



# The Web We Mix: Benevolent AIs for a Resilient Web

Fabien Gandon

► **To cite this version:**

Fabien Gandon. The Web We Mix: Benevolent AIs for a Resilient Web. WebSci '19, Jun 2019, Boston, United States. hal-02148911

**HAL Id: hal-02148911**

**<https://hal.inria.fr/hal-02148911>**

Submitted on 5 Jun 2019

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# The Web We Mix: Benevolent AIs for a Resilient Web

Fabien Gandon

Fabien.Gandon@inria.fr

Inria, Université Côte d'Azur, CNRS, I3S, France

Sophia Antipolis, France

## ABSTRACT

The Web was initially perceived and used as a globally distributed hypertext space for humans. But from its inception, the Web has always been more: its hypermedia architecture is in fact linking programs world-wide through remote procedure calls [12]. In parallel to the social expansion of the Web we witnessed in the 90s, a more hidden but as important extension started very early to make it more and more machine friendly [4] supporting the publication and consumption by software agents of worldwide linked data published on a semantic Web [13]. The Web managed to become at the same time the largest social application on earth and the default and most adopted architecture and framework for internet applications. It is now a space where more than three billion users interact with billions of pages and numerous software. These evolution trends of the Web were joined by many others (mobile Web, Web of things, etc.)<sup>1</sup> and as a result the Web became a collaborative space for natural and artificial intelligence distributed and situated everywhere. Nowadays when a link is followed – when a call is made on the Web – the answer can come from an arbitrary source of knowledge or form of intelligence, be it natural or artificial. The Web we weaved effectively is a universal social and programming space linking data, programs, users,... everything in a unified and standardized architecture, for better and for worse, so Web science needs to speak now.

This Web we mix should pursue a synergistic connection of intelligent forms for the good of the Web and society. If "The Web We Want [is] a public good[,] a basic right, and (...) a catalyst for social justice and human rights."<sup>2</sup> ensuring, freedom of expression, access, neutrality and privacy to everyone, diversity, decentralization and openness, then we need AI on the Web to be aiming for that by design.

In this keynote I will mention a number of works from the research team Wimmics<sup>3</sup> (pronounced "we mix") that has been studying the challenges in bridging social semantics and formal semantics on the Web [15]. These contributions address some of the challenges in connecting AIs to the Web.

The Web is already populated by many bots and a number of classical tasks we perform on the Web can benefit from AI e.g. to ease search [7], support exploration [21, 24] and browsing, optimize

crawling [19], integrate data sources [23], etc. There is also a special mutual benefit in the relation between AI and the data(sets) found on the Web. AI can of course help us extract, curate, enrich, share and maintain knowledge graphs [26]. Inversely AI can be fed by data from the Web to learn and reason e.g. to provide external knowledge to improve robots interactions [6] and behaviors [27] or to improve data analysis and predictions in very different domains such as smart cities [20] or health-care [18].

With the advent of the Web, we individually have to face humanity in all its scale and diversity and AI can help us, users, scale to the Web scale. Goal-driven Web bots can actively participate to the online activity and, for instance, prevent bullying and harassment [1]. The coupling of AI and the Web has the potential to take our interactions to the next level of intelligence [16] and to take into account complex aspects of them such as the role of emotions in online debates [3]. An important goal for Web Science therefore is the production of AIs benevolent-by-design for the good of the Web and society. For instance, educational AI could help educate Web users in many domains [25] including the many dimensions of Web itself (technical, social, economical, etc.).

The more we study intelligence, the more diversified it becomes: we identify ever more forms of intelligence and smart behaviours. The Web can both benefit and contribute to this. First the Web is a great tool to study this diversity of intelligence and the multidisciplinary nature of Web Science [11] puts it in an ideal position to explore and expand the forms of intelligence. Inversely, the Web requires a diversity of forms of intelligence to address the many types of diversity we find online (content, users, contexts, tasks, usages, resources, etc.). By nature and to address its expansion and evolution, the Web needs advances in distributed intelligence and situated intelligence. This study must include different forms of natural intelligence (e.g. people, connected animals, connected plants) and different forms of artificial intelligence (reasoning, learning, inducing, etc.) [14]. The challenge will also be to study their interactions with the resources of the Web (linked pages, linked data, connected objects, etc.) [8]. Distributed AI and the multi-agent systems have a rendezvous with the Web and its sciences [10] to study and design hybrid societies of natural intelligence and artificial intelligence on the Web and their normative rules [17].

This research program can also be seen as making Web Science a meeting point between two research fields born in the 50s: "AI" for Artificial Intelligence [22] and "IA" for Intelligence Amplification [2] and Intelligence Augmentation [9]. The long term potential of the Web is to augment and link all forms of intelligence and we need to prepare for a time when we will be "All Watched Over by a Web of Loving Grace" [5]

<sup>1</sup>see W3C Rec. <https://www.w3.org/TR/>

<sup>2</sup><https://webwewant.org/about/>

<sup>3</sup><https://team.inria.fr/wimmics/>

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).

WebSci '19, June 30-July 3, 2019, Boston, MA, USA

© 2019 Copyright held by the owner/author(s).

ACM ISBN 978-1-4503-6202-3/19/06.

<https://doi.org/10.1145/3292522.3329406>

## CCS CONCEPTS

• Information systems → World Wide Web; • Computing methodologies → Artificial intelligence.

## KEYWORDS

web, web science, artificial intelligence, AI

## BIOGRAPHY

Fabien's PhD in 2002 [10] at Inria pioneered the joint use of distributed artificial intelligence (AI) and semantic Web to manage a variety of data sources and users above a Web architecture. Then, at Carnegie Mellon University, he proposed an AI method to enforce privacy preferences in querying and reasoning about personal data. In 2004, as a researcher at Inria, he started to study models and algorithms to integrate social media and knowledge based AI systems on the Web. In 2012 he became the representative of Inria at W3C and founded Wimmics, a joint research team between Université Côte d'Azur, Inria, CNRS and I3S, on bridging social and formal semantics on the Web. In 2014, Fabien became a research director (DR). He supervised 10 PhD, chaired major international conferences (e.g. WWW 2012 and 2018, ESWC 2015, ISWC 2019) and authored 23 journal papers, 136 conference and workshop papers, 2 books and 11 book chapters. In 2015 he initiated a series of bilingual MOOCs on the national FUN platform on semantic Web and linked data. In 2017 he established and became the director of the joint research laboratory between Inria and the QWANT search engine and he also became responsible for the research convention between the Ministry of Culture and Inria. In 2018 Fabien became Vice Head of Science of Inria Sophia Antipolis – Méditerranée. <http://fabien.info>



Figure 1: Fabien Gandon

## REFERENCES

- [1] Pinar Arslan, Michele Corazza, Elena Cabrio, and Serena Villata. 2019. Overwhelmed by Negative Emotions? Maybe You Are Being Cyber-bullied!. In *SAC 2019 - The 34th ACM/SIGAPP Symposium On Applied Computing*. Cyprus.
- [2] Ross Ashby. 1956. Design for an intelligence-amplifier. *Automata studies* 400 (1956), 215–233.
- [3] Sahbi Benlamine, Maher Chaouachi, Serena Villata, Elena Cabrio, Claude Frasson, and Fabien Gandon. 2015. Emotions in Argumentation: an Empirical Evaluation. In *International Joint Conference on Artificial Intelligence, IJCAI 2015 (Proceedings of the Twenty-Fourth International Joint Conference on Artificial Intelligence, IJCAI 2015)*. Buenos Aires, Argentina, 156–163. <https://hal.inria.fr/hal-01152966>
- [4] Tim Berners-Lee, Robert Cailliau, Ari Luotonen, Henrik Frystyk Nielsen, and Arthur Secret. 1994. The World-Wide Web. *Commun. ACM* 37, 8 (Aug. 1994), 76–82. <https://doi.org/10.1145/179606.179671>
- [5] Richard Brautigan. 1968. All watched over by machines of loving grace. *TriQuarterly* 11 (1968), 194.
- [6] Michel Buffa, Catherine Faron Zucker, Thierry Bergeron, and Hatim Aouzal. 2016. Semantic Web Technologies for improving remote visits of museums, using a mobile robot. Proceedings of the ISWC 2016 Posters & Demonstrations Track co-located with 15th International Semantic Web Conference (ISWC2016). <https://hal.inria.fr/hal-01400924> Poster.
- [7] Elena Cabrio, Julien Cojan, Alessio Palmero Arosio, Bernardo Magnini, Alberto Lavelli, and Fabien Gandon. 2012. QAKIS: an Open Domain QA System based on Relational Patterns. International Semantic Web Conference, ISWC 2012. <https://hal.inria.fr/hal-01171115> Poster.
- [8] Andrei Ciortea, Simon Mayer, Fabien Gandon, Olivier Boissier, Alessandro Ricci, and Antoine Zimmermann. 2019. A Decade in Hindsight: The Missing Bridge Between Multi-Agent Systems and the World Wide Web. In *AAMAS 2019 - 18th International Conference on Autonomous Agents and Multiagent Systems*. Montréal, Canada, 5p. <https://hal-emse.ccsd.cnrs.fr/emse-02070625>
- [9] Douglas C Engelbart. 1962. *Augmenting human intellect: A Conceptual Framework*. SRI Summary Report AFOSR-3223. Stanford Research Institute.
- [10] Fabien Gandon. 2002. *Distributed Artificial Intelligence And Knowledge Management: Ontologies And Multi-Agent Systems For A Corporate Semantic Web*. Theses. Université Nice Sophia Antipolis. <https://tel.archives-ouvertes.fr/tel-00378201>
- [11] Fabien Gandon. 2014. The three "W" of the World Wide Web call for the three "M" of a Massively Multidisciplinary Methodology. In *WEBIST 2014 - 10th International Conference (Web Information Systems and Technologies)*, Valérie Monfort and Karl-Heinz Krempels (Eds.), Vol. 226. Springer International Publishing, Barcelona, Spain. <https://doi.org/10.1007/978-3-319-27030-2>
- [12] Fabien Gandon. 2017. For everything: Tim Berners-Lee, winner of the 2016 Turing award for having invented... the Web. *1024 : Bulletin de la Société Informatique de France* 11 (Sept. 2017), 21. <https://hal.inria.fr/hal-01843967>
- [13] Fabien Gandon. 2018. A Survey of the First 20 Years of Research on Semantic Web and Linked Data. *Revue des Sciences et Technologies de l'Information - Série ISI : Ingénierie des Systèmes d'Information* (Dec. 2018). <https://doi.org/10.3166/ISI.23.3-4.11-56>
- [14] Fabien Gandon. 2019. *Web Science, Artificial Intelligence and Intelligence Augmentation (in Dagstuhl Perspectives Workshop 18262 - 10 Years of Web Science: Closing The Loop)*. Other. Dagstuhl. <https://hal.inria.fr/hal-01976768>
- [15] Fabien Gandon, Michel Buffa, Elena Cabrio, Olivier Corby, Catherine Faron Zucker, Alain Giboin, Nhan Le Thanh, Isabelle Mirbel, Peter Sander, Andrea G. B. Tettamanzi, and Serena Villata. 2013. Challenges in Bridging Social Semantics and Formal Semantics on the Web. In *5th International Conference, ICEIS 2013 (Lecture Notes in Business Information Processing)*, Hammoudi, S., Cordeiro, J., Maciaszek, L.A., Filipe, and J. (Eds.), Vol. 190. Springer, Angers, France, 3–15.
- [16] Fabien Gandon and Alain Giboin. 2017. Paving the WAI: Defining Web-Augmented Interactions. In *Web Science 2017 (WebSci17)*. Troy, NY, United States, 381 – 382. <https://doi.org/10.1038/nbt0609-508>
- [17] Fabien Gandon, Guido Governatori, and Serena Villata. 2017. Normative Requirements as Linked Data. In *JURIX 2017 - The 30th international conference on Legal Knowledge and Information Systems - Luxembourg, Luxembourg, 1–10*. <https://hal.archives-ouvertes.fr/hal-01643769>
- [18] Raphaël Gazzotti, Catherine Faron Zucker, Fabien Gandon, Virginie Lacroix-Hugues, and David Darmon. 2019. Injecting Domain Knowledge in Electronic Medical Records to Improve Hospitalization Prediction. In *ESWC 2019 - The 16th European Semantic Web Conference*. Portoroz, Slovenia. <https://hal.archives-ouvertes.fr/hal-02064421>
- [19] Hai Huang and Fabien Gandon. 2019. Learning URI Selection Criteria to Improve the Crawling of Linked Open Data. In *ESWC2019 - The 16th Extended Semantic Web Conference*. Portoroz, Slovenia. <https://hal.inria.fr/hal-02073854>
- [20] Freddy Lécué, Simone Tallevi-Diotallevi, Jer Hayes, Robert Tucker, Veli Bicer, Marco Luca Sbodio, and Pierpaolo Tommasi. 2014. Smart traffic analytics in the semantic web with STAR-CITY: Scenarios, system and lessons learned in Dublin City. *Journal of Web Semantics* 27-28 (2014), 26–33.
- [21] Nicolas Marie. 2012. *Rough Paths, Gaussian Processes and Applications*. Theses. Université Paul Sabatier - Toulouse III. <https://tel.archives-ouvertes.fr/tel-00783931>
- [22] John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon. 1955. A proposal for the Dartmouth summer research project on artificial intelligence. <http://raysolomonoff.com/dartmouth/boxa/dart564props.pdf>
- [23] Franck Michel, Catherine Faron Zucker, Olivier Corby, and Fabien Gandon. 2019. Enabling Automatic Discovery and Querying of Web APIs at Web Scale using Linked Data Standards. In *WWW 2019 - LDOW/LDDL Workshop of the World Wide Web Conference*. San Francisco, United States. <https://doi.org/10.1145/3308560.3317073>
- [24] Emilie Palagi. 2018. *Evaluating exploratory search engines : designing a set of user-centered methods based on a modeling of the exploratory search process*. Theses. Université Côte d'Azur. <https://tel.archives-ouvertes.fr/tel-01976017>
- [25] Oscar Rodríguez Rocha, Catherine Faron Zucker, and Alain Giboin. 2018. Extraction of Relevant Resources and Questions from DBpedia to Automatically Generate Quizzes on Specific Domains. In *International Conference on Intelligent Tutoring Systems 2018*. Montreal, Canada. <https://hal.inria.fr/hal-01811490>
- [26] Andrea G. B. Tettamanzi, Catherine Faron Zucker, and Fabien Gandon. 2015. Dynamically Time-Capped Possibilistic Testing of SubClassOf Axioms Against RDF Data to Enrich Schemas. In *The 8th International Conference on Knowledge Capture, K-CAP 2015*. Palisades, NY, United States.
- [27] Jay Young, Valerio Basile, Lars Kunze, Elena Cabrio, and Nick Hawes. 2016. Towards Lifelong Object Learning by Integrating Situated Robot Perception and Semantic Web Mining. In *Proceedings of the European Conference on Artificial Intelligence (ECAI) 2016 conference*. The Hague, Netherlands.