The Age of Social Machines

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I have a dream for the Web [in which computers] become capable of analyzing all the data on the Web – the content, links, and transactions between people and computers. ...the day-to-day mechanisms of trade, bureaucracy and our daily lives will be handled by machines talking to machines.

Tim Berners-Lee (1999) Weaving the Web
Did it work?

“Semaphobia”: fear of average Web developers to use Semantic Web technologies. – Markus Lanthaler

The Semantic Web is dead! Long live…
Real life is and must be full of all kinds of social constraint – the very processes from which society arises. Computers can help if we use them to create abstract social machines on the Web: processes in which the people do the creative work and the machine does the administration. The stage is set for an evolutionary growth of new social engines.
But more than that!!
Pushing the boundaries

Social intensiveness of solution

Conventional computation

Social but centralised systems

Social computation decentralised through society
EXAMPLES OF SOCIAL MACHINES
Russia will not send the aircraft carrier ‘Admiral Kuznetsov’ to the coast of Syria

Electricity returns to Kobane after years of outage. Repairs have been completed on the countryside.
THE SOCIAM PROJECT
The SOCIAM Project

Theme 6 Social Machine Observatory: observe, monitor and classify social machines

- Theme 1 Social Computation
- Theme 2 Curated Data and Social Computation
- Theme 3 Privacy, Trust and Accountability
- Theme 4 Interaction
- Theme 5 Social Machine Implementations
Web Macroscope
Web Macroscope

External APIs
- Twitter
- Wikipedia
- Instagram
- Google Trends
- Yahoo Trends

Pre-processing Stage:
1. Enrich Streams
2. Unify feeds into WO JSON Format

Streaming Stage:
1. Post incoming stream to RabbitMQ exchange (each source has its own exchange)

HTTP Streaming Stage:
1. Send Stream to Web Observatory Server

Hadoop Storage Stage:
1. Apache Flume for each stream

Daily Storage Stage:
1. MapReduce Daily Results

HDFS

MongoDB
Observation – analysis: Twitter
Observation – analysis: Zooniverse

Most active users in red
Policing: e.g. the Horsemeat Scandal

How horsemeat entered beef products via Comigel, France

Source: French investigators, FSA, news agencies
Sociality – Narratives

• Stories in social machines
  • [individual/local level]
  • [group level]
  • [wider community/global level]

• Archetypes
Trust: e.g. Healthcare Research

Data controller 1 (e.g. education department)

Data controller 2 (e.g. NHS)

Data controller opts into the study and sends personal data for indexing
Data controllers send personal identifying information and a random index number to the TTP. The CHI number can be used but is not essential.

Linkage TTP:
- links identifiers
- destroys personal information
- sends key that allows random index numbers to be joined

TTP never receives health or education data, only CHI number or names and addresses

Linkage key
TTP provides the index key to the linker

Analytic platform never receives personal data (CHI number, names, etc.), only indexed study data

Data store
Data are archived for defined periods

Research dataset
Research dataset created and provided on analytic platform

Research access
Researcher accesses de-identified data remotely under controlled conditions. Statistics tools are provided

Disclosure control
eDRIS research coordinator checks results before release back to researcher
Privacy vs Provenance – Safe Havens

- How can we test/reproduce the results?
misaligned incentives

people want to
- text, chat, call, post
- privately share photos,
- keep things forever
- joke, troll, experiment,
- look up sensitive info,
- buy embarrassing stuff

facebook wants to
- understand everything you like and dislike, and
- keep track of what you do
- infer what you might buy
- predict what you might do
Decentralised Equivalents (of popular social machines)

Needs-driven
Privacy & Persistence
Desire for Control
Self-hosting

Radical Departures (from popular social machines)

Technology-driven
Cryptography for disintermediation & anonymity
identity consolidation and forced verified ID among social machines and places platforms as central information controllers

platform-centralised web

precludes identity partitioning
At the centre of each person's ecosystem is their social personal data store.

re-de-centralised web

https://github.com/solid/
INTERACTION MODELS

Social Machine
Premise

- There is a model of interaction behind any social machine.
  - Who can communicate what, when, and to whom.
  - “Social DNA”
Goal

- *Can we build a social machine starting from its interaction model?*
- Lightweight Social Calculus (LSC)
- Protocols that are first-class objects:
  - Declarative, transparent, executable
  - Heterogeneous
  - Editable, discoverable, shareable, composable
  - Distributed, platform-independent
  - Verifiable
Decentralised protocols of social interaction
LSC Example

Message in: content <= sender role

Role: description and agent id

```
a(invitee(C), A) ::
  dinner(Time,Place) <= a(confirmer, C)
  then
  confirm(yes) => a(confirmer, C) <=- ok(Time,Place)
  or
  confirm(no) => a(confirmer, C)
  then
  a(invitee(C), A).
```

Sequencing

Choice

Message out: content => receiver role

Resume invitee role

Implication: if RHS can be satisfied, substitute and execute LHS
Current Directions with LSC

BOOTSTRAPING SOCIAL MACHINES
Social Machines creating Social Machines

Development Social Machine

Target Social Machine

Coordination Protocols

Forum Platform

deploy

monitor
Feature-Oriented Software Development
Interaction

Coordination
Protocols

Expansion

Prioritisation

Development

Social Machine

Deploy

Expand

Select

Implement

Observe

interact

Coordination

Protocols

Development

Artefact

Software

Artefact

Development Machine

Target

Social Machine

Deploy
Dynamic Protocols

- **Adapt** to changing situations / evolving Social Machines – **monitor** state:
  - Population shifts, participant involvement, etc.
  - Utility / interest shifts.

- **Combine**:
  - Computational Intelligence
  - Observation / Big Data Analytics

- **Prioritise** different aspects:
  - Cost, Utility, Speed.
  - Set goals and select best strategy.
Simulation

Graphs showing various performance metrics such as CostPerNode, Utility, Cost, and Nodes, with sub-metrics UtilityAvgCost, UtilityIncreaseRate10.0, UtilityPerNode, and NodesPerTime, each with different process types like Agile, Dynamic, Escalation, and Traditional.
Current Directions with LSC

SHADOW INSTITUTIONS
Lightweight Social Machines

Twitter
Stream of messages on existing social network

Master
Looks for messages which initiate interactions

Runners
Look for messages belonging to particular interactions

Agents
Formal agents running interaction model. Includes purely computational agents, and shadow agents representing humans

Interaction completed

Str
Steam of messages on existing social network

Looks for messages which initiate interactions

Runners
Look for messages belonging to particular interactions

Agents
Formal agents running interaction model. Includes purely computational agents, and shadow agents representing humans

Other people sign up, vote, etc.

Direct message from @dave to @mealbot is interpreted as starting a meal organising protocol, for tonight

Create a unique id for the interaction, and start a bot to listen for tweets relating to that interaction

Create a shadow agent for @dave and add it as a subscriber in the interaction

Fill in a template tweet that can be broadcast to tell people about the interaction using a special hashtag, and direct message it to @dave

@dave retweets, for anyone following #sociam-dinner

@jem’s tweet is picked up by the special hashtag, and interpreted as subscribing to the meal

@pat’s tweet is picked up by the special hashtag, and interpreted as voting for a time and place, which are copied into the formal process

@dave’s direct message tells the meal coordinator that it’s time to make a decision on time and place

The coordinator decides on the best time and place, and stores it

The stored term matches a template tweet, which is directed messaged to @dave

@dave then broadcasts the tweet publicly to tell the participants where to go

Notes
Master bot is listening to the @mealbot twitter account
The Age of Social Machines

Nigel Shadbolt et al