# ARCHEO.FOSS XIV 2020

## Open software, hardware, processes, data and formats in archaeological research

Proceedings of the 14th International Conference
15-17 October 2020

edited by
Julian Bogdani, Riccardo Montalbano,
and Paolo Rosati

# ArcheoFOSS 14 | 2020

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## Julian Bogdani,
## Riccardo Montalbano,
## and Paolo Rosati

Image cover: Theatrum Pompei and surrounding areas, from SITAR - Sistema Informativo Territoriale Archeologico di Roma, Soprintendenza Speciale Archeologia Belle Arti e Paesaggio di Roma (Ministero della Cultura)


All contributions of this volume have undergone a double peer-review process.

This book is available in print and as a free download from www.archaeopress.com

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# Foreword

This volume represents the editorial outcome of the 14th edition of ArcheoFOSS international conference, which took place on 15–17 October 2020 on the World Wide Web. The event has been held annually since 2006 and is dedicated to the theoretical framework and actual application of free and open-source software solutions and the promotion and encouragement of the Open Data paradigm for archaeology and, more generally, for Cultural Heritage.

Compared to the past editions, the 2020 conference introduced some substantial changes. First of all, the pandemic crisis due to the COVID-19 outbreak, forced us for the first time to hold a Web-based conference, a solution that introduced some important advantages. For example there was the facility to overcome geographical distances and therefore greatly broadening participation, both in terms of speakers (presentations, workshops, demos) and audience. Additionally we had the possibility to share thoughts on the specific topics of the conference with foreign colleagues from different backgrounds (universities, research centres), widening consequently the network of collaboration. We hope that the effort to open the ArcheoFOSS conference beyond Italian national borders – and beyond a small circle of individuals who in the last years have tenaciously and with great difficulty tried to keep alive the spirit of the conference – will not remain isolated, but will be further pursued in the next editions.

Another innovative aspect was the introduction of a panel dedicated to open data, open formats and open standards. While these topics have not been absent in the previous editions, the main focus has always been on the development and application of FLOS software and hardware solutions for Cultural Heritage. By specifically calling for papers dealing with the free sharing of data, we tried to go beyond software and technological development. Open and reusable data publishing platforms, available in open formats, and distributed with open licenses with no bias on the tools with which the data were created. The aim was to encourage and enhance the creation and publication of open archaeological archives, easily re-usable by the community.

This volume well represents the approach taken at the conference and the extensive participation it received. Eighteen high-level and peer-reviewed papers, well distributed in two thematic sections – application cases and development, and open data – contributed by more than forty Italian and foreign scholars, researchers and freelance archaeologists working in the field of Cultural Heritage. For an event organized at no cost, without funding or support of any kind, these are significant numbers, which reward us for the great organizational and editorial effort. The most important budget line was invested in releasing this book as open-access, using a CC BY license. We strongly believe that the conference proceedings must strictly follow the spirit of the event, and that the free distribution and sharing of the volume is a *conditio sine qua* non for its publication. This also marks a break with the past, when open-access was not always a prerequisite. It is worth noting, furthermore, that these proceedings are being published only one year after the conference. This is a decisive turnaround, which testifies to the strong will to revitalize the ArcheoFOSS community. Technology is evolving very fast, and it is not uncommon to read on fresh publications about outdated software and

workflows or scripts that have already disappeared, greatly reducing or nullifying the utility of the publication, if not (perhaps) for the academic careers of its authors.

Not strictly related to this book, but important to the ArcheoFOSS community, was the decision to accelerate the publication of the 2019 edition, which was neglected due to financial issues and the outbreak of the COVID-19 pandemic. Furthermore, it was decided to alternate 'lighter' versions of the conference, mostly focused on workshops and hands-on sessions, demos, etc. and more 'traditional' ones, based on paper presentations. This will hopefully facilitate the prompt publication of the proceedings and regain a closer relationship with younger and frequently more active researchers.

Looking to the future, we all hope for the end of the current pandemic emergency, but it is clear how much this crisis sped up many cultural processes already ongoing, by changing our lives, our way of researching, teaching, experiencing and communicating archaeology.

In the coming years, the financial resources earmarked to fund digital projects in the field of Cultural Heritage will be substantial (consider, for example, the Italian National Recovery and Resilience Plan). The challenge for our community is therefore to stand ready to proactively suggest solutions to govern and guide this change, rather than passively undergo it.

The Editors

Julian Bogdani
Riccardo Montalbano
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# An introspective, incomplete, view on the activity of the FLOS community dealing with Archaeology and Cultural Heritage

## Julian Bogdani, Federico Sciacca

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Federico Sciacca, Independent researcher; fede__fs@libero.it

**Abstract**

*This short contribution was presented at the demo/poster section of ArcheoFOSS 2020 edition and is aimed at providing a snapshot of the activity of the Italian FLOS community, as it appeared in 2020, through the lens of what has been published in the available conference proceedings. It is inevitably, and by definition, incomplete research. For this reason, the Github repository can be used by anyone willing to update and integrate the available data and actively contribute to improve this self-evaluation attempt.*

**Keywords:** ARCHEOFOSS; OPEN-SOURCE; ARCHAEOLOGY; FREE SOFTWARE; RESEARCH SUSTAINABILITY.

## Introduction

The idea behind this contribution was developed during the preparation of the 2020 edition of ArcheoFOSS International Conference with the clear intent to feel the pulse of the community of people and institutions who, since 2006, have gathered and shared projects and ideas in the context of the conference.

The data was gathered by Federico Sciacca and Julian Bogdani and made available with MIT license during the 2020 edition works on a public Github repository.[1] The raw data were also paginated to a form a HTML presentation[2] and finally the single page application was published using the Github Pages.[3] The presentation is rebuilt on each change (commit) on the main repository. It is the firm intention of the authors to update the dataset behind the application as soon as other proceedings will be published. The state of art presented here has been updated for the last time on October 6th, 2020. It is therefore possible, rather desirable, that the state of the data and conclusions presented here will differ in the near future with the state of the presentation in the repository. For this reason, we are looking forward to seeing active contributions, possible corrections or updates to the dataset by the readers of this paper.

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[1] https://github.com/jbogdani/af-introspection (accessed 16/6/2021).
[2] Reveal.js (https://revealjs.com/, accessed 16/6/2021) was used to create the Web-based presentation.
[3] https://jbogdani.github.io/af-introspection/ (accessed 16/6/2021).

This is not the first attempt to have an inner look on the activity of the ArcheoFOSS community. In 2013 an article by S. Costa and A. Palombini[4] tried to closely analyse the 'seven-year itch' of the conference, providing a deep insight on topics introduced in the conference, geographical and affiliation distribution of researchers, the growth of the relations and connections between them, being the conference editions the main catalyst. The present article might be considered as a natural follow-up, with a closer focus on the fate of single applications and projects through time and policies aimed at improving collaboration and openness.

*J.B.*

## Methodology and sources

As already revealed in the first paragraph, the principal sources for the dataset are the published volumes of the proceedings of the various editions of ArcheoFOSS. The complete mapping of the conference editions and their publication can be seen in table. 1, par. 4. For each conference edition, the year of the publication, along with full bibliographic reference is provided. Furthermore, the explicit license of the volume is reported.

The publications were analysed to extract information about the different projects that were being presented. Two major typologies of projects were mapped in the bibliography: (1) applications, software packages, plugins, and scripts (Table 2, par. 4) and (2) GIS, webGIS and data portals (Table 3, par. 3). Each project, be it an application or a data-presentation project, was made the object of a Web search aiming at tracing its presence online and at obtaining possible updates on its lifecycle. We are well aware of the fact that the Web search is not a very reliable source of information since projects living in the deep Web, not indexed by search engines or hidden behind virtual private networks might not instantly appear. Yet, since openness does not come without findability, we assume that projects targeting an open community might not have walked many steps towards intentional invisibility. Once more, we warmly invite the reader to correct data vagueness due to the inaccuracy of our research by filing an issue or by requesting a repository merge.

To find the source code for each considered application, we looked for possible links provided as reference in the publications, a relatively rare practice. The main open-source public code repositories, such as GitHub, GitLab, BitBucket, SourceForge, Codeberg, etc. were sounded out. Furthermore, a generic Web search using the most popular search engines was also performed to look for 'ghost' projects.

It was highly problematic to determine whether a project is currently maintained or not, as well. For the aims of this contribution a project was considered 'not maintained' or 'abandoned' when no recent activity is clearly measured in the available source repository. To us 'recent' means a period of at least two years. If the source code is not available, the application is assumed to be not in an active status of development. It is also clear that projects that do not provide explicit reference to the last update have been considered abandoned, even if they might be actively maintained behind the curtains.

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[4] Costa and Palombini 2013. La crisi del settimo anno: sette rassegne di progetti open-source per l'archeologia italiana. In M. Serlorenzi (ed.) *ARCHEOFOSS Free, Libre and Open-source Software e Open Format nei processi di ricerca archeologica. Atti del VII Workshop (Roma, 11–13 giugno 2012)*: 27–34. *Archeologia e* Calcolatori Supp. 4. Firenze: All'Insegna del Giglio.

When it comes to measuring the life duration of each project (up to October 2020), the year of the conference where it was presented was considered as the first reference. We are aware of the fact that the development of many projects might have started well before their presentation to the community; if clear evidence of this prior date is available from the text or from the date of the first commit in the publicly available repository, this prior date has been considered.

For applications maintained in git- or svn-based code repositories the total number of commits is available (Figure 7). This information does throw a glimpse on the activity of developers but is not truly representative of the overall life cycle of an application, especially for older projects initially not based on a version control system. Also, different developing techniques (early and frequent releases vs. long-cycle projects) might condition the total number of commits.

In the following sections (par. 3) some basic analysis will be presented in the form of charts. Raw data are presented as tables in par. 4 and a few synthetic conclusions will close the discussion (par. 5).

*J.B.*

**Visual analysis of the data**

In the next few pages are presented a series of bar charts displaying some very simple, yet highly informative analyses of the collected data, published in par. 4. For the general discussion and some preliminary observations, see sec. 5.
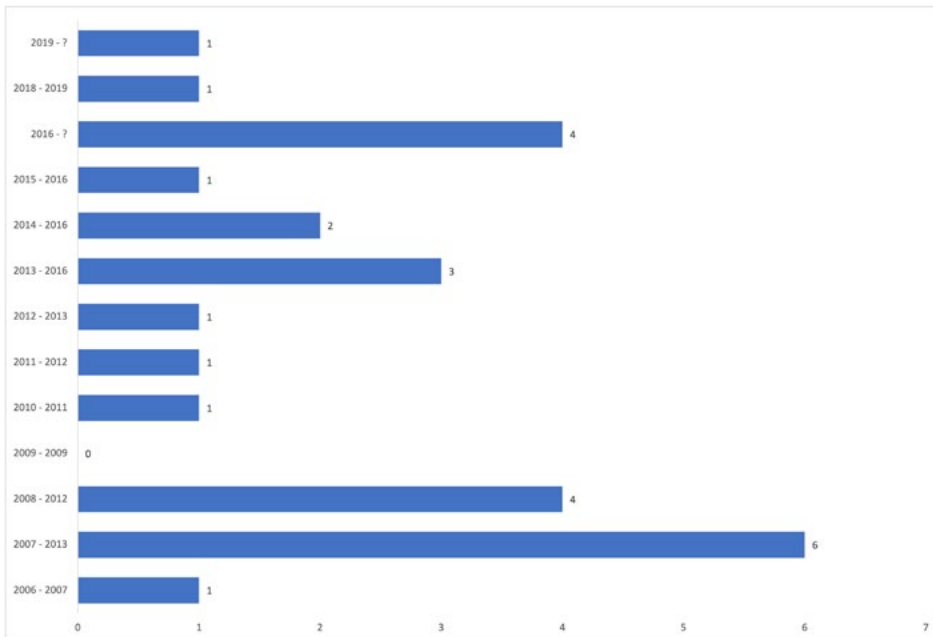


Figure 1: Years elapsed from the conference edition to the publication of its proceedings. Question marks indicate volumes that have never, or have not yet, been published. At the time of writing (2021), the 2019 proceedings are in press.

Figure 2: Licensing of the publications.



Figure 3: Availability of the source code of applications, software packages, plugins and scripts presented at ArcheoFOSS conferences.
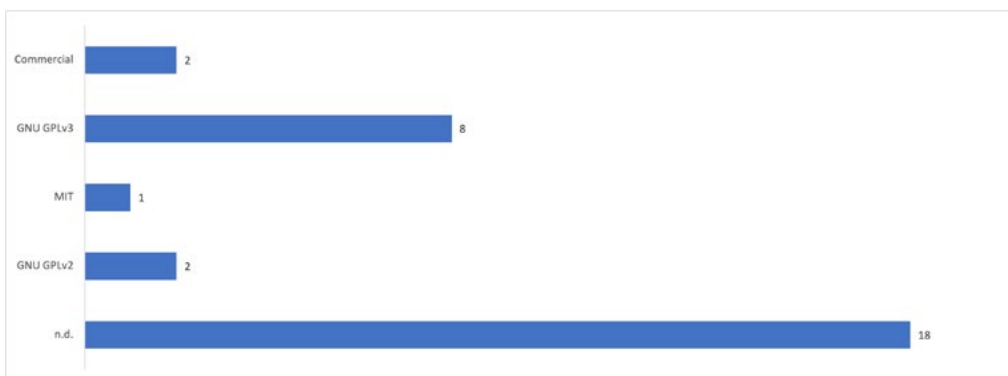


Figure 4: Explicit licensing of applications, software packages, plugins and scripts presented at ArcheoFOSS conferences.
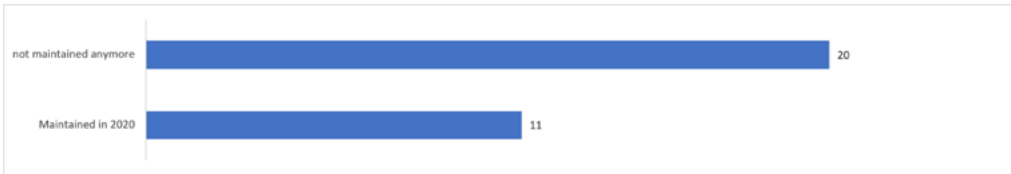
Figure 5: Survival rate of applications, software packages, plugins and scripts presented at ArcheoFOSS conferences.
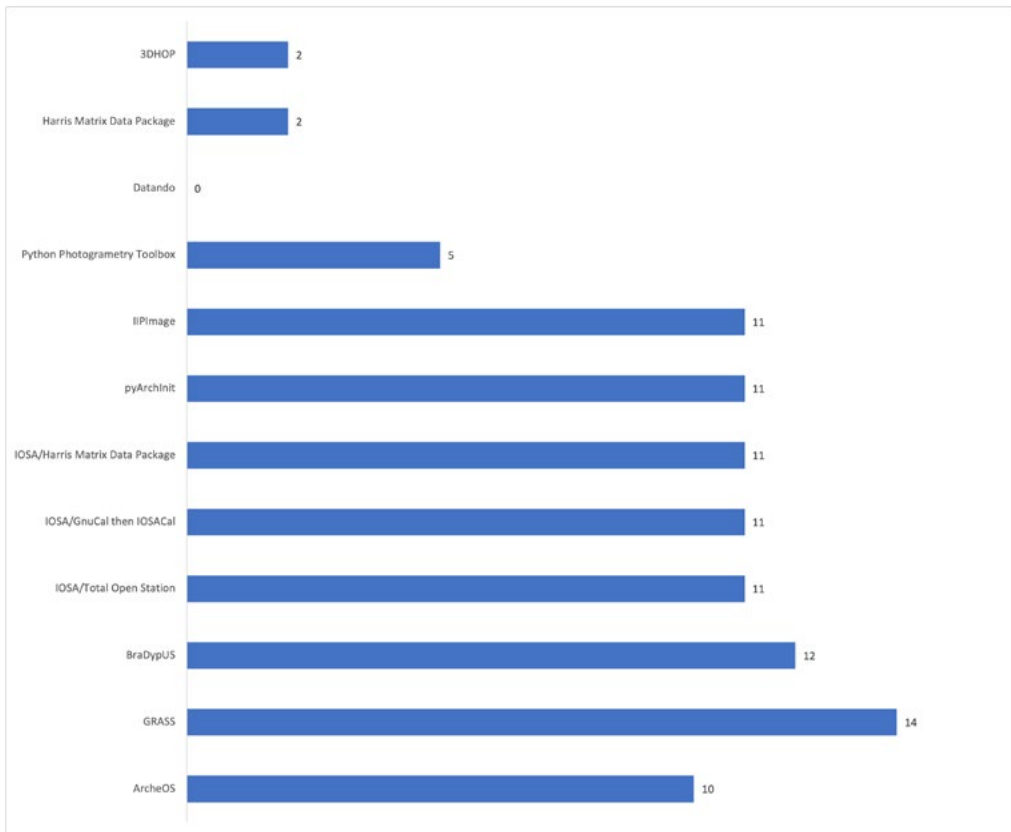


Figure 6: Longevity of applications, software packages, plugins and scripts presented at ArcheoFOSS conferences.
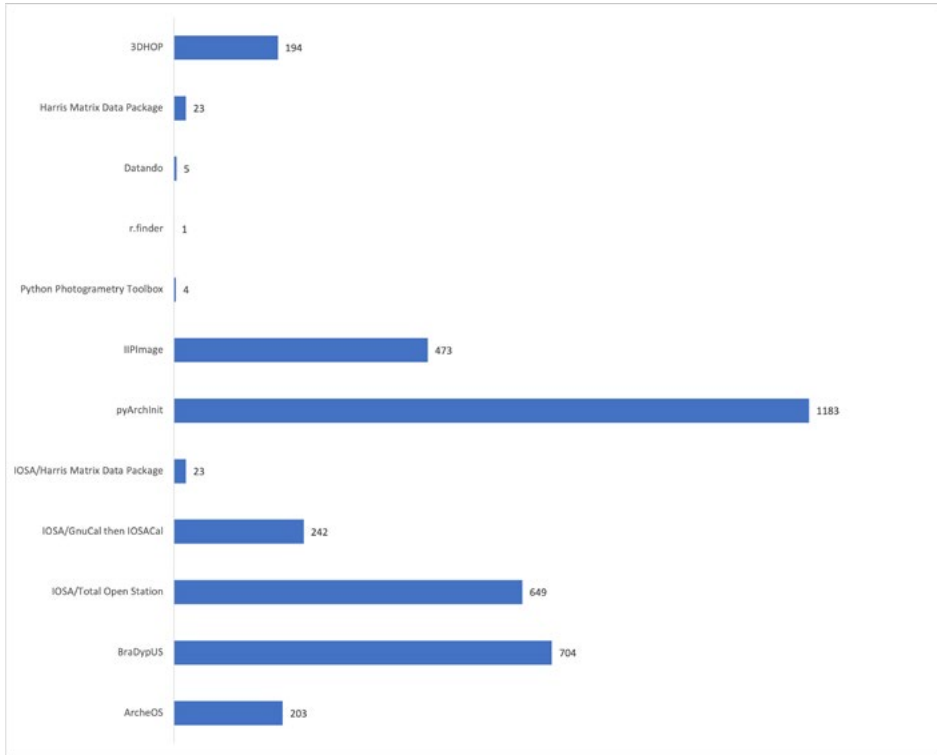
Figure 7: Total number of commits for applications, software packages, plugins and scripts presented at ArcheoFOSS conferences, as available in the public repository. GRASS with more than 20,000 commits has been excluded from the chart.
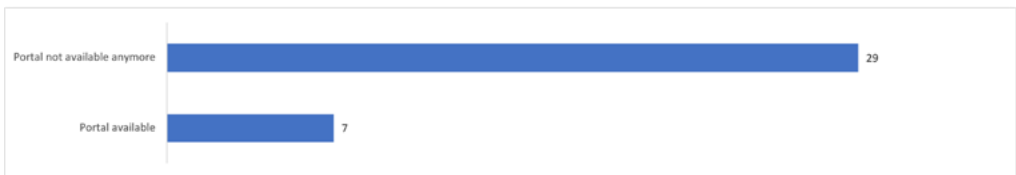


Figure 8: Online availability of Databases, GIS, webGIS and data portals presented at ArcheoFOSS.
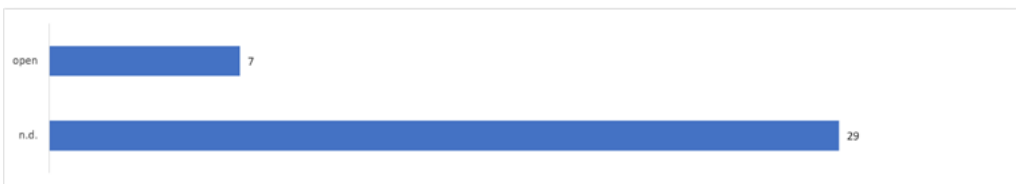


Figure 9: *De facto* data access policy for Databases, GIS, webGIS and data portals presented at ArcheoFOSS.

*J.B.*

## Data sets

| Conference year | Publication year | Full bibliographic record | License of the publication |
|---|---|---|---|
| 2006 | 2007 | G. Macchi Jánica and R. Bagnara (eds) 2007. *Open-source, free software e open format nei processi di ricerca archeologici atti del 1. Workshop (Grosseto, 8 maggio 2006)*. Firenze: Centro editoriale toscano. ISBN 978-88-7957-260-6 | All rights reserved |
| 2007 | 2013 | S. Costa and G.L. Pesce 2013 *Open-source, Free Software e Open Format nei processi di ricerca archeologica 2007*. London: Ubiquity Press. DOI:http://dx.doi.org/10.5334/bae | CC BY 3 |
| 2008 | 2012 | L. Bezzi, D. Francisci, P. Grossi and D. Lotto 2012. *Open-source, Free Software e Open Format nei processi di ricerca archeologica. Atti del III Workshop (Padova, 8-9 maggio 2008)*. Roma: Quasar | All rights reserved |
| 2009 | 2009 | C. Paolo, A. Palombini, S. Pescarin (eds) 2009. *ARCHEOFOSS Open-source, Free Software e Open Format nei processi di ricerca archeologica. Atti del IV Workshop (Roma, 27-28 aprile 2009)*. Rome: Archeologia e Calcolatori, Supplemento 2 | CC BY-NC-ND 4 |
| 2010 | 2011 | F. Cantone 2011. *ARCHEOFOSS Open-source, Free Software e Open Format nei processi della ricerca archeologica. Atti del VI Workshop (Napoli, 9–10 giugno 2011)*. Napoli: Naus Editoria | All rights reserved |
| 2012 | 2013 | M. Serlorenzi (ed.) 2013. *ARCHEOFOSS Free, Libre and Open-source Software e Open Format nei processi di ricerca archeologica. Atti del VII Workshop (Roma, 11–13 giugno 2012)*. Rome: Archeologia e Calcolatori, Supplemento 4 | CC BY-NC-ND 4 |
| 2013 | 2016 | F. Stanco and G. Giovanni (eds) 2016. *Free, libre and open-source software e open format nei processi di ricerca archeologica. VIII Edizione Catania 2013*. Oxford: Archaeopress | All rights reserved |
| 2014 | 2016 | P. Basso, A. Caravale and P. Grossi (eds.) 2016. *ARCHEOFOSS. Free, Libre and Open-source Software e Open Format nei processi di ricerca archeologica. Atti del IX Workshop (Verona, 19–20 giugno 2014)*. Rome: Archeologia e Calcolatori, Supplemento 8 | CC BY-NC-ND 4 |
| 2015 | 2016 | S. Campana, R. Scopigno, G. Carpentiero and Marianna Cirillo (eds) 2016. *Proceedings of the 43rd Annual Conference on Computer Applications and Quantitative Methods in Archaeology*. Oxford: Archaeopress. ISBN 97817849133892 | All rights reserved |
| 2016 | Never published | | |
| 2018 | 2019 | G. Piergiovanna, S. Costa, A. Jaia, S.G. Malatesta, F.R. Stasolla (eds) 2019. *ArcheoFOSS. Free, Libre and Open-source Software e Open Format nei processi di ricerca archeologica, Atti del XII Workshop (Roma, 19–22 febbraio 2018)*. Rome: Archeologia e Calcolatori | CC BY-NC-ND 4 |
| 2019 | In press | | |

Table 1: ArcheoFOSS conferences and the publishing of the proceedings, with indication of the license, source: https://github.com/jbogdani/af-introspection/blob/master/data/publications.js (accessed 16/6/2021).

| Year | Authors | Application name and description | License | Is it maintained? | Source code available at: | Last commit in | Total number of commits |
|---|---|---|---|---|---|---|---|
| 2006, 2021 | A. Bezzi, L. Bezzi, D. Francisci R. Gietl, F. Furnari | ArcheOS Linux distribution targeted to archaeologists. Presented a new release of v.1.1.6 Akhenaton. | - | - | https://github.com/archeos/ArcheOS | 2016 | 203 |
| 2006 | F. Niccolucci, A. D'Andrea, S. Hermon, T. Zoppi, A. Felicetti | MAD (Managing Archaeological Data) Tool for the management of archaeological data, based on XML and eXist. | - | - | - | - | - |
| 2006 | M. Neteler, A. Bezzi, L. Bezzi, R. Gietl, D. Francisci, M. Barton | GRASS Use of GRASS GIS package for archaeology | GNU GPL v2+ | yes | https://github.com/OSGeo/grass | 2020 | 20832 |
| 2006 | F. Cuniolo | ARIS (Archaeological Resource Information System) A multi-user system for the management of the archaeological record. | - | - | - | - | - |
| 2007 | L. Calori, C. Camporesi, A. Palombini, S. Pescarin | Osg4Web Software package for 3D navigation and interaction with archaeological landscapes | - | - | - | - | - |
| 2007 | D. Lotto, F. Biscani, A. Facchin, S. Tibolla | Knossos DBMS for archaeology | - | - | - | - | - |
| 2007 | F. Giudici, A. Macdonnel McLean, A. Palombini | VRC (Visual Resource Collaborative) RDBMS for the online cataloguing and visualisation of Cultural Heritage items | - | - | - | - | - |
| 2008 | J. Bogdani, E. Vecchietti | BraDypUS Web-based RDBMS for the archaeological record | MIT | yes | https://github.com/bdus-db/BraDypUS | 2020 | 704 |

| Year | Authors | Application name and description | License | Is it maintained? | Source code available at: | Last commit in | Total number of commits |
|------|---------|-------------------------------|---------|-------------------|--------------------------|----------------|------------------------|
| 2009 | S. Costa, G.L. Pesce, L. Bianconi | IOSA/Total Open Station A program for downloading and processing survey data from total station devices | GNU GPL v3 | yes | https://github.com/totalopenstation/totalopenstation | 2020 | 649 |
| 2009 | S. Costa, G.L. Pesce, L. Bianconi | IOSA/GnuCal then IOSACal An open-source radiocarbon (14C) calibration software. Written in Python http://c14.iosa.it/ | GNU GPL v3 | yes | https://codeberg.org/steko/iosacal | 2020 | 242 |
| 2009 | S. Costa, G.L. Pesce, L. Bianconi | IOSA/Harris Matrix Data Package A Data Package specification for archaeological stratigraphy data following the Harris Matrix convention | GNU GPL v3 | yes | https://codeberg.org/steko/harris-matrix-data-package | 2020 | 23 |
| 2009 | C. Pedelì | ArcheoTRAC Software package for the tracking of the life cycle of Cultural Heritage items | - | - | - | - | - |
| 2009 | M. Felicori, M. Gaiani, A. Guidazzoli, M.C. Liguori | Visman Framework based on OpenSceneGraph and wxWidgets for 3D visualisation | - | - | - | - | - |
| 2009, 2012 | L. Mandolesi, E. Cocca | pyArchInit QGIS plugin for the management of the archaeological record | GNU GPL v2 | yes | https://github.com/pyarchinit/pyarchinit | 2020 | 1183 |
| 2009 | S. Laurenza, S. Mancuso, A. Costantino | V.I.R.A. (Visualizzatore Interattivo delle Rotte Antiche) Calculation and visualisation of naval routes in the ancient Mediterranean | - | - | - | - | - |
| 2009 | D. Pitzalis, R. Pillay | IIPImage Client-server package for the remote visualisation of high-resolution images over the Web | GNU GPL v3 | Yes | https://github.com/ruven/iipsrv/ | 2020 | 473 |

| Year | Authors | Application name and description | License | Is it maintained? | Source code available at: | Last commit in | Total number of commits |
|---|---|---|---|---|---|---|---|
| 2009 | G. De Felice, G. Sibilano, G. Volpe, E. Di Sciascio, R. Mirizzi, G. Piscitelli, E. Tinelli, M. Trizio | IreMaS Web based system for the management of excavation records | - | - | - | - | - |
| 2009 | A. Pozzi, P. Salonia | Cloud Manager Software package for the management of point clouds | - | - | - | - | - |
| 2010 | D. Gnesi Bartolani, S. Petruzzelli | Extended ICCD Software package for the management of ICC catalogue items | - | - | - | - | - |
| 2011 | P. Moulon, A. Bezzi | Python Photogrammetry Toolbox Photogrammetry software that creates 3D models from images | GNU GPL | - | - | - | - |
| 2011 | A. Palombini | r.finder GRASS script for predictive archaeology | GNU GPL | - | http://www.palombini.net/sw/finder/ | - | - |
| 2012 | D. Francisci | ArchaeoSection Application aimed at automatising the documentation of archaeological sections | - | - | - | - | - |
| 2013 | D. Gnesi Bartolani, U. Moscatelli | Datando Python library to manage and convert dates in DBMSs | - | - | https://pypi.org/project/datando/ | 2013 | 5 |
| 2013 | M. Monti, G. Arvizzigno, D. Lombardo, G. Maino | AKVIS Retoucher Software package for the digital restoration of photographs | commercial | yes | - | - | - |
| 2014 | G. Di Giacomo | GIS Cloud GIS functions distributed on the cloud | - | - | - | - | - |
| 2014 | M. Frassine, G. Naponiello, S. De Francesco, A. Asta | Raptor Geo RDBMS for the archaeological record | commercial | yes | - | - | - |

| Year | Authors | Application name and description | License | Is it maintained? | Source code available at: | Last commit in | Total number of commits |
|---|---|---|---|---|---|---|---|
| 2015 | J. Sikora, J. Sroka, J. Tyszkiewicz | Strati5 Mobile application for the creation of Harris Matrix | - | - | - | - | - |
| 2018 | S. Costa | Harris Matrix Data Package Harris Matrix Builder | GNU GPL | yes | https://codeberg.org/steko/harris-matrix-data-package | 2020 | 23 |
| 2018 | A. Vecchione, A. Lureau, M. Callieri | 3DHOP 3D Viewer | GNU GPL v3 | yes | https://github.com/cnr-isti-vclab/3DHOP | 2020 | 124 |
| 2018 | D. Bursich | iGIS (Immersive GIS System) Immersive 3D platform | - | - | - | - | - |

Table 2: Applications, software packages, plugins and scripts presented at ArcheoFOSS conferences, source: https://github.com/jbogdani/af-introspection/blob/master/data/applications.js (accessed 16/6/2021).

| Year of presentation | Authors | Name | URL | Availability | Access policy |
|---|---|---|---|---|---|
| 2006 | S. Alivernini, M. Brovelli, D. Magni | ArchaeoGEW: Pre-Roman archaeological evidences at Spina Verde (Como) | http://geomap.como.polimi.it/ | - | - |
| 2006 | L. Deravignone, G. Macchi, M. Serragli, A. Vichi | ASFT: Atlas of fortified sites in Tuscany | - | - | - |
| 2006 | A. Bonomi, M. Cattani, G. Mantegari, G. Vizzari | WebGIS and portal of the Bronze Age in Northern Italy | - | - | - |
| 2007 | M. Baldassarri, G. Naponiello, G. Pagni | WebGIS of Montescudaio in Val di Cecina (PI) | http://www.cediamp.it | - | - |
| 2008 | N. Pisu, G. Naponiello | ArcheoTanatOS. WebGIS of the funerary archaeology in Trentino | http://arc-team.homelinux.com/archeotanatos/archeotanatos.php | - | - |
| 2008 | M. De Gennaro, L. Zennaro | WebGIS of the Veneto region | - | - | - |
| 2008, 2009 | L. Calori, C. Camporesi, A. Negri, A. Palombini, S. Pescarin | Roma città aperta. 3D VR webGIS of the Agro Romano | http://www.virtualrome.it | - | - |

| Year of presentation | Authors | Name | URL | Availability | Access policy |
|---|---|---|---|---|---|
| 2008 | P. Grossi, F. Pirotti | WebGIS of Montegrotto Terme (Padua) | http://www.ketos.lettere.unipd.it/montegrotto | – | – |
| 2009 | G. Di Giacomo, G. Scardozzi | Atlas and Fortifications of Hierapolis | http://antares.ibam.cnr.it/atlante-hierapolis | – | – |
| 2010 | L. Endrizzi, M. Frassine, R. Gietl, G. Naponiello, N. Pisu | Castellum Vervassium. WebGIS of S. Martino Vervò (Trentino) | n.d. | – | – |
| 2010 | N.M. Mangialardi, M.G. Sibilano | ArchiDB | | | |
| 2010 | E. Scampoli, A. Sahlin | Geodatabase of Florence and Pratomagno | – | – | – |
| 2011, 2012, 2014, 2018 | M. Serlorenzi, A. De Tommasi, S. Ruggeri, R. Grassucci, A. Vismara, G. De Rosa, A. Cecchetti, F. Lamonaca, F. Zonetti | SITAR. WebGIS for Rome | https://archeositarproject.it/ | yes | open |
| 2011 | A. De Stefano, M.G. Sibilano, G. Volpe | La città nascosta. Map of the hypogea in Foggia | – | – | –. |
| 2011 | D. Leone, N. Mangialardi | LIBURNA. Database for underwater archaeology | Nd. | – | –. |
| 2012 | F. Anichini, G. Gattiglia, M.L. Gualandi, V. Noti | MAPPA: Open-Data container | http://www.mappaproject.org/ | yes | open |
| 2012 | D. Berardi, A. Ciapetti, M. De Vizia Guerriero, A. Donnini, M. Lorenzini, M.E. Masci, D. Merlitti, S. Norcia, F. Piro, O. Signore | baseculturale.it. Semantic portal for Cultural heritage | http://baseculturale.it | – | – |
| 2013 | A. Scianna, S. Gristina, R. Sciortino | 3D GIS of the castle of Maredolce, Palermo | – | – | – |

| Year of presentation | Authors | Name | URL | Availability | Access policy |
|---|---|---|---|---|---|
| 2013 | D. Giusti | Spatial database of the Palaeolithic site of Pirro Nord, Apricena (FG) | - | - | - |
| 2013 | M.S. Busana D. Francisci, A.R. Tricomi | Archeologia della lana. A Spatialite database on wool trade in the Roman Cisalpine area | - | - | - |
| 2013 | P. Albrizio, F. De Virgilio, G. Panzarino, E. Zambetta | Siponto Aperta: a webGIS of Siponto (Manfredonia) | - | - | - |
| 2013, 2014 | B. Bruno, P. Basso, P. Grossi, A. Belussi, S. Migliorini, G. Cavalieri Manasse | SITAVr: webGIS of Verona | https://sitavr.scienze.univr.it/ | yes | open |
| 2013 | A. Santoriello, A. Rossi, P. Rossi | SIUrBE: urban webGIS of Benevento | - | - | - |
| 2013 | L. Gambaro, S. Costa | Archaeological database of Albintimilium, Liguria | - | - | - |
| 2014 | C. Alfonso, G. Di Giacomo | Archaeological map of the Protected Marine area of Porto Cesareo | - | - | - |
| 2014 | L. Peyronel, D. Bursich, G. Di Giacomo | Draft webGIS of the plain of Erbil, Irachi Kurdistan | - | - | - |
| 2014 | L. Michielin, G. Strapazzon | Database of Casa delle Bestie Ferite, Aquileia | - | - | - |
| 2014 | D. Rose, E. Ceccaroni | WebGIS of the aqueduct of Alba Fucens | - | - | - |
| 2014 | F. Brunet, A. Cosner, G. Naponiello | Le fonti per la storia: webGIS of the Primiero and Vanoi valleys (Trento) | - | - | - |
| 2014 | D. Malfitana, G. Cacciaguerra, A. Mazzaglia, S. Barone, V. Noti | OpenCiTy: webGIS of the urban archaeology of the city Catania | - | - | - |
| 2014 | G. Andreozzi, G.C. Cianferoni, C. Francini, A. Sahlin, E. Scampoli | ArcheoFi: information archaeological system of Florence | - | - | - |
| 2014 | V. Vassallo, N. Kyriacou, S. Hermon, I. Eliades | Draft webGIS of Cyprus | - | - | - |

| Year of presentation | Authors | Name | URL | Availability | Access policy |
|---|---|---|---|---|---|
| 2014 | J. Bogdani | Ghazni: an open-access digital archive of the Italian Archaeological Mission in Ghazni, Afghanistan, backed by a BraDypUS database | https://ghazni.bradypus.net, https://ghazni.bdus.cloud | yes | open |
| 2014 | A. Caravale | Sethlans. Archaeological database of the Faina museum, Orvieto | http://bronzifaina.isma.cnr.it/ | yes | open |
| 2018 | J. Bogdani | PAThs: an open-access geodatabase and archaeological atlas of Late Antique Egypt, backed by a BraDypUS database | https://atlas.paths-erc.eu | yes | open |
| 2018 | S. Mariotti | Percorsi BioGrafici: webGIS and media wiki for the urban archaeology of Monforte San Giorgio (ME) | http://www.percorsibiograficimsg.com/wiki/index.php?title=Pagina_principale | - | - |

Table 3: Databases, GIS, webGIS and data portals presented at ArcheoFOSS conferences, source: https://github.com/jbogdani/af-introspection/blob/master/data/webgis.js (accessed 16/6/2021).

*F.S., J.B.*

## Concluding notes

To sum up the previous data visual analyses, it can be said as a conclusion that generally ArcheoFOSS meetings have been promptly published (Figure 1). In most cases (seven) it took only one year for the volume to be published; in one case it was published in the same year of the meeting. Some major difficulties have been encountered in the second edition of the conference (2007) whose proceedings were published only in 2013, and in the case of the 2016 edition that has never been published. As for the 2019 edition, the proceedings are by the time of writing this article under press. While logistic and funding issues might have been the main cause of the delay of publication, it can be observed that the restrictive licensing of the books is due, probably to a scarce attention towards the free and open dissemination of the research, apparently in sharp contrast to the mission of the meetings (Figure 2). An open license (CC BY-NC-ND 4) is available when the proceedings are published as Supplements of the *Archeologia e Calcolatori* journal and only in one case (conference year 2007, published in 2013) it seems to be a conscious choice of the editors (CC BY). Most of the volumes have been published with all rights reserved.

Turning our attention to the single projects presented in the conferences (and published), as for the applications, software packages, plugins and scripts, most of them (18) do not at present expose publicly the source code, in private or third-party repositories (Figure 3). Only 13 projects can be today labeled as open-source, but we must consider that many of the projects that are not maintained anymore might simply have disappeared in the last few years. There is no way to know how many of the missing ones were originally published on the Web, yet it can be argued that published articles rarely cite links, and when they do, they are projects whose code is still available. It is reasonable to assume that the code of the missing projects has never been published online.

Despite the mission of the conference, a very poor attention is dedicated to the licensing of the applications presented in the conferences, as well. The majority of the considered projects are totally reticent on this topic (Figure 4) and focus mainly on the usage of open-source tools, applications or libraries. GNU GPL is the most used FLOS license (ten cases) and MIT is used only once[5]. Unexpectedly, two commercial projects have been presented and at least in one case it was promised by project managers that the first stable release of the product would have been released with a GNU GPL license. Despite the promise, the product is still being maintained but the source code has never been shared with the community. Many of the 18 projects with no clear indication of the license, regard the use of FLOS software and tools, a fact that does not help to understand the forgetfulness of the open license for the final project.

The 'survival rate' represented in Figure 5 also clearly indicates that most of the applications presented in the conference were short-living projects, aimed at resolving very limited tasks or in some cases serving only academic purposes, since no clear track could be found of them except academic articles in scientific journals. Apparently, the push to investigate IT applications to the archaeological domain (and more in general in the domain of Cultural Heritage) has been determined in the past more by academic needs than by market or everyday practice.

The longevity of applications, software packages, plugins and scripts presented in Figure 6, refers to projects whose code is available and is measured in years from the date of their first commit (or from the date of presentation, if prior) to the date of the most recent commit/activity. Most of these projects can boast of being around for more than ten years, clearly demonstrating a huge interest of the community towards them. The count of commits, for applications using a Git-based public repository, gives account of the intensity of development and the general picture confirms the information about the longevity. By far, pyArchinit seems to be the most intensively updated project, probably reflecting the interest of the community in its development.

When it comes to projects about databases, GIS, WebGIS and data portals, the data on availability clearly shows an impressive volatility and instability of the presented projects (Figure 8). Of the vast majority of the considered projects (28/35) no traces could be found online, with the obvious exception of scientific articles published in ArcheoFOSS proceedings and in few other scientific journals. We can assume that some of them might have gone offline and disappeared from the reach of search engines after the scientific (and financial) interest on the project faded, yet many of them probably were never published online, since in many cases no link could be found in the publications. The good news is that the remaining seven projects still available today on the Web are all adopting open policies for the access to data (Figure 9). This overview does not clearly measure the openness of each project, but the contribution by P. Grossi and M. Ciurcina in this volume can help for a first attempt to look closer to data sharing policies.

<div align="right"><em>J.B.</em></div>

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[5] The new Version 4 of the Bradypus project, previously licensed as MIT, is now distributed as GNU AGPL v3.0. As the well-known MIT license does not include a share-alike clause, and forks of a MIT licensed project can be released under a commercial license.