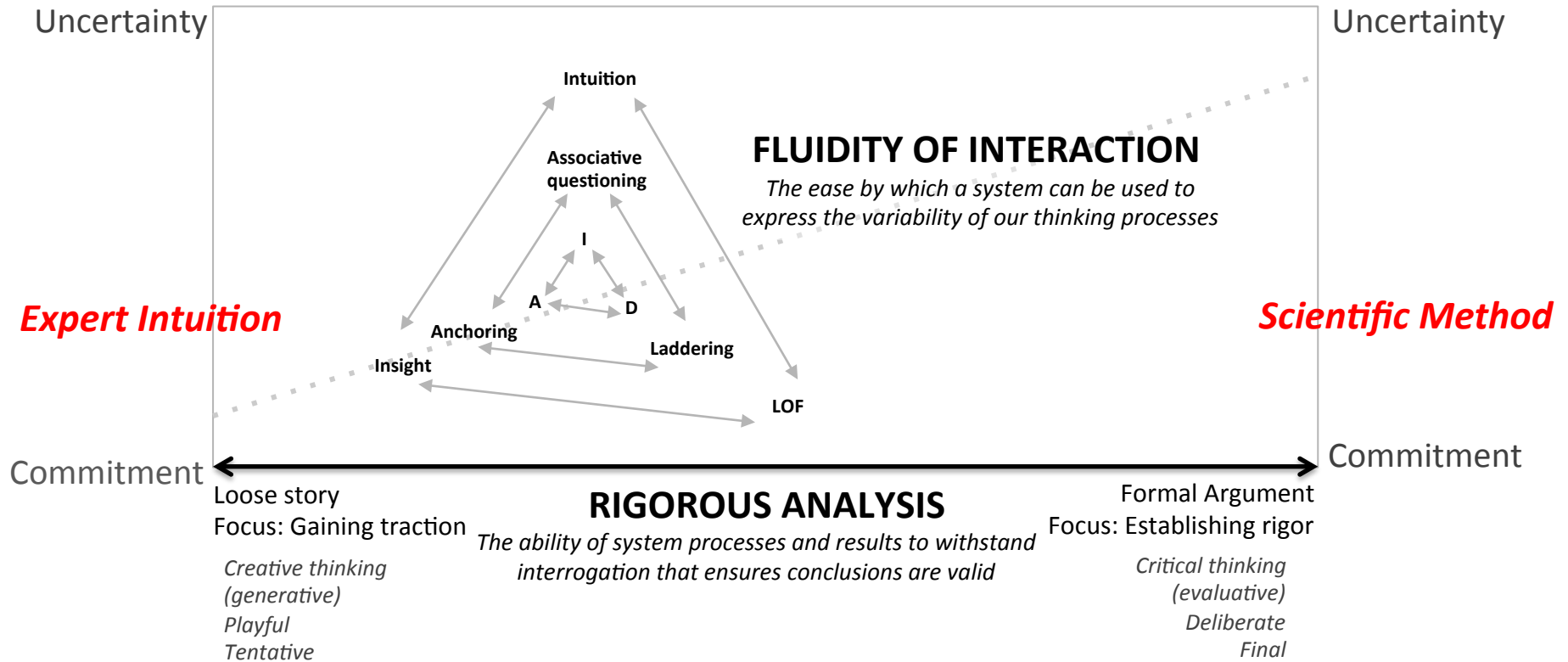
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# Expert intuition to scientific method: Fluidity and Rigour Model for Interaction Design

Wong, B. L. W. (2016). Fluidity and Rigour: Addressing the Design Considerations for OSINT Tools and Processes. In B. Akhgar, P. S. Bayerl, & F. Sampson (Eds.), *Open Source Intelligence Investigation: From Strategy to Implementation* (pp. 167-189). Cham, Switzerland: Springer International Publishing AG.



Legend

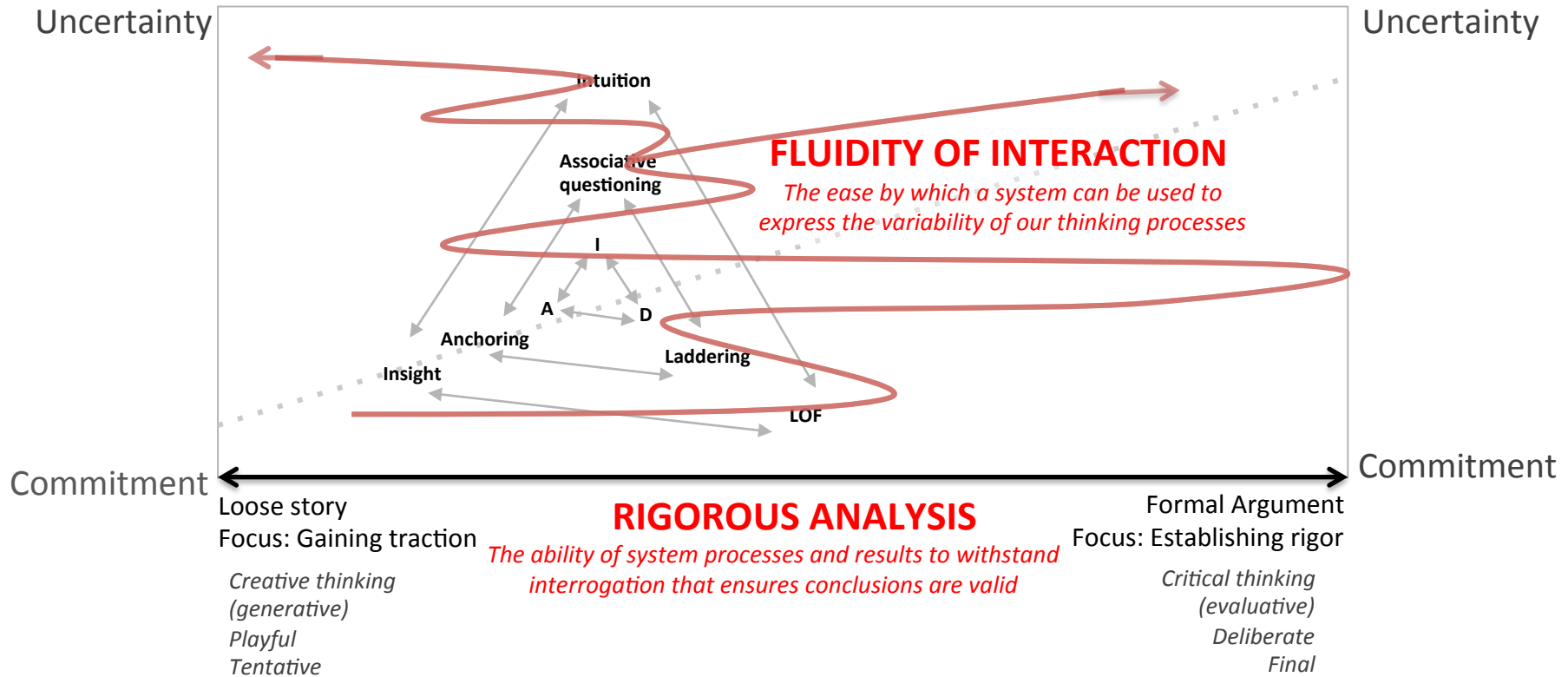
**Inference making:** Induction (I), deduction (D) and abduction (A)

**User strategies:** Anchoring, Laddering, Associative question

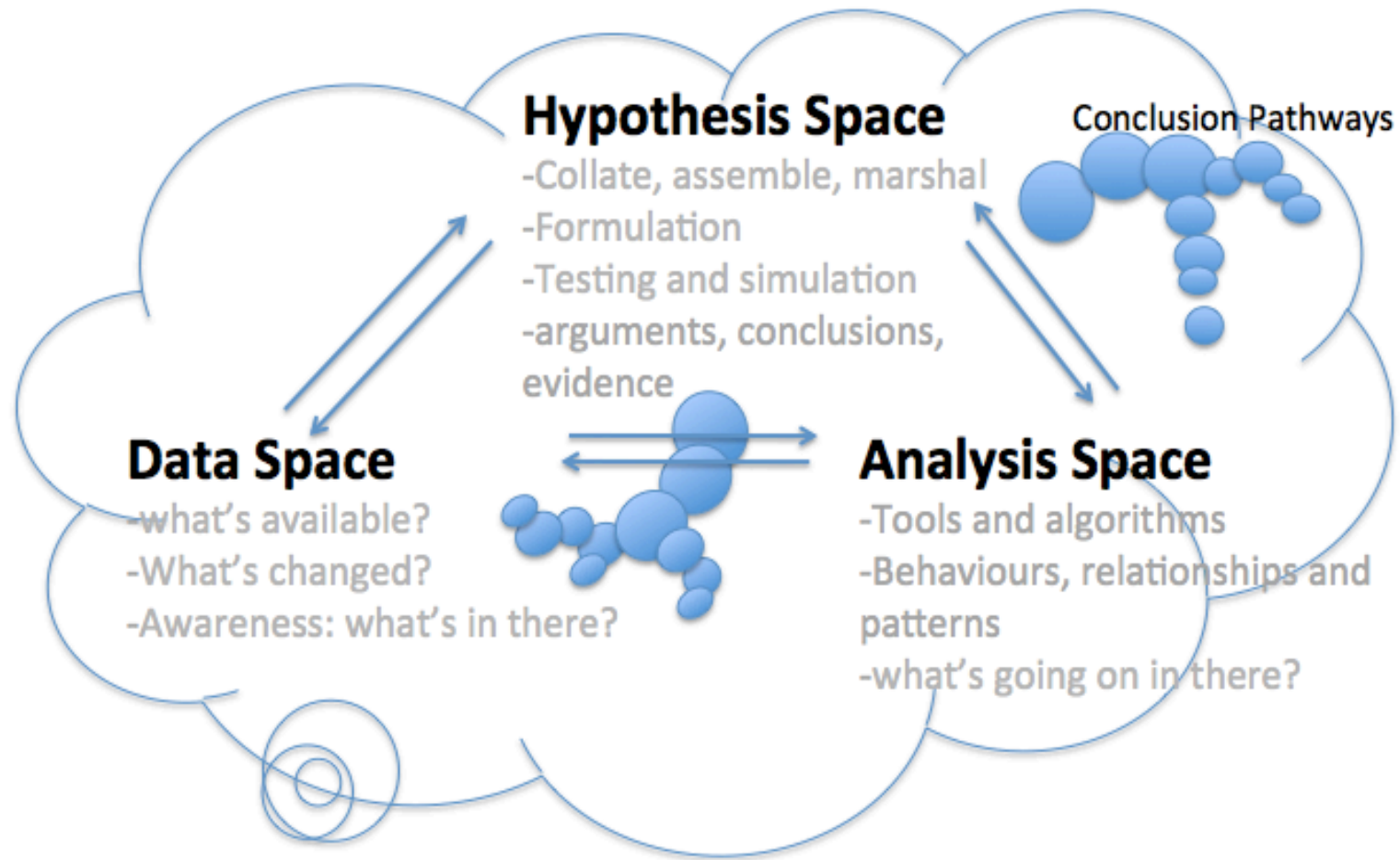
**Cognitive Acts:** Intuition, LOF and Insight

# Expert intuition to scientific method: Fluidity and Rigour Model for Interaction Design

Wong, B. L. W. (2016). Fluidity and Rigour: Addressing the Design Considerations for OSINT Tools and Processes. In B. Akhgar, P. S. Bayerl, & F. Sampson (Eds.), *Open Source Intelligence Investigation: From Strategy to Implementation* (pp. 167-189). Cham, Switzerland: Springer International Publishing AG.



# Supporting How Analysts Think: Reasoning Workspace



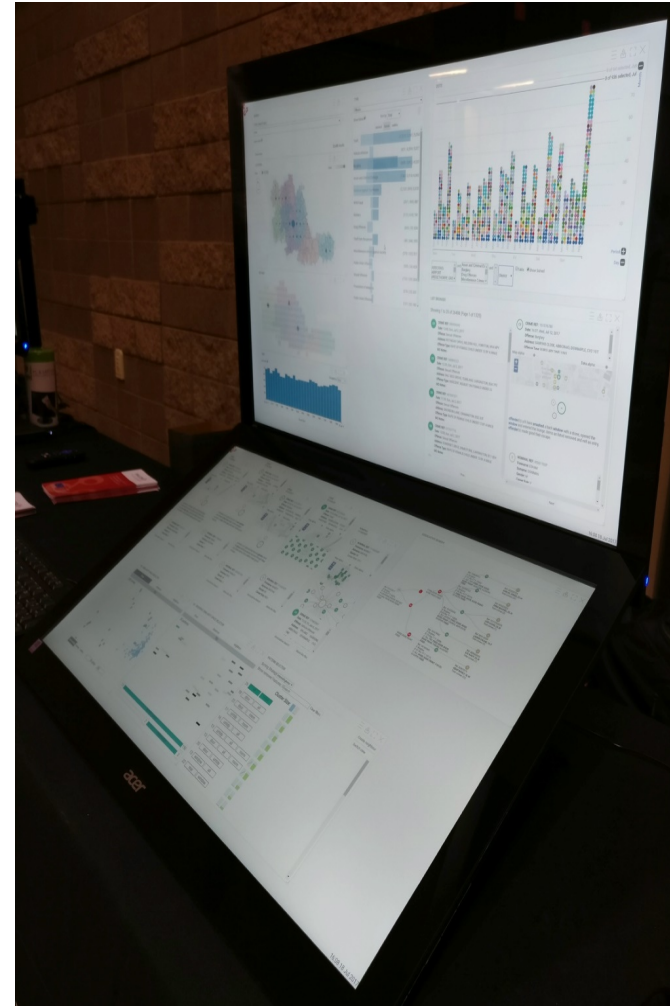
Wong, B. L. W. (2016). Fluidity and Rigour: Designing for Intelligence Analysis. In B. Akhgar, P. S. Bayerl, & F. Sampson (Eds.), *Open Source Intelligence Investigation: From Strategy to Implementation* (pp. To be published): Springer.

# Operationalising Fluidity and Rigour Model

## Persistence

### Thinking landscape

- nearby – detail to help assemble and construct;
- farther away – summarise and a place to park and mull;
- distance – helps orientate and gain context where situational and contextual information is located



# Operationalising Fluidity and Rigour Model

## Tactile Reasoning for Tentative and Playful Interactions

- An interaction technique that stimulate human analytical reasoning



# Humans decide; Machines do heavy lifting

- **Humanly unfeasible to search multiple databases (e.g. 250+) in time available**
  - look for similar, collate similar
  - arrange data to show relationships
- **Combine data from multiple sources into easy-to-digest information and charts**
  - structured AND unstructured
  - ‘Joined-up picture’ data entity model enables complex queries
- **Facilitate complex queries:**  
**Criminal behaviour vs. retrieve records**
  - Which persons either pose a high risk for the community or are harmed unusually often?
  - Which unsolved crimes could be committed by any of the known offenders?
  - Which cars or other events could be related to an unsolved crime?

CRIME REF: 159561571  
Date: Sun Sep 10 01:02:00 GMT+100 2017  
Super offence: Burglary  
Address: ORMSIDES STREET,  
Map alpha: —●— Data alpha: —●—

offender climbed onto garden shed and flat roof to dwelling house, forced entry via rear window gathered stolen property in duvet and pillowcases. offender chased from scene by witnesses and detained. on arrest found to be in possession of large kitchen knife, small knife and screwdriver.

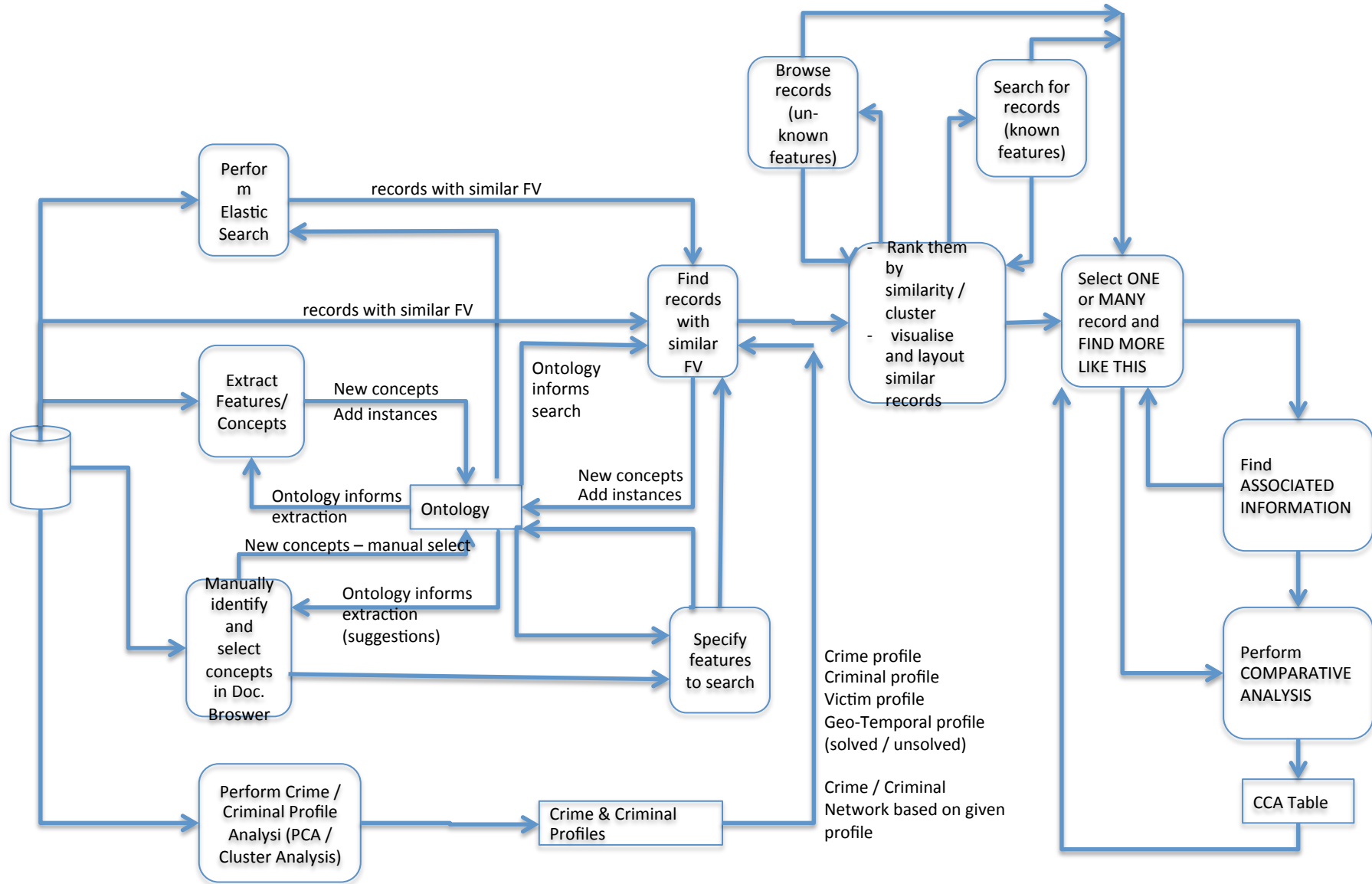
NOMINAL REF: 102740070X  
Forename: TIMY  
Surname: BUI  
Gender: F  
Career Role: VD

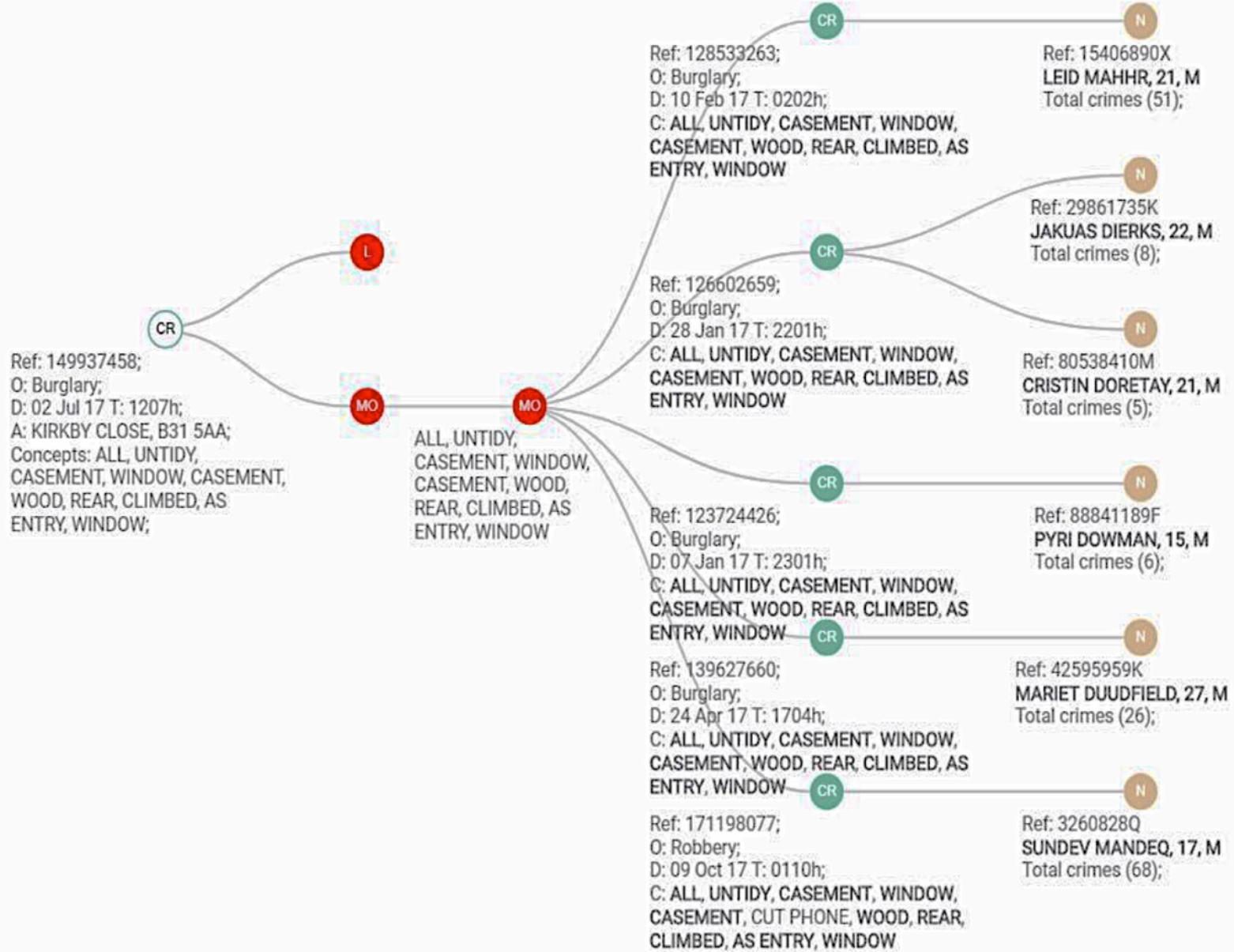
Run Assoc. Search

# Humans decide; Machines do heavy lifting

- **Encourage exploration and generate plausible explanations & new leads**
- **Semantic Similarity: “Given one report, show me more reports like this”**
  - Based on structured and un-structured text
  - Transform stack of reports into Comparative Case Analysis tables
- **Associative search: what else? who else? where else? when else? why else? how else?**
  - Proactively suggests other crimes in the same area and period that may provide new leads or a potential suspects list

# DRAFT - COMBINED SEARCH





# Storytelling

- Easy to assemble data into stories, and re-assemble
- Visual persistence
- Easy re-assembly lowers effort to consider alternative possibilities and encourages imagination
- New visuo-spatial arrangements (of data and analyses) enables insight
  - A – B – C – D – E
  - B – E – D – ? – C ...
  - Explanatory narrative



CRIME  
152034928

CRIME REF: 152034928  
Date: 17:37, Mon, Jul 17, 2017  
Offence: Burglary  
Address: DELIUS GROVE,  
YONDOVER HEATH

Map alpha: Data alpha:

offenders entered premises via rear partially open bedroom window, untidy search made of all rooms. property stolen and left by way entered, left by way entered.

NOMINAL REF: 97816529L  
Forename: ARSHIA  
Surname: FAUIS  
Gender: F  
Career Role: V

Associative Search More like this

CRIME  
151972045

CRIME REF: 151972045  
Date: 13:00, Mon, Jul 17, 2017  
Offence: Burglary  
Address: MORSBY ROAD,  
GARDEN HEIGHT

Map alpha: Data alpha:

between time and date given entered rear yard of premises door by using a crowbar to gain entry searches room property. made good escape.

NOMINAL REF: 3...  
Forename: ZARIQ  
Surname: FAKHR  
Gender: M  
Career Role: RV

Associative Search

CRIME  
15190805

CRIME REF: 15190805  
Date: 02:30, Mon, Jul 17, 2017  
Offence: Burglary  
Address: CHARTERHOUSE STREET,  
TARLINGTON

Map alpha: Data alpha:

affected by suspect(s) unknown opening side window on ground floor to gain access to rear dining room. tidy search made of downstairs rooms and lights left on. property stolen as listed. offender(s) then left via front door.

NOMINAL REF: 4510768298  
Forename: TAJJWAR  
Surname: CHANDLER  
Gender: M  
Career Role: RD

Associative Search More like this

CRIME  
151965606

CRIME REF: 151965606  
Date: 04:30, Mon, Jul 17, 2017  
Offence: Burglary  
Address: SLADE LANE,  
DRAYFORD COMMON

Map alpha: Data alpha:

CRIME REF: 97549377P  
Forename: SHAMI  
Surname: TUKQHANH  
Gender: V

More like this

CRIME  
151949988

CRIME REF: 151949988  
Date: 12:16, Mon, Jul 17, 2017  
Offence: Burglary  
Address: RAINOW AVENUE,  
LOWER DRAYFORD

Map alpha: Data alpha:

NOMINAL REF: 241060387Q  
Forename: LEID  
Surname: GARI  
Gender: M  
Career Role: RDV

Associative Search More like this

CRIME  
151919026

CRIME REF: 151919026  
Date: 03:00, Mon, Jul 17, 2017  
Offence: Burglary  
Address: ALDWICK AVENUE,  
NAYBAIN, CARSHINGTON, B13

Map alpha: Data alpha:

offender/s unknown have gained entry to flat probably using keys stolen earlier from the flat. tidy search of all rooms accessed, property removed, no damage caused

NOMINAL REF: 97534305X  
Forename: ZAKIA  
Surname: TUOGER  
Gender: F  
Career Role: RV

Associative Search More like this

CRIME  
155505549

CRIME REF: 155505549  
Date: 17:30, Mon, Jul 17, 2017  
Offence: Burglary  
Address: JANEWAY PLACE,  
TEIGN HILL, CARSHINGTON, B11

Map alpha: Data alpha:

persons unknown forced door handle to front lower upvc door with 5 point locking system breaking same, alarm activated, no entry made. no property stolen. offenders made good escape.

NOMINAL REF: 64274009L  
Forename: BAJIT  
Surname: HILSOON  
Gender: M  
Career Role: RV

Associative Search More like this

CRIME  
152324546

CRIME REF: 152324546  
Date: 09:00, Mon, Jul 17, 2017  
Offence: Burglary  
Address: HOOTON PAGNELL ROAD,  
FORTHINGTON

Map alpha: Data alpha:

uk offenders gained access to rear garden went to secured shed forced door with uk instrument entered and stole property. made good their escape.

NOMINAL REF: 144425155H  
Forename: ZIED  
Surname: EDMONDS  
Gender: M  
Career Role: RD

Associative Search More like this



CRIME 151949988

CRIME REF: 151949988  
Date: 12:16, Mon, Jul 17, 2017  
Offence: Burglary  
Address: RAINOW AVENUE, LOWER DRAYFORD

CRIME 152034928

CRIME REF: 152034928  
Date: 17:37, Mon, Jul 17, 2017  
Offence: Burglary  
Address: DELIUS GROVE, YONDOVER

CRIME 151972045

CRIME REF: 151972045  
Date: 13:00, Mon, Jul 17, 2017  
Offence: Burglary  
Address: MORESBY ROAD, GARDEN HEIGHTS, CARSLINGTON

CRIME 15190805

CRIME REF: 15190805  
Date: 02:30, Mon, Jul 17, 2017  
Offence: Burglary  
Address: CHARTERHOUSE STREET, TARLINGTON

CRIME 155505549

CRIME REF: 155505549  
Date: 17:30, Mon, Jul 17, 2017  
Offence: Burglary  
Address: JANEWAY PLACE, TEIGN HILL, CARSLINGTON, B11

CRIME 151919026

CRIME REF: 151919026  
Date: 03:00, Mon, Jul 17, 2017  
Offence: Burglary  
Address: ALDWICK AVENUE, NAYBAIRN, CARSLINGTON, B13

CRIME 152324546

CRIME REF: 152324546  
Date: 09:00, Mon, Jul 17, 2017  
Offence: Burglary  
Address: LIDGOTON ROAD, FORTHINGTON

NOMINAL REF: 97816529L  
Forename: APASHIA  
Surname: FAUIS  
Gender: F  
Career Role: V

CRIME 151965606

CRIME REF: 151965606  
Date: 04:30, Mon, Jul 17, 2017  
Offence: Burglary  
Address: SLADE LANE, DRAYFORD COMMON

NOMINAL REF: 3111631376  
Forename: ZARQAR  
Surname: FAKHR  
Gender: M  
Career Role: RV

NOMINAL REF: 4510768298  
Forename: TAJJWAR  
Surname: CHANDLER  
Gender: M  
Career Role: RD

CRIME 152324546 (Detailed View)

CRIME REF: 152324546  
Date: 09:00, Mon, Jul 17, 2017  
Offence: Burglary  
Address: LIDGOTON ROAD, FORTHINGTON

NOMINAL REF: 144425155H  
Forename: ZIED  
Surname: EDMONDS  
Gender: M  
Career Role: RD

is entered premises via rear partially broken window, which search made of a property stolen and left by way left by way entered.

between time and date given, person unknown entered rear yard of premises, forced rear door by using a crowbar type instrument, gained entry searches room and stole property, made good escape.

affected by suspect(s) unknown opening side window on ground floor to gain access to rear living room. tidy search made of downstairs rooms and lights left on, property stolen as listed, offender(s) then left via front door.

persons unknown forced door handle to front lower upvc door with 5 point locking system breaking same, alarm activated, no entry made, no property stolen, offenders made good escape.

ffender/s unknown have gained entry to flat probably using keys stolen earlier from the flat, tidy search of all rooms accessed, property removed, no damage caused

offenders gained access to rear garden via vent to secured shed forced door with uk instrument entered and stole property, made good their escape.

Associative Search More like this

Associative Search More like this

Associative Search More like this

Associative Search More like this

Associative Search More like this

Associative Search More like this

Associative Search More like this

Associative Search More like this



LIST BROWSER

Showing 1 to 8 of 8 (Page 1 of 1)

**CR** CRIME REF: 151949988  
Date: 12:16, Mon, Jul 17, 2017  
Offence: Burglary  
Address: RAINOW AVENUE, LOWER DRAYFORD, CARINGTON, B36 0SJ  
Offence Type: ATTEMPT BURGLARY DWELLING  
MO Notes: -

**CR** CRIME REF: 152324546  
Date: 09:00, Mon, Jul 17, 2017  
Offence: Burglary  
Address: HOOTON PAGNELL ROAD, FORTHINGTON, CARINGTON, B24 9NH  
Offence Type: BURGLARY OTHER BUILDING  
MO Notes: uk offenders gained access to rear garden went to secured shed forced door with uk instrument entered and stole property. made good their escape.

**CR** CRIME REF: 152034928  
Date: 17:37, Mon, Jul 17, 2017  
Offence: Burglary  
Address: DELIUS GROVE, YONDOVER HEATH, CARINGTON, B16 0HS  
Offence Type: BURGLARY DWELLING  
MO Notes: offenders entered premises via rear partially open bedroom window, untidy search made of all rooms. property stolen and left by way entered., left by way entered.

**CR** CRIME REF: 151965606  
Date: 04:30, Mon, Jul 17, 2017  
Offence: Burglary  
Address: SLADE LANE, DRAYFORD COMMON, CARINGTON, B35 6PJ  
Offence Type: BURGLARY DWELLING  
MO Notes: -

**CR** CRIME REF: 151972045  
Date: 13:00, Mon, Jul 17, 2017  
Offence: Burglary  
Address: MORESBY ROAD, GARDEN HEIGHTS, CARINGTON, B21 9QD  
Offence Type: BURGLARY DWELLING  
MO Notes: between time and date given. person unknown entered rear

**CR** CRIME REF: 151949988  
Date: 12:16, Mon, Jul 17, 2017  
Offence: Burglary  
Address: RAINOW AVENUE, LOWER DRAYFORD, CARINGTON, B36 0SJ  
Offence Type: ATTEMPT BURGLARY DWELLING

**D** NOMINAL REF: 241060387Q  
Forename: LEID  
Surname: GARI  
Gender: M  
Career Role: RDV  
Role Type: DEFE  
DOB: 01:00, Thu, Aug 25, 1994

Map alpha: Data alpha:

Prev Next





### LIST BROWSER

Showing 1 to 8 of 8 (Page 1 of 1)

**CR** CRIME REF: 151949988  
 Date: 12:16, Mon, Jul 17, 2017  
 Offence: Burglary  
 Address: RAINOW AVENUE, LOWER DRAYFORD, CARSHINGTON, B36 0SJ  
 Offence Type: ATTEMPT BURGLARY DWELLING  
 MO Notes: -

**CR** CRIME REF: 152324546  
 Date: 09:00, Mon, Jul 17, 2017  
 Offence: Burglary  
 Address: HOOTON PAGNELL ROAD, FORTHINGTON, CARSHINGTON, B24 9NH  
 Offence Type: BURGLARY OTHER BUILDING  
 MO Notes: uk offenders gained access to rear garden went to secured shed forced door with uk instrument entered and stole property. made good their escape.

**CR** CRIME REF: 152034928  
 Date: 17:37, Mon, Jul 17, 2017  
 Offence: Burglary  
 Address: DELIUS GROVE, YONDOVER HEATH, CARSHINGTON, B16 0HS  
 Offence Type: BURGLARY DWELLING  
 MO Notes: offenders entered premises via rear partially open bedroom window, untidy search made of all rooms. property stolen and left by way entered, left by way entered.

**CR** CRIME REF: 151965606  
 Date: 04:30, Mon, Jul 17, 2017  
 Offence: Burglary  
 Address: SLADE LANE, DRAYFORD COMMON, CARSHINGTON, B35 6PJ  
 Offence Type: BURGLARY DWELLING  
 MO Notes: -

**CR** CRIME REF: 151972045  
 Date: 13:00, Mon, Jul 17, 2017  
 Offence: Burglary  
 Address: MORESBY ROAD, GARDEN HEIGHTS, CARSHINGTON, B21 9QD  
 Offence Type: BURGLARY DWELLING  
 MO Notes: Misuse between time and date when person

**CR** CRIME REF: 152324546  
 Date: 09:00, Mon, Jul 17, 2017  
 Offence: Burglary  
 Address: HOOTON PAGNELL ROAD, FORTHINGTON, CARSHINGTON, B24 9NH  
 Offence Type: BURGLARY OTHER BUILDING

Map alpha: [Map] Data alpha: [Map]

uk offenders gained access to rear garden went to secured shed forced door with uk instrument entered and stole property. made good their escape.

**D** NOMINAL REF: 14442515SH  
 Forename: ZIED  
 Surname: EDMONDS  
 Gender: M  
 Career Role: RD  
 Role Type: DEFE  
 DOB: 00:00, Mon, Feb 1, 1999  
 EA Desc: WHITE SKINNED EUROPEAN

Prev Next

### S3 - SIMILARITY SPACE SELECTOR

linear distances -ulating... neighbors flip

6 crimes

non-overlap overlap outliers 1 #Labels 250

### LOCATION

Map [Map] Data [Map]

### SCHEMA LINE

These seems coonec...

Looks like a burglary ...

- 267876100 Vehicle offences -
- 267875004 Violence Against
- 267873096 Burglary -

269605588 Drug Offences -

269606547 Theft - THEFT FROM

269604766 Vehicle offences -

269605177 Arson and Criminal

These crimes with Arson and theft seems to be connected

- 267877607 Arson and Criminal
- 267872127 Arson and Criminal
- 267875963 Theft - THEFT OTHER
- 267876511 Theft - THEFT OTHER
- 267877744 Arson and Criminal
- 272907151 Theft - THEFT OTHER
- 272957019 Theft - THEFT FROM
- 272953868 Miscellaneous
- 272954553 Vehicle offences -
- 272903726 Vehicle offences -
- 272903452 Burglary -
- 272950854 Vehicle offences -

Oct 29 Oct 06 Oct 13 Oct 20 Oct 27 Nov 03

### CCT - CRIME CLASSIFICATION TABLE

Sorting Strategy/interestingness

room	room	room	room	room
window	rear	room	door	tidy
all				

Cluster 0  
2 / 6

Cluster 1  
4 / 6

# Transparency: Visibility, provenance, and security-ethics-privacy-legal

- SEPL concepts: Security, Ethics, Privacy and Legal issues
- Ensure analysts and investigators have the best tools to make sense of large amounts of private and personal data, while respecting the rights and privacy of individuals
- VALCRI
  - Fine-grained access control via OpenPMF vs. role-based access
  - Transparency and accountability



**“Today we were unlucky,  
but remember we only have to be lucky once –  
you will have to be lucky always.”**

*IRA statement the day after the Brighton bombing*



<http://www.telegraph.co.uk/news/politics/margaret-thatcher/9979915/Margaret-Thatcher-Seconds-from-death-at-the-hands-of-an-IRA-bomber.html>