

# Trust models emerging from online social interactions

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## Objectives

The evolution of online social networks has created new opportunities to validate existing trust models in literature and/or evaluate emerging new models. In this context we set to achieve the following:

- Define online social networks where trust emerges naturally
- Propose an universally applicable architecture and implementation for data collection from online social networks of interest.
- Collect large data-sets of data representing interactions and trust
- Validate existing trust models and/or empirically search for new patterns of trust emerging.

## Introduction

Since the early days of the web, there have been efforts to Formalise Trust as Computational Concept [1].

*As people interact on the web, generate content and exchange information, the problem of who to trust and the trustworthiness of information is a critical issue. [2]*

There is a growing need for a robust and scalable interpersonal trust model and metrics with universal applicability.

Trust is a fuzzy concept, and the problem is bound to be non-trivial. Often models in literature [3] are seen applied to single datasets or OSNs.

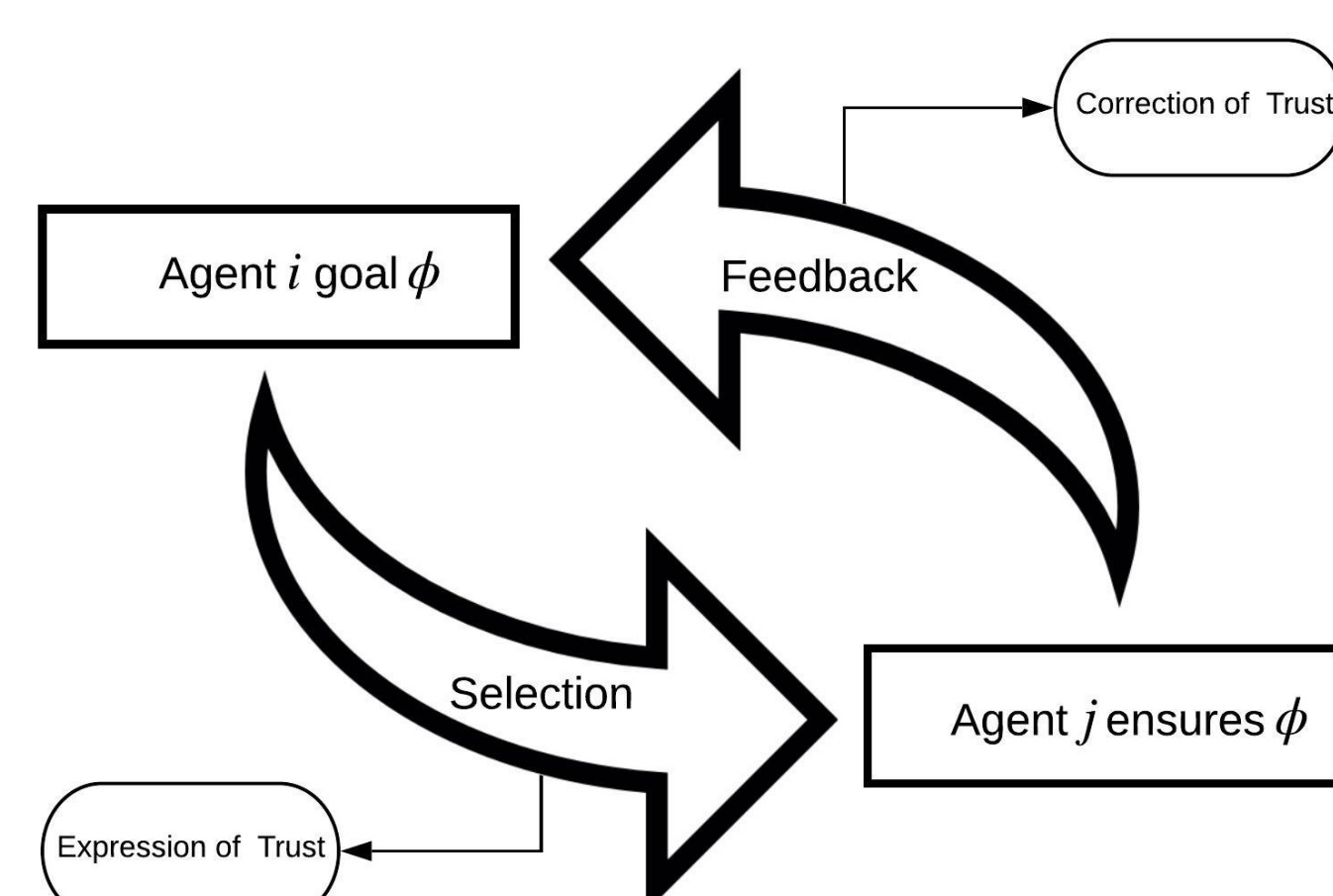


Figure 1: Basic interaction flow

## Datasets

The following datasets were build and analysed to complete the research:

- Childcare job reviews from childcare.co.uk
- Babysitter reviews and profiles from babysits.uk
- Homeowner jobs and reviews from checkatrade.com
- Home rental reviews from AirBNB

The trust datasets collected from OSNNs (Online Social Network of Needs) are categorised into three levels of trust:

- 1 **High:** 'I trust you with the care of my loved ones.'
- 2 **Medium:** 'I trust you with the care of my safe place'
- 3 **Low:** 'I trust you with access and use of my safe place'

## Trust as computational concept

The social concept of trust and its relation to forgiveness and regret are best represented by the trust continuum introduced by Marsh in [4]. The following formulae is of particular interest and used to model Situational Trust [1]:

$$T_x(y, \alpha) = U_x(\alpha) \times I_x(\alpha) \times \widehat{T_x(y)} \quad (1)$$

where:

$T_x(y, \alpha)$  is Situational Trust of  $x$  in  $y$  for situation  $\alpha$

$U_x(\alpha)$  is the Utility of  $\alpha$  to  $x$

$I_x(\alpha)$  is the Importance of  $\alpha$  to  $x$

and  $\widehat{T_x(y)}$  is the Generic Trust of  $x$  in  $y$  based on previous trust-based knowledge

## Online Social Network of Needs

OSNNs are the group of online systems where agents interactions can be reduced to the steps in figure 1

## A Modern Web Scraping Architecture

We defined a modern architecture for data scraping with the following characteristics and build a system based on it.

- **Queryable:** built upon existing technologies for querying web
- **Scalable:** architecturally able to scale horizontally to harness OSNs the size of Facebook.
- **Distributed:** Web Crawling architectures[5] are often described as a dual process of discovery (breadth) and data extraction (depth) ...
- **Open Source and Extendable:** our intention is to fill a gap that has often been observed when approaching the issue of collecting data from the web

## Results

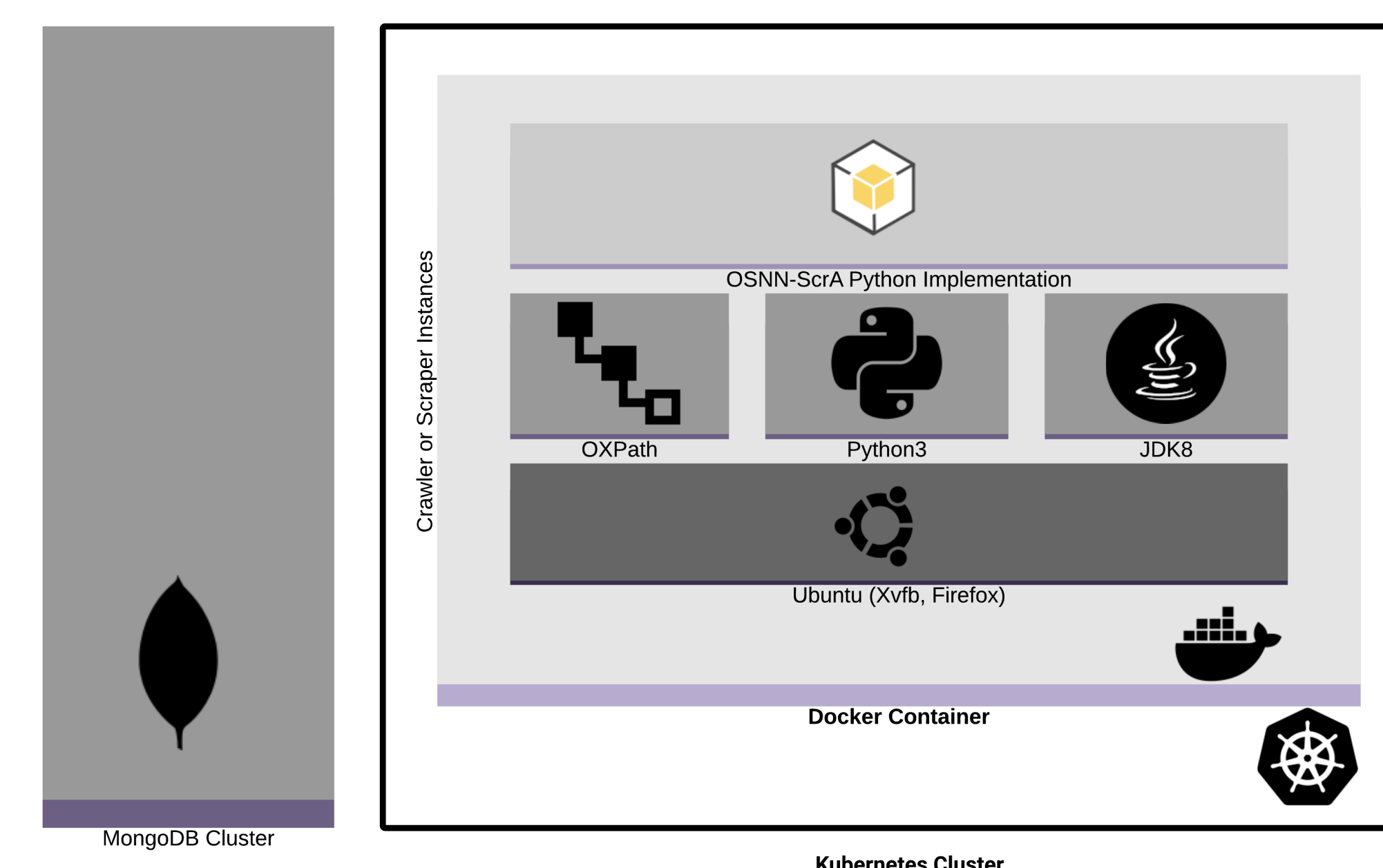


Figure 2: Technology Stack

A highly scalable system represented in fig 2 used to collect semi-structured data from the web using queries written in JSON or XPath augmented constructs.

## Conclusion

We looked at trust as a computational concept and more specifically at trust models emerging from data. As such we defined OSNNs as a category of Online Social Networks where needs and trust are exchanged. We build a system for collecting large and holistic datasets on selected OSNNs and set to analyse the data and compare with existing models

## Additional Information

Web querability open source packages

- Python Data Retrieval (JSON Construct): <https://pypi.org/project/dr-web-engine/>
- Java OXPath Data Retrieval (XPath Construct): <https://github.com/oxpath/oxpath>

## References

- [1] Stephen Paul Marsh. Formalising trust as a computational concept. Technical report, University of Stirling, 1994.
- [2] Jennifer Golbeck. *Introduction to Computing with Social Trust*. Springer, London, UK, 2009.
- [3] Raph Levien and Alexander Aiken. Attack-Resistant Trust Metrics for Public Key Certification. In *Proceedings of the 7th Conference on USENIX Security Symposium - Volume 7, SSYM'98*, page 18, USA, 1998. USENIX Association.
- [4] Stephen Marsh and Pamela Briggs. Examining Trust, Forgiveness and Regret as Computational Concepts. In *Computing with Social Trust, Human-Computer Interaction Series*, page 9. Empty, 2009.
- [5] Christopher Olston, Marc Najork, et al. Web crawling. *Foundations and Trends® in Information Retrieval*, 4(3):175–246, 2010.
- [6] Olaf Hartig and Jorge Pérez. Semantics and complexity of graphql. In *Proceedings of the 2018 World Wide Web Conference*, pages 1155–1164, 2018.
- [7] Santa Agreste, Pasquale De Meo, Emilio Ferrara, Sebastiano Piccolo, and Alessandro Provetti. Trust networks: Topology, dynamics, and measurements.