Erik Zamora

D. Sc.
National Researcher Level 1 (Jan2020-Dec2027)
Full-time Professor, Titular C
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Research Interests

- **Neural Networks.** Deep neural networks are very popular nowadays because of their success. However, their mathematical structure is limited to affine transformations, convolutions and layer compositions. My research focuses on exploring new and better mathematical structures for neural networks.
- **Autonomous Robots**. Automatic robots are limited to controlled environments. We need autonomous robots in unstructured environments to increment the productivity and efficiency of several human activities. My research focuses on developing navigation systems for robots.

Publications

In JCR Journals

1. Rogelio Peralta, Erik Zamora*, Humberto Sossa, Fernando Arce, Luis Arturo Soriano. "Orientation Modeling Using Quaternions and Rational Trigonometry". Machines, MPDI, 2022. **(Impact Factor: 2.899).**
2. U Escalona, E Zamora*, H Sossa. Fast Crack Segmentation with Depth-to-Space Operator for Pavement Maintenance, IEEE Latin America Transactions 100 (XXX), 2022 **(Impact Factor: 0.967).**
3. Luis Arturo Soriano, Erik Zamora, J M Vazquez-Nicolas, Gerardo Hernández, José Antonio Barraza and David Balderas, "PD control compensation based on a cascade neural network applied to a robot manipulator", Frontiers in Neurorobotics 2020 **(Impact Factor: 3.790)**
4. Gerardo Hernández, Erik Zamora, Humberto Sossa, Germán Téllez, and Federico Furlán, "Hybrid neural networks for big data classification", **Neurocomputing 2020 (Impact Factor: 4.072)**
5. Jesus Vazquez, Erik Zamora, Ivan Gonzalez, Rogelio Lozano, Humberto Sossa, "PD+SMC Quadorotor Control for Altitude and Crack Recognition using Deep Learning", International Journal of Control, Automation and Systems. 2020 **(Impact Factor: 2.181)**
6. Juan Humberto Sossa Azuela, Rogelio Peralta y Erik Zamora, "The Efficient FPGA hardware implementation for robot manipulator kinematic modeling" IEEE Latin America Transactions. 2019 **(Impact factor: 0.804).**
7. Fernando Arce, Erik Zamora, Carolina Fócil and Humberto Sossa, "Dendrite ellipsoidal neurons based on k-means optimization", Evolving Systems, Jule 25th 2018.**(Impact Factor: 1.908)**
8. Fernando Arce, Erik Zamora, Humberto Sossa and Ricardo Barrón, "Differential Evolution Training Algorithm for Morphological Neural Networks", Applied Soft Computing, Abril 3rd 2018. **(Impact Factor: 3.54)**
9. Erik Zamora* and Humberto Sossa, "Dendrite Morphological Neurons Trained by Stochastic Gradient Descent", Neurocomputing, May 2017. **(Impact Factor: 3.39)**

10. Erik Zamora & Wen Yu, Novel Autonomous Navigation Algorithms in Dynamic and Unknown Environments, Cybernetics & Systems, 47(7): 523 - 543, 2016. http://dx.doi.org/10.1080/01969722.2016.1209372 **(Impact Factor: 0.888)**
11. Wen Yu, Erik Zamora, Alberto Soria, "Ellipsoid SLAM: A Novel Set Membership Method for Simultaneous Localization and Mapping," Autonomous Robots (Impact Factor: 1.75), 39(3):1-13, 2015. DOI 10.1007/s10514-015-9447-y **(Impact factor**: 2.706)
12. Erik Zamora, Wen Yu, "Recent Advances on Simultaneous Localization and Mapping (SLAM) for Mobile Robots," IETE Technical Review, 30(6):490-496, 2013. DOI:10.4103/0256-4602.125671 **(Impact factor: 1.330).**

In Journals indexed by CONACYT

13. R Ochoa-Montiel, R Román-Godínez, E Zamora, H Sossa, G Hernández. Dendritic neural networks in the classification of estrous cycle images. International Journal of Combinatorial Optimization Problems & Informatics. 2023.
14. International Journal of Combinatorial Optimization Problems & Informatics ...
15. Rodrigo Román-Godínez, Erik Zamora, and Humberto Sossa, A Comparative Study of Dendrite Neural Networks for Pattern Classification. International Journal of Combinatorial Optimization Problems and Informatics, 2021.
16. Omar Edgardo Lugo Sánchez, Juan Humberto Sossa Azuela, Erik Zamora, "Robust Place Recognition using Convolutional Neural Networks", Computación y sistemas. 2020.
17. U. Escalona, F. Arce, E. Zamora and H. Sossa. Fully Convolutional Networks for Automatic Pavement Crack Segmentation. Computación y sistemas. 2019.
18. G. Hernández, L. Delgado, R. Ochoa-Montiel, E. Zamora, H. Sossa, A. Barreto, F. Ramos, and R. Reyes.Estrous Cycle Classification Through Automatic Feature ExtractionEstrous Cycle Classification Through Automatic Feature Extraction. Computación y sistemas. 2019.

6.

In International Conferences

1. U Escalona, E Zamora, H Sossa. RiskIPN: Pavement Risk Database for Segmentation with Deep Learning. Mexican International Conference on Artificial Intelligence, 69-80
2. CE Solórzano-Espíndola, E Zamora, H Sossa. Multi-subject classification of Motor Imagery EEG signals using transfer learning in neural networks. 2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC). 1006-1009.
3. CE Solórzano-Espíndola, H Sossa, E Zamora. A comparison study of eeg signals classifiers for inter-subject generalization. Mexican Conference on Pattern Recognition, 305-315.
4. O Gutiérrez, E Zamora, R Menchaca. Graph Representation for Learning the Traveling Salesman Problem. Mexican Conference on Pattern Recognition, 153-162.
5. Víctor R. Virgilio, Humberto Sossa, Erik Zamora, "Vision-Based Blind Spot Warning System by Deep Neural Networks", The 12th Mexican Conference on Pattern Recognition, Mexico. 2020.
6. G. Hernández, L. G. Hernández, E. Zamora, H. Sossa, J. M. Antelis, O. Mendoza-Montoya, and L. E. Falcón. Using Morphological-Linear Neural Network for upper limb movement intention recognition from EEG signals. The 11th Mexican Conference on Pattern Recognition, Queretaro, Mexico. 2019.
7. F. Arce, O. Mendoza-Montoya, E. Zamora, J. M. Antelis, H. Sossa, J. Cantillo, R. I. Carino, L. G. Hernandez and L. Falcon. Dendrite Ellipsoidal Neuron Trained by Stochastic Gradient Descent for Motor Imagery Classification. The 11th Mexican Conference on Pattern Recognition, Queretaro, Mexico. 2019.
8. Salvador Ortiz, Wen Yu, Erik Zamora, Sliding mode SLAM for robust simultaneous localization and mapping, 44th Annual Conference of the IEEE Industrial Electronics Society (IECON18), Washington DC, USA, 5674-5679, 2018.
9. Salvador Ortiz, Wen Yu, Erik Zamora, Sliding mode three-dimension SLAM with application to quadrotor helicopter, 15th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE18), Mexico City, Mexico, 1-6, 2018.
10. Joel García, Erik Zamora, Humberto Sossa, "Supervised and unsupervised neural networks: Experimental study for anomaly detection in electrical consumption", 17th Mexican International Conference on Artificial Intelligence Guadalajara, Mexico, October 22 to 27, 2018.
11. Jesus Vazquez, Erik Zamora, Ivan Gonzalez, Rogelio Lozano, Humberto Sossa, "Towards automatic inspection: crack recognition based on Quadrotor UAV-taken images", ICUAS 2018.

12. G Hernandez, Erik Zamora, & H Sossa, “Morphological-Linear Neural Network”, IEEE World Congress on Computational Intelligence, Rio de Janeiro, Brasil, 8-13th July 2018.
13. F Arce, G Hernandez, Erik Zamora, M Antelis & H Sossa, “Recognizing Motor Imagery Tasks Using Deep Multi-Layer Perceptrons”, Intern. Conference on Machine Learning and Data Mining, New York, USA, 14-19th July 2018.
14. L. Delgado, G. Hernández, E. Zamora, H. Sossa, A. Barreto, F. Ramos, R. Reyes. “Classification of the Estrous Cycle through texture and shape features”, Symposium Series on Computational Intelligence, Hawaii, USA, November 27th - December 1st, 2017.
15. F Arce, G Hernandez, Erik Zamora & H Sossa, “EFFICIENT LANE DETECTION BASED ON ARTIFICIAL NEURAL NETWORKS” en 2nd International Conference on Smart Data and Smart Cities October 4–6, 2017, Puebla, Mexico.
16. Hernandez, Zamora & Sossa, “Comparing Deep and Dendrite Neural Networks: A case Study”, MCPR, June 21-24th, 2017.
17. F Arce, Erik Zamora, & H Sossa, “Dendrite Ellipsoidal Neuron ”, IJCNN, May 14-19th, 2017.
18. Erik Zamora & H. Sossa, “Dendrite Morphological Neurons Trained by Stochastic Gradient Descent ”, IEEE Symposium Series on Computational Intelligence, Athens, Greece, December 6-9, 2016. code
19. F Arce, Erik Zamora, R Barron & H Sossa, “Dendrite Morphological Neurons Trained by Differential Evolution “, IEEE Symposium Series on Computational Intelligence, Athens, Greece, December 6-9, 2016.
20. Erik Zamora, Wen Yu, "Novel Autonomous Navigation Algorithms in Dynamic and Unknown Environments," 2014 IEEE International Conference on Systems, Man, and Cybernetics, San Diego, California, USA, October 5-8, 2014.
21. Erik Zamora, Wen Yu, "Mobile Robot Navigation in Dynamic and Unknown Environments," 2014 IEEE Multi-conference on Systems and Control, October 8-10, 2014, Antibes, France.
22. Erik Zamora, Wen Yu, "Ellipsoid SLAM: A Novel On-line Set Membership Method for Simultaneous Localization and Mapping," 53rd IEEE Conference on Decision and Control, Los Angeles, California, USA, December 15-17, 2014.

In Chapers:

- Morphological
- Zamora & Sossa, “Regularized Divide and Conquer Training for Dendrite Morphological Neurons”, Mecatrónica y Robótica de Servicio: Teoría y Aplicaciones , Asociación Mexicana de Mecatrónica, Noviembre 2016, code

In Magazines:

- Erik Zamora, Robots Autónomos: Navegación, Komputer Sapiens, SMIA, 2015.

Intellectual property

Patents

1. Número de solicitud MX/u/2022/000098. DISPOSITIVO ELECTRONICO INTELIGENTE PARA LA DETECCION DE PROBLEMAS DE ENERGIA EN EL SUMINISTRO ELECTRICO. Fecha de presentación 04/03/2022.
2. Oficina, No de Patente y Tipo de documento: MX 390228 B. VEHICULO TRANSFORMABLE ENTRE HELICOPTERO Y AEROBRAZO O VICEVERSA, BASADO EN MULTIRROTORES O TURBINAS. Fecha de presentación 08/11/2016. Fecha de concesión. 20/02/2022.

Software

1. Rodrigo Roman, Humberto Sossa, Erik Zamora, Dendrite-Neural-Networks. Registered at INDAUTOR, 13 Mayo 2022
2. Antonio Barraza, Erik Zamora et al.. Interfaz Grafica de Control para un sistema ambulatorio de analisis de movimiento de la marcha. Registered at INDAUTOR, 2019.
3. Cesar Gerardo Bravo Conejo, Juan Humberto Sossa Azuela, Erik Zamora Gómez, “Navegación autonoma de un robot tipo automovil en psta de carreras con obstaculos”. Registered at INDAUTOR, 2019.

4. Tonatiuh Danhiel Vanegas Sanchez, Juan Humberto Sossa Azuela, Erik Zamora Gómez, “Navegación autonoma de un vehiculo a escala por medio de Redes Neuronales Profundas”. Registered at INDAUTOR, 2019.
5. Esteban Ivan Rojas Hernandez, Erik Zamora Gómez, “Reconocimiento de semaforos y señales de transito para navegación autonoma de robot movil”. Registered at INDAUTOR, 2019.
6. Erik Zamora Gómez, Álvaro Jonathan Salazar Ordoñez, “Dendrite Morphological Neurons APP 2”, Registered at INDAUTOR, 2018.
7. Erik Zamora Gómez, Álvaro Jonathan Salazar Ordoñez, “Dendrite Morphological Neurons APP”, Registered at INDAUTOR, 2016.

Funded projects:

1. Director, SIP-IPN 20230232. 2023. “Aportaciones y aplicaciones de modelos neuronales”. Budget: 100,000 MXN pesos.
2. Director, SIP-IPN 20226945. “Segmentación de grietas y otros riesgos en imágenes hacia el diagnóstico automático del pavimento”. 2022. Budget: 99,212 MXN pesos.
3. Director, SIP-IPN 20220002. “Modelos neuronales para problemas de baja dimensión”. 2022. Budget: 88950 MXN pesos.
4. Director, SIP-IPN 20210316. “Modelos neuronales y sus aplicaciones”. 2021. Budget: 48500 MXN pesos.
5. Director, SIP-IPN 20200651. “Automatización para la industria 4.0: aportaciones y aplicaciones”. 2020. Budget: 58,823 MXN pesos.
6. Director, SIP-IPN 20190166. “Automatización para la industria 4.0: aportaciones y aplicaciones”. 2019. Budget: 48,585 MXN pesos.
7. Director, SIP-IPN 20182321 “Robot repartidor autónomo para unidades habitacionales”. 2018. Budget: 94,409.33 MXN pesos.
8. Director, SIP-IPN 20180180 “Navegación de un mini-coche en una pista de carreras y mejores redes neuronales”. 2018. Budget: 49,000 MXN pesos.
9. Director, SIP-IPN 20170836 “Navegación autónoma de robots móviles y redes neuronales”. 2017. Budget: 24,000 MXN pesos.
10. Director, SIP-IPN 20160945 “Construcción de multicamaras e implementación de visión computacional para la reconstrucción 3D del ambiente”. 2016. Budget: 14,100 MXN pesos.

Advisor/Supervisor

Doctor of Science

1. Miguel, January 2028.
2. Saulo, January 2028.
3. Jordi, January 2028
4. Raul, July 2026.
5. Idarth. January 2026.
6. Andrea. January 2025.
7. Rodrigo Roman. January 2024.
8. Omar Gutierrez. July 2023.
9. Omar Edgardo Lugo Sánchez. “Reconocimiento robusto de lugares usando redes neuronales convolucionales”. March 14th 2022.
10. José Uriel González Escalona. “Fast image segmentation for pavement cracks and risks on road surfaces”. January 28th 2022.
11. Rogelio Martinez Peralta. MODELADO DE ROBOTS CON TRIGONOMETRÍA RACIONAL. July 13th 2020.
12. Gerardo Hernández, Hybrid neural networks with morphological neurons and perceptrons, November 29th 2019.
13. Fernando Arce, Contributions to the Study of Neural Networks with Dendritic Processing: New Training Algorithms and New Models, August 2nd 2019.
14. Salvador Ortiz, Localización y mapeo simultáneo robusto aplicado a la planeación de trayectorias en robot móviles, March 27th 2019.

Master of Science

1. Almendra, July 2025.
2. Miguel Galicia. Simplificación del componente de visión para un modelo del mundo. July 2023.
3. Carlos Julian Rivera Ortiz. "Red neuronal de cápsulas para el aprendizaje de navegación autónoma basado en visión". January 27th 2022.
4. Axel Hurtado Araiza."Autocodificador variacional para el aprendizaje en navegación autónoma basado en visión". January 21th 2022.
5. Carlos Emiliano Solorzano Espindola. Clasificación de señales EEG mediante transferencia de aprendizaje en redes neuronales artificiales. August 13th 2021.
6. Victor Rubén Virglio Gonzalez. "Sistema de virtualización de automóviles en puntos ciegos basado en visión por computadora mediante modelos neuronales profundos". July 31th 2020.
7. Aldo Pedraza Sánchez. Detección de personas en video mediante redes neuronales convolucionales. January 8th 2020.
8. Cabral Guzman Luis Miguel. Detección de automóviles usando un teléfono inteligente Android con redes neuronales convolucionales. October 25th 2019.
9. Joel García Velasco. Detección de anomalías en el consumo eléctrico mediante redes neuronales. March 27th 2019.
10. Tonatiuh Daniel Vanegas Sánchez. Navegación autónoma de un vehículo a escala por medio de Redes Neuronales Profundas. January 14th 2019.
11. Enrique Maldonado Romo. Construcción de mapas de ocupación 2D y 3D para la generación de entornos virtuales. July 6th 2018.
12. Cesar Gerardo Bravo Conejo. Navegación autónoma de un robot tipo automóvil en pista de carreras con obstáculos. July 6th 2018.

Bachelor thesis/ Terminal projects

1. Heras Godínez Josué, Rosaldo Serrano Marcos A., Mercado Álvarez Mario. "Diseño, manufactura y automatización del sistema utilizado para el depósito de películas delgadas por el método de centrifugado (spin-coating) de atmosfera controlada". Ingeniería Mecatrónica, UPIITA. July 2011.
2. Hernández Espinosa Josué Israel, Montesinos Morales José Iván, Torres Vázquez Benjamín. "Implementación de Visión Artificial en un Cuadrirotor para el Seguimiento de Objetivos". Ingeniería Mecatrónica, UPIITA. July 2012.
3. Conde Rangel María Gisel, García Reséndiz Erick Gabriel, Serra Ramírez Jaime, Trujillo Sánchez Juan Carlos. "*Diseño, Manufactura e Implementación de un Sistema de Seguimiento de Objetos mediante Visión Artificial para un Robot Humanoide NAO*", Ingeniería Mecatrónica, UPIITA. August 2013.
4. Iván Adrián Anguiano Torres, Miguel Daniel Garrido Reyes, Jonathan Emmanuelle Martínez Loredo. *"Modelado y control de un cuadrirrotor para vuelo en entornos cerrados implementando visión artificial"*, Ingeniería Mecatrónica, UPIITA. December 2013).
5. Lagunes Fortiz Miguel Antonio. "*Sistema de navegación evasor de obstáculos en un robot móvil"*. Ingeniería Mecatrónica, UPIITA. January 2015.
6. SURF detector for embedded computational vision on FPGA (Detector SURF para visión computacional embebida en FPGA). Erick Geovanny Morales Renteria, UPIITA-IPN, December 2015.
7. Navigation system of an intelligent mobile robot in controlled environment for localization of targets. (Sistema de navegación de robot móvil inteligente en ambiente controlado para la ubicación de objetivos). Calderón Gómez Eduardo, Carboney Palafox Leslie Janet, Hernández Girón Alan, UPIITA-IPN, December 2015.
8. Depth multiocular and rotating cameras (Cámara Multiocular y Cámara Estereoscópica Giratoria de Profundidad). Arroyo Valdez Ernesto, Hernández López Héctor Hugo, Ortiz Torres Erick, UPIITA-IPN, June 2016.
9. Vehicular assistant for the prevention of road accidents (Asistente Vehicular para la prevención de accidentes viales) José Alejando Guillén Solís, Mauricio Martinez Anaya, UPIITA-IPN, June 2016.
10. Ulises Bautista Gómez, Miguel Ángel Claudio Gómez, Víctor Antonio Cruz Pérez y Daniel Rivera Marrón "Implementación de un sistema de seguimiento automático en una carriola", June 2017.
11. Cruz Betanzo Alberto, Durán Sandoval Erick Daniel, Hernández Gama Rodrigo y Reyes Martínez Missael "Sistema de vigilancia cooperativo e inteligente aplicado en un ambiente de prueba", June 2017.
12. Bernardo Irving Uribe Hernández, "Prototipo de sistema detector de fallas para línea de producción de bebidas envasadas", UPIITA-IPN, December, 2017.
13. Castillo dueñas Martha Marfil, "Escaneo de una área en tres dimensiones con la Implementacion de LiDAR", December, 2017.
14. García Tovar Víctor Eduardo, Guzmán Martínez Salvador, Pérez Nicolás Pedro y Terán Chapul Roberto Enrique, "Robot Repartidor Autónomo", UPIITA-IPN, December, 2017.

15. Daniel Miranda Badillo, Jorge Alejandro Peña Muñoz, Eduardo Cruz González. Sistema de control de acceso de personas basado en reconocimiento facial, UPIITA-IPN, Junio, 2018.
16. David Camhi de la Tejera, Gerardo Galván López, Jorge González Tron. Prototipo de enjam bre robótico de 3 unidades para la planificación de trayectorias m ediante cam pos potenciales artificiales e n espacios confinados y controlados, UPIITA-IPN, Junio, 2018.
17. Rojas Hernández Esteban Iván. Reconocimiento de Semáforos y Señales de Tránsito para Navegación Autónoma de Robot Móvil, UPIITA-IPN, Junio, 2018.
18. Arvizu Rondero David, Flores Gutierrez Luis Vicente, Martinez Ramirez Mario. Sistema aéreo no tripulado semiautónomo para limpieza de ventanas, UPIITA-IPN, December, 2018.
19. Portillo Villalobos Sabik Fernando, Rivera Martínez Jorge Ali. Interfaz natural de usuario para la manipulación de piezas en un proceso de troquelado, UPIITA-IPN, December, 2018.
20. Hurtado Araiza Axel, Rivera Ortiz Carlos Julián. Plataforma para navegación autónoma basada en visión artificial implementada en un vehículo a escala, UPIITA-IPN, December, 2018.
21. Luis Fernando González Torres, José Arley Sánchez Cortes, Gustavo Eduardo Carcia Sánchez. Prototipo de un sistema de detección de intrusos en huertas de aguacate, basado en reconocimiento de imágenes, UPIITA-IPN, June 2019.
22. Giovanna Charlene Chichía Cerda. Sistema de navegación autónomo basado en una red neuronal artificial implementado a un robot móvil que se desplaza en un ambiente semicontrolado, UPIITA-IPN, June 2019.

Competitions

- Coordinator of the CIC-IPN team for the rally of mini autonomous cars. Gerardo Cesar Bravo Conejo, Vanegas Sánchez Tonatiuh Daniel, Peña Muñoz Jorge Alejandro & Ayala Espejel Edgar Rubén. 2nd place, April 2-4th, 2017.

Science Outreach Activities:

Talks:

1. Erik Zamora. Aplicaciones de Inteligencia Artificial en el diseño. Ingenious Minds 2022 FORD . November 10th 2022.
2. Erik Zamora. Aplicaciones de Inteligencia Artificial. CONCIAS 2022 FORD . December 8th 2022.
3. Erik Zamora. Aprendizaje profundo en inteligencia artificial. Sociedad de Ingenieros Automotrices, sección Mexico. March 17th 2022.
4. Erik Zamora ¿Cómo puede un programa a jugar videojuegos? Universidad Politecnica Salesiana, Sede Cuenca, Ecuador. August 28th 2021.
5. Erik Zamora. Entre el empleo y el emprendimiento en la academia. CIDESI July 1st 2021.
6. Erik Zamora. Métodos de navegación autónoma basados en visión. IV CONGRESO INTERNACIONAL DE SISTEMAS Y CIENCIAS DE LA COMPUTACION. Universidad Nacional de Moquegua, Perú. November 23-24th 2020.
7. Erik Zamora. Navegación autonoma, el elemento de la economia del futuro. IPICYT November 22th 2019.
8. Erik Zamora. Detectando personas en imágenes usando deep learning. RIIAA Agosto 19th 2019.
9. Erik Zamora. Detectando personas en imágenes usando deep learning. CORE Agosto 5-9th 2019.
10. Erik Zamora. Deep Learning: su impacto y sus logros más importantes. Seminario estudiantil CITEDI November 22th 2018.
11. Erik Zamora. TalentLand 2018.
12. Erik Zamora. Deep Learning: su impacto y sus logros más importantes. Witcom November 7th 2018.
13. Erik Zamora. Navegación autonoma de robot moviles y redes neuronales. Semana de investigación, May 21th UPIITA 2018.
14. Erik Zamora. Redes Neuronales Profundas en Python. Taller CinvesPy November 21-22th 2017.
15. Erik Zamora. Navegación autonoma de robot moviles. SIMEVANT October 26th 2017.
16. Erik Zamora. Taller: Deep Neural Networks. September 25th CORE 2017.
17. Erik Zamora. Navegación autonoma, el elemento de la economia del futuro. Witcom 2016.
18. Erik Zamora. Aprendizaje en la 4a Revolución Industrial y Hackeando Tec. Red de Talentos Mexicanos Dallas. August 25th 2016.
19. Erik Zamora. Segundo foro nacional de computación, informatica, y áreas afines. UAEM Zumpango November 17-18th 2016.

Forum/Roundtable discussions

1. Irving Vazquez, Erik Zamora. CIRCoS: El impacto de la navegación autonoma. RIIAA August 27th 2021.
2. Erik Zamora. Cómo completar un posgrado exitosamente. CORE 2021

Television/Videos on Internet

1. Erik Zamora. Entrevista TV Educativa - Navegación autónoma de robots móviles. Febraury 19th 2020.
2. YouTube channel to disseminate technological skills in the Hispanic world to create business value. Hackeando Tec, +150 videos, +15,300 subscribers, +1,620,000 views, a See an Introductory video. Since 2015.

15 years of Teaching Experience

- Graduate courses:
  - Deep learning (material)
  - Extreme learning machine (material)
  - Morphological neurons (material)
- Undergraduate courses:
  - Modeling and simulation of linear dynamic systems.
  - Classic and Modern control theory
  - Neurofuzzy systems (online course http://ow.ly/QDvcJ)
  - Electronic design with op-amps and thyristors.
  - Probability
  - Neural Networks (online course http://ow.ly/QhsvU)
  - Signals and systems

Research stays

- **Posdoc in CIC-IPN. January 2017-December 2017.** Autonomous navigation for mobile robots.
- **Posdoc in CIC-IPN. January 2016-December 2016.** New algorithms for artificial neural networks and their applications in autonomous robotics.
- **Navigation in unknown environments guided by emergency signs**: As PhD student, I participated in a research stay at the **University of Bristol** in England led by **Walterio Mayol-Cuevas**. The aim was to develop a navigation system for a differential mobile robot (iRobot). The task was to look for the emergency exit guided by the existing emergency signs on the building. The video shows some examples of these emergency signs and the robot searching for the exit. It uses a RGBD camera (Kinect) to detect emergency signs and determine the direction that it should move. The same sensor provides information on obstacles such as chairs, walls, tables, people, etc. It uses a SLAM method (Gmapping method) to build a 2-D map as it moves; at the beginning the robot does not know the environment, i.e. it does have a map. It uses a planning method (A* search) to find the shortest path. This method was modified to integrate the information of emergency signs. The planned path is executed by a P controller and a method of obstacle avoidance (Smooth Nearness Diagram) was added. All software is written in Python and C/C++ on ROS platform (Robot Operating System). The most interesting part of this project was to implement the system of perception which must detect, recognize and interpret the emergency signs to know how to move. Furthermore, it was necessary to implement a system to prevent repeated detections which was coupled to the SLAM method.

Academic Education

- Self-driving car Nanodegre, UDACITY. Term 1, Term2.
- **PhD** in Automatic Control Department at CINVESTAV-IPN, 2015
  - Thesis: Autonomous navigation for a mobile robot. I have implemented algorithms for mapping, localization, SLAM, path planning and nonlinear controllers. I have proposed a novel non-probabilistic SLAM technique for large-scale environments. Download my thesis.
  - Extra-Courses: Machine Learning (Stanford), Artificial Intelligence (Stanford), Programming a Robotic Car (Udacity), Writing in the Sciences (Coursera-Stanford), Pensamiento Cientifico (Coursera-UNAM), Algorithms: Design & Analysis Part 1 & 2 (Coursera-Stanford), Change Innovation and Creativity (Coursera-PennState).

- **M. Sc.** in Electric Engineering at CINVESTAV-IPN with a scholarship from the National Council on Science and Technology (CONACYT). Aug2004-Feb2007. Score 9.40/10.0 Thesis: "Bipolar Junction Transistor as Auto-Calibrated Thermometer" (The 5th procedure in the mankind history to measure temperature without any previous calibration. It was **patented** by CINVESTAV-IPN, my mentor Dr. Jaime Mimila is the inventor). Download my thesis.
- **Scientific Research Summer** for undergraduate students at CINVESTAV-IPN in Computation Science Department with a scholarship from Mexican Academy Sciences, 2003. I have developed an Evolutionary Programming Algorithm whose performance was to optimize 30 of 32 benchmark functions in less than 2 seconds running on Red Hat Linux O.S. My advisors were Dr. Carlos Coello Coello and Dr. Ricardo Landa Becerra.
- **B. Eng.** in Electronic and Communication Engineering at the University of Veracruz, México. Score 9.25/10.0. Sep1999-Jan2004. Title obtained by the National Center for Higher Education Assessment test (CENEVAL), First National Place with 1207/1300 score.
- **High School** at the College of Veracruz State number 14 (1996-1999). Score 8.6/10.0.

Professional Appointments

- **Titular B Professor of Systems Academy** at the Professional Interdisciplinary Unit in Engineering and Advanced Technologies (UPIITA). Jan2016-Today.
- **Titular A Professor of Systems Academy** at the Professional Interdisciplinary Unit in Engineering and Advanced Technologies (UPIITA). Jan2012-Dic2015.
- **Associated C Professor of Systems Academy** at the Professional Interdisciplinary Unit in Engineering and Advanced Technologies (UPIITA). Jan2009-Dic2011.
- **Chief Teaching of Neurofuzzy Systems** at the UPIITA. Jan2011-Today.
- **Chief Teaching of Modeling and Simulation of Linear Dynamic Systems** at the UPIITA. Aug2009-Jun2010.
- **Electronic and Control Engineer** at PROBIONICS S.A. de C.V. I have designed and deployed a myo-electronic control system for a prosthetic arm with 3 free degrees. It is the First Commercial Myoelectronic Arm sold and developed by Mexicans. It was **patented** by PROBIONICS whose owner is Eng. Luis Armando Bravo Castillo. Apr2007-Jan2008.

Formation as professional teacher

- Diploma of Implementation of a learning unit in virtual environment. Mar2011-Today.
- Diploma of Formation and Update Teaching for the New Educative Model. 2009. 240Hrs.
- Workshop on Analysis of the Institutional Educative Model. 2009. 70Hrs.

Other courses, workshops, and assisted conferences

- Fundaments of Fuzzy Logic and Artificial Neural Networks. México, UPIITA-IPN, 2010
- National Meeting of IEEE branches. Acapulco, Guerrero. 2008
- MSP430's day. Texas Instruments, 2007.
- Workshop on C2000 family. Texas Instruments. 2007
- Workshop on EasyWeb – MSP430. AG Electrónica. México. 2007.
- Seminar on Da Vinci Technology. Texas instruments. México 2007.
- Cisco Networking Academy. 2 Courses at University of Veracruz. Aug2003-Jan2004.
- Latin-American IEEE CAS Tour 2002. Tonantzintla, Puebla, Mexico.

Awards

- Mexican State Award on Science and Technology for PROBIONICS SA de CV in technology modality and small industrial organization category. Estado de Mexico. 2007.
- Acknowledge for being finalist in National Youth Contest on Science and Technology. Mexican Institute Youth. Distrito Federal, México. 2007.
- Scholarship from the National Council on Science and Technology (CONACYT). Aug2004-Feb2007.
- Testimony of Outstanding Performance from the National Center for Higher Education Assessment (CENEVAL). 2004. First National Place with 1207/1300 score.
- Scholarship from Mexican Academy Sciences for scientific research summer. 2003.
- 5 "Notas Laudatorias" during Bachelor's degree.

Skills

- **Languages**:
  - Spanish: Native.
  - English: TOEFL. Reading 26/30 Listening 19/30, Speaking 17/30, Writing 18/30. Total 80/120. Date: April 2nd 2011

    - German: Basic level.
- **Programming**: Python, Keras, Tensorflow, C/C++, Matlab & Simulink, ROS.
- **Operating Systems**: Linux, Windows

Professional References

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