

# Diego Jiménez-Badillo

## Research Professor in Computational Archaeology

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### Profile

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Expert in the field of Computational Archaeology; combines his training in Mesoamerican Archaeology, Mexican Colonial History, Computer Science and Geographical Information Science to develop methodologies for the analysis and dissemination of cultural heritage. His most recent projects deal with: (a) application of 3D Computer Vision and Machine Learning to automate the recognition, retrieval and classification of cultural heritage objects, particularly from museum collections and online repositories; (b) developing a methodology based on Corpus Linguistics and Named Entity Recognition for data mining and discovery of new knowledge in sixteenth century documents from New Spain; and (c) reconstruction of road networks to study interaction of Aztec and early colonial towns in the core of the Aztec Empire..

### Education

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| 2004 | <b>PH.D. IN GEOGRAPHICAL INFORMATION SCIENCES</b><br>University of London, UCL. London, UK<br><a href="http://www.ucl.ac.uk/geomatics">http://www.ucl.ac.uk/geomatics</a>                                                      |
| 1996 | <b>MASTER CERTIFICATE IN COMPUTER SCIENCES</b><br>Fundación Arturo Rosenblueth para el Avance de la Ciencia, Mexico City.<br><a href="http://www.rosenblueth.mx/sitio/index.php">http://www.rosenblueth.mx/sitio/index.php</a> |
| 1991 | <b>MASTER CERTIFICATE IN ASIAN AND AFRICAN STUDIES WITH SPECIALTY IN CHINESE HISTORY</b><br>El Colegio de México, Mexico City.<br><a href="http://ceaa.colmex.mx/">http://ceaa.colmex.mx/</a>                                  |
| 1988 | <b>BACHELOR DEGREE IN ARCHAEOLOGY</b><br>Escuela Nacional de Antropología e Historia. Mexico City. <a href="http://www.enah.edu.mx/">http://www.enah.edu.mx/</a>                                                               |
| ◇◇◇◇ | <b>FULL PROFICIENCY IN SPANISH AND ENGLISH; DELF-B2 LEVEL IN FRENCH; ELEMENTARY LEVEL OF MANDARIN</b>                                                                                                                          |

### Selected accomplishments

#### BUILT AN AUTOMATIC SEARCH ENGINE FOR 3D DIGITAL CULTURAL HERITAGE OBJECTS

Under his leadership, an interdisciplinary research group developed an automatic 3D shape recognition system to retrieve cultural heritage objects from web repositories based exclusively on the analysis of their geometric properties. This search-engine operates in a similar manner than Google, but instead of text-based queries it uses 3D shape recognition algorithms for retrieving objects.

### Appointments

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#### 2015-2020

##### **CHAIRMAN OF THE STEERING COMMITTEE**

International Network for Researching Digital Technologies Oriented to the Dissemination of Cultural Heritage. National Council for Science Humanities and Technology (Conahcyt), Mexico.

#### SINCE 2014

##### **CO-CHAIRMAN (WITH P. MURRIETA FLORES)**

Mexican Chapter of the Association for Computer Applications and Quantitative Methods in Archaeology (CAA-Mexico).

#### SINCE 2004

##### **RESEARCH PROFESSOR**

Instituto Nacional de Antropología e Historia, Museo del Templo Mayor, [National Institute of Anthropology and History, Templo Mayor Museum]. Seminario 8, Centro Histórico, Ciudad de México CP 06060, México.  
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#### 1993-2004

##### **ASSOCIATE PROFESSOR**

National Institute of Anthropology and History (INAH), Templo Mayor Museum ([www.inah.gob.mx](http://www.inah.gob.mx))

#### 1988-1993

##### **ASSISTANT PROFESSOR**

National Institute of Anthropology and History (INAH), Templo Mayor Museum.

A recent paper and free access to the search engine software and source code can be downloaded from <https://f1000research.com/articles/12-182>.

#### DEVELOPED A METHODOLOGY FOR THE IDENTIFICATION OF NEW KNOWLEDGE IN HISTORIC DOCUMENTS

This project applied Computational Linguistics to automatically tag words belonging to analytic categories in a sixteenth century corpus known as *Relaciones Geográficas* (1577-1585). Thanks to a combination of Named Entity Recognition and Disambiguation techniques, and Georeferencing of places mentioned in the documents, the methodology allows historians to retrieve unsuspected patterns of information in just a few seconds, a task that would take months of years through normal reading. This project was conducted in collaboration with Bruno Martins (Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa, INESC-ID, University of Lisbon) and Patricia Murrieta-Flores (Digital Humanities Hub, Lancaster University).

#### CREATED THE RELATIVE NEIGHBOURHOOD METHOD OF SPATIAL ANALYSIS (RN-METHOD)

Responding to the need of historians and archaeologists to assess different scenarios on how a set of sites could have interacted in the past, this method defines areas of influence (i.e. relative neighbourhoods) around point locations in order to produce adjacency-networks, which describe links and topological structure at different levels of resolution. It provides formulae to measure properties, such as degree of 'integration' and 'control' of each node (i.e. town) within the network structure, facilitating the understanding of the social and economic dynamics of ancient regions.

#### DESIGNED AND IMPLEMENTED RGN EXPLORER SOFTWARE

This software was developed to support the application of the RN-Method. It features tools to compute, analyse and visualize adjacency networks interactively through the integration of spatial analysis functionality, graph-theoretical algorithms, DBMS transactions, and 3D rendering functions.

#### DEVELOPED THE FIRST MUSEUM MANAGEMENT INFORMATION SYSTEM IN MEXICO (1988)

This led to major improvements in the processing of information collected during excavations of the main ceremonial Aztec site and the subsequent operations of the Templo Mayor museum, such as responding to lending requests and tracking administrative, conservation and archaeological records.

## Leadership

#### FOUNDER AND CHAIRMAN OF THE INTERNATIONAL RESEARCH NETWORK FOR THE APPLICATION OF DIGITAL TECHNOLOGIES TO THE DISSEMINATION OF CULTURAL HERITAGE (RedTDPC)

Between 2015-2019, the RedTDPC investigated the best economic, technical, intellectual and legal conditions for applying information and communication technologies to the analysis and dissemination of cultural heritage in museums, archives, libraries, research and cultural centres. The organization benefited the work of 250 academics, students and experts in 42 research fields, distributed in 61 academic institutions and 10 countries. The RedTDPC operates from 2015 to 2020 thanks to renewable annual grants from the National Council of Science and Technology of Mexico (Conacyt). The Covid pandemic put a hold on the research network, but current plans consider a relaunch in 2025. It is still the major Mexican research association in the field of Digital Humanities and Computational Archaeology.

#### CO-CHAIRMAN OF THE MEXICAN CHAPTER OF THE ASSOCIATION OF COMPUTER APPLICATIONS AND QUANTITATIVE METHODS IN ARCHAEOLOGY (CAA MEXICO).

This is a local branch of CAA International, the most important association of professionals in the field of computational archaeology. Founded by a group of British archaeologists 46 years ago, CAA International organizes annual conferences in different countries since 1973. The Mexican chapter is very active in promoting the academic exchange between its local members and researchers residing

in other parts of the world.

#### **DIRECTOR OF THE SHAPING ARCHAEOLOGY GROUP (SAG)**

SAG was created to promote collaboration between professionals in the Humanities and experts in Computer Sciences, Mathematics, Computer Vision and Machine Learning with the objective of developing new methods for quantitative analysis of cultural heritage. We celebrate a colloquium and organize several workshops and seminars each year. SAG operates through a consortium formed by the National Institute of Anthropology and History (INAH), and the Supercomputer Centre and You-i-Lab from the Science and Technology Institute of San Luis Potosí (IPICYT).

### **Academic collaboration and grants**

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| <b>2023-2024</b>  | <p><b>CONACHyT (FORMERLY CONACYT). GRANT FOR INTERNATIONAL RESEARCH COLLABORATION</b></p> <p>Awarded with a 15,000 US dollars grant to work at the German Archaeological Institute during a sabbatical period from 1 October 2023 to 30 September 2024. The research, conducted in collaboration with Dr. Benjamin Ducke aims at reconstructing the road network of the Aztec empire and study its evolution during the first stage of the colonial period (sixteenth century).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>2017-2020</b>  | <p><b>TRANS-ATLANTIC PLATFORM FOR SOCIAL SCIENCES AND HUMANITIES (T-AP)</b></p> <p>During the latest competition for T-AP grants, 109 academic groups from Europe and North America submitted their research proposals. Our team –composed by researchers from the United Kingdom, Mexico and Portugal– presented the project <i>Digging into Early Colonial Mexico: A large-scale computational analysis of sixteenth century historical documents</i>. This was declared winner of one of the 14 grants awarded for the period 2017-2020. A sum of 480,000 US dollars were allocated for the three-year duration of the project. The project is conducted in collaboration with Dra. Patricia Murrieta-Flores (Digital Humanities HUB, Lancaster University) and Dr. Bruno Martins ((Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa, INESC-ID, University of Lisbon).</p> |
| <b>2015-2020</b>  | <p><b>CONACyT, THEMATIC RESEARCH NETWORKS PROGRAM</b></p> <p>Over 210,000 US dollars were awarded for the operation of the Research Network for the Application of Digital Technologies to the Dissemination of Cultural Heritage through annual grants from the National Council of Science and Technology (CONACyT-254302, 272060, 280835 and 294971). Newfoundings expected in 2025.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>SINCE 2015</b> | <p><b>INAH INSTITUTIONAL RESEARCH FUND</b></p> <p>Three annual grants for a total of 60,000 US dollars have been awarded to the project Shaping archaeology: Automatic 3D shape recognition of archaeological heritage. The project is conducted in collaboration with Dr. Salvador Ruiz-Correa (Instituto Potosino de Investigaciones en Ciencia y Tecnología, IPICYT, San Luis Potosi, Mexico), and Dr. Oman Mendoza-Montoya (Instituto tecnologico de Monterrey, Guadalajara, Mexico).</p>                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>2010 -2015</b> | <p><b>NATIONAL INSTITUTE OF ANTHROPOLOGY AND HISTORY (INAH), GRANT 1364-2010-2015</b></p> <p>The project 3D digitization of archaeological sites and artefacts received a total sum of 90,000 US dollars through a renewable annual application process. Grant 2010-2015/1364.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>SINCE 1995</b> | <p><b>MEMBER OF THE NATIONAL SYSTEM OF RESEARCHERS (SNI-CONACyT)</b></p> <p>Recipient since 1995 of SNI-Conacyt grant, awarded to high productivity researchers through a proof-based assesment of their accomplishments in renewable periods of two to four years.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## Publications

### Books

JIMÉNEZ-BADILLO, D.

*Relative Neighbourhood Networks for spatial analysis of archaeological contexts*. México: INAH (expected April 2025).

VALADEZ VÁZQUEZ, R., CASTAÑEDA DE LA PAZ, M. AND JIMÉNEZ-BADILLO, D.

2021 *Zempoala. Historia y paisaje de un corregimiento en el Estado de Hidalgo*. México: Universidad Nacional Autónoma de México, Instituto de Investigaciones Jurídicas. ISBN: 978-607-30-4920-7. Available at: <https://biblio.juridicas.unam.mx/bjv/detalle-libro/6707-zempoala-historia-y-paisaje-de-un-corregimiento-en-el-estado-de-hidalgo>

JIMÉNEZ-BADILLO, D. (ED.).

2021 *Patrimonio Digital. Métodos computacionales y medios interactivos para estudiar y divulgar el patrimonio cultural*. México: Instituto Nacional de Antropología e Historia. ISBN (printed): 978-607-539-602-6; ISBN (PDF): 978-607-539-597-5. Available at: [https://mediateca.inah.gob.mx/islandora\\_74/islandora/object/libro%3A853](https://mediateca.inah.gob.mx/islandora_74/islandora/object/libro%3A853)

JIMÉNEZ-BADILLO, D. (ED.).

2017 *Arqueología Computacional. Nuevos enfoques para la documentación, análisis y difusión del patrimonio cultural*. México: Instituto Nacional de Antropología e Historia. ISBN 978-607-539-027-7.

JIMÉNEZ-BADILLO, D. AND GÁNDARA, M. (EDS.).

2016 *El patrimonio cultural y las tecnologías digitales. Experiencias recientes desde México*. México: Instituto Nacional de Antropología e Historia. ISBN 978-607-484-790-1.

JIMÉNEZ-BADILLO, D.

1998 *Ofrendata. Aplicación de un sistema de base de datos para controlar una colección arqueológica*. México: Instituto Nacional de Antropología e Historia. ISBN 978-970-180-694-4.

### Articles

MURRIETA-FLORES, P., JIMÉNEZ-BADILLO, D., AND FAVILA-VÁZQUEZ, M.

Placing New Spain through Early Modern Big Data: Developing a Geographical Text Analysis approach to the Relaciones Geográficas de Nueva España. In *Knowing the Empire in Early Modern China and Spain*, edited by Mackenzie Cooley and Wu Huiyi. Ann Arbor, Michigan: Lever Press (expected at the end of 2024).

JIMÉNEZ-BADILLO, D., MENDOZA-MONTOYA, O. AND RUIZ-CORREA, S.

2024 Application of computer vision techniques for 3D matching and retrieval of archaeological objects. *New Digital Archaeologies, F1000 Research*. Available online at: <https://f1000research.com/articles/12-182>

JIMÉNEZ-BADILLO, D.

2023 Análisis regional basado en la Teoría de Lugar Central con herramientas disponibles en un Sistema de Información Geográfica. In *Sistemas de Información Geográficos para arqueólogos: Repensando el espacio en contextos arqueológicos mesoamericanos*, edited by Armando Trujillo Herrada. Zinacantepec, Estado de México: El Colegio Mexiquense, A. C. y El Colegio de Michoacan. ISBN: 978-607-8836-57-4

JIMÉNEZ-BADILLO, D.

2023 Nearest and relative neighbourhood networks. In *Oxford Handbook of Archaeological Network Research*, edited by Tom Brughmans, Barbara J. Mills, Jessica Munson, and Matthew A. Peeples, pp. 165-185. Oxford: Oxford University Press. ISBN: 978-01-98854-26-5 <https://doi.org/10.1093/oxford->

hb/9780198854265.013.9

**JIMÉNEZ-BADILLO, D., RUIZ-CORREA, S. AND MENDOZA-MONTOYA, O.**

- 2023      Análisis computarizado de forma para el reconocimiento automatizado de objetos del patrimonio cultural. Revista *Ichan Tecolotl*, 34 (371), April 2023. Special Issue *Humanidades Digitales en Latinoamérica: Avances y perspectivas*, edited by Mariana Favila Vázquez. ISSN: 2683-314x. Available online at: <https://ichan.ciesas.edu.mx/analisis-computarizado-de-forma-para-el-reconocimiento-automatizado-de-objetos-del-patrimonio-cultural/>

**MURRIETA-FLORES, P., JIMÉNEZ-BADILLO, D., AND MARTINS, B.**

- 2022      Digital resources: Artificial intelligence, computational approaches, and geographical text analysis to investigate Early Colonial Mexico. Oxford Research Encyclopedia of Latin American History. Oxford: Oxford University Press. Available at: <https://doi.org/10.1093/acrefore/9780199366439.013.977>

**JIMÉNEZ-BADILLO, D.**

- 2021      Introduction. In Jiménez-Badillo, D. (ed.). *Patrimonio digital. Métodos computacionales y medios interactivos para estudiar y divulgar el patrimonio cultural*, pp. 11-16. Mexico: Instituto Nacional de Antropología e Historia. ISBN (printed): 978-607-539-602-6; ISBN (PDF): 978-607-539-597-5. Available at: [https://mediateca.inah.gob.mx/islandora\\_74/islandora/object/libro%3A853](https://mediateca.inah.gob.mx/islandora_74/islandora/object/libro%3A853)

**JIMÉNEZ-BADILLO, D., RUIZ-CORREA, S., AND ROMÁN-RANGEL, E. F.**

- 2021      Morphological analysis of archaeological artefacts using computer vision and machine learning algorithms. In Jiménez-Badillo, D. (ed.). *Patrimonio digital. Métodos computacionales y medios interactivos para estudiar y divulgar el patrimonio cultural*, pp. 17-23. Mexico: Instituto Nacional de Antropología e Historia. ISBN (printed): 978-607-539-602-6; ISBN (PDF): 978-607-539-597-5. Available at: [https://mediateca.inah.gob.mx/islandora\\_74/islandora/object/libro%3A853](https://mediateca.inah.gob.mx/islandora_74/islandora/object/libro%3A853)

**JIMÉNEZ-BADILLO, D., MURRIETA-FLORES, P., MARTINS, B., GREGORY, I., FAVILA VÁZQUEZ, M., LICERAS-GARRIDO, R., BELLAMY, K., WON, M., AND ESTIMA, J.**

- 2021      Análisis histórico-geográfico de documentos novohispanos del siglo XVI mediante técnicas de lingüística computacional y análisis espacial. En D. Jiménez-Badillo (ed.), *Patrimonio digital. Métodos computacionales y medios interactivos para estudiar y divulgar el patrimonio cultural*, pp. 35-64 México: Instituto Nacional de Antropología e Historia. ISBN (printed): 978-607-539-602-6; ISBN (PDF): 978-607-539-597-5. Available at: [https://mediateca.inah.gob.mx/islandora\\_74/islandora/object/libro%3A853](https://mediateca.inah.gob.mx/islandora_74/islandora/object/libro%3A853)

**JIMÉNEZ-BADILLO, D., MURRIETA-FLORES, P., MARTINS, B., GREGORY, I., FAVILA VÁZQUEZ, M., AND LICERAS-GARRIDO, R.**

- 2020      Developing geographically oriented NLP approaches to sixteenth century historical documents: Digging into Early Colonial Mexico. *Digital Humanities Quarterly*, 14(4), special Issue edited by Hannah Alpert-Abrams and Clayton McCarl. ISSN 1938-4132. <http://digitalhumanities.org/dhq/vol/14/4/000490/000490.html>

**MURRIETA-FLORES, P., FAVILA-VÁZQUEZ, M., BELLAMY, K., JIMÉNEZ-BADILLO, D., MARTINS, B., LÓPEZ CAMACHO, J., McDONOUGH, K., AND PALACIOS, A.**

- 2020      Pelagios Commons: Subaltern Recogito Project Dataset", Dataverse, Texas Data Repository. <https://doi.org/10.18738/T8/L2SJQT>.

**MURRIETA-FLORES, P., FAVILA VÁZQUEZ, M., BELLAMY, K., JIMÉNEZ BADILLO, D., MARTINS, B., LÓPEZ CAMACHO, J., McDONOUGH, K., AND PALACIOS, A.**

- 2020      Subaltern Recogito Ontology. Figshare. Dataset. <https://doi.org/10.6084/m9.figshare.12063180.v1>

**LICERAS-GARRIDO, RAQUEL, MARIANA FAVILA-VÁZQUEZ, KATHERINE BELLAMY, PATRICIA MURRIETA-FLORES, DIEGO JIMÉNEZ-BADILLO, ET AL.**

- 2019      Digital Approaches to Historical Archaeology: Exploring the Geographies of 16th Century New Spain. Open Access Journal of Archaeology & Anthropology 2(1). DOI: 10.33552/OAJAA.2019.02.000526.

**CANUL KU, M., HASIMOTO, R., JIMÉNEZ-BADILLO, D., RUIZ-CORREA, S. Y ROMAN-RANGEL, E.F.**

2018 Classification of 3D archaeological objects using multi-view curvature structure signatures. *IEEE Access*, 7(1): 3298-3313. ISSN 2169-3536 (printed version); DOI 10.1109/ACCESS.2018.2886791.

**JIMÉNEZ-BADILLO, D.**

2018 Una introducción a tres campos de la arqueología computacional. En I. Galina Russell, et al. (Eds.), *Humanidades digitales, Vol. 2: Lengua, texto, patrimonio y datos*, pp. 111-155. México: Bonilla Artigas Editores and Red de Humanidades Digitales. ISBN: 978-607-856-060-8

**JIMÉNEZ-BADILLO, D. AND ROMAN-RANGEL, E.**

2017 Clasificación automática de fragmentos de vasijas arqueológicas mediante el modelo Bolsa de Palabras. En D. Jiménez-Badillo (Ed.), *Arqueología Computacional. Nuevos enfoques para la documentación, análisis y difusión del patrimonio cultural*, pp. 111-126. México: INAH. ISBN 978-607-539-027-7.

**JIMÉNEZ-BADILLO, D. AND RUIZ-CORREA, S.**

2017 Aplicación de agrupamiento espectral para analizar una colección de máscaras arqueológicas En D. Jiménez-Badillo (Ed.), *Arqueología Computacional. Nuevos enfoques para la documentación, análisis y difusión del patrimonio cultural*, pp. 143-172. México: INAH. ISBN 978-607-539-027-7.

**JIMÉNEZ-BADILLO, D. AND RUIZ-CORREA, S.**

2017 Análisis tridimensional de objetos arqueológicos con técnicas de visión por computadora. En E. Matos Moctezuma and P. Ledesma Bouchan (Eds.), *Templo Mayor: Revolución y estabilidad*, pp. 199-214. México: INAH. ISBN 978-607-484-983-7.

**JIMÉNEZ-BADILLO, D.**

2017 Introducción. In D. Jiménez-Badillo (ed.), *Arqueología computacional. Nuevos enfoques para la documentación, análisis y difusión del patrimonio cultural*, pp. 11-19. México: INAH. ISBN 978-607-539-027-7.

**JIMÉNEZ-BADILLO, D. AND ROMAN-RANGEL, E.**

2016 Application of the Bag of words model (BoW) for analysing archaeological potsherds. En S. Campana, R. Scopigno, G. Carpentiero and M. Cirillo (Eds.), *Keep the Revolution Going. Proceedings of the 43th Annual Conference on Computer Applications and Quantitative Methods in Archaeology*, Universitat di Siena, Siena, Italy, 30 March-3 April, 2015, pp. 847-856. Oxford: Archaeopress. ISBN 978-178-491-337-3.

**ROMAN-RANGEL, E., JIMÉNEZ-BADILLO, D. AND MARCHAND-MAILLET, S.**

2016 Classification and retrieval of archaeological potsherds using Histograms of Spherical Orientations. *ACM Journal on Computing and Cultural Heritage*, 9(3): article 17, 23 pp. ISSN 1556-4673/2016/09-ART17. DOI: 10.1145/2948069.

**ROMAN-RANGEL, E. JIMÉNEZ-BADILLO, D. AND MARCHAND-MAILLET, S.**

2016 Rotation invariant local shape descriptors for classification of archaeological 3D models. En J. F. Martínez-Trinidad et al (eds.), *Pattern Recognition. Lecture Notes in Computer Science*, 9703: 13-22. ISSN 0302-9743; ISBN 978-3-319-39392-6; DOI: 10.1007/978-3-319-39393-3 2.

**GÁNDARA VÁZQUEZ, M., AND JIMÉNEZ-BADILLO, D.**

2016 Introducción. En D. Jiménez-Badillo and M. Gándara Vázquez (Eds.), *El patrimonio cultural y las nuevas tecnologías. Experiencias recientes desde México*, pp. 19-30. México: INAH. ISBN 978-607-484-790-1.

**JIMÉNEZ-BADILLO, D.**

2016 La RedTDPC y la difusión del patrimonio cultural en el siglo XXI. En D. Jiménez-Badillo and M. Gándara Vázquez (Eds.), *El patrimonio cultural y las nuevas tecnologías. Experiencias recientes desde México*, pp. 42-59. México: INAH. ISBN 978-607-484-790-1.

**ROMAN-RANGEL, E. JIMÉNEZ-BADILLO, D.**

- 2015 Similarity analysis of archaeological potsherds using 3D surfaces. En J. A. Carrasco-Ochoa et al (eds.), *Pattern Recognition. Lectures Notes in Computer Science*, 9116, pp. 125-134. ISSN 0302-9743 (printed version) and ISSN 1611-3349 (digital version).

**ROMAN-RANGEL, E. JIMÉNEZ-BADILLO, D., AND AGUAYO-ORTIZ, E.**

- 2015 Categorization of Aztec potsherds using 3D local descriptors. En C. V. Jawahar and S-G. Shan (eds.), *Proceedings of the 3rd. Workshop on e-Heritage, 12th Asian Conference on Computer Vision (ACCV)*. Singapore, November 2014. *Computer Vision. Lecture Notes in Computer Science* 9009, pp. 567-582. Cham: Springer. ISSN 0302-974. ISBN 978-3-319-16630-8. [https://doi.org/10.1007/978-3-319-16631-5\\_42](https://doi.org/10.1007/978-3-319-16631-5_42)

**JIMÉNEZ-BADILLO, D.**

- 2014 Proyecto desarrollo de aplicaciones de computación en arqueología. *Arqueología Mexicana*, Special Issue 56: 75-76.

**REYES SOLIS, A. AND JIMÉNEZ-BADILLO, D.**

- 2014 Técnicas para el modelado tridimensional de artefactos arqueológicos. Online: <http://remarq.ning.com/page/tecnicas-para-el-modelado-tridimensional-de-artefactos-arqueologi> [accessed 7 July, 2018].

**JIMÉNEZ-BADILLO, D.**

- 2013 Los sistemas de información geográfica en arqueología. *Arqueología Mexicana*, 21(121): 71-76.

**JIMÉNEZ-BADILLO, D.**

- 2013 A new method of spatial analysis based on the extraction of proximity graphs. En G. Earl, T. Sly, A. Chrysanthi, P. Murrieta-Flores, C. Papadopoulos, I. Romanowska, and D. Wheatley (Eds.), *Archaeology in the digital era*, pp. 400-413. Amsterdam: Amsterdam University Press. ISBN 978 90 8964 663 7

**JIMÉNEZ-BADILLO, D., RUIZ-CORREA, S. AND GARCÍA ALFARO, W.**

- 2013 Developing a recognition system for the retrieval of archaeological 3D models. En F. Conreras, M. Farjas and F. J. Melero (Eds.), *Proceedings of the 38th Annual Conference on Computer Applications and Quantitative Methods in Archaeology, CAA2010*, Granada, Spain, April 2010, pp. 325-331. Oxford: Archaeopress. ISBN 978 14 0731 108 1.

**JIMÉNEZ-BADILLO, D.**

- 2012 Relative Neighbourhood Networks for archaeological analysis. En M-Q. Zhou, et al. (Eds.), *Revive the past. Proceedings of the 39th Annual Conference on Computer Applications and Quantitative Methods in Archaeology*, Beijing, China, 12-16 April, 2011, pp. 370-380. Amsterdam: Pallas Publications. ISBN 978-90-8555-066-2.

**JIMÉNEZ-BADILLO, D.**

- 2011 Interpretación de dos ofrendas del Templo Mayor con el apoyo de fuentes pictográficas. En M. C. Valverde and V. Solanilla (Eds.), *Las imágenes precolombinas, reflejo de saberes*, pp. 361-395. México: UNAM. ISBN 978-607-02-2716-5.

**JIMÉNEZ-BADILLO, D.**

- 2011 Aztec religión and spatial symbolism. En Essays in honour of An Zhimin. Beijing: Cultural Relics Press. ISBN 978-7-5010-3245-7.

**JIMÉNEZ-BADILLO, D. AND RUIZ-CORREA S.**

- 2010 3D shape matching and retrieval for archaeological analysis. En F. J. Melero, P. Cano and J. Revelles (Eds.), *Fusion of Cultures. Long abstracts of the 38th Annual Conference on Computer Applications and Quantitative Methods in Archaeology, CAA2010*, Granada, Spain, April 2010, pp. 583-588. Granada, Spain: University of Granada. ISBN 978-84-693-0772-4.

**JIMÉNEZ-BADILLO, D.**

- 2009 Una aplicación de la teoría de gráficas en arqueología. Primera parte. *Carta Informativa de la Sociedad Matemática Mexicana*, 60: 1-8.

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## Presentations in academic meetings

**JIMÉNEZ-BADILLO, D.**

- 2023 Un sistema computarizado para el reconocimiento, búsqueda y recuperación automática de modelos 3D de objetos arqueológicos, aplicable a museos del patrimonio cultural [A computerized system for automatic search and retrieval of 3D models of archaeological objects], *5to. Ciclo Arqueometría y nuevas tecnologías en arqueología, del Museo del Templo Mayor*. Ciudad de México, 7 June 2023.

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- 2023 Desarrollo de un sistema de visión por computadora para el reconocimiento y análisis automático de modelos tridimensionales de objetos arqueológicos [Developing a Computer Vision system for automatic recognition and anlysis of 3D models of archaeological objects], 4th Ciclo del Seminario Permanente: Diálogos y casos de estudio en museos y arqueología. Museo del Templo Mayor. Ciudad de México, 16 October 2023.

**JIMÉNEZ-BADILLO, D.**

- 2023 Modelling connectivity in ancient regions through the application of Beta-skeletons. A case study from sixteenth century New Spain, Session 30, Crossing Landscapes of the Past: Developments in Modelling Mobility and Connectivity in Archaeology, 50th Annual Conference on Computer Applications and Quantitative Methods in Archaeology, Amsterdam, The Netherlands, 5 April, 2023.

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**JIMÉNEZ-BADILLO, D.**

2019 Aplicación del Aprendizaje de Máquina al Estudio del Patrimonio Cultural. Primer Foro de Diplomacia Cultural México-Francia "La Cultura en la Era Digital", Paris, 8 November, 2019.

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**JIMÉNEZ-BADILLO, D.**

2019 Arqueología computacional: Oportunidades para la colaboración entre ingenieros y humanistas [Computational Archaeology: Opportunities of collaboration between Engineering and Humanities professionals]. Instituto Tecnológico Autónomo de México (ITAM), March 27, 2019.

**JIMÉNEZ-BADILLO, D., ET AL.**

2018 Aplicación de visión por computadora para clasificar objetos arqueológicos de manera automática utilizando un algoritmo de deformación [An application of Computer Vision to classify archaeological objects with a morphing algorithm]. Quinto Congreso El Patrimonio Cultural y las Nuevas Tecnologías, Museo Nacional de Antropología, Mexico City, 6-9 November, 2018.

**FAVILA VÁZQUEZ, M., JIMÉNEZ-BADILLO, D., Y MURRIETA-FLORES, P.**

2018 ¿Yanhuitlán, Yodzocahi o Yodzoquehe? Estrategias digitales para la desambiguación de topónimos en la Relaciones Geográficas del Siglo XVI [Yanhuitlán, Yodzocahi o Yodzoquehe? Digital Strategies for toponym disambiguation in Sixteenth Century Geographical Reports from New Spain]. Quinto Congreso el Patrimonio Cultural y las Nuevas Tecnologías, Museo Nacional de Antropología, Mexico City, 6-9 November, 2018.

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2018 A machine learning methodology to analyse 3D digital models of cultural heritage objects. Digital Humanities International Conference DH2018, Mexico City, 25-29 June, 2018.

**MURRIETA-FLORES, JIMÉNEZ-BADILLO, D., P., MARTINS, B., AND GREGORY, I.**

2018 Digging into Early Colonial Mexico: Large-scale computational analysis of XVI century historical documents. Digital Humanities International Conference, DH2018, Mexico City, 25-29 June, 2018.

**JIMÉNEZ-BADILLO, D.**

- 2018 Técnicas computacionales aplicadas al trabajo arqueológico [Applying computational techniques to archaeological work]. Seminario de Métodos y Técnicas Aplicados a la Investigación de Salvamento Arqueológico. August 15, 2018.

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**JIMÉNEZ-BADILLO, D. AND ROMAN-RANGEL, E. F.**

- 2015 Clasificación automática de cerámica y artefactos arqueológicos por medios computarizados mediante el análisis de Bolsas de Rasgos Visuales [Computer-assisted automatic classification of ceramics and archaeological artefacts with Bag of Words analysis]. Segundo Congreso Internacional El Patrimonio Cultural y las Nuevas Tecnologías. Museo Nacional de Antropología, Ciudad de México, 12-16 October, 2015.

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- 2015 A computer platform to analyse the shape of museum objects in 3D. Second Symposium on Virtual Archaeology, Museums and Cultural Tourism, VAMCT 2015, Delphi, Greece, 23-26 September, 2015.

**ROMÁN-RANGEL, E. F. AND JIMÉNEZ-BADILLO, D.**

- 2015 Similarity analysis of archaeological potsherds using 3D surfaces. 7th Mexican Conference on Pattern Recognition. Guanajuato, Mexico City, 24-27 June, 2015.

**JIMÉNEZ-BADILLO, D.**

- 2015 Aplicación de nuevas tecnologías y su problemática en la difusión del patrimonio cultural [Problems concerning the application of new technologies for the dissemination of cultural heritage]. Mesa Redonda Tecnologías Digitales para la Difusión del Patrimonio Cultural, Museo Interactivo de Economía (MIDE), Ciudad de México, 19 June, 2015.

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- 2015 A new classification of masks from Guerrero discovered in the Great Temple of Tenochtitlan. 80th Anniversary Meeting of the Society of American Archaeology, San Francisco, USA, 15-19 April, 2015.

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- 2015 Application of the bag-of-words approach to the analysis of archaeological sherds and artefacts. 43rd Annual Conference on Computer Applications and Quantitative Methods in Archaeology, CAA2015, Università di Siena, Italy, 30 March-3 April, 2015.

**JIMÉNEZ-BADILLO, D., RUIZ-CORREA, S., CANUL-KU, M., AND HASIMOTO BELTRÁN, R.**

- 2015 A new approach for classifying archaeological objects based on 3D shape similarity analysis. 43rd Annual Conference on Computer Applications and Quantitative Methods in Archaeology, CAA2015, Università di Siena, Italy, 30 March-3 April, 2015.

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- 2014 Implementación de un sistema de reconocimiento de formas en 3D aplicado a la arqueología [Implementing a 3D shape recognition systems applied to Archaeology]. Primer Congreso Internacional de Patrimonio Cultural y Nuevas Tecnologías. Museo Nacional de Antropología, Mexico City, 3-6 December, 2014.

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- 2014 Reconocimiento de objetos en escenas complejas para aplicaciones de realidad aumentada, [Recognition of objects in complex scenes for applications of Augmented Reality]. Primer Congreso Internacional de Patrimonio Cultural y Nuevas Tecnologías. Museo Nacional de Antropología, Mexico City, 3-6 December, 2014.

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- 2014 Aplicación de agrupamiento espectral para el análisis exploratorio de máscaras arqueológicas, [Application of Spectral Clustering for an exploratory analysis of archaeological masks]. Primer Congreso Internacional de Patrimonio Cultural y Nuevas Tecnologías. Museo Nacional de Antropología, Mexico City, 3-6 December, 2014.

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- 2014 A search Engine to retrieve archaeological objects similar to a given 3D model. Conference by invitation from the Department of History and Archaeology, University of Chester, UK, 7 October, 2014.

**JIMÉNEZ-BADILLO, D. AND RUIZ-CORREA, S.**

- 2014 Identifying formal similarities in archaeological artefacts using a new clustering technique based on Spectral Graph Theory. Third Joint Chapter Meeting of the CAA Germany and CAA Netherlands and Flandes, Cologne, Germany. 3-4 October, 2014.

**JIMÉNEZ-BADILLO, D.**

- 2014 Arqueología 3D: Un panorama de nuevas tecnologías para la construcción de modelos digitales de sitios y artefactos arqueológicos [3D archaeology: A survey of new technologies for producing digital models of archaeological sites and artefacts]. Coloquio Investigaciones Recientes sobre la Cuenca de Mexico, Museo del Templo Mayor, Mexico City, 19 September, 2014.

**JIMÉNEZ-BADILLO, D., RUIZ-CORREA, S.**

- 2014 Beyond 3D Scanning: Implementing a computer program for analysing the shapes of archaeological 3D Models. 42nd. Annual Conference on Computer Applications and Quantitative Methods in Archaeology, CAA2012. Université Paris 1 Panthéon-Sorbonne, Paris, France, 22-25 April, 2014.

**JIMÉNEZ-BADILLO, D.**

- 2013 Developing a computer program for analyzing 3D archaeological models. Conference by invitation of the Department of Anthropology of Western University. Ontario, Canada, 14 November, 2013.

**JIMÉNEZ-BADILLO, D.**

- 2013 Human sacrifice as Earth worship. Conference by invitation of the Department of Anthropology of Western University, Mike Spence Lecture Series. Ontario, Canada, 13 November, 2013.

**JIMÉNEZ-BADILLO, D.**

- 2013 Evidencias del culto a la Tierra en dos ofrendas del Templo Mayor de Tenochtitlan, [Evidences of Earth worship in two offerings from the Great temple of Tenochtitlan]. Coloquio sobre Coyolxauhqui a 35 años de su descubrimiento. Museo del Templo Mayor, Mexico City, 12 February, 2013.

**JIMÉNEZ-BADILLO, D.**

- 2012 A new exploratory method to discover contextual relationships based on relational networks. E-Humanities Seminar, University of Leipzig, Germany, 7 November, 2012.

**JIMÉNEZ-BADILLO, D.**

- 2012 A new method of spatial analysis based on proximity graphs. 40th Annual Conference on Computer Applications and Quantitative Methods in Archaeology, CAA2012. University of Southampton, UK, 26-29 March, 2012.

**JIMÉNEZ-BADILLO, D.**

- 2012 Analysing formal features of archaeological artefacts through the application of spectral clustering. Digital Classicist Seminar. Institute of Archaeology, Berlin, Germany, 6 November, 2012.

**JIMÉNEZ-BADILLO, D.**

- 2012 Analysing archaeological masks through quantitative methods and Computer Vision. 54th International Congress of Americanists. Vienna, Austria, 15-20 July, 2012.

**JIMÉNEZ-BADILLO, D.**

- 2012 Análisis espacial basado en gráficas de adjacencia y su uso en contextos arqueológicos [Spatial analysis based on adjacency graphs and its application to archaeological contexts]. 45 Congreso Nacional de la Sociedad Matemática Mexicana. Queretaro, Mexico, 30 October, 2012.

**JIMÉNEZ-BADILLO, D.**

- 2012 Avances del proyecto de digitalización tridimensional de sitios y artefactos arqueológicos [Advances of the project 3D digitisation of sites and archaeological artefacts]. VIII Jornadas Permanentes de Arqueología, Mexico City, 2012.

**JIMÉNEZ-BADILLO, D.**

- 2012 Modelado digital y análisis de artefactos arqueológicos en tres dimensiones [Digital modeling and analysis of archaeological artefacts in three dimensions]. Coloquio Templo Mayor: 25 Años Recuperando Nuestro Pasado. Museo del Templo Mayor, Mexico City, 8 December, 2012.

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- 2011 3D modelling of archaeological artefacts and some strategies to analyse their shape. Chinese Institute of Archaeology, Beijing, 18 April, 2011.

**JIMÉNEZ-BADILLO, D. AND RUIZ-CORREA, S.**

- 2011 Application of spectral clustering for exploratory analysis of archaeological data. 39th Annual Confer-

ence on Computer Applications and Quantitative Methods in Archaeology, CAA2011. Beijing, China, 12-16 April, 2011.

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2011 Aplicaciones de computación en arqueología [Computer Applications in Archaeology]. National Institute of Anthropology and History, Seminario de la Coordinación Nacional de Arqueología. Mexico City, 7 March, 2011.

**JIMÉNEZ BADILLO, D., AND RUIZ-CORREA, S.**

2010 Medición, captura y recuperación de formas en 3D y su aplicación en arqueología [Measurement, acquisition and retrieval of 3D shapes and their applications in archaeology]. Congreso Anual de la Unión Geofísica Mexicana. Puerto Vallarta, Jalisco, 7-12 November, 2010.

**JIMÉNEZ BADILLO, D., REYES SOLIS, A. AND MEDINA GARCÍA, G.**

2010 Producción de modelos tridimensionales de artefactos arqueológicos con fines de investigación [Producing tridimensional models of archaeological artefacts for research purposes]. Congreso Anual de la Unión Geofísica Mexicana. Puerto Vallarta, Jalisco, 7-12 November, 2010.

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2010 3D shape matching and retrieval of archaeological analysis. 38th Annual Conference on Computer Applications and Quantitative Methods in Archaeology, CAA2010. University of Granada, Spain, 6-9 April, 2010.

**JIMÉNEZ-BADILLO, D.**

2008 El culto a la Tierra en dos ofrendas del Templo Mayor. The Templo Mayor Museum, Ciclo de Conferencias El Templo Mayor en la Voz de sus Investigadores. Mexico City, 18 October, 2008.

**JIMÉNEZ-BADILLO, D.**

2008 Identificación de patrones de puntos por medio de grafos de vecindad relativa: Principios y aplicaciones [Recognition of pointset patterns through the application of relative neighbourhood graphs: Principles and applications]. Centro de Investigación en Matemáticas. Guanajuato, Mexico, 12 Sept.

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2008 Aztec religion and spatial symbolism. Chinese Academy of Social Sciences, Institute of Archaeology. Beijing, 26 May, 2008.

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2007 Análisis espacial de contextos arqueológicos simbólicos [Spatial analysis of symbolic archaeological

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**NIETO, R. CASTAÑEDA, L. AND JIMÉNEZ-BADILLO, D.**

- 2007 Geografía política de los asentamientos prehispánicos en el sur de la Cuenca de México [Political geography of the Prehispanic settlements in the south of the Basin of Mexico]. Segundo Coloquio de Arqueología. Instituto Nacional de Antropología, Dirección de Estudios Arqueológicos and Museo del Templo Mayor. Mexico City, 27-31 August, 2007.

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- 2006 Análisis especial de contextos arqueológicos mediante la exploración de relaciones topológicas [Spatial analysis of archaeological contexts by exploring topological relationships]. 52th International Congress of Americanists. Seville, Spain, 2006.

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- 2006 Interpretación de las ofrendas mexicas por medio de grafos de vecindad relativa [Interpretation of Mexica offerings through relative neighbourhood graphs]. Jornadas Académicas en Honor de Eduardo Matos Moctezuma, Museo Nacional de Antropología, 2006.

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- 2002 Analizando la estructura interna de las ofrendas del Templo Mayor, [Analysing the internal structure of the Great Temple offerings]. Ciclo de conferencias El Templo Mayor en la Voz de sus Investigadores. Museo del Templo Mayor, 2002.

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- 1998 Identifying spatial patterns in archaeological assemblages: A progress report. UK Annual Conference on Computer Applications and Quantitative Methods in Archaeology. Cardiff University, UK, 1999.

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- 1998 An application of proximity graphs in archaeological spatial analysis. UK Annual Conference on Computer Applications and Quantitative Methods in Archaeology. University of Southampton, UK, 1998.

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- 1998 Recognizing 3D spatial patterns in archaeological assemblages. Hunter College Seminar, New York, NY, 1998.

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**JIMÉNEZ-BADILLO, D. AND FILLOY NADAL, L.**

- 1995 Análisis y diseño de un sistema de base de datos para controlar registros de conservación de una colección arqueológica, [Design and analysis of a database system to manage conservation records of an archaeological collection]. Primer Coloquio Internacional sobre Instrumentos de Consulta, Inventario y Catalogación del Patrimonio Artístico de México. Universidad Nacional Autónoma de México, Instituto

de Investigaciones Estéticas, 1995.

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- 1995 La educación de los Mexica, [Mexica Education]. Seminario de Historia de la Ciudad de México. Universidad Iberoamericana, Mexico City, 1995.

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- 1995 La investigación en el Templo Mayor [Research in the Templo Mayor project]. Pinacoteca Virreinal, Mexico City, 1995.

**JIMÉNEZ-BADILLO, D.**

- 1994 El control de colecciones arqueológicas por medios electrónicos. La experiencia del The Templo Mayor Museum, [Management of archaeological collections by electronic means, the experience of the Great Temple museum]. Primer Coloquio sobre el Uso del Cómputo en Arqueología, Mexico City, 1994.

**JIMÉNEZ-BADILLO, D.**

- 1994 El juego político de la interpretación en la historiografía china contemporánea: 1979-1989, [The political game of historiographic interpretation in contemporary China: 1979-1989]. Sexto Congreso Nacional de la Asociación Latinoamericana de Estudios Afroasiáticos. Universidad de Colima, Mexico, 1994.

**JIMÉNEZ-BADILLO, D.**

- 1994 Una comparación del origen del Estado en dos sociedades antiguas: los casos de Oaxaca y China, [A comparison of the origin of the state in two ancient societies: the case of Oaxaca and China]. Sexto Congreso Nacional de la Asociación Latinoamericana de Estudios Afroasiáticos. Universidad de Colima, Mexico, 1994.

**JIMÉNEZ-BADILLO, D. AND FILLOY NADAL, L.**

- 1994 Hacia una nueva concepción del registro contextual y de conservación de una colección arqueológica, [Towards a new conception of contextual and conservation recording of an archaeological collection]. XXIII Mesa Redonda de la Sociedad Mexicana de Antropología. Villahermosa, Tabasco, Mexico, 1994.

**JIMÉNEZ-BADILLO, D.**

- 1994 Las corrientes teóricas actuales de la arqueología [Current theoretical trends in Archaeology]. Symposium de Antropología. Enfoque programático de la Arqueología en México. Universidad Autónoma del Estado de México, Estado de México, 1994.

**JIMÉNEZ-BADILLO, D.**

- 1993 El rescate arqueológico del Palacio Nacional [Archaeological rescue of the National Palace]. Ciclo de conferencias El Proyecto de Arqueología Urbana. Museo del Templo Mayor, Mexico City, 1993.

**JIMÉNEZ-BADILLO, D.**

- 1993 El rescate arqueológico del Palacio Nacional [Archaeological rescue at the National Palace]. XIII Congreso Internacional de Ciencias Antropológicas e Históricas, 1993.

**JIMÉNEZ-BADILLO, D. AND FILLOY NADAL, L.**

- 1993 Implementación de un registro computarizado de datos de conservación [Implementation of a computer-assisted record for conservation data]. Sexto Encuentro Nacional de Conservadores del Patrimonio Cultural. San Miguel de Allende, Guanajuato, Mexico, 1993.

**JIMÉNEZ-BADILLO, D.**

- 1993 The political dimension of Historiography in Postrevolutionary China. Combined Annual Meeting of the Western and South-Western Conferences of the Association for Asian Studies, Acapulco, Guerrero, Mexico, 1993.

**JIMÉNEZ-BADILLO, D.**

- 1992 El feudalismo como categoría histórica. El caso de China, [Feudalism as historic category. The case of China]. Séptimo Congreso Nacional de la Asociación Latinoamericana de Estudios Afroasiáticos. Acapulco, Guerrero, México, 1992.

**JIMÉNEZ-BADILLO, D.**

- 1992 La música en el mundo mexicana, [The music in the Mexican world]. Ciclo de Conferencias del Museo del Templo Mayor. Mexico City, 1992.

**JIMÉNEZ-BADILLO, D.**

- 1992 La música en México antes de Colón, [Music in Mexico before Columbus]. Semana del Quinto Centenario del Descubrimiento de América. Universidad La Salle, Mexico City, 1992.

**JIMÉNEZ-BADILLO, D. AND FILLOY NADAL, L.**

- 1991 Diseño de una forma para el registro en computadora de datos de conservación in situ, [Design of a format for computer-assisted recording of conservation data in situ]. Quinto Encuentro Nacional de Conservadores del Patrimonio Cultural. Mexico City, 1991.

**JIMÉNEZ-BADILLO, D.**

- 1991 Ofrenda. Un sistema de información sobre las ofrendas del Templo Mayor de Tenochtitlan, [Offering data. A Management Information System for offerings from the Great Temple of Tenochtitlan]. 47th International Congress of Americanists, Tulane, New Orleans, 7-11 July, 1991.

**JIMÉNEZ-BADILLO, D.**

- 1990 La malacología del Templo Mayor a partir de los datos de la Ofrenda H, [Prehispanic malacology according to data from Offering H]. Coloquio Internacional La Época Final del México Antiguo, Siglos XIII al XVI. Mexico City, 1990.

**JIMÉNEZ-BADILLO, D.**

- 1990 La música en la sociedad mexicana, [The music in Mexican society]. Ciclo de Conferencias del Templo Mayor Museum. Mexico City, 1990.

**JIMÉNEZ-BADILLO, D.**

- 1990 Los instrumentos musicales mexicanos, [Mexican musical instruments]. Ciclo de Conferencias del Templo Mayor Museum. Mexico City, 1990.

**JIMÉNEZ-BADILLO, D.**

- 1990 La reacción de los intelectuales chinos frente al impacto occidental durante la segunda mitad del siglo XIX, [The reaction of Chinese intellectuals in the face of the Western impact during the second half of the XIX century]. Quinto Congreso Nacional de la Asociación Latinoamericana de Estudios Afroasiáticos. Mexico, 1990.

## Teaching

- 09/2016 Técnicas digitales para el análisis arqueológico [Digital techniques for archaeological analysis]. Instituto Nacional de Antropología e Historia, Mexico City, September 5-9, 2016; 35

hours..

- 03/2016 Arqueología digital [Digital archaeology]. Instituto Nacional de Antropología e Historia, Mexico City, 2-3 March, 2016; 16 hours.
- 03/2016 Técnicas digitales para el análisis arqueológico. Curso de especialización para profesionistas en patrimonio cultural [Digital techniques for archaeological analysis. Specialization course for professionals in Cultural Heritage]. Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, 35 hours.
- 02/2016 Introducción a la arqueología digital: Curso de especialización para profesionistas en patrimonio cultural [Introduction to digital archaeology: Specialization course for professionals in Cultural Heritage]. Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, 22-26 February; 16 hours.
- 10/2015 Construcción de modelos digitales de sitios y artefactos arqueológicos: Curso de especialización para profesionistas en patrimonio cultural [Producing digital models of archaeological sites and artefacts: Specialization course for professionals in Cultural Heritage]. Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, 35 hours.
- 10/2015 Aplicación de tecnologías digitales para arqueología, [Application of digital techniques for Archaeology]. Escuela Nacional de Antropología e Historia, Mexico City, 5-9 October, 2015; 40 hours.
- 05/2015 Tecnologías computacionales en arqueología: Curso de especialización para profesionistas en patrimonio cultural [Computational techniques for Archaeology: Specialization course for professionals in Cultural Heritage]. Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, 40 hours.
- 11/2012 Los Sistemas de Información Geográfica en arqueología: Curso de especialización para profesionistas en patrimonio cultural [Geographical Information Systems for Archaeology: Specialization course for cultural heritage professionals]. EEE, Mexico City, 35 hours.
- 10/2010 Digitalización con escaner láser: Curso de especialización para profesionistas en patrimonio cultural [Digitization with laser scanner: Specialization course for cultural heritage professionals]. Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, 26-30 November, 2012; 28 hours.
- 10/2010 Construction de modelos digitales en tres dimensiones a partir de piezas arqueológicas de Palenque, Chiapas. Curso de especialización para profesionistas en patrimonio cultural, [Producing digital models of archaeological objects from Palenque, Chiapas. Specialization course for cultural heritage professionals]. Palenque, Chiapas, 18-25 October, 2010; 60 hours.
- 10/2010 Modelado de artefactos en tres dimensiones con escaner láser de triangulación: Curso de especialización para profesionistas en patrimonio cultural, [3D modeling of archaeological artefacts with triangulation laser scanner: Specialization course for cultural heritage professionals]. Instituto Nacional de Antropología e Historia, Mexico City, 12-16 July 2010; 40 hours.
- 08/2009 Aplicando la tecnología de los sistemas de información geográfica a la investigación de Monte Albán, Oaxaca. Curso de especialización para profesionistas en patrimonio cultural, [Applying Geographical Information Systems technology to research in Monte Alban, Oaxaca. Specialization course for cultural heritage professionals]. Centro INAH Oaxaca, August 2009; 40 hours.

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|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 08/2009         | El desarrollo de los sistemas de información geográfica. Curso de especialización para profesionistas en patrimonio cultural [Development of Geographical Information Systems. Specialization course for cultural heritage professionals]. Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, 10-14 August 2009, 40 hours.                                                            |
| 10/2008         | La tecnología de los sistemas de información geográfica y su aplicación a la arqueología. Curso de especialización para profesionistas en patrimonio cultural [Geographical Information Systems technology and its application to Archaeology. Specialization course for cultural heritage professionals]. Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, October 2008; 40 hours. |
| 07/2008         | Implementación de un SIG con el programa ArcGIS 9.2, [Implementation of GIS with ArcGIS 9.2 software], Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, July 2008; 40 hours.                                                                                                                                                                                                        |
| 07/2007         | Aplicando la tecnología GIS en arqueología. Curso de especialización para profesionistas en patrimonio cultural, [Applying GIS technology in Archaeology. Specialization course for cultural heritage professionals]. Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, 16-20 July 2007; 40 hours.                                                                                   |
| 11/2007         | La operación del programa ArcView 9.0,. Curso de especialización para profesionistas en patrimonio cultural, [Using the ArcView 9.0 software. Specialization course for cultural heritage professionals]. Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, 12-16 November 2007; 40 hours.                                                                                           |
| 02/1996-06/1996 | Análisis espacial. Curso de Maestría, [Spatial Analysis: MsC Course]. Escuela Nacional de Antropología e Historia, Mexico City, February-June 1996; 80 hours.                                                                                                                                                                                                                                                                        |
| 10/1995         | Curso de Licenciatura sobre Arqueología Teórica. [Course on Theoretical Archaeology for undergraduate students]. Escuela nacional de Conservación, Restauración y Museografía, Mexico City, 1995.                                                                                                                                                                                                                                    |
| 10/1995         | La educación entre los mexicanos. Curso de diplomado en antropología, [The education among the Mexicans. Course for certification in Anthropology]. Universidad Iberoamericana, Mexico City. October 1995.                                                                                                                                                                                                                           |
| 04/1995-06/1995 | La organización económica de los mexicanos. Curso de diplomado en antropología [The economic organization of the Mexicans. Course for certification in Anthropology]. Universidad Iberoamericana, Mexico City, April-June 1995.                                                                                                                                                                                                      |
| 02/1995         | Bases de datos aplicadas a la conservación del patrimonio cultural. Curso de especialización para profesionistas en patrimonio cultural, [Database systems applied to cultural heritage conservation. Specialization course for cultural heritage professionals]. Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, February 1995; 45 hours.                                         |
| 02/1995/06/1995 | Arqueología teórica. Curso de Licenciatura, [Theoretical archaeology. Course for undergraduate students]. Escuela Nacional de Conservación, Restauración y Museografía, Mexico City, February-June 1995; 80 hours.                                                                                                                                                                                                                   |
| 02/1995-06/1995 | Historia de México III-A: El periodo Clásico mesoamericano, curso de Licenciatura [Mexican History III: the Mesoamerican Classic Period; course for undergraduate students]. Escuela Nacional de Antropología e Historia, Mexico City, February-June 1995; 80 hours.                                                                                                                                                                 |
| 02/1995-06/1995 | Historia de México III-B: El periodo Postclásico mesoamericano, curso de Licenciatura [Mexican History III-B: the Mesoamerican Postclassic Period; course for undergraduate students]. Escuela Nacional de Antropología e Historia, Mexico City, February-June 1995; 80 hours.                                                                                                                                                       |

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| 09/1994-01/1995 | Historia de México III-A: El periodo Clásico mesoamericano, curso de Licenciatura [Mexican History III: the Mesoamerican Classic Period; course for undergraduate students]. Escuela Nacional de Antropología e Historia, Mexico City, September 1994-January 1995; 80 hours.                                                                                                               |
| 09/1994-01/1995 | Historia de México III-B: El periodo Postclásico mesoamericano, curso de Licenciatura (Mexican History III-B: the Mesoamerican Postclassic Period; course for undergraduate students). Escuela Nacional de Antropología e Historia, Mexico City, September 1994-January 1995; 80 hours.                                                                                                     |
| 03/1994-08/1994 | Historia de México III-A: El periodo Clásico mesoamericano, curso de Licenciatura [Mexican History III: the Mesoamerican Classic Period; course for undergraduate students]. Escuela Nacional de Antropología e Historia. Mexico City, March-August 1994; 80 hours.                                                                                                                         |
| 03/1994-08/1994 | Aplicación de bases de datos en el trabajo arqueológico, segunda parte. Curso de especialización para profesionistas en patrimonio cultural, [Application of database systems in archaeological work, Part 2; specialization course for professionals in Cultural Heritage], Centro INAH del Estado de México, March 1994-August 1994; 45 hours.                                            |
| 02/1994-06/1994 | Aplicación de bases de datos en el trabajo arqueológico, primera parte; curso de especialización para profesionistas en patrimonio cultural, [Application of database systems in archaeological work, Part 1; specialization course for professionals in Cultural Heritage], Centro INAH del Estado de México, February-June 1994; 45 hours.                                                |
| 10/1993-12/1993 | Curso de Licenciatura sobre Rescate Arqueológico, [Rescue Archaeology, a course for undergraduate students]. Escuela Nacional de Conservación, Restauración y Museografía, Mexico City, October-December 1993; 60 hours.                                                                                                                                                                    |
| 09/1993-01/1994 | Diseño y operación de bases de datos en arqueología, curso de especialización para profesionistas en patrimonio cultural, [Design and operation of database systems in Archaeology. Specialization course for professionals in Cultural Heritage]. Instituto Nacional de Antropología e Historia, Coordinación Nacional de Arqueología, Mexico City, September 1993-January 1994; 45 hours. |
| 10/1987         | Curso de Licenciatura Introducción a la Arqueología, [Introduction to Archaeology, a course for undergraduate students]. Escuela Nacional de Conservación, Restauración y Museografía, Mexico City, October 1987; 60 hours.                                                                                                                                                                 |

## Fieldwork

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|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2017-2019 | Director of the project Unleashing the power of digital technologies in Becan, Campeche. This project brought archaeologists, tourism professionals, designers, and software application engineers to the archaeological zone of Becan, Campeche, to figure out –in the field– the best way to produce mobile applications for disseminating the cultural knowledge of this important Mayan region. The project seeks to improve access to new technologies in the site while encouraging the participation of local communities in the design of applications with cultural content. The project started in 2016 and will continue till 2019. |
| 1991-1994 | Field Director of the Archaeological Rescue Project at the National Palace of Mexico, within the Program of Urban Archaeology of the National Institute of Anthropology and History; June 13 1991 to July 31 1994.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 1987      | Field Researcher for the Ethnoarchaeological Project in the Valley of Toluca, Mexico. A re-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

- search focused on social organization and work practices of pottery villages in the Basin of River Lerma, Mexico, 1987.
- 1987 Field Assistant for The Ancient City of Teotihuacan Project. Excavation of household units from the Classic Period in the Northeast of Teotihuacan, under the direction of Dra. Linda Manzanilla, 1987..
- 1986 Field Assistant during the Second Season of the Temamatla project. Surface survey of archaeological sites with geophysical and geochemical techniques, under the direction of Dra. Mari Carmen Serra Puche and Dr. Luis Barba Pingarrón, 1986.
- 1985 Field Assistant during the Second Season of the Temamatla project. Survey of archaeological sites in the Southern region of the Basin of Mexico, under the direction of Dra. Mari Carmen Serra Puche, 1985.

## Organisation of colloquiums, symposia and round tables

- 2018 Symposium Close Range 3D Data Acquisition, Processing and Querying in Cultural Heritage. Organized in collaboration with Dirk Rieke-Zapp, Vera Moitinho de Almeida and Mona Hess. 46th Annual Conference on Computer Applications and Quantitative Methods in Archaeology CAA2018. Eberhard Karls Universität Tübingen, Germany, 21 March, 2018.
- 2017 Primer Coloquio Internacional: Divulgación del Patrimonio Cultural y Tecnologías Digitales, (First International Colloquium on Dissemination of Cultural Heritage and Digital Technologies). International Research Network of Digital Technologies for the Dissemination of Cultural Heritage and National School of Conservation, Restoration and Museology. Mexico City, 26 October, 2017.
- 2017 Tercer Encuentro Internacional La Interacción con el Patrimonio Cultural en la Era Digital: Repositorios de Información, (Third International Meeting Interacting with Cultural Heritage in the Digital Age: Repositories of Information). International Research Network of Digital Technologies for the Dissemination of Cultural Heritage and The Mexican National Library. Mexico City, 21 September, 2017.
- 2017 Segundo Coloquio de Desarrollo Tecnológico al Servicio del Patrimonio Cultural, (Second Colloquium on Technological Development at the Service of Cultural Heritage). International Research Network of Digital Technologies for the Dissemination of Cultural Heritage. Mathematics Research Centre, Guanajuato, Mexico, 17-18 August, 2017.
- 2017 Primer Encuentro de Centros de Cultura Digital, (First Encounter of Cultural Digital Centres). Ministry of Culture of Mexico and Spanish Cultural Centre in Mexico. Mexico City, August 10, 2017.
- 2017 Symposium Close Range 3D Data Acquisition, Processing, Querying and Presentation in Cultural Heritage. Organized in collaboration with Dirk RiekeZapp and Vera Moitinho de Almeida,). 45th Annual Conference on Computer Applications and Quantitative Methods in Archaeology. Georgia State University, Atlanta, Georgia, 16 March, 2017.
- 2016 Primera Reunión Aceleradora de Proyectos Digitales, (First RedTDPC Incubator of Digital Projects). International Research Network of Digital Technologies for the Dissemination of Cultural Heritage and the Centre of Digital Culture and the FabLab Impact MX, Mexico City, 24-25 November, 2016.
- 2016 Primer Coloquio de Desarrollo Tecnológico al Servicio del Patrimonio Cultural, (Second

- Colloquium on Technological Development at the Service of Cultural Heritage). International Research Network of Digital Technologies for the Dissemination of Cultural Heritage. Mathematics Research Centre, Guanajuato, Mexico, October 18, 2016.
- 2016 Segundo Encuentro Internacional La Interacción con el Patrimonio Cultural en la Era Digital: Nuevas Estrategias Multimedia para Museos, (Second International Meeting: Interacting with Cultural Heritage in the Digital Age: New Multimedia Strategies for Museums). International Research Network of Digital Technologies for the Dissemination of Cultural Heritage and the Centre of Digital Culture. Mexico City, 13 October, 2016.
- 2016 Mesa Redonda Medios Digitales para la Difusión del Patrimonio Cultural en el Museo Nacional de Antropología, (Round Table Digital Applications for Disseminating Cultural Heritage in the National Museum of Anthropology). National Museum of Anthropology, Mexico City, 12 October, 2016.
- 2016 Mesa Redonda Evaluando Aplicaciones Digitales Multimedia para el Museo Nacional de Historia, (Round Table Evaluating Multimedia Digital Applications for the National History Museum). National History Museum, Mexico City, 11 October, 2016.
- 2015 Primer Encuentro Internacional La Interacción con el Patrimonio Cultural en la Era Digital, (First International Meeting Interacting with Cultural Heritage in the Digital Age). International Research Network of Digital Technologies for the Dissemination of Cultural Heritage and National Institute of Anthropology and History. National Museum of Anthropology. Mexico City, 4 December, 2015.
- 2015 Coloquio Tecnología y Patrimonio Cultural, Perspectivas desde las Industrias Creativas, (Technology and Cultural Heritage from the Perspective of the Creative Industries). International Research Network of Digital Technologies for the Dissemination of Cultural Heritage and Spanish Cultural Centre in Mexico, Mexico City, 14 August, 2015.
- 2015 Round Table Retos y Oportunidades de la Red de Tecnologías Digitales para la Difusión del Patrimonio Cultural, (Challenges and Opportunities for the Research Network on Digital Technologies for the Dissemination of Cultural Heritage). International Research Network of Digital Technologies for the Dissemination of Cultural Heritage and Interactive Museum of Economy (MIDE). Mexico City, 19 June, 2015.
- 2015 Symposium New Trends in 3D Archaeology: Innovative Techniques and Methodologies for the Acquisition, Retrieval and Analysis of Cultural Heritage. 43rd Annual Conference on Computer Applications and Quantitative Methods in Archaeology. Siena, Italy, 2 April, 2015.
- 2015 Symposium Machine Learning and Pattern Recognition for Archaeological Research. 43rd Annual Conference on Computer Applications and Quantitative Methods in Archaeology. Siena, Italy, 2 April, 2015.