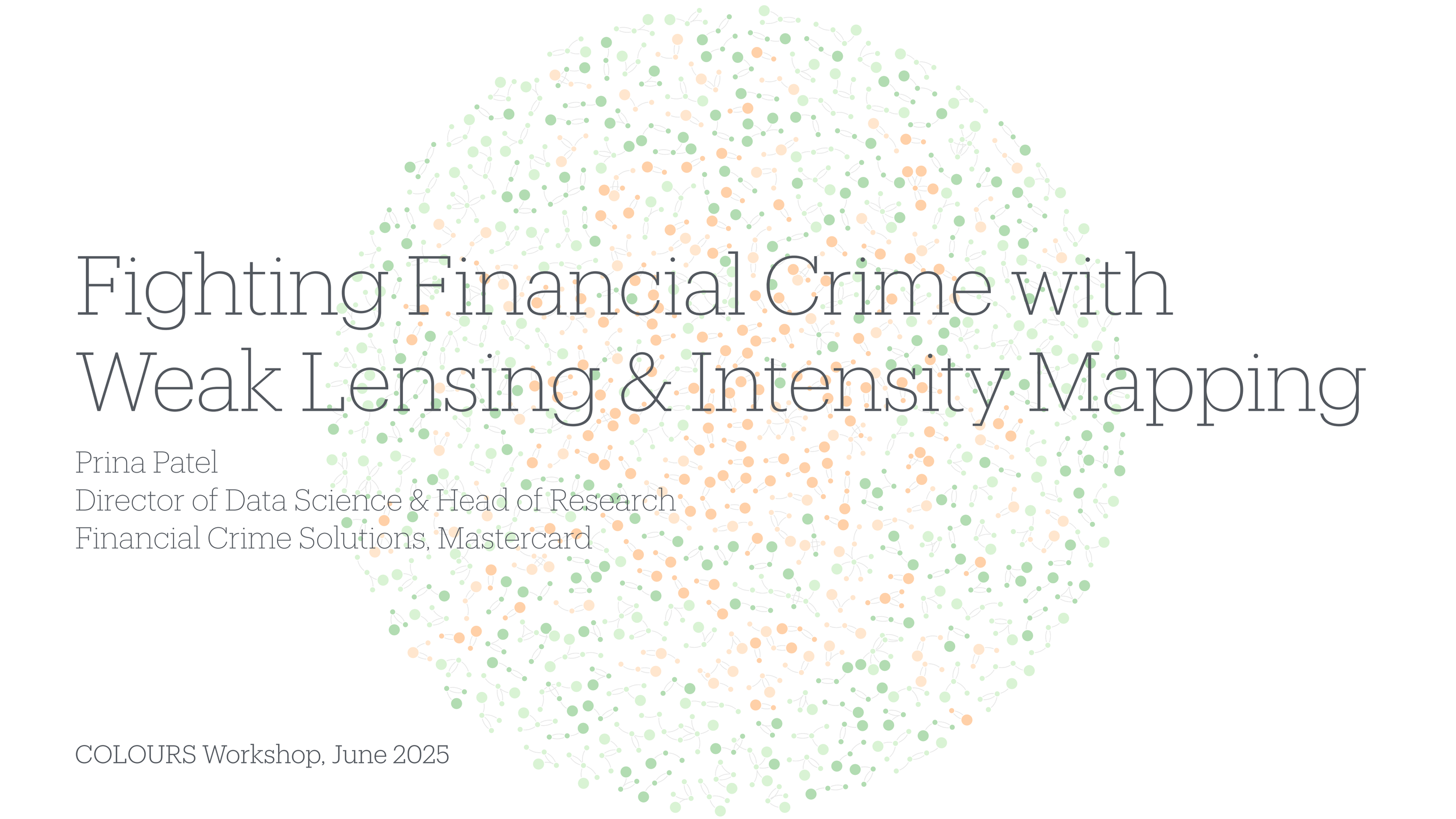


Fighting Financial Crime with Weak Lensing & Intensity Mapping

Prina Patel
Director of Data Science & Head of Research
Financial Crime Solutions, Mastercard

COLOURS Workshop, June 2025

Me

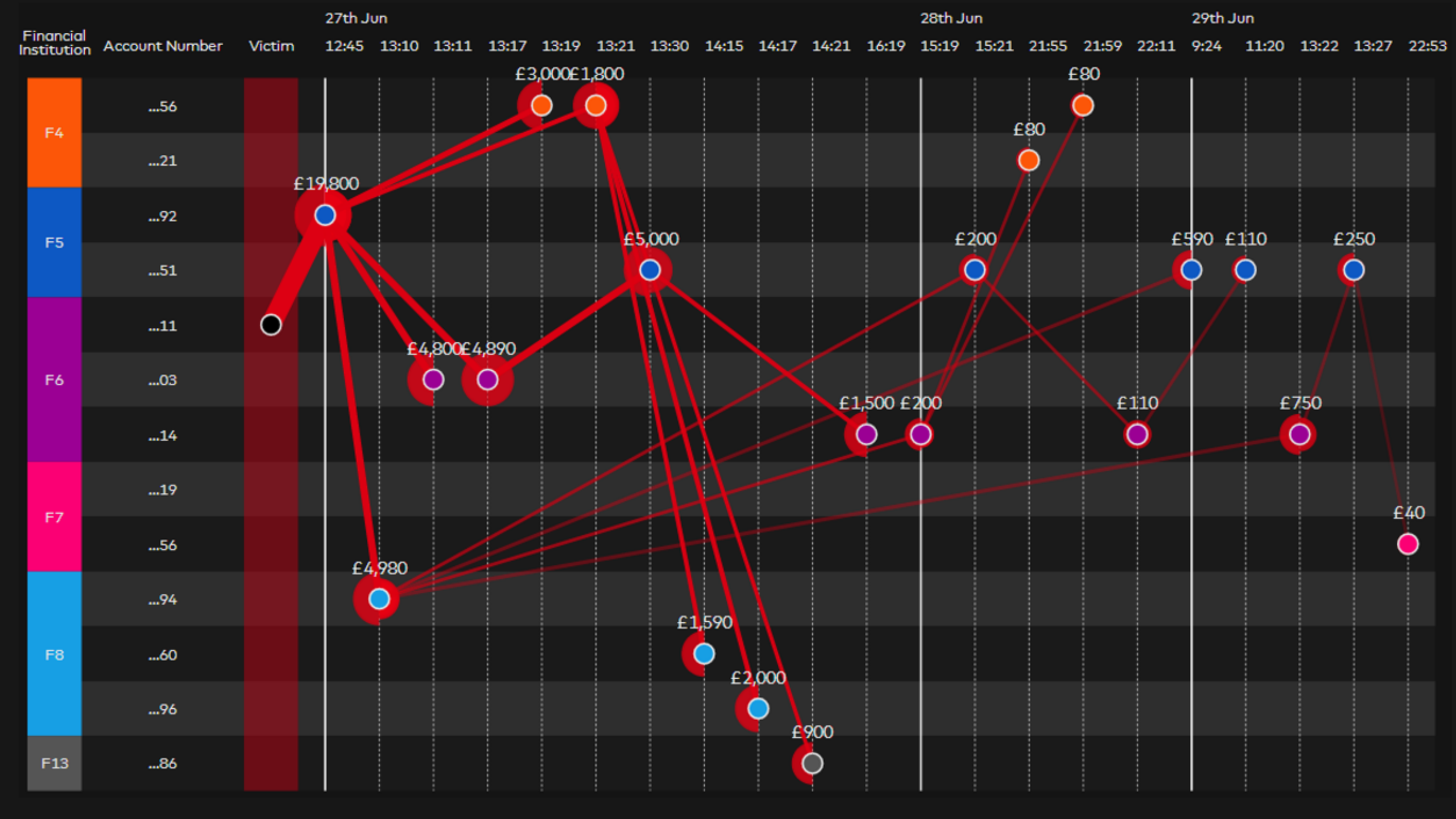
- Undergraduate at University of Edinburgh, 2002-2007
- PhD at the ICG in Portsmouth, 2007-2010
  - Weak Gravitational Lensing at Radio Wavelengths
- SKA Postdoc at UCT, 2010-2013
- SKA Postdoc at UWC, 2013-2016
- Vocalink/Mastercard, 2017-present

What do we do?

- The IMF estimates that 2-5% of global GDP is associated with economic crime annually, $2-5Tr…
- … while less than 1% of this is actually caught
- … and FIs are spending billions trying to combat this

We use Mastercard's network view of transaction data to build products and services to aid financial institutions in combating financial crime


Financial Institution
Account Number
Victim
27th Jun
12:45
13:10
F4
...56
...21
£19,800
F5
...92
...51
F6
...11
...03
...14
F7
...19
...56
F8
...94
...60
...96
F13
...86


Financial Institution
Account Number
Victim
27th Jun
28th Jun
29th Jun
12:45
13:10
13:11
13:17
13:19
13:21
13:30
14:15
14:17
14:21
16:19
15:19
15:21
21:55
21:59
22:11
9:24
11:20
13:22
13:27
22:53
F4
...56
...21
F5
...92
...51
F6
...11
...03
...14
F7
...19
...56
F8
...94
...60
...96
F13
...86
£3,000
£1,800
£80
£80
£19,800
£5,000
£200
£590
£110
£250
£4,800
£4,890
£1,500
£200
£110
£750
£40
£4,980
£1,590
£2,000
£900

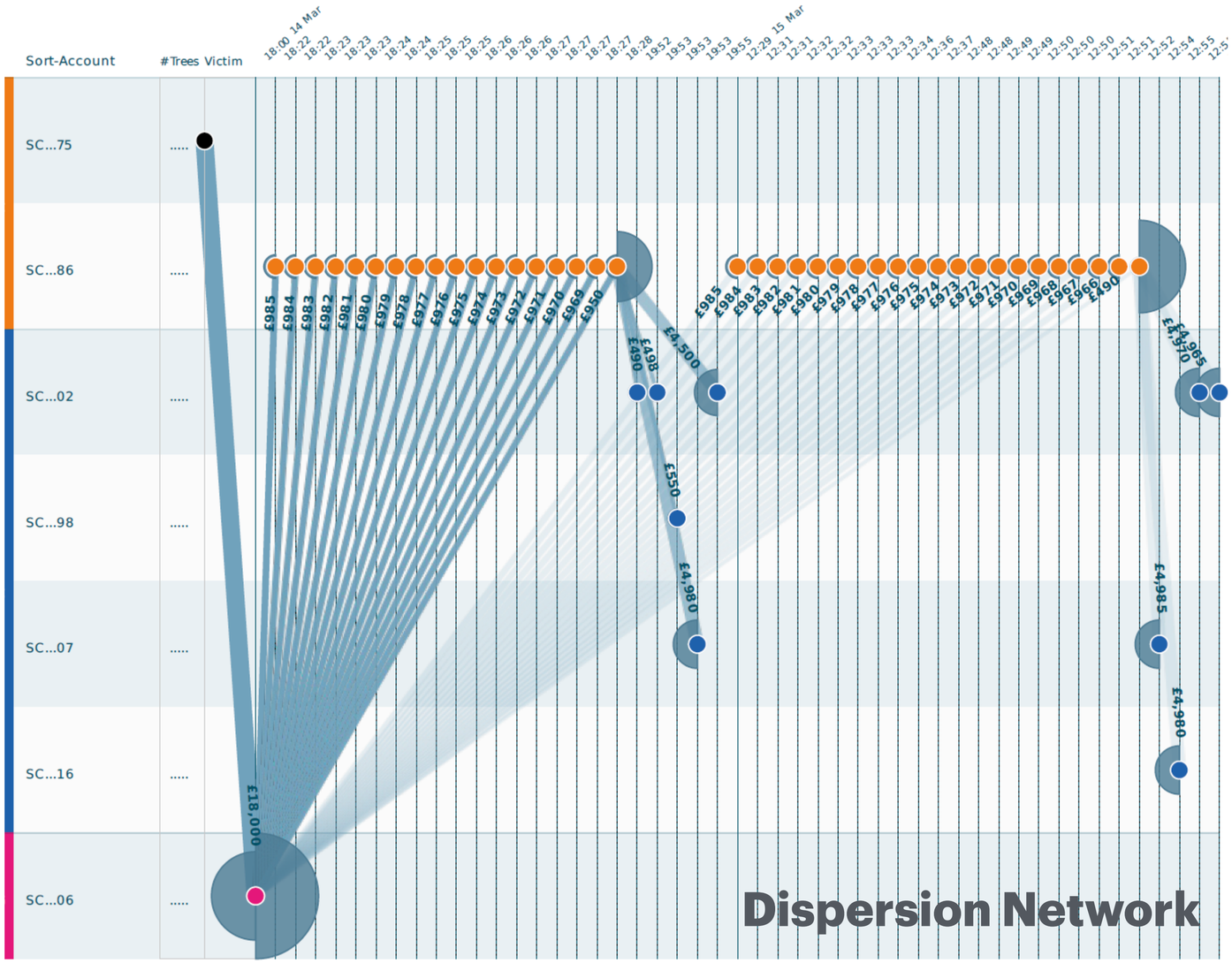
Data

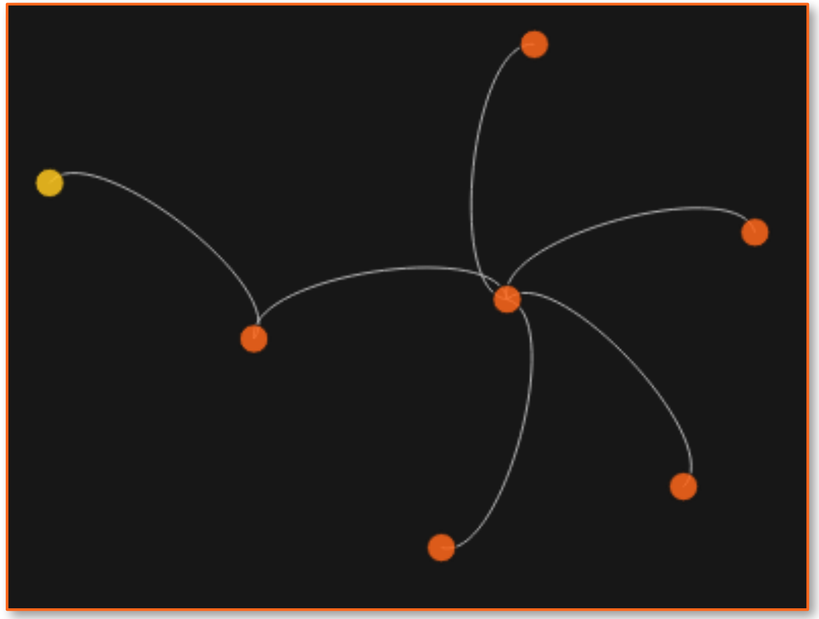
A2A in the UK

- 3 day clearing
- 26m transactions per day
- Most wages
- Direct Debits
- Benefits
- Invoices

- < 2 seconds clearing
- 7m transactions per day
- Standing orders
- Internet payments

Why is this interesting?

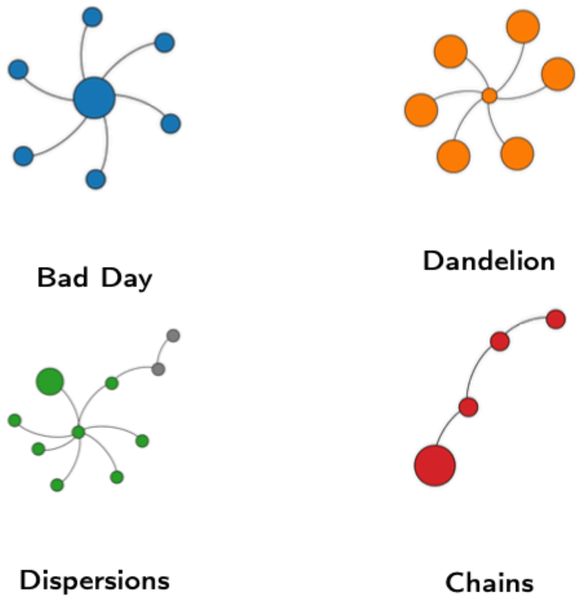


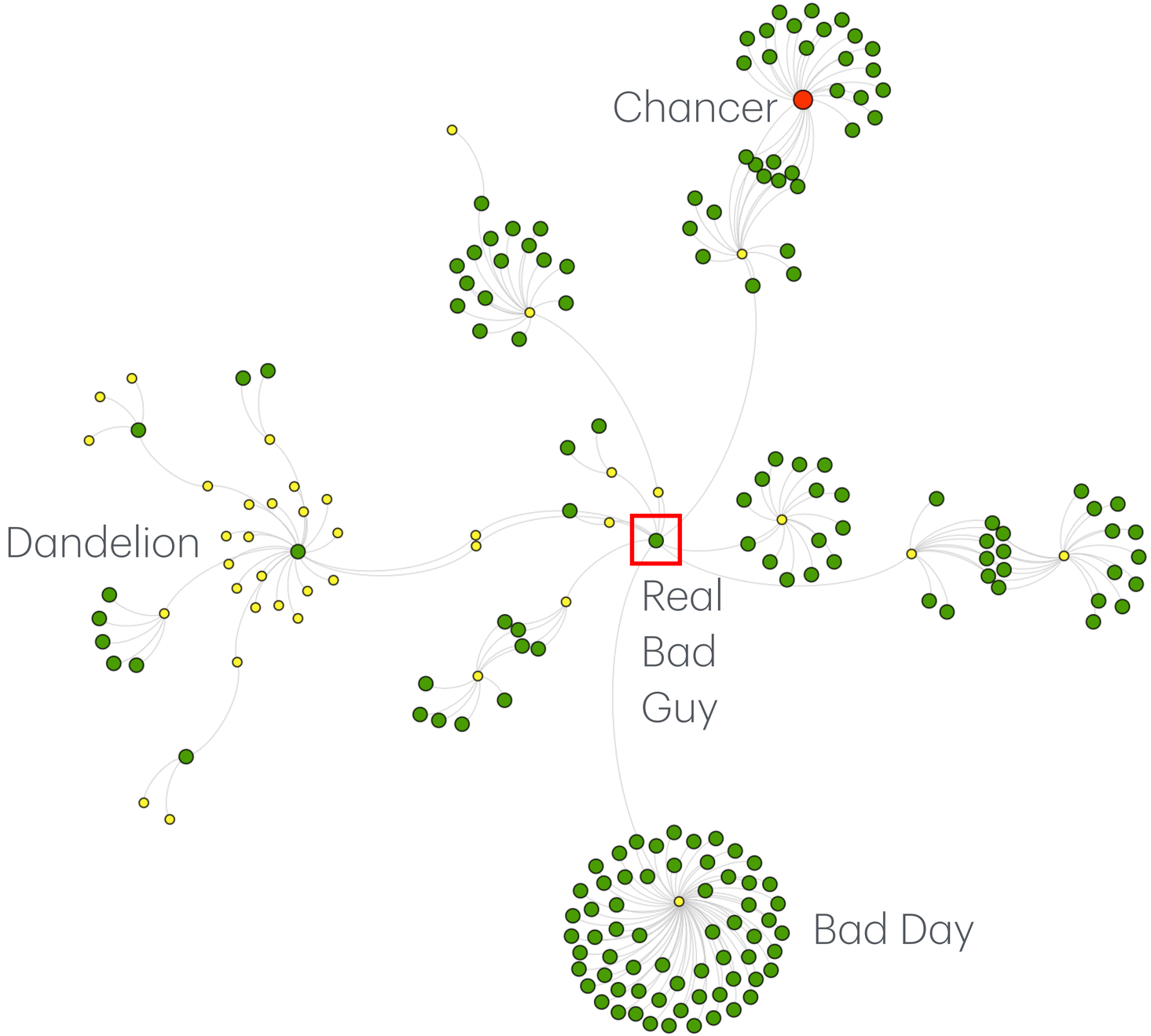


Neighbourhood

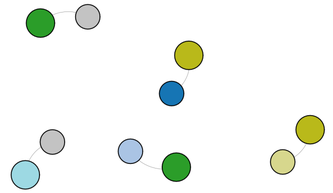
Attack Frauds

- Birdseye view of fraud reveals coordinated attacks and central collecting nodes

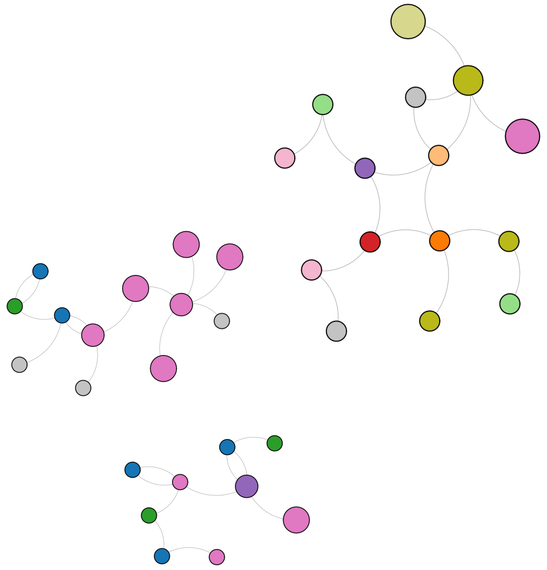




Neighbourhoods at scale

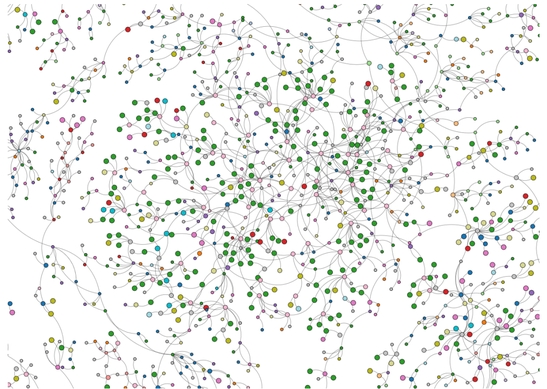


Simple e.g. Dyads



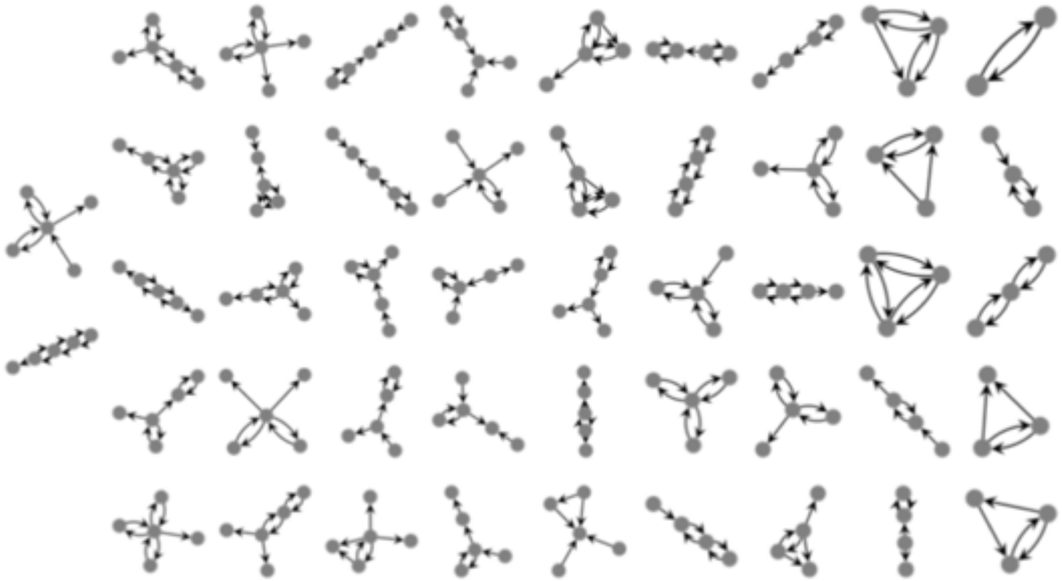
ML behaviour sweet spot

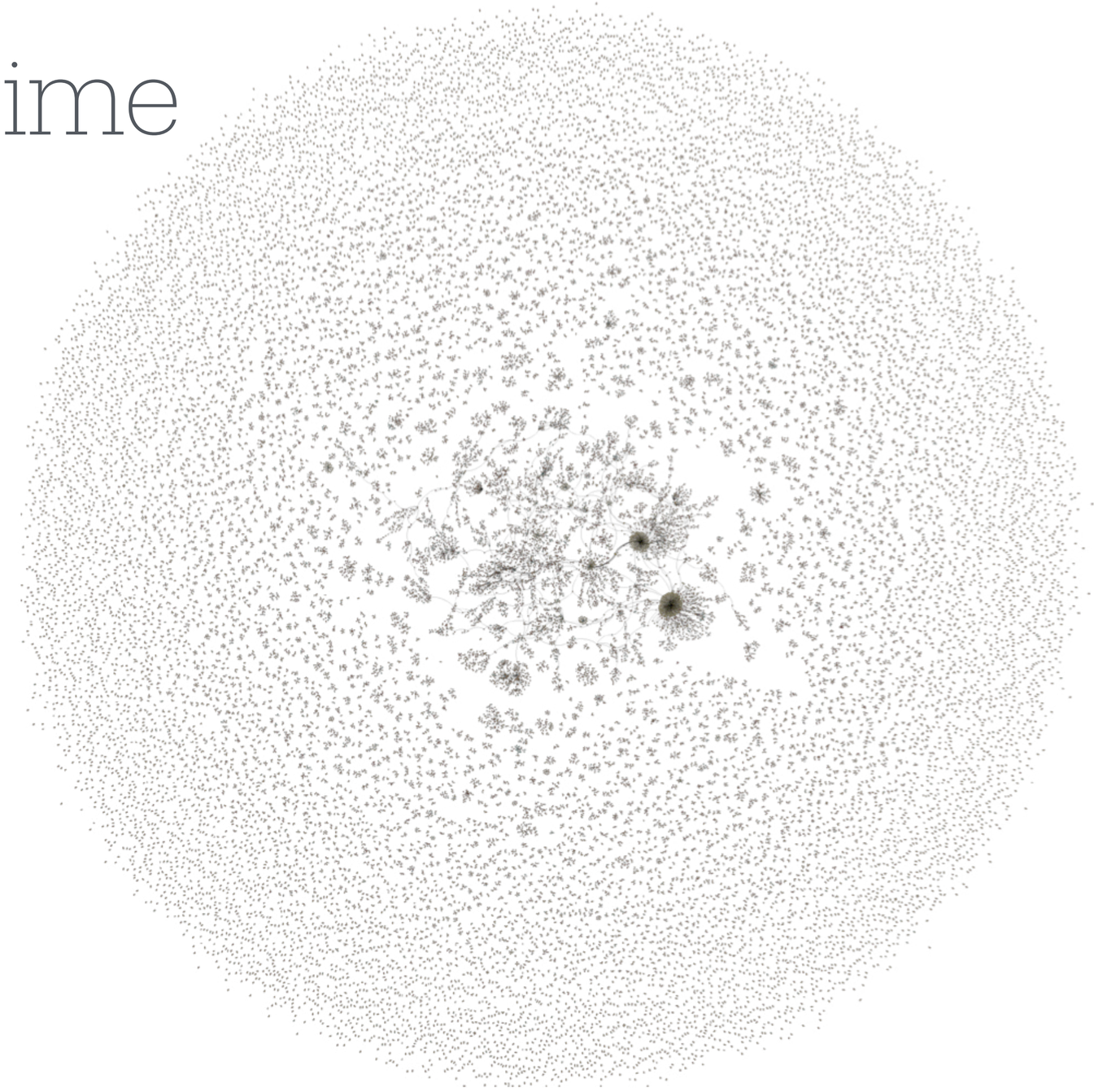
Interconnected e.g. the hairball

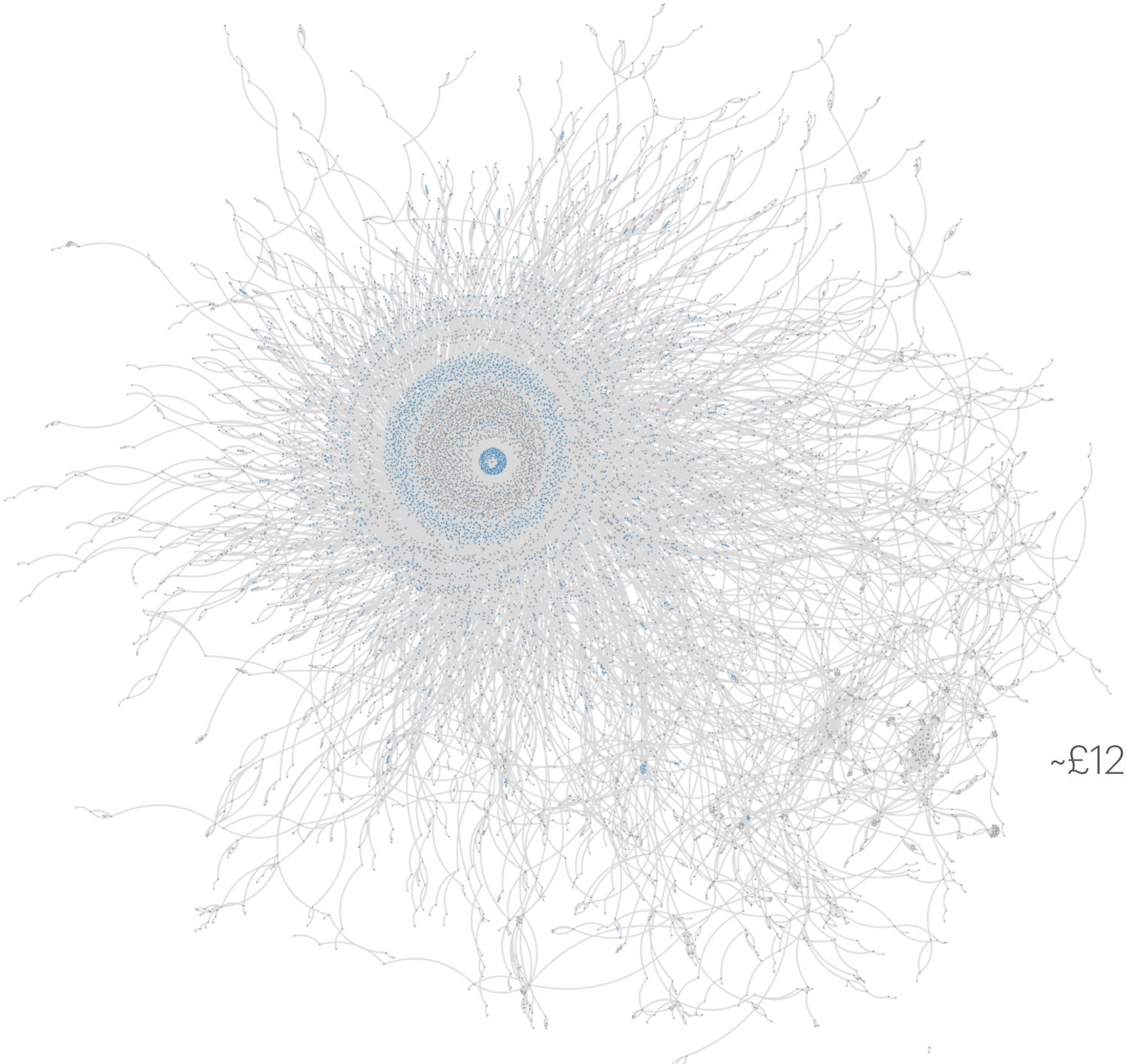


Economy Sized Crime

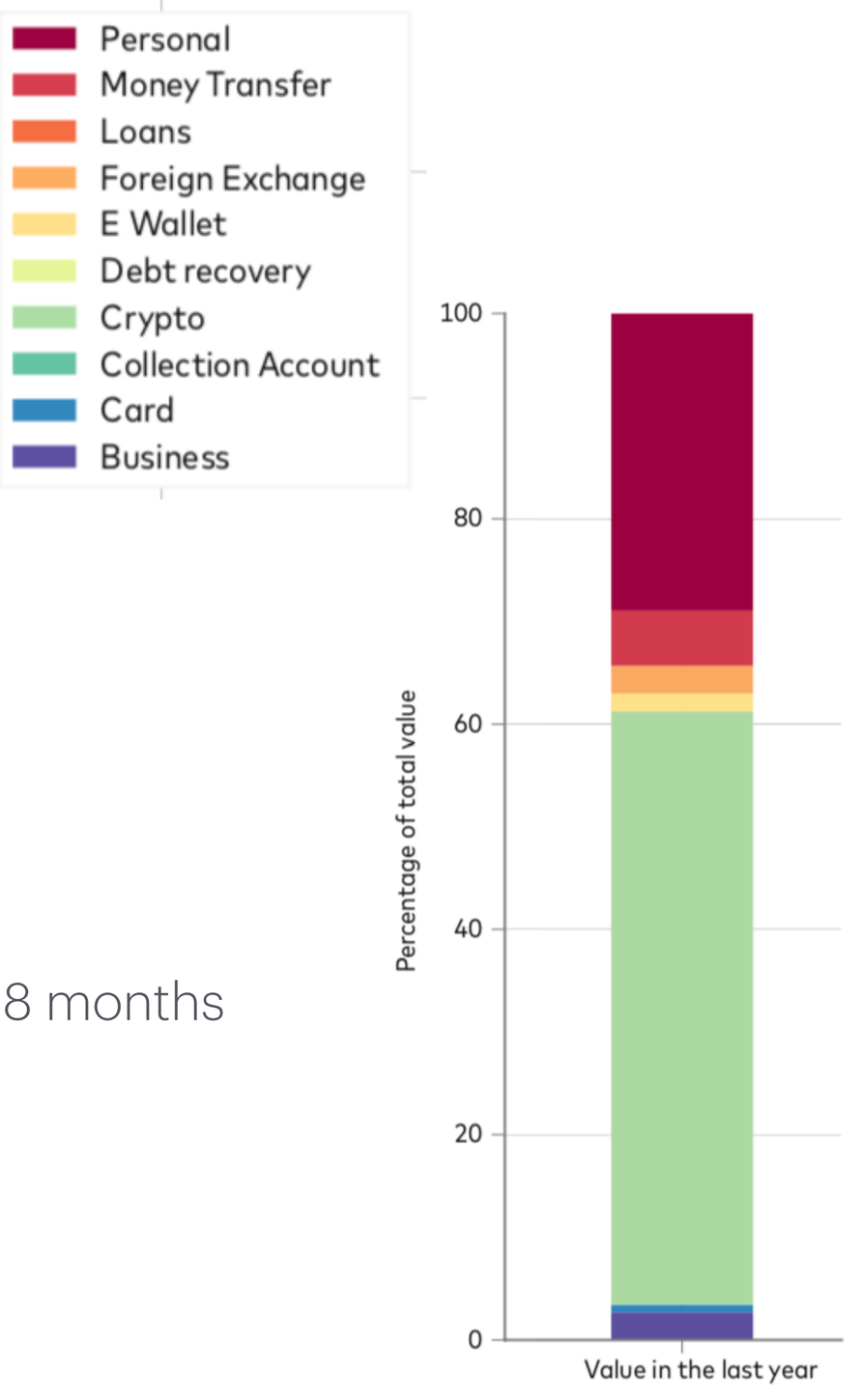
- How can you make sense of this?
- Motifs!

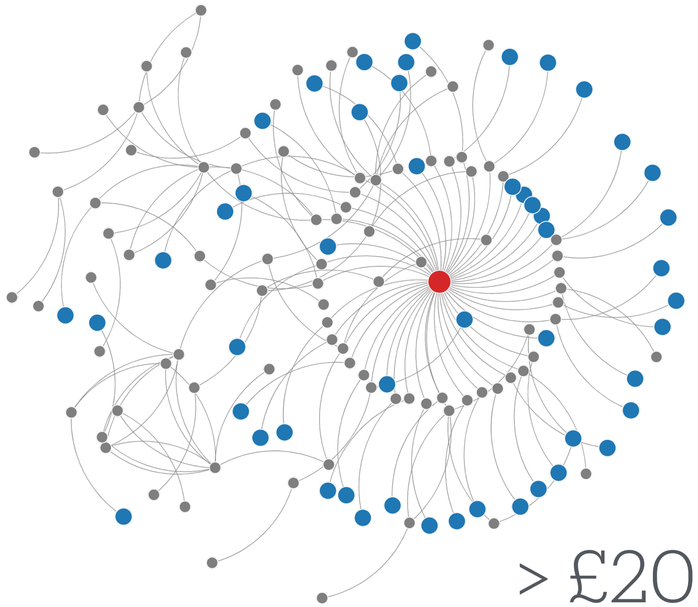




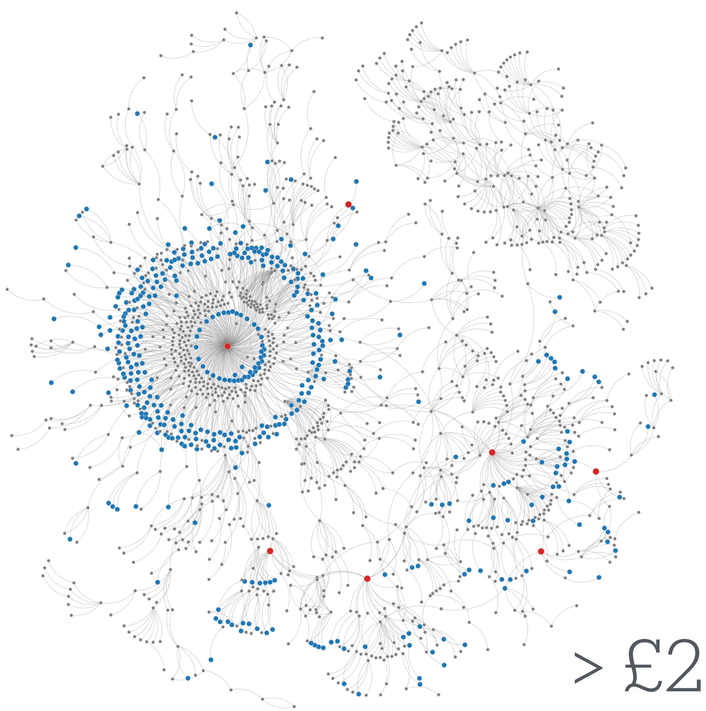


~£12m in 18 months

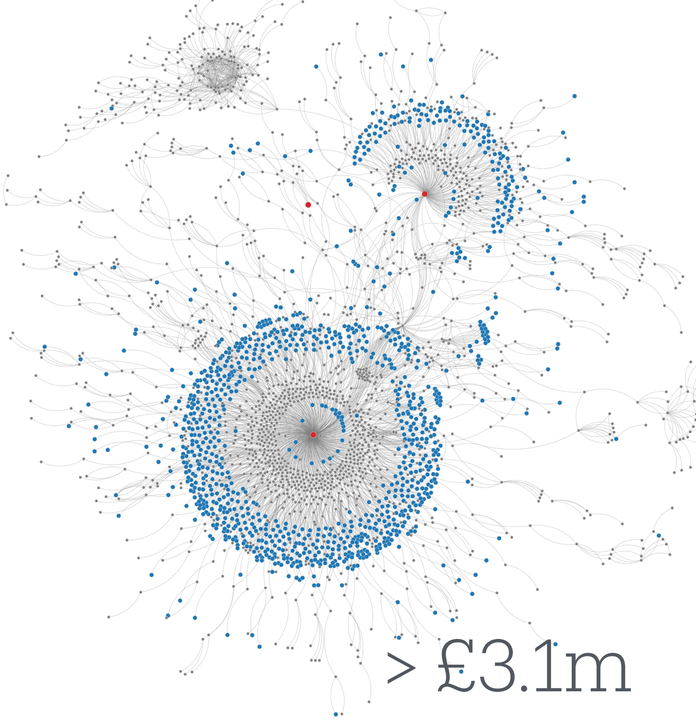




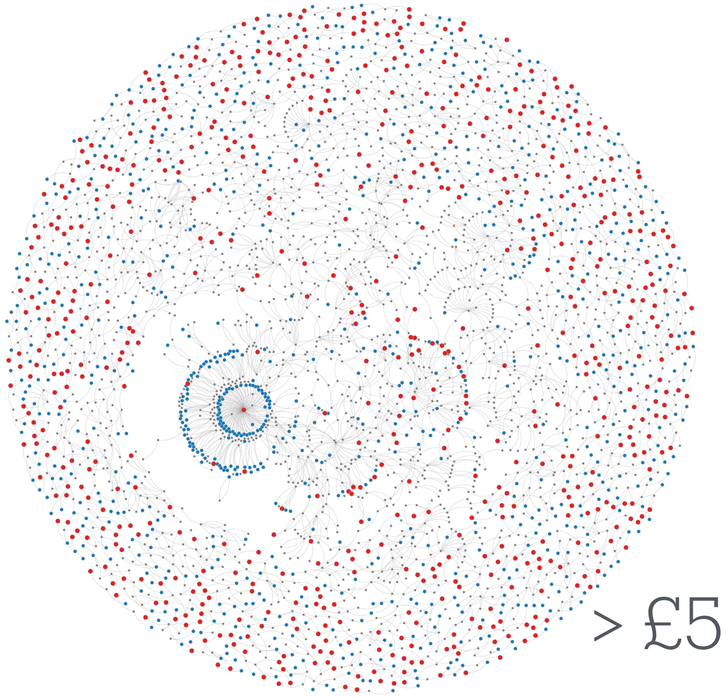
> £200k



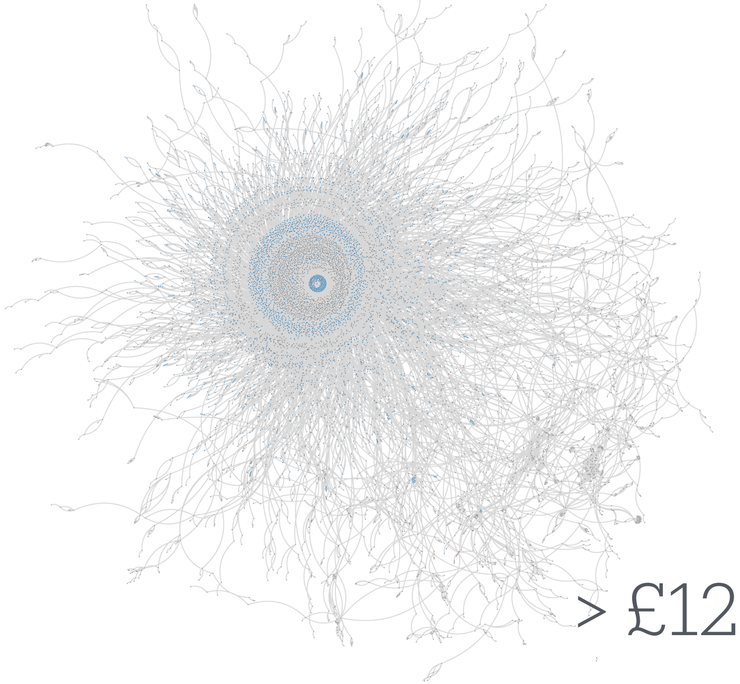
> £2m



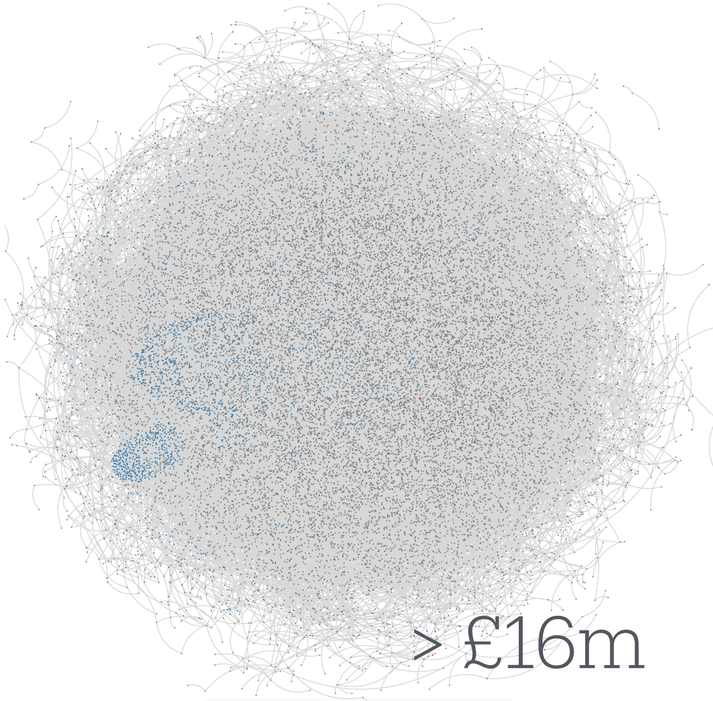
> £3.1m



> £5m



> £12m



> £16m

Thank you!

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