

# Report on the Ninth International Workshop on Location and the Web (LocWeb 2019)

Workshop held at The Web Conference, WWW2019

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## Abstract

LocWeb 2019 was the ninth workshop in the LocWeb workshop series at the intersection of location-based services and Web architecture and was held at The Web Conference, WWW 2019, in San Francisco. It focused on Web-scale services and systems facilitating location-aware information access as well as on Spatial Social Behavior Analytics on the Web. The LocWeb 2019 workshop had contributions ranging from location data analysis over vocational trips and visualization of linked data to geolocation and browser integration. This report briefly presents the theme, contributions, and discussions of the workshop.

## 1 Introduction

Location has quickly become part of the mainstream of the (mobile) Web and it continues to be a strong driver of applications and research activities. The general appeal and usefulness of geo-located data (e.g., for information access with freely available mapping services) are only some of the reasons for its fast rise. After the initial boost and consolidation of approaches based on the simple use of geospatial coordinates, we now see an increasing demand for (i) more sophisticated systems, (ii) stronger retrieval, mining, and analytics solutions, and (iii) more powerful semantics. Location plays a key role as a context factor for users, and it is also of paramount importance to consider the implicit or explicit place of resources and people in the physical world. It is an important factor in mobile and geo-social applications and it drives geospatially-aware Web data mining. Focusing on static and dynamic spatio-social networks allows to understand how people are influenced by social interaction in their daily life decision.

Following the LocWeb workshops held in 2008, 2009, 2010, 2014, 2015, 2016, 2017, and 2018, LocWeb 2019 continues the workshop series, addressing issues at the intersection of

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location-based services and Web architecture. It focuses on Web-scale services and systems facilitating *location-aware information access* as well as on *Spatial Social Behavior Analytics* on the Web as part of social computing.

The location topic is seen as a cross-cutting issue equally concerning information access, semantics and standards, social analysis and mining, and Web-scale systems and services. The workshop is an integrated venue where location and spatio-social aspects can be discussed in depth with an interested community. New application areas for Web architecture, such as the Internet of Things (IoT) and the Web of Things (WoT), will lead to increasingly rich and large sets of applications for which location is highly relevant as the connection to the physical world. Location further has high importance in Web-based designs, and continues to provide challenging research questions.

LocWeb 2019 is the ninth event in the workshop series and took place on May 13th, 2019 in San Francisco, USA, co-located with WWW2019<sup>1</sup>, The Web Conference, previously the International World Wide Web Conference, which was held in the Hyatt Regency San Francisco.<sup>2</sup> It drew a varied audience of different backgrounds and interests, ranging from technical to social.

Workshop details, including most presentations, can be found on the workshop homepage<sup>3</sup> and on the workshop series homepage<sup>4</sup>. The previous LocWeb report for 2018 has been published in SIGIR Forum [1] as well as those for previous years.

## 2 Workshop Theme and Topics

LocWeb continues the main theme of Web-scale Location-Aware Information Access and spatial social computing. Subtopics include (i) geospatial semantics, systems, and standards; (ii) large-scale geospatial and geo-social ecosystems; (iii) mobility; (iv) location in the Web of Things; and (v) mining and searching geospatial data on the Web. The workshop encourages work describing Web-mediated or Web-scale approaches that build on reliable foundations, and that thoroughly understand and embrace the geospatial dimension through interdisciplinary perspectives.

The workshop's topics of interest were: Location-Aware Information Access, Spatial Social Behavior, Location-Aware Web-Scale Systems and Services, Location in the Internet/Web of Things, Geospatial aspects of Smart Cities, Location prediction in social media and the Web, Influence modeling and processing in static and dynamic spatio-social graphs – Evaluation of frameworks, metrics and algorithms, Events detection and fake news on social media and the Web, Large-scale Geospatial Ecosystems, Standards for Location and Mobility Data, Modeling Location and Location Interaction, Geo-Social Media and Systems, Location-Based Social Networks, Geospatial Web Search and Mining, Mobile Search and Location-Based Recommendation, Geo-Crowdsourcing.

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<sup>1</sup><https://www2019.thewebconf.org/>

<sup>2</sup>[geo:37°47'39\"](https://www.google.com/maps/place/37°47'39\)

<sup>3</sup><http://dhere.de/locweb2019/>

<sup>4</sup><http://dhere.de/locweb/>

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## 3 Workshop Contributions

The workshop had an interdisciplinary combination of contributions, with one research keynote and four papers. The proceedings [2] are available in the ACM Digital Library and also from the conference page<sup>5</sup> as part of the WWW 2019 Companion. Browsing from there gives free access to the PDFs in the ACM DL. A full PDF of the companion proceedings is also available.<sup>6</sup> Slides are available from the workshop homepage.

### 3.1 Keynote

Leo Ferres from Universidad del Desarrollo, Chile gave the keynote with the title *Indoor Towers, DPIs, and More People in Parks at Night: New Trends in Mobile Phone Location Research* [4]. He investigated the traffic generated by mobile phones using geolocation and cell tower information. The interesting characteristic of mobile phone information is that they are always geo-located, either by GPS, cell antenna triangulation, or simply cell antenna connections. Mobile phone data sets as either Call Detail Records (CDRs) or the "data channel" (XDRs) constitute a potential treasure trove of information about what people do in the physical world, but also about when and where they are accessing information online. Experiment were performed through his association to the Telefónica Chile R&D department, where they have been privileged in having access to mobile phone data sets to study socially relevant issues. Leo presented the results from several studies done using data sets of mobile phone usage, data exchanged, and cell towers connected to (CDRs, XDRs, and partially even lower level of data flow analysis through packet inspection) He presented conclusions and predictions pf different kinds of behavior, from social mixing over news consumption to gender equality. The studies were conducted by analyzing web traffic either by proxy to applications like Pokémon Go or effectively through DNS information.

He concluded his talk with coming trends in the field of mobile phone data analysis, its limitations, and discussed issues of privacy, data security, anonymization and general data responsibility for researchers and the company providing the data. These aspects will be an important aspect of future location research questions.

### 3.2 Paper Presentations

The workshop accepted 4 full papers. Our PC members provided over 3 reviews per paper on average. With 10 papers submitted, we had a 40% acceptance rate. We had international author groups from Europe and the US, with some cross-country and cross-continent authorships of papers.

The first presentation was on *Location Embeddings for Next Trip Recommendation* [3] by Amine Dadoun, Raphaël Troncy, Olivier Ratier, and Riccardo Petitti. The paper proposed an approach that leverages contextual, collaborative and content information in order to recommend personalized destinations to travellers. They also compared their approach with a set of state of the art collaborative filtering methods and deep learning based recommender systems.

The next paper described *GViz – An Interactive WebApp to Support GeoSPARQL over Integrated Building Information* [5] by Kris McGlinn, Darragh Blake, and Declan O’Sullivan.

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<sup>5</sup><https://www2019.thewebconf.org/media/toc-companion.html>

<sup>6</sup><https://www2019.thewebconf.org/media/TheWebConf2019-Companion.pdf>

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It presented a visualization tool for Building Information Models (BIM) built upon HTML5 and WebGL technologies that supports queries over linked data without the need to understand the resulting SPARQL queries. It allows for better access to geospatially enhanced BIM data for the building lifecycle. The interactive web interface can be quickly extended to support new use cases, for example, related to 3D geometries. Their paper discussed the underlying data management, the methodology for uplifting several open data sources into RDF, and the front-end implementation tested over a sample use case.

The third paper titled *Hashtag Usage in a Geographically-Local Microblogging App* [6] by Jens Helge Reelfs, Timon Mohaupt, Oliver Hohlfeld and Niklas Henckell investigated hashtag usage based on analyzing the mobile-only location-aware Jodel microblogging app, which has an established user base in several European countries and Saudi Arabia. All posts are user-to-user anonymous (i.e., no displayed user handles) and are only displayed in the proximity of the user's location (up to 20 km). It thereby forms local communities and opens the question of how information propagates within and between these communities. They tackle this question by applying established metrics for Twitter hashtags to a ground-truth data set of Jodel posts within Germany that spans three years. They find the usage of hashtags in Jodel to differ from Twitter; despite embracing local communication in its design, Jodel hashtags are mostly used country-wide. They also identified similarities in hashtag usage between nearby and larger cities and presented case studies of their spatial impact supporting this finding.

Finally, *Geolocation in the Browser – From Google Gears to Geolocation Sensors* [7] by Thomas Steiner, Anssi Kostiaainen and Marijn Kruisselbrink explored location integration into Browser development. They looked at the World Wide Web Consortium (W3C) Geolocation API specification that defines a standard for accessing location services and especially the user location in the browser via JavaScript by a Web page. They track historic developments based on the need for more advanced features like background geolocation tracking and geofencing. They explore privacy decisions around the Geolocation API, and compare different current and future efforts, challenges, and use cases. Apart from the Geolocation API, there is also the Geolocation Sensors API, which deals differently with one-off or background updates. Open questions include the level of privacy, along with granularity and permission issues, and the impact on background location requests.

## 4 Discussion Session

The discussion was started by the organisers presenting some information about locality of the conference. This included the local characteristics of San Francisco and the seven hills that it is built on.

grid patterns in multiple orientations The grid pattern even holds in rather steep areas of downtown, for example around Nob Hill. Around Coit Tower on Telegraph Hill, only the last street on the top breaks the pattern.

Similarly, in Russian Hill, Lombard Street has a famous steep section of one-block length that has eight hairpin turns to cover the height distance, but which is still embedded within the grid pattern. However, in some places, streets do not connect to the other side of the block due to the height difference, but may be continued as stairs for pedestrians. Such patterns are more regularly found in older cities in Europe, for example in Lyon as the venue of LocWeb2018 [1]. These stairways are also promoted for better walkability. Only in some

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even steeper areas to the South-East, the pattern is broken into streets that more closely follow the contour lines of the topography, for example around Mount Sutro and Twin Peaks.

In terms of place names, some of the toponyms referenced above do not only stand for the actual natural structure, but also lend their name to neighbourhoods. While many people think that San Francisco is built on a mountain, the story claims that it is indeed seven hills. There are very different characterisations of San Francisco, but the main features are not the flat parts, but the multiple separate steep hills. Their numbers are most frequently given as 42 hills, distributed over the 36 neighbourhoods.

The transitions between these patterns and the slight change in orientation for the grids can make unassisted spatial orientation interesting. The steepness of the terrain is important and challenging enough that it should be included into route planning and navigation systems. One system is trying to visualise this, called Hillmapper.<sup>7</sup> In fact, the geography of the town brings not only challenges to navigation, but also for transportation, building, and urban planning. The urban planning guidelines highlight a few items that can be understood as influenced by geography: view corridors throughout the city, buildings following (stepped) topography, stairways, design for multiple vantage points, including from above, and many more.<sup>8</sup>

## 5 Conclusion and Future Directions

LocWeb 2019 showed showed cross-cutting work around social media and geospatial analysis, building information and structured search, ongoing browser and web architecture achievements, and fruitful combinations of these. We reached participants with a wide range of backgrounds from academia and industry who discussed the breadth of location in the Web context. We see an evolution of location on the Web, with more sophisticated approaches being presented and new research questions coming out of these. Finally, we expect the work presented at the workshop to be the basis for further growth in this field.

## Acknowledgements

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<sup>7</sup><http://hillmapper.com/>

<sup>8</sup>Urban Design Guidelines, San Francisco Planning Department, 2018, <https://sfplanning.org/resource/urban-design-guidelines>

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