CURRICULUM of Petra Wiederhold

Birthday and place:	25.12.1962, Nordhausen am Harz (German Democratic Republic).
Family:	married, two children (born 1996 and 2004), living in Mexico since 1988.
Adscription:	**Dept. of Automatic Control, CINVESTAV-IPN, Mexico City**
Full name in Mexico:	Petra Wiederhold Grauert de Matos
Postal Address:	Petra Wiederhold, Dept. of Automatic Control, CINVESTAV-IPN,
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Academic preparation:

- Master in Science, Mathematics, Friedrich-Schiller-University, Jena, Germany, 15.08.1986.
- Doctor in Science (Ph.D.), Mathematics, Universidad Autónoma Metropolitana, Unidad Iztapalapa, D.F., México, 10.11.1998.
  PhD Thesis: "Dimension Functions for Alexandroff Spaces", supervisor: Richard G. Wilson.
- Member of the National Investigators System of Mexico (SNI level I), 1999-2018.

Professional experience:

- Assistant Teacher, Dept. of Technology, University "Friedrich Schiller", Jena (Germany), 09/1986–05/1988.
- Associate Teacher, Dept. of Mathematics, "Universidad Autónoma Metropolitana – Iztapalapa" D.F., México, 1988-1989.
- Teacher and Investigator, **Dept. of Automatic Control** (until 1999 Sect. of Automatic Control, Dept. of Electrical Engineering), **CINVESTAV-IPN** ("Centro de Investigación y de Estudios Avanzados"), México, CDMX, since 1989.
  Actual position: Investigador CINVESTAV-3B.

Actual research interests:

- Digital Topology and Digital Geometry (topological aspects of tilings on R^n, dimension functions);
- mathematical foundations of Digital Image Processing (digital spaces, digital surfaces, skeletons, digital estimators of geometrical properties of 2D/3D objects);
- contributions to Mathematical Physics based on applications of Algebra and on the visualization of physical entities by digital images;
- generation and representation of digital images by grammars and formal languages.

Actual teaching fields:

- Mathematics - basic and specialized courses (General Topology, Analysis, Algebra)
- Discrete Mathematics related to models for digital images (Digital Geometry and Topology)
- Digital Image Processing and Image Analysis

Research papers in international journals:

1. T. Matos, P. Wiederhold: SL(4,R) - invariant chiral fields", *Letters in Mathematical Physics* 27 (4) 265-272, **1993**.

2. P. Wiederhold and R.G. Wilson: The Krull dimension of Alexandroff T_0 spaces, in: S. Andima et al (Eds.), Papers on General Topology and Applications, *Annals of the New York Academy of Science* 806, 444-453, **1996**.
(published online 2006, DOI: 10.1111/j.1749-6632.1996.tb49187.x)

3. T. Matos, U. G. Nucamendi, P. Wiederhold: SU(N)- and SO(N)- invariant chiral fields - one- and two-dimensional subspaces, *Journal of Mathematical Physics* 40 (5) 2500-2513, **1999**.

4. P. Wiederhold and R.G. Wilson: The Alexandroff dimension of digital quotients of Euclidean spaces, *Discrete & Computational Geometry* 27, 273-286, **2002**.
ISSN 0179-5376 (Print) / 1432-0444 (Online)

5. M. Alcubierre, F. Siddharta G., T. Matos, D. Nuñez, L. A. Ureña-López, P. Wiederhold: Galactic collapse of scalar field matter, *Classical and Quantum Gravity* 19, 5017-5024, **2002**.

6. P. Wiederhold and R.G. Wilson: The Alexandroff dimension of quotients of R^2, *Discrete & Computational Geometry* 32, 149-160, **2004**.
ISSN 0179-5376 (print) / 1432-0444 (online)

7. P. Wiederhold and S. Morales: Thinning on cell complexes from polygonal tilings, *Discrete Applied Mathematics* (Elsevier) 157, Issue 16, 3424-3434, **2009**.
DOI: 10.1016/j.dam.2009.04.016, ISSN: 0166-218X .

8. T. Matos, G. Miranda, R. Sanchez-Sanchez, P. Wiederhold: Class of Einstein-Maxwell-dilaton-axion space-time, *Physics Review D* 79, 124016 [12 pages], **2009**.
DOI: 10.1103/PhysRevD.79.124016, ISSN 1550-2368 (online), 1550-7998 (print).

9. P. Wiederhold and M. Villafuerte: A new algorithm for triangulation from cross sections and its application to surface area estimation, *International Journal of Imaging Systems and Technology* (IJIST-Wiley) 21, Issue 1, 58-66, **2011**. DOI: 10.1002/ima.20267 .

10. K.G. Subramanian, P. Wiederhold, I. Venkat, R. Abdullah: Generative models for pictures tiled by triangles, *Romanian Journal of Information Science and Technology* (ROMJIST), Vol.15 Nb.3, 246-265, **2012**. ISSN 1453-8245 .

11. H. Fernau, R. Freund, M.L. Schmid, K.G. Subramanian, P. Wiederhold: Contextual array grammars and array P Systems, *Annals of Mathematics and Artificial Intelligence* (AMAI, Springer Netherlands), Vol. 75, Issue 1, pp. 5-26, Oct. 2015 (published online 12 Nov. **2013)**.
DOI: 10.1007/s10472-013-9388-0. ISSN: 1012-2443 (print) / 1573-7470 (electronic).
https://link.springer.com/article/10.1007/s10472-013-9388-0

12. S.M. Domínguez-Nicolás, P. Argüelles-Lucho, P. Wiederhold: FPGA based image acquisition and graphic interface for hardness tests by indentation, *International Journal of Advanced Computer Technology* (IJACT, ISSN:2319-7900), Vol. 5, Nb. 6, pp. 6-16, December **2016**.

13. M. Marquez, T. Matos, P. Wiederhold: Cosmic acceleration from topological considerations II: Fiber bundles, Classical and Quantum Gravity, IOP Publishing, Vol. 37, 015005 (14pp), Jan. **2020** (online 29.11.2019), https://doi.org/10.1088/1361-6382/ab533f .

14. J.G. Cebada-Reyes, P. Wiederhold, P. Sánchez-Sánchez, I. López-Cruz: Visual control law tuning using the JADE algorithm applied to leaf detection and cutting, *IEEE Latin America Transactions*, Vol. 18, No. 7, pp. 1255- 1263, July **2020** (online 15.05.2020) https://www.inaoep.mx/~IEEElat/index.php/transactions/article/view/1893

15. M. Villafuerte, P. Wiederhold: A polygonal approximation for general 4-contours correspon-ding to weakly simple curves, *Journal of Mathematical Imaging and Vision* (Springer), Vol. 64, Issue 2, pp. 161-193, Feb. **2022** (online Jan. 09, 2022), DOI: 10.1007/s10851-021-01060-0, https://link.springer.com/article/10.1007/s10851-021-01060-0

Books:

1. P.Wiederhold: *Softwaresysteme AMBA/R und AMBA/72 zur Automatischen Bildverarbeitung für die BVS A6471, A6472*, Software User Handbook, 73 pages, edited by the University "Friedrich Schiller", Jena, Germany, **1988**.

2. T. Matos and P.Wiederhold: *Principios Matemáticos para Ciencias Exáctas* ("Mathematics for Exact Sciences", textbook written in Spanish, mainly focused to students in graduate studies in Mathematical Physics), Editorial Colofón S.A. de C.V. (Ediciones Académicas de Matemáticas), Serie de Textos de Astronomía y Astrofísica del Instituto Avanzado de Cosmología, 534 pages, ISBN: 978-607-8513-33-8, printed in Mexico, January 2017.

Research papers as book chapters:

1. P. Wiederhold and R.G. Wilson: Dimension for Alexandrov spaces, in: R. Melter, A. Wu (Eds.), Vision Geometry, SPIE Proceedings Series, Vol. 1832, 13-22, **1993**. doi:10.1117/12.142181.

2. P. Wiederhold and S. Morales: Thinning on quadratic, triangular, and hexagonal cell complexes, in: V.E. Brimkov, R.P. Barneva, H.A. Hauptmann (Eds.), Proc. IWCIA'2008 (Intern. Workshop on Combinatorial Image Analysis, Buffalo, N.Y., U.S.A., April 2008), LNCS 4958, 13-25, Springer Verlag, Berlin Heidelberg, **2008**. ISSN 0302-9743.

3. P. Wiederhold and M. Villafuerte: Triangulation of cross-sectional digital straights segments and minimum length polygons for surface area estimation, in: P. Wiederhold and R.P. Barneva (Eds.), Progress in Combinatorial Image Analysis, Research Publishing Services (247 pages, ISBN-13: 978-981-08-3870-9), Singapore, 79-92, **2010** .

4. K.G. Subramanian, I. Venkat, P. Wiederhold: A P system model for contextual array languages, in: R.P. Barneva et al (Eds.), Proc. IWCIA'2012 (Intern. Workshop on Combinatorial Image Analysis, Texas, U.S.A., Nov. 2012), LNCS 7655, 154-165, Springer-Verlag, Berlin Heidelberg, **2012**. ISSN: 0302-9743,
https://link.springer.com/chapter/10.1007/978-3-642-34732-0_12 .

5. P. Wiederhold and H. Reyes: Relative convex hull determination from convex hulls in the plane, Proc. of IWCIA 2015 (Int. Workshop on Combinatorial Image Analysis, Nov. 2015, Kolkata, India), Springer Switzerland, LNCS 9448, pp. 46-60, **2015**.
DOI: 10.1007/978-3-319-26145-4_4
Arxiv-Version: https://arxiv.org/pdf/1604.08698.pdf

Surveys and revision papers as book chapters:

1. P. Wiederhold: Graphentheorie, Chapter of the book "*AUTBILD'88 - Mathematische Grundlagen der Digitalen Bildverarbeitung*", edited by the Friedrich Schiller University, Jena, Germany, pp. 26-38, **1989**.

2. P.Wiederhold: Digital Geometry, 13 pages, in: P. Laplante (Ed.), *Encyclopedia of Computer Science and Technology* (Second Edition, 1500 pages), CRC Press, Taylor & Francis Group, Volume I, pp. 364-376. December 2016. DOI: 10.1081/E-ECST2-120054031
https://www.crcpress.com/Encyclopedia-of-Computer-Science-and-Technology-Second-Edition-Print/Laplante/p/book/9781482208191

Edition of special issues of international journals:

1. V.E. Brimkov, R.P. Barneva and P. Wiederhold (Guest Eds.), Theoretical Computer Science Issues in Image Analysis and Processing, Volume 412, Issue 15, pp. 1299-1442 (12 papers), March 2011.

Preface: V.E. Brimkov, R.P. Barneva, P. Wiederhold, Theoretical Computer Science Issues in Image Analysis and Processing - Preface, Theoretical Computer Science (Elsevier) 412(15) 1299-1300, **2011**.

2. V. E. Brimkov, R.P. Barneva and P. Wiederhold (Guest Eds.), Special Issue: Combinatorial Problems and Algorithms in Image Analysis, International Journal of Imaging Systems and Technology (IJIST-Wiley), Vol.21 Issue 1, pp. 1-119 (11 papers), March 2011.

Preface: R.P. Barneva, V.E. Brimkov, P. Wiederhold, Combinatorial Problems and Algorithms in Image Analysis (Guest Editorial), International Journal of Imaging Systems and Technology (Wiley) 21(1) 1-2, **2011**.

Edition of books:

1. P. Wiederhold and R.P. Barneva (Eds.): Combinatorial Image Analysis - 13th Intern. Workshop IWCIA 2009, Playa del Carmen, Mexico, Nov. 2009, LNCS Volume 5852, Springer, Berlin Heidelberg, **2009**. (Proceedings, 33 papers, 437 pages, ISBN-10: 3-642-10208-5)

2. P. Wiederhold and R.P. Barneva (Eds.): Progress in Combinatorial Image Analysis, Research Publishing Services, Singapore, **2010**. (16 papers, 247 pages, ISBN-13: 978-981-08-3870-9, ISBN-10: 981-08-3870-6) .

Research papers in proceedings of international congresses:

1. J.M. Ibarra Zannatha, U. Zaldivar Colado, P. Wiederhold: An approach to internet robotics: generation of interactive virtual worlds and internet teleoperation", in: U. Yildiran (Ed.), Proc. of the First Intern. Conf. on Information Technology in Mechatronics, (Istanbul, Turkey, 2001), IEEE Press, pp. 108-115, **2001**.

2. M. Alcubierre, F.S. Guzman, T. Matos, L. A. Ureña-Lopez y D. Núñez, P.Wiederhold: Scalar field dark matter and galaxy formation", in: H.V. Klapdor-Kleingrothuas y R.D. Viollier (Eds.), Proc. of the Intern. Conf. "Dark Matter in Astro- and Particle Physics", (South Africa, 2002), Springer (ISBN 3-540-44257-X), pp. 356-364, **2002**. (available on astro-ph/0204307)

3. C. Cruz-Gomez, P. Wiederhold, M. Gudino-Zayas: Automatic liver tissue segmentation in microscopic images using fusion color space and multiscale morphological reconstruction, Proc. of TAEECE 2013 – Int. Conf. on Technological Advances in Electrical, Electronics and Computer Engineering (May 2013, Konya, Turkey), pp. 88 - 92, **2013**. Print ISBN 978-1-4673-5612-1, DOI: 10.1109/TAEECE.2013.6557201 , https://ieeexplore.ieee.org/xpl/articleDetails.jsp?tp=&arnumber=6557201 .

4. C. Cruz-Gomez, P. Martins, W.C.A. Pereira, P. Wiederhold: A symmetry similarity measure via the Log-Gabor transform for B-mode ultrasound images and magnetic resonance volumes, IFMBE Proceedings Vol. 45 (Proc. of the 6th European Conf. of the Int. Federation for Medical and Biological Engineering, Sept. 2014, Dubrovnik, Croatia), pp. 180-183, Springer Switzerland, **2015**. ISBN: 978-3-319-11127-8 (Print) 978-3-319-11128-5 (Online), DOI: 10.1007/978-3-319-11128-5_45.

5. S.M. Domínguez Nicolás, P. Wiederhold: A real-time image acquisition system based on FPGA hardness tests by indentation, Proc. of ICCSAI 2014 - 2014 Int. Conf. on Computer Science and Artificial Intelligence (Dec. 20-21, 2014, Wuhan, China), DEStech Publications, 7 pages, **2015**.

6. S.M. Dominguez-Nicolas, P. Wiederhold: Indentation image analysis for Vickers hardness testing, 15th Int. Conf. on Electrical Engineering, Computing Science, and Automatic Control, Ciudad de México, Sept. 5-7, **2018**, IEEE Proceedings, pp. 1-6, DOI: 10.1109/ICEEE.2018.8533881

Revision papers in journals:

1. P. Wiederhold: Bibliographie zur Automatischen Bildverarbeitung in der DDR 1985/86, *Bild und Ton*, Vol. 40, No. 6, pp. 181-182, 1987.

2. P. Wiederhold: Bibliographie zur Digitalen Bildverarbeitung 1986/87 in der DDR, *Bild und Ton*, Vol. 41, No. 6, pp. 185-189, 1988.

3. P. Wiederhold: Rezension of the book "Geometry of Locally Finite Spaces", " (review by invitation, book written by V. Kovalevsky, 330 pages), *IAPR News Letters,* Vol.30 Nb.4 (Oct. **2008**), pp. 18-20. see https://www.iapr.org/members/newsletter/Newsletter08-04/ (direct link to the first page: https://www.iapr.org/members/newsletter/Newsletter08-04/index_files/Page387.htm).
My review is cited in Amazon for providing an overview on the book:
https://www.amazon.de/Geometry-Locally-Finite-Spaces-Algorithms/dp/product-description/3981225201)

Technical reports:

1. K. Voss, A. Hübler, P. Wiederhold: Theoretical approaches to image processing, Technical Report, Forschungsergebnisse der FSU Jena, 1989.

2. J.L. Gordillo, H. Sossa, P. Wiederhold: Análisis de Imágenes y Reconocimiento de Patrones, Technical Report, Teaching Material, 80 pages, Dept. of Electrical Engineering, CINVESTAV-IPN, 1992.

3. P. Wiederhold: Funciones de dimensión en espacios de Alexandroff, Ph.D. Thesis (in Spanish), Dept. of Mathematics, Universidad Autónoma Metropolitana - Iztapalapa, D.F., México, 1998, supervisor: Richard G. Wilson.

4. P. Wiederhold and R.G. Wilson: Dimension functions for T_0 digital spaces", Technical Report CS-TR-147 / CITR-TR-6, 10 pages, Computer Science Dept., University of Auckland, May 1997, see https://researchspace.auckland.ac.nz/handle/2292/3490 .

Undergraduate Theses supervised:

1. Carmen López Arroyo, "Análisis del parásito Nosema Algerae por medio de imágenes digitalizadas", March **1994**, Faculty of Electrical Engineering, "Universidad Autónoma del Estado de México", cosupervisor.

Master Theses supervised: (as unique supervisor, when not indicated as cosupervisor)

1. Eduardo Santillán Zeron, "Análisis de Invarianza Rotacional de Filtros Discretos", 8.11.**1991**, Dept. of Electrical Engineering, CINVESTAV-IPN. This thesis obtained a mention of outstanding quality.

2. Juan Luis Díaz de León Santiago, "Algoritmos de Esqueletización de Imágenes Digitales Binarias", 10.8.**1993**, Dept. of Electrical Engineering, CINVESTAV-IPN.

3. Veronica Barzola Lumbreras, "Determinación del área de hoja de la espinaca mediante el procesamiento de imágenes", 1.03.**2002**, Dept. of Automatic Control, CINVESTAV-IPN, (cosupervisor).

4. Marco A. Chavarria Fabila, "Percepción visual monocular para el control de robots", 4.09.**2002**, Dept. of Automatic Control, CINVESTAV-IPN (cosupervisor).

5. Saúl M. Domínguez Nicolás, "Seguimiento de fronteras de objetos en complejos celulares cúbicos de dimensión dos y tres", 24.06.**2003**, Dept. of Automatic Control, CINVESTAV-IPN.

6. Luis A. Martínez Castro, "Convexidad de subcomplejos celulares de dimensión dos", 24.09.**2004**, Dept. of Automatic Control, CINVESTAV-IPN.

7. María del Rayo Zempoala Ramírez, "Adelgazamiento de subcomplejos celulares de dimensión dos", 30.11.**2004**, Dept. of Automatic Control, CINVESTAV-IPN.

8. Arturo Gamino Carranza, "Operaciones morfológicas por descomposición del elemento estructura mediante discos", 8.12.**2004**, Dept. of Automatic Control, CINVESTAV-IPN (cosupervisor).

9. Salvador Juárez López, "Esqueletos morfológicos continuos y discretos en el plano", 13.12.**2004**, Dept. of Automatic Control, CINVESTAV-IPN (cosupervisor).

10. Gabriela A. Gallegos Garrido, "Convergencia multi-reticular de propiedades de los esqueletos continuos y discretos generados mediante adelgazamiento", 19.08.**2005**, Dept. of Automatic Control, CINVESTAV-IPN.

11. Pablo Sandino Morales Chávez, "Topología del adelgazamiento sobre el complejo celular cuadrático y sobre el complejo celular triangular", 5.12.**2007**, Dept. of Automatic Control (Option "Mathematics"), CINVESTAV-IPN.

12. Alfredo Trejo Martínez, "Geometría del adelgazamiento sobre el complejo celular cuadrático y sobre el complejo celular hexagonal", 14.12.**2007**, Dept. of Automatic Control (Option "Mathematics"), CINVESTAV-IPN.

13. Martha Patricia Rubio González, "Longitud de curva plana estimada mediante el MLP de la curva digitalizada", 14.12.**2009**, Dept. of Automatic Control (Option "Mathematics"), CINVESTAV-IPN.

14. Hugo Reyes Becerril, "Versión revisada de un algoritmo que determina la cubierta convexa relativa de polígonos simples en el plano", 18.09.**2013**, Dept. of Automatic Control, CINVESTAV-IPN.

15. Manuel Alejandro Ojeda Misses, "Compresión de Imágenes Digitales mediante Fractales generados por Sistemas de Funciones Iteradas", 2.09.**2015**, Dept. of Automatic Control, CINVESTAV-IPN.

16. Guillermo García Jiménez, "Circularidad en Imágenes Digitales", 10.11.**2017**, Dept. of Automatic Control, CINVESTAV-IPN.

PhD Theses supervised:

(PhD thesis "Estimadores del área de superficies digitales", M. Villafuerte Bante, Dept. of Automatic Control, CINVESTAV-IPN, started Sept. 2003, interrupted by the student for several periods, cancelled in June 2010.)
(María C. Cruz Gómez, "Reconstrucción 3D a partir de imágenes reales 2D de cortes histológicos del hígado del hámster: Órgano sano vs órgano parasitado con amibas", started in Sept. 2011 but interrupted in 2014/2015 and later cancelled due to health problems of the student, Dept. of Automatic Control, CINVESTAV-IPN.)

1. Saúl M. Domínguez Nicolás, "Adquisición y procesamiento digital de imágenes microscópicas provenientes de pruebas de dureza Vickers", final exam: 29.11.**2018**, Dept. of Automatic Control, CINVESTAV-IPN.

2. Mario Villafuerte Bante, "Aportaciones a la estimación del perímetro de curvas y áreas de superficies digitales", final exam: 30.09.**2022**, cosupervisor, cooperation with CIC-IPN (Centro de Investigación en Computación), supervisor at CIC-IPN: Humberto Sossa.

Organization of international conferences:

1. P. Wiederhold. General Chair of the IWCIA'09 - 13th Workshop on Combinatorial Image Analisis, Playa del Carmen, Mexico, November 24-27, **2009**, publication of Proceedings in Springer LNCS Vol. 5852 (2009), and the edited book "Progress in Combinatorial Image Analysis" (RPS Singapore, 2010).

2. P. Wiederhold. Tutorial Chair of the *PSIVT'2013 - Pacific-Rim Symposium on Image and Video Technology* (Oct./Nov. 2013, Guanajuato, Mexico).

3. P. Wiederhold. Chair/Organizer of the Session on Applied Topology, International Conference on Topology (on honour of 70th birthday of R. Wilson) (Cocoyoc, Morelos, Mexico, Aug. 2014).

4. P. Wiederhold. Chair of the Track on Automatic Control, CCE 2016 - 13th International Conference on Electrical Engineering, Computing Science and Automatic Control, (Mexico City, Sept. 26-30, 2016).

Reviewing work for international journals and editorials:

(this part has not been actualized since 2016)

Annals of Mathematics and Artificial Intelligence (AMAI, Springer) - **2013, 2014** (super-reviewer).
Applied General Topology (ISSN 1989-4147) – **2007, 2010, 2012, 2014**.
Computers and Mathematics with Applications (Elsevier) - **2011**.
Discrete Applied Mathematics (Elsevier) – **2008, 2015**.
IEEE-Transactions on Pattern Analysis and Machine Intelligence (PAMI) – **2003, 2005.**
IEEE-Transactions on Multiscale Systems – **2016.**
Intern. Journal of Computer Mathematics (Taylor and Francis) – **2010**, **2011, 2012, 2013.**
Intern. Journal of Imaging Systems and Technology (Wiley) – **2008.**
Intern. Journal of Shape Modeling (World Scientific) – **2009**.
Journal of Intelligent of Data Analysis (IDA, IOS Press) – **2015**.
Journal of Mathematical Imaging and Vision (Springer) **2006, 2009, 2010, 2011, 2012.**
Mathematical Problems in Engineering (Hindawi Publishing) - **2013**.
Theoretical Computer Science (Elsevier) – **2010**.
Topological Methods in Nonlinear Analysis (Juliusz Schauder Center for Nonlinear Studies, ISSN 1230-3429**) - 2014**.

Reviewer of chapters of monographs by editorial Springer - **2012**.
Reviewer of project proposals of monographs by editorial Springer – **2011, 2013**.

Reviewer, member of Program Committees, or, of Steering Committees, for international conferences:

(this part has not been actualized since 2016)

Reviewer for the IEEE-Conference *CCE-2008: 5th Int. Conf. on Electrical Engineering, Computing Science and Automatic Control* (2008, Mexico), **2008**.
PC member and Reviewer for *PSIVT'2007 - Pacific-Rim Symposium on Image and Video Technology* (2007, Chile), Springer's LNCS 4872, **2008**.
PC member and Reviewer for *IWCIA 2008 – Int. Workshop on Combinatorial Image Analysis* (2008, USA), Springer's LNCS 4958, **2008**.
PC member and Reviewer for *CompIMAGE'10 - Computational Modeling of Objects Presented in Images: Fundamentals, Methods, and Applications* (2010, USA), **2009**/**2010**.
PC member and Reviewer (9 papers) for *ICPR'2010 – Int. Conference on Pattern Recognition* (2010, Turkey), **2010**.
Steering Committee member, PC member and Reviewer (3 papers) for *IWCIA'2011 – Int. Workshop on Combinatorial Image Analysis*" (2011, Spain). **2010/2011**.
PC member and Reviewer (7 papers) for *ICIEV - The Int. Conference on Informatics, Electronics & Vision* (endorsed by the IAPR, May 2012, Dhaka, Bangladesh), **2011/2012**.
PC member and Reviewer for *ICPR'2012 – Int. Conference on Pattern Recognition* (2012, Japan), **2012**.

Steering Committee member for *IWCIA'2012 – Int. Workshop on Combinatorial Image Analysis*" (2012, USA). **2012**.

PC member and Reviewer for *ICIEV - The International Conference on Informatics, Electronics & Vision* (endorsed by the IAPR, May 2013, Dhaka, Bangladesh), **2013**.

PC member and Reviewer (7 papers) for *CIARP 2014 - 19nd Iberoamerican Congress on Pattern Recognition* (Nov. 2-5, 2014, Puerto Vallarta, México), **2014**.

PC member and Reviewer (5 papers) for *ICIEV 2014 – Int. Conference on Informatics, Electronics and Vision* (May 2014, Dhaka, Bangladesh), **2014**.

Reviewer (2 papers) for *ICPR 2014 - 22nd Int. Conference on Pattern Recognition* (August 24-28, 2014, Stockholm, Sweden), **2014**.

Steering Committee member for *IWCIA'2014 – 16th Int. Workshop on Combinatorial Image Analysis*" (May **2014**, Brno, Czech Republic).

Steering Committee member for *IWCIA'2016 – 17th Int. Workshop on Combinatorial Image Analysis*" (Nov. **2015**, Kolkata, India).

PC member and Reviewer for *ICIEV 2015 – Int. Conference on Informatics, Electronics and Vision* (June 2015, Fukuoka, Japan), **2015**.

Reviewer for *IEEE - CCE 2016 - 13th Int. Conference on Electrical Engineering, Computing Science and Automatic Control* (Sept. 26-30, 2016, Mexico City), **2016**.

Reviewer for *icIVPR - Int. Conference on Imaging, Vision & Pattern Recognition* (Sept. 2016, Dhaka, Bangladesh), **2016**.

Reviewer for CompIMAGE 2016 – Int. Symposium "Computational Modeling of Objects Presented in Images: Fundamentals, Methods, and Applications" (Sept. 2016, Niagara Falls, USA), **2016**.

PC member and Reviewer for *ICPR'2016 – Int. Conference on Pattern Recognition* (Dec. 2016, Cancun, Mexico), **2016**.

PC member and Reviewer for *IWCIA'2017 – Int. Workshop on Combinatorial Image Analysis*" (2017, Plovdiv, Bulgaria). **2017**.

Direction of research projects:

Participation (talks) in international conferences:

1. "Contours from the digitizer tableau", Intern. Conf. about Geometrical Problems of Image Processing GEOBILD'87, Georgenthal, Germany, 1987.

2. "Einsatzmoeglichkeiten des Systems A6472-AMBA/RJ", together with M. Hegner, 3. Intern. Symposium "Morphometrie in Forschung und Praxis - Automatische Mikroskopbildanalyse", Berlin, Germany, 1987.
3. "The Alexandroff dimension of digital quotients of Euclidean spaces", together with R. Wilson, 13th Summer Conference on Topology and its Applications, México, D.F., 1998.
4. "About the dimension of digital spaces constructed from tilings of Euclidean spaces", together with R. Wilson , Workshop on Digital Topology, New York, U.S.A., 2002.
5. "Digital spaces constructed from R^n with non-convex tiles", together with R. Wilson , Seminar on Mathematical Structures for Computable Topology and Geometry, Dagstuhl, Saarbruecken, Germany, 2002.
6. "Skeletons and curves in Alexandroff spaces", Section "Applied Topology", 22nd Conference on Topology and its Applications, Castellón, Spain, July **2007**.
7. "Thinning on quadratic, triangular, and hexagonal cell complexes", together with S. Morales, IWCIA'2008 - Intern. Workshop on Combinatorial Image Analysis, Buffalo, N.Y., U.S.A., April **2008**.
8. "About the dimension of discrete sets", Section "Applied Topology", 2008 Conference on Topology and its Applications, Mexico City, Mexico, July **2008**.
9. "Triangulation of cross-sectional DSS and MLP for surface area estimation", together with M. Villafuerte, IWCIA'09 – 13th Int.. Workshop on Combinatorial Image Analysis, Playa del Carmen, Mexico, Nov. **2009**.
10. "On the relative convex hull" (Poster), Convexity, Topology, Combinatorics, and Beyond: A workshop in honor of Montejano´s 60 birthday, Puerto Vallarta, Jalisco, Mexico, Oct. **2011**.
11. "A P System Model for Contextual Array Languages", together with K.G. Subramanian, I. Venkat, IWCIA 2012, Austin, Texas, USA, Nov. **2012**.
12. "Automatic liver tissue segmentation in microscopic images using fusion color space and multiscale morphological reconstruction" (C. Cruz-Gomez, P. Wiederhold, M. Gudino-Zayas), TAEECE 2013 – Int. Conf. on Technological Advances in Electrical, Electronics and Computer Engineering, May 2013, Konya, Turkey. The work was presented by my student C. Cruz-Gomez.
13. "Relative Convex Hull Determination from Convex Hulls in the Plane", together with H. Reyes, IWCIA 2015, Kolkata, India, Nov. **2015**.
14. "A geometric description of the brain arterial network", together with N. Weinstein, A. Guzmán-Sáenz, F. Sagols, I. Gitler, J. Klapp, K. G. Pedroza-Ríos, E. Nathal, M. Zenteno, 16th IEEE/ACM Int. Symposium on Cluster, Cloud, and Grid Computing (Cartagena, Columbia, May 16-19, **2016**).

Courses given since 2010 *(in the Master Program at Dept. of Automatic Control, CINVESTAV-IPN, Campus Zacatenco, Mexico City)***:**

"Análisis Real", 35 horas, Mayo/Junio 2010 (Curso propedéutico para la Maestría).
"Análisis Real", 35 horas, Mayo/Junio 2011 (Curso propedéutico para la Maestría).
"Topología General", 120 horas, Enero-Abril 2012 (Curso básico obligatorio de la Opción Matemáticas).
"Topología General", 60 horas, Enero-Abril 2013 (Curso básico obligatorio de la Opción Matemáticas).
"Análisis Real", 35 horas, Mayo/Junio 2013 (Curso propedéutico para la Maestría).
"Geometría Digital", 60 horas, Enero-Abril 2014 (Curso opcional especializado).

"Compresión de Imágenes mediante Fractales", 30 horas, Sept.-Dic. 2014 (Seminario con carácter de curso).

"Fractales", 30 horas, Enero-Abril 2015 (Seminario con carácter de curso).

"Geometría Digital", 60 horas, Enero-Abril 2016 (Curso opcional especializado).

"Análisis Real", 35 horas, Mayo/Junio 2017 (Curso propedéutico para la Maestría).

"Geometría Digital", 60 horas, Sept.-Dic. 2018 (Curso opcional especializado).

"Algebra y álgebra lineal", 45 horas, Sept.-Nov. 2019 (Curso obligatorio de Maestría)

"Topología General", 120 horas, Mayo-Agosto 2020 (Curso básico obligatorio de la opción Matemáticas).

"Algebra y Ecuaciones Diferenciales", 60 horas, Sept.-Dic. 2021 (Curso obligatorio de Maestría)

"Algebra y Ecuaciones Diferenciales", 60 horas, Sept.-Dic. 2022 (Curso obligatorio de Maestría)

"Análisis Real", 35 horas, Mayo/Junio 2023 (Curso propedéutico para la Maestría).

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