

A Generic And Flexible Analysis Framework to Categorise Social Support Networks

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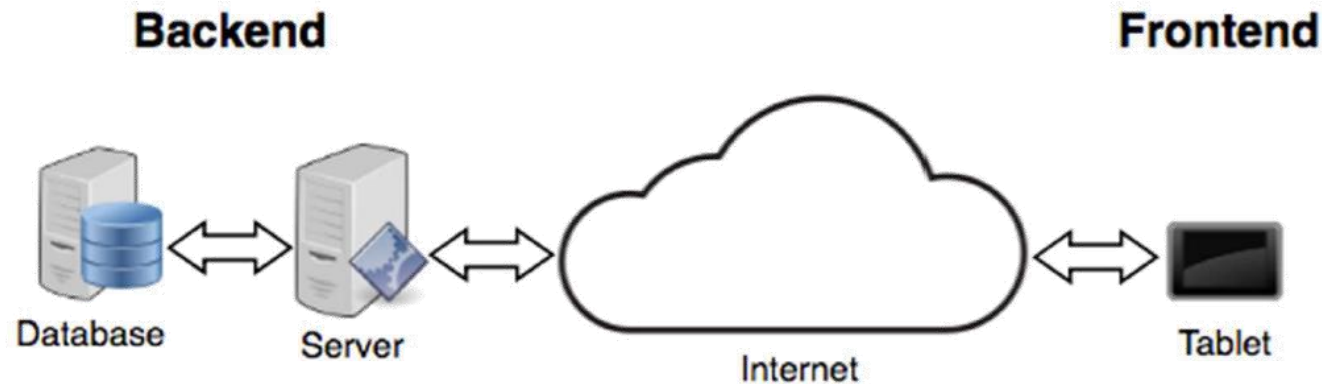
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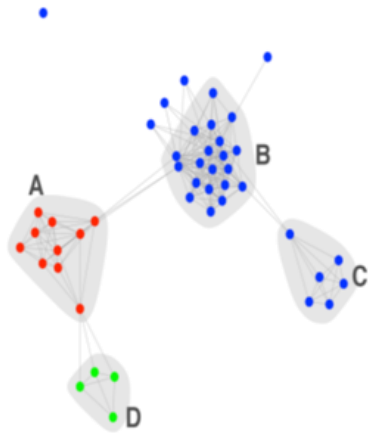
The Egonet Project

- ▶ Promoting social support network mapping with severe mentally ill patients in order to improve care coordination, patient involvement, and personalised care
- ▶ Development of a computerized tool & analysis tool



The Egonet Project

- ▶ Feedback and analysis help personalize care given to the patient
- ▶ Structural & Composition metrics



A	Housing and Social Support	OK
B	Medical Support	ⓘ Clustered around one hospital
C	Relational Support	ⓘ Professional-dependent
D	Vocational Support	ⓘ Lack of resources

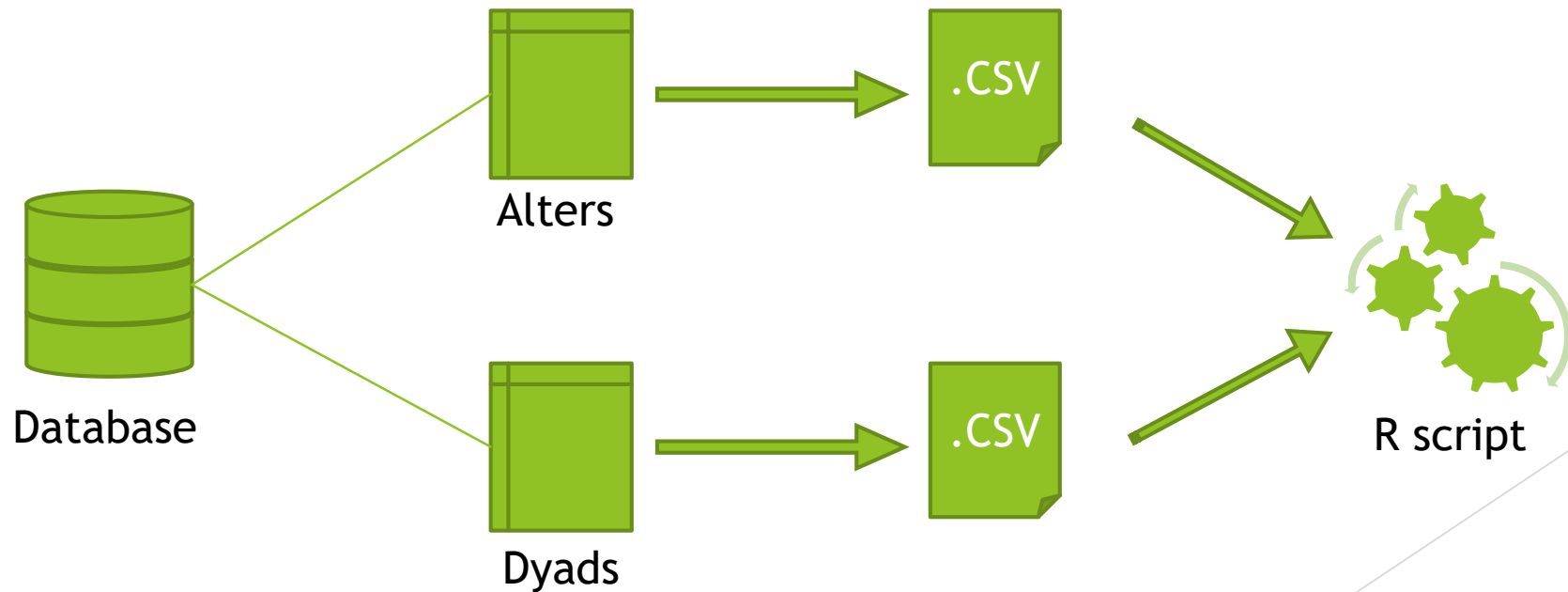
The need for a responsive tool

The tool needs to give quick and accurate feedback

- ▶ An efficient way of storing / retrieving data
- ▶ A quick way of computing required metrics on the graphs stored

The relational model

- ▶ The traditional approach to storing data is the relational model
- ▶ Relational tables can be exported in .CSV format, which is convenient



The relational model

- ▶ The downside? *Reconstruction*

Alters

<u>ID</u>	Name	Address	...
1	Alice
2	Bob
3	Charlie
4	Dave
5	Eve

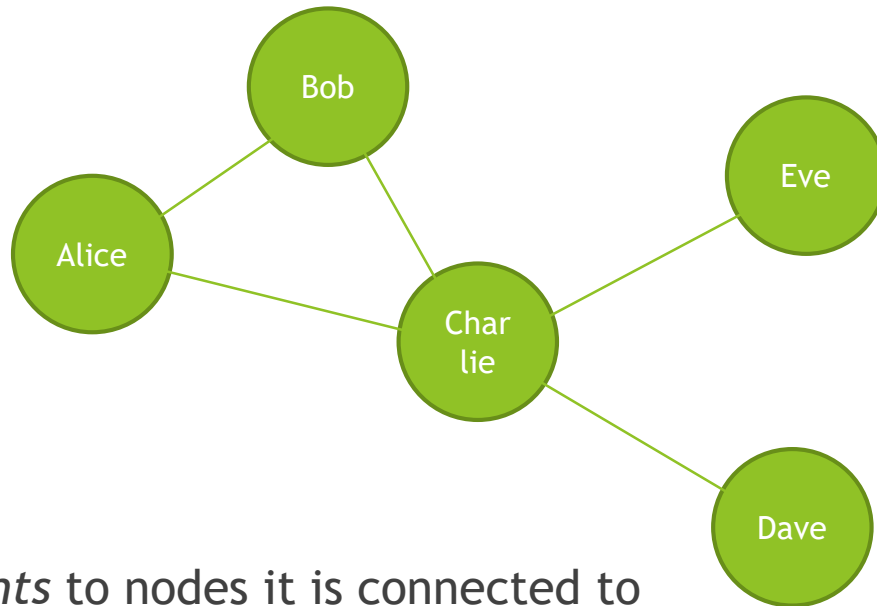
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<u>From</u>	<u>To</u>
1	2
1	3
2	3
3	4
3	5

- ▶ When joining two tables A and B, up to $|A| \times |B|$ entries are computed

The Graph Data Model

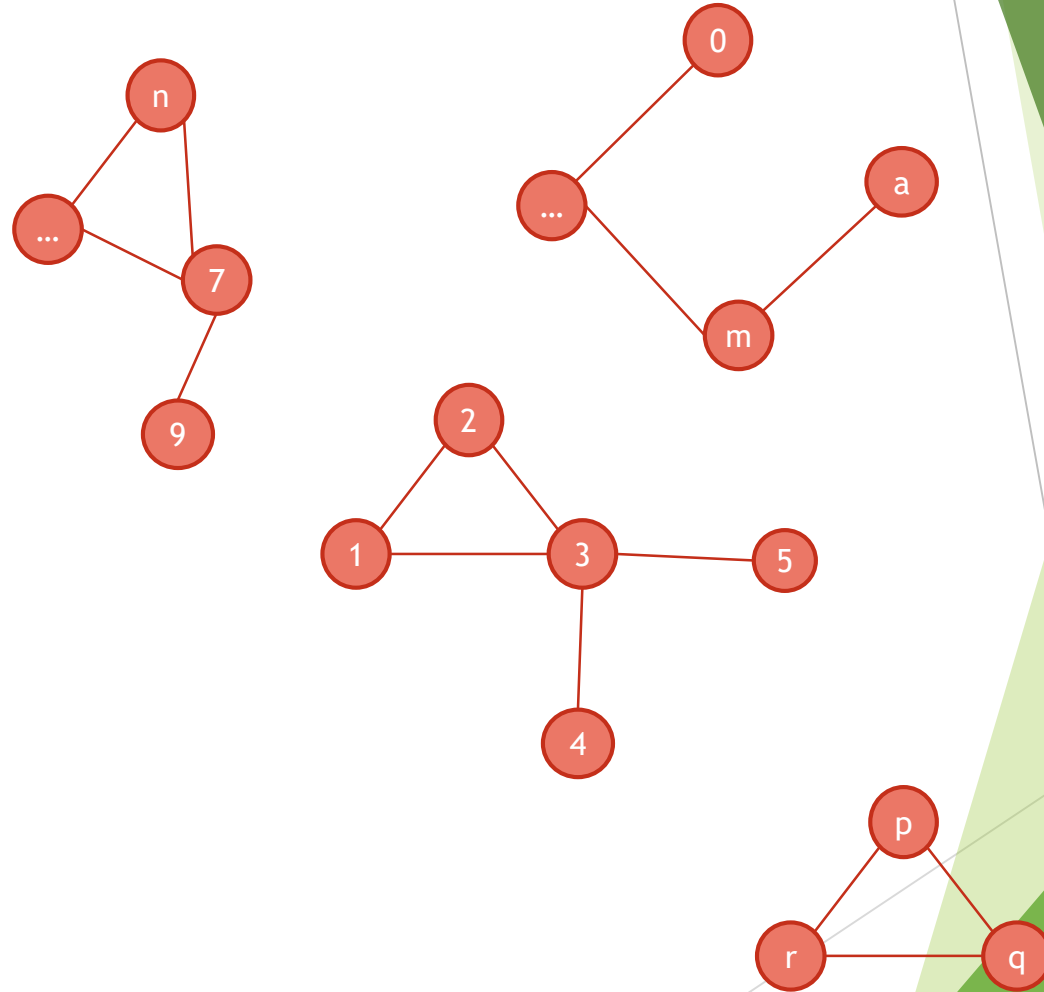
- ▶ The Graph Data Model represents data as a graph in the *mathematical* sense
 - ▶ Data consists of *nodes* connected by *edges*



- ▶ Every node *points* to nodes it is connected to
- ▶ Graph-oriented data stores come with their querying language

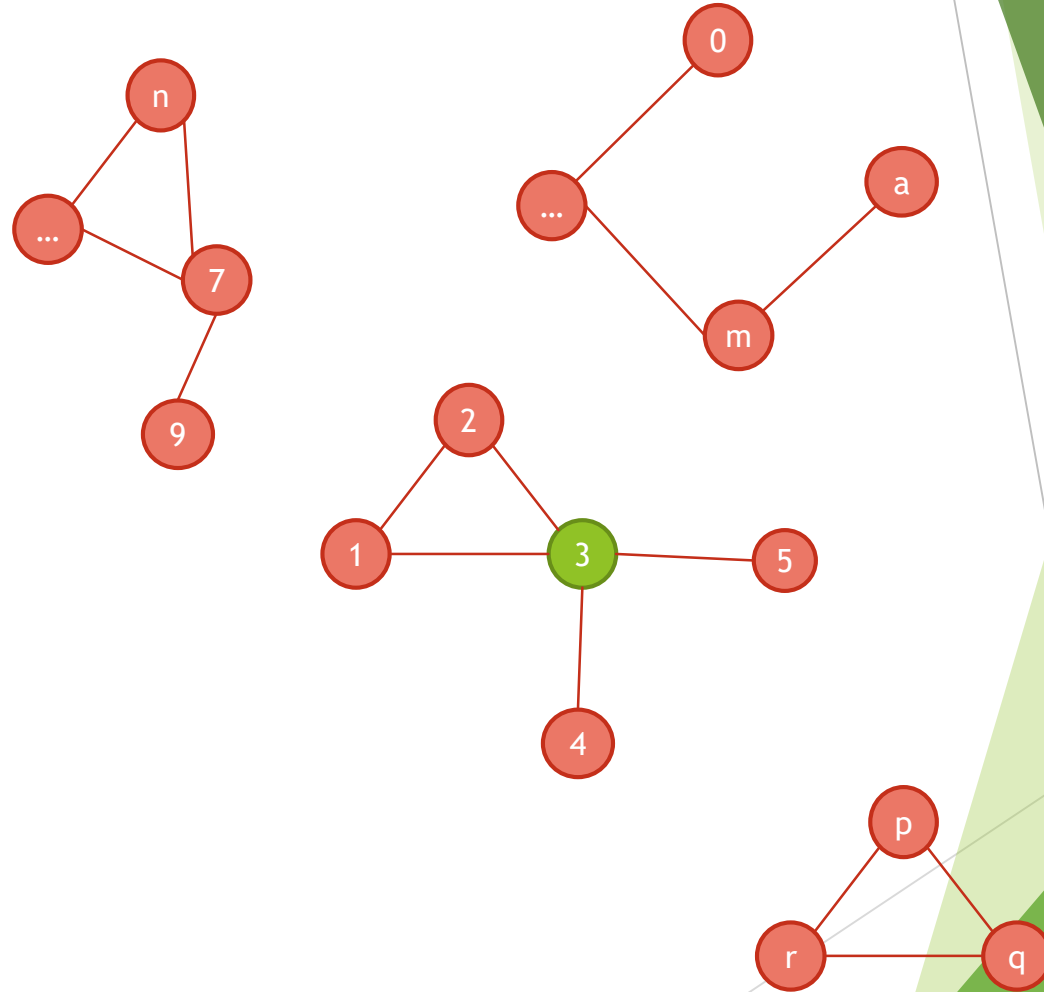
Querying graph data

- ▶ At the center of each network is a patient



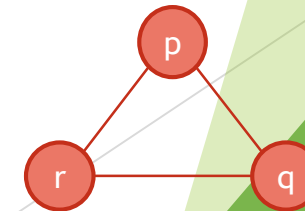
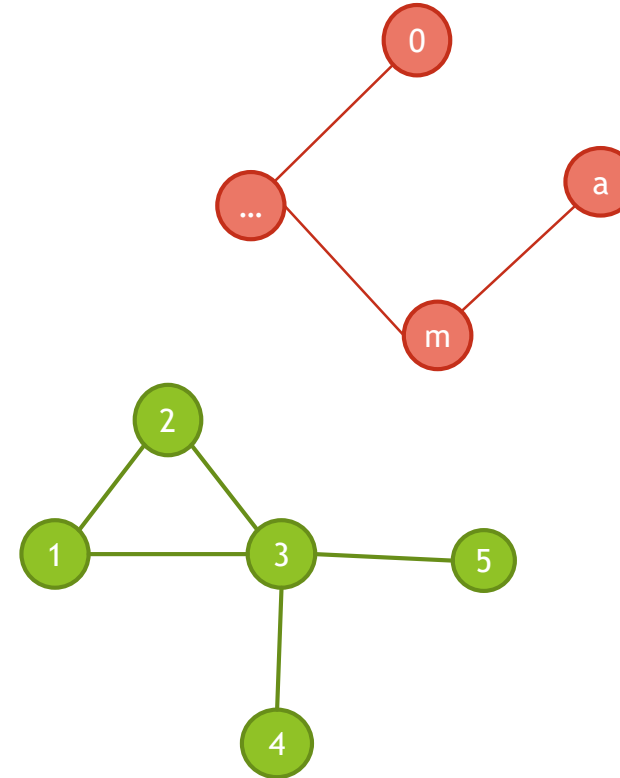
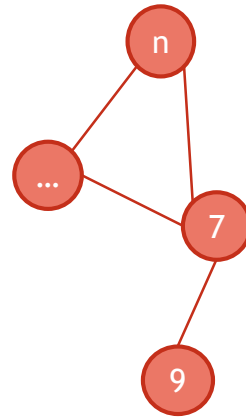
Querying graph data

- ▶ At the center of each network is a patient
- ▶ Once that patient has been found...



Querying graph data

- ▶ At the center of each network is a patient
- ▶ Once that patient has been found...
- ▶ ... His/Her relatives can be found by following the ties



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Analysis & Performance

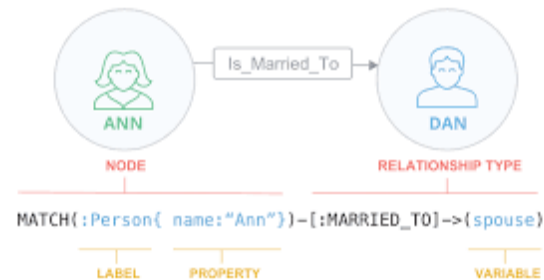
- ▶ There are two limiting factors to the speed at which feedback can be provided :
 - ▶ Computing time of the analyses required
 - ▶ No graph reconstruction + efficient algorithms
 - ▶ Size of data to transfer from the database to the server
 - ▶ Extract only the results, not the data

Analysis & Performance

- ▶ We have implemented our tool with Neo4j, a graph-based database engine



- ▶ Neo4j has a language dedicated to querying its data store



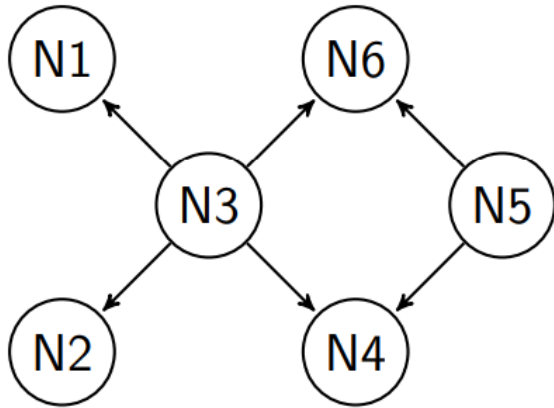
Source : neo4j.com

- ▶ It can be used to compute metrics *inside the database* rather than in an external script

Taking advantage of the model's structure



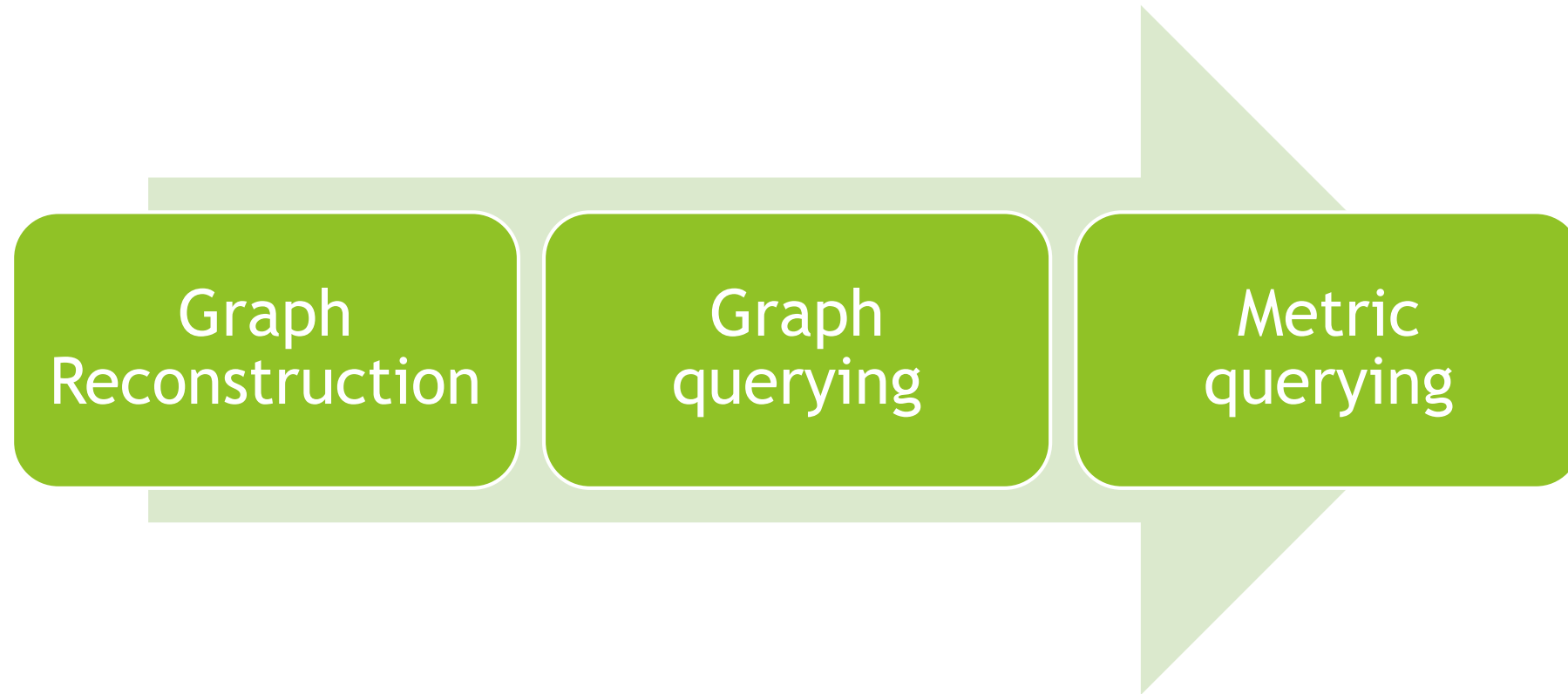
An example metric : Betweenness centrality



name	centrality
"N3"	7.5
"N4"	1.5
"N6"	1.5
"N5"	0.5
"N1"	0.0
"N2"	0.0

```
CALL algo.betweenness.stream("Request  
graph from the database")  
YIELD nodeID, centrality  
[...]
```

To summarize...

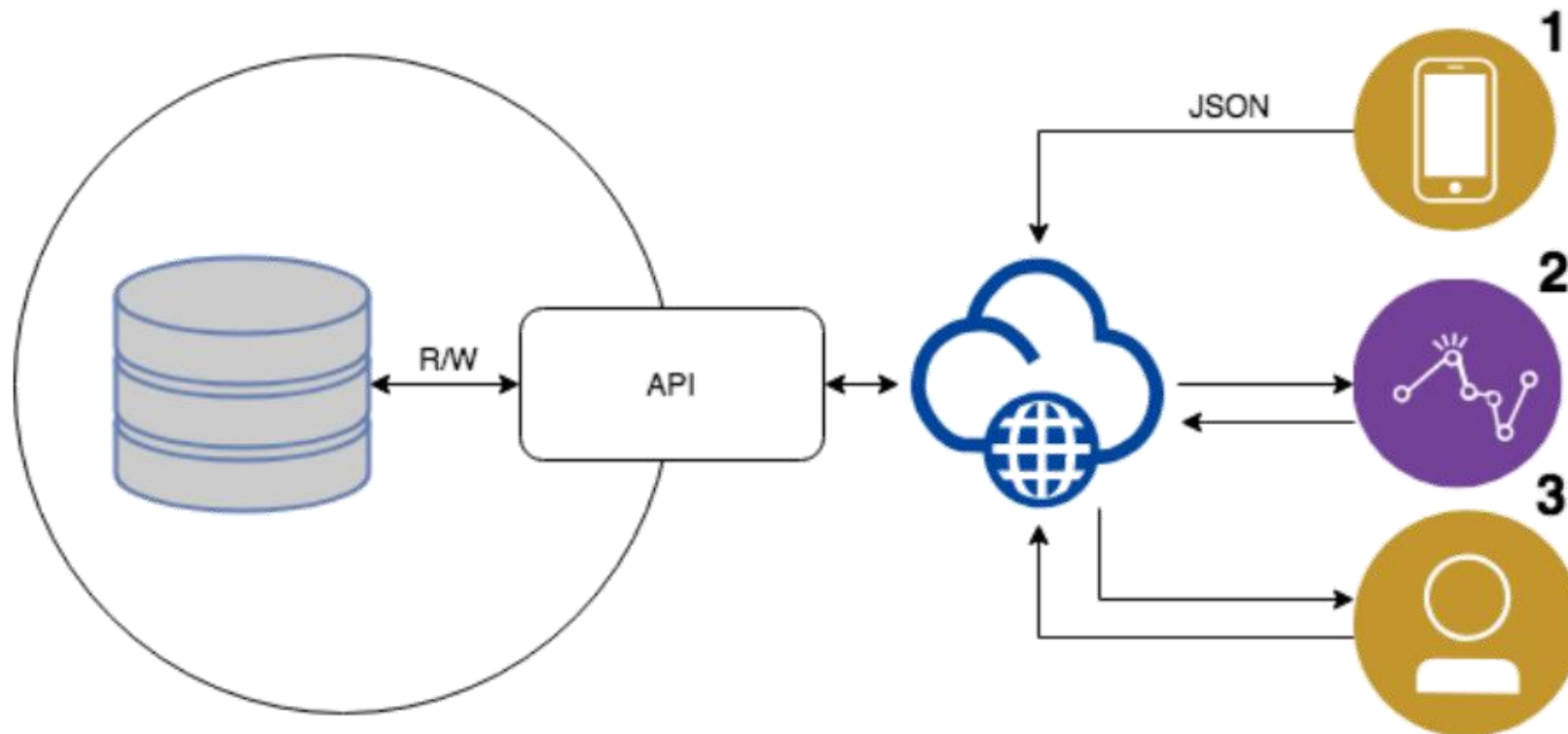


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Deployment



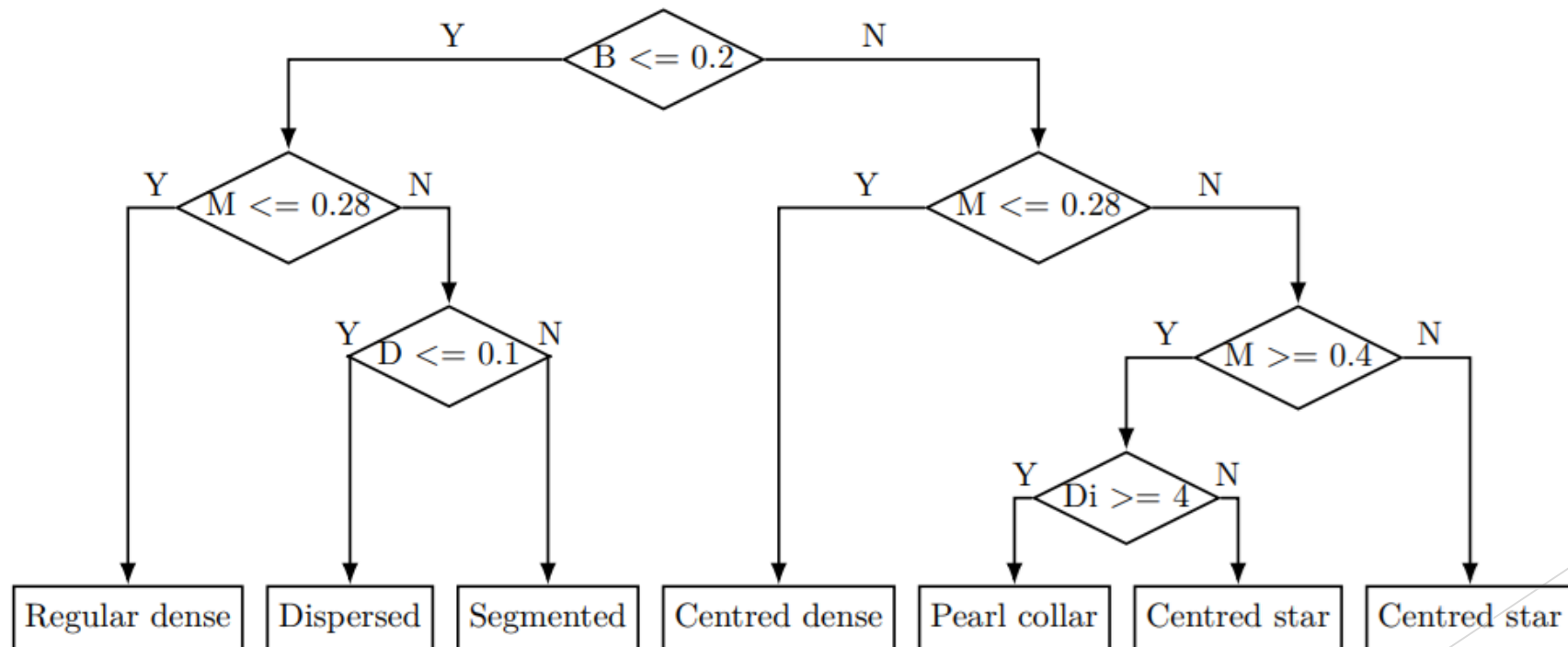
Gaétan GURU, ECAM

Deployment

- ▶ POST /api/input
- ▶ GET /api/network/
- ▶ GET /api/patients/
- ▶ GET /api/metrics/all
- ▶ GET /api/metrics/<...>
- ▶ ...

Classification

- ▶ The tool has been tested with a classification tool based on C.Bidart et. Al.



Classification

- ▶ R script with data reconstruction to validate results
- ▶ Python API to classify the networks with database-computed indicators
- ▶ Speed difference is undeniable
 - ▶ However, more specific test conditions are required to estimate the real speedup factor

Conclusion

- ▶ A fast, responsive tool for different purposes
- ▶ Uses the graph data model
- ▶ Allows traditional graph reconstruction
- ▶ Modular tool, with easy addition of new routes



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Thank you for your attention

Any questions?

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