

CURRICULUM VITAE

Prepared Jan 2014

Lev Guzmán Vargas

Place of birth: Putla, Oaxaca, México

Date of birth: December 8, 1972.

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(UPIITA), Instituto Politécnico Nacional
Av. IPN No. 2580, G. A. Madero,
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Education:

1995	BS (Phys. and Math.)	Instituto Politécnico Nacional, México
1997	MS (Physics)	Instituto Politécnico Nacional, México
2002	PhD (Physics)	Instituto Politécnico Nacional, México

Employment:

2000–present	Associate Professor. UPIITA- Instituto Politécnico Nacional, México D.F.
2003	Summer Visit Northwestern University
2004-2005	Visiting Scholar Northwestern University Evanston, IL, USA.

Personal and Academic Statement

Throughout my scientific career I have developed a strong interest in the applied science, particularly, physics of life. Through this genuine attraction for science I developed an interest in subjects located in the interface of Physics and Biology. The areas of physics that I am most interested in are time series analysis, complex networks and energy converters. Since I concluded my Ph. D. I have worked in the non linear analysis of time series and dynamical systems. My involvement in projects related to time series analysis and networks helped me to strengthen my interests in the area of non-linear dynamics and to enrich my knowledge with this new form to study complex systems. My recent work has been focused on the study of scaling properties of heartbeat and excursions time series, electrical signals related earthquake activity and characteristics of complex networks.

In the case of complex networks, I have studied the transcriptional regulatory networks of bacteria like the *E. coli* and *S. cerevisiae*. I am also interested in exploring the transport properties and organization of complex networks with applications to physical, biological and social systems.

Publications:

1. **L. Guzmán-Vargas** and F. Angulo-Brown. A dissipative Joule-Brayton cycle model. *Rev. Mex. Fis.* **44**, (6), 619-623, (1998).
2. **L. Guzmán-Vargas**, E. Calleja-Quevedo and F. Angulo-Brown. Fractal changes in heart rate dynamics with aging and heart failure. *Fluctuations and Noise Letters*, Vol. **3**, No. 1, 2003, L81-L87
3. **L. Guzmán-Vargas** and F. Angulo-Brown. Simple model of the aging effect in heart interbeat time series. *Physical Review E*, **67**, 052901 (2003).
4. R. D. Mota, V. D. Granados, A. Queijeiro, J. García and **L. Guzmán**. Creation and annihilation operators, symmetry and supersymmetry of harmonic oscillator. *J. Phys A: Math. and Gen.*, **36**, 17, (2003.)
5. **L. Guzmán-Vargas**, E. Calleja-Quevedo and F. Angulo-Brown. Fractal methods and cardiac interbeat time series. *Rev. Mex. Fis.*, **51** SUPLEMENTO **2**, 122-127, (2005)
6. **L. Guzmán-Vargas**, A. Muñoz and F. Angulo-Brown. Influence of the loss of time-constants repertoire in pathologic cardiac dynamics. *Physica A*, **348**, 304-316, (2005).
7. A. Ramírez, A. Muñoz, **L. Guzmán-Vargas** and F. Angulo-Brown. Some cases of crossover behavior in heart interbeat and electroseismic time series. *Fractals*, Vol. **13**, No. 4, 253-263, (2005).
8. **L. Guzmán-Vargas**, I. Reyes-Ramírez and N. Sánchez. The effect of heat transfer laws and thermal conductances on the stability of an endoreversible engine. *J. Phys. D: Appl. Phys*, **38**, (2005), 1282-1291.
9. **L. Guzmán-Vargas** and R. Hernández-Pérez. Small-world topology and memory effects on decision time in opinion dynamics. *Physica A*, Vol. 372, (2006), 326-332.
10. A. Diaz-Guilera, A. Moreira **L. Guzmán** and L. Amaral. Complex fluctuations and robustness in stylized signaling networks. *J. Stat. Mech.*, P01013, 2007.
11. J. C. Chimal, I. Reyes and **L. Guzmán-Vargas**. Local stability analysis of an endoreversible engine working in an ecological regime. *Open Systems and Information Dynamics*, 14:411-424, 2007.
12. A. Ramirez-Rojas, E. L. Flores-Marquez, **L. Guzmán-Vargas**, J. Marquez-Cruz, C. G. Pavia-Miller and F. Angulo-Brown. A comparison of ground geoelectric activity between three regions of different level of seismicity. *Natural Hazards and Earth System Sciences*, **7**, 591 (2007).
13. C. A. Vargas, E. Basurto, **L. Guzmán-Vargas** and F. Angulo-Brown. Sliding size distribution in a simple spring-block system with asperities. *Physica A* Volume 387, Issue 13, Pages 3137-3144
14. **L. Guzmán-Vargas**, M. Santillán. Comparative analysis of the complex transcription-factor gene regulatory networks of *E. coli* and *S. cerevisiae*. *BMC Systems Biology*, **2**:13 (31 January 2008)

15. **L. Guzmán-Vargas**, A. Ramirez-Rojas and F. Angulo-Brown. Multiscale entropy analysis of electro-seismic time series. *Natural Hazards and Earth System Sciences*,8, 855-860, 2008 (2008).
16. A. Ramirez-Rojas, E. L. Flores-Marquez, **L. Guzmán-Vargas**, G. Gálvez-Coyt, L. Telesca and F. Angulo-Brown. Statistical features of seismoelectric signals prior to M7.4 Guerrero-Oaxaca earthquake (México). *Natural Hazards and Earth System Sciences*, Vol. 8, No. 5, (2008).
17. **L. Guzmán-Vargas**, A. Ramirez-Rojas, R. Hernández-Pérez and F. Angulo-Brown. Variability and correlations in electroseismic time series. *Physica A*, 388, 4218-4228 (2009).
18. R. Hernández-Pérez, **L. Guzmán-Vargas**, A. Ramírez-Rojas and F. Angulo-Brown. Pattern synchrony in electrical signals related to earthquake activity. *Physica A* 389, 1239-1252 (2010).
19. I. Reyes-Ramírez and **L. Guzmán-Vargas**. Scaling properties of excursions in heartbeat dynamics. *Europhysics Letters*, **89**, 38008 (2010)
20. P. L. Curto-Risso, A. Medina, A. C. Calvo Hernández, **L. Guzmán-Vargas** and F. Angulo-Brown. On cycle-to-cycle heat release variations in a simulated spark ignition heat engine. *Applied Energy* 88, 1557-1567 (2010)
21. P. L. Curto-Risso, A. Medina, A. C. Calvo Hernández, **L. Guzmán-Vargas** and F. Angulo-Brown. Monofractal and multifractal analysis of simulated heat release fluctuations in a spark ignition heat engine. *Physica A*, **389**, 24, 5662-5670 (2010)
22. R. Hernández-Pérez, **L. Guzmán-Vargas**, I. Reyes-Ramírez and F. Angulo-Brown. Evolution in time and scales of the stability of heart interbeat rate. *Europhysics Letters*, **92**, 68006 (2010)
23. I. Reyes-Ramírez, L. Guzmán-Vargas, R. Hernández-Pérez. Statistical Properties and Memory of Excursions in Heartbeat Intervals. *Computing in Cardiology* **37**:963966. 2010.
24. **L. Guzmán-Vargas**, I. Reyes-Ramírez, R. Hernández-Pérez and F. Angulo-Brown. Scaling differences of heartbeat excursions between wake and sleep periods. *Methods in Enzimology (Computer Methods, C)*, **487**, 409-428, (2011)
25. R. Hernández-Pérez, **L. Guzmán-Vargas**, I. Reyes-Ramírez and F. Angulo-Brown. Differences in the stability of the heart interbeat rate during wake and sleep periods. *Fluctuation and Noise Letters*, **10**, No. 4 (2011).
26. Marco A. Barranco-Jiménez, Ricardo T. Páez-Hernández, Israel Reyes-Ramírez and **L. Guzmán-Vargas**. Local Stability Analysis of a Thermo-Economic Model of a Chambadal-Novikov-Curzon-Ahlborn Heat Engine. *Entropy* 13(9), 1584-1594, (2011).
27. B. Obregón, R. Hernández-Pérez, **L. Guzmán-Vargas**. Algunas propiedades de transporte en redes regulares y complejas. *Rev. Mex. Fis.*, S 58 (1) 69-75,(2012)
28. C.A. Vargas, E. Basurto, **L. Guzmán-Vargas**, F. Angulo-Brown. Correlations and scaling in a simple sliding spring-block model. *Rev. Mex. Fis.* S 58(1) (2012) 0116.
29. A. Rojas-Pacheco, B. Obregón, L. S. Liebovitch and **L. Guzmán-Vargas**. Time-delay effects on dynamics of a two actor conflict model. *Physica A*, 392,3,458467,(2013).
30. **L. Guzmán-Vargas**, I. Reyes-Ramírez, R. Hernández-Pérez. On excursion increments and homeostatic stability of heartbeat dynamics. *Chaos, Solitons & Fractals*,52,1-7, (2013).

31. P. Curto-Risso, A. Medina, A. C. Hernández, **L. Guzmán-Vargas** and F. Angulo-Brown. Fluctuations in the energetic properties of a spark-ignition engine model with variability. *Entropy* 15 (8), 3367-3386,(2013).
32. B. Aguilar-San Juan, **L. Guzmán-Vargas**. Magnitude earthquake time series: scaing behavior of visibility graphs, *European Physical Journal B*, 86:454 (2013)
33. I. Reyes-Ramírez, MA Barranco-Jiménez, A Rojas-Pacheco, **L. Guzmán-Vargas**. Global stability analysis of a CurzonAhlborn heat engine using the Lyapunov method, *Physica A*, Vol. 399, issue C, 98-105 (2014)
34. R. Juárez, B. Obregón, R. Hernández-Pérez, I. Reyes-Ramírez, **L. Guzmán-Vargas**. Evaluating the transport in small-world and scale-free networks, *Chaos, Solitons & Fractals* 69, 100-106 (2014)
35. Israel Reyes-Ramírez, Marco A. Barranco-Jiménez, Adolfo Rojas-Pacheco, **Lev Guzmán-Vargas**. Global Stability Analysis of a CurzonAhlborn Heat Engine under Different Regimes of Performance, *Entropy* 16 (11), 5796-5809 (2014)
36. C. R. Martínez-Garca, I Reyes-Ramírez, F Angulo-Brown, **Lev Guzmán-Vargas**. Crossover scaling evaluation in mixed correlated signals by means of Detrended Fluctuation Analysis. *Journal of Physics: Conference Series* 582 (1), 012062 (2015)
37. Jacek Hunicz, Alejandro Medina, Grzegorz Litak, Pedro L. Curto-Risso, **Lev Guzmán-Vargas**. Effects of direct fuel injection strategies on cycle-by-cycle variability in a gasoline HCCI engine: sample entropy analysis. *Entropy* 17(2), 539-559 (2015)
38. E. Pérez-Campuzano, **Lev Guzmán-Vargas**, F. Angulo-Brown. Distributions of city sizes in Mexico during the 20th century. *Chaos, Solitons & Fractals*, Volume 73, Pages 6470 (2015)
39. A. Calvo-Hernández, J.M.M. Roco, A. Medina, and S. Velasco and **L. Guzmán-Vargas**. The maximum power efficiency $1 - \sqrt{\tau}$: Research, education, and bibliometric relevance. *European Journal of Physics - Special Topics* 224 (5), 809-823 (2015)
40. I. Fernández-Rosales, Larry S. Liebovitch, **L. Guzmán-Vargas**. The dynamic consequences of co-operation and competition in small-world networks. *PLoS ONE* 10(4): e0126234. doi: 10.1371/journal.pone.0126234 (2015)
41. **L. Guzmán-Vargas**, B. Obregón, Daniel Aguilar, R. Hernández-Pérez and L. S. Liebovitch. Word-Length Correlations and Memory in Large Texts: A Visibility Network Analysis. *Entropy* 17(11), 7798-7810 (2015)

Conference Proceedings and Book Chapters:

1. **L. Guzmán-Vargas**, V. Granados and R. D. Mota. Efficiency of simple quantum engines: The Joule-Brayton and Otto Cycles Proceedings of the 1st. International Conference on Quantum limits to the Second Law. *Am. Institute of Physics*, Vol. **643** p. 291-296, 2002
2. **L. Guzmán-Vargas**, E. Calleja-Quevedo and F. Angulo-Brown. On fractal analysis of cardiac interbeat time series VII Mexican Symposium on Medical Physics. Edited by *Am. Institute of Physics* Vol. **682**, p. 226-231, (2003)

3. **L. Guzmán Vargas**, Características y dinámica de redes complejas. "Tendencias actuales de la física en México". Editado por el *Instituto Politécnico Nacional*, México, 2008
4. **L. Guzmán-Vargas**, A. Muñoz-Diosdado, E. Calleja-Quevedo and F. Angulo-Brown. Some Fractal Properties of Human Heartbeat Dynamics. Statistical Mechanics Research, Editors: Byung-Soo Kim, *Nova Publishers*, 2008.
5. **L. Guzmán Vargas**, A. Muñoz Diosdado, E. Calleja Quevedo, G. Gálvez Coyt and F. Angulo Brown. Variabilidad del interlatido cardiaco: un análisis basado en técnicas de la dinámica no lineal. La Física Biológica en México: TEMAS SELECTOS 2, Editores: L. Gracia-Colín Scherer, L. Dagdug, M. Picquart, E. Vázquez, *El Colegio Nacional*, 2008.
6. A. Muñoz Diosdado, J. L Del Río Correa, G. Gálvez Coyt, F. Angulo Brown, **L. Guzmán Vargas**, El grado de multifractalidad y la asimetría del espectro de singularidades para el análisis de series de interlatido cardiaco. La Física Biológica en México: TEMAS SELECTOS 2, Editores: L. Gracia-Colín Scherer, L. Dagdug, M. Picquart, E. Vázquez, *El Colegio Nacional*, 2008.
7. **L. Guzmán-Vargas** et al. Some complexity studies of the mexican subduction zone. Earthquake research analysis (Ed. S. D amico)., Intech Publishers, 2013.
8. A. Medina, P. L. Curto-Risso, A. C. Hernández, **L. Guzmán-Vargas**, F. Angulo-Brown, AK Sen. Quasi-Dimensional Simulation of Spark Ignition Engines (Book), *Springer* 19-55, (2013).

Courses Taught:

2012-2014	Selected Topics in Signal Processing
2010-2012	Física II (Electromagnetism)
2008	Física III (Optics and Modern Physics)
2007	Física III (Optics and Modern Physics), Biophysics
2006	Biophysics, Physics III (Optics and Modern Physics)
2005	Physics I (Mechanics and Dynamics)
2004	Physics III (Optics and Modern Physics)
2003	Physics I (Mechanics and Dynamics) Physics III (Optics and Modern Physics)
2002	Physics I (Mechanics and Dynamics) Physics III (Optics and Modern Physics)
2001	Biophysics (Bionic Department)
2000	Physics II (Electromagnetic Theory) Biophysics (Bionics Department)
1999	Physics III (Optics and Modern Physics) Physics I (Mechanics and Dynamics)

Honors and Awards

Undergraduate fellowship of Instituto Politécnico Nacional, México, 1993-1995.

Graduate (MSc) fellowship of Consejo Nacional de Ciencia y Tecnología, 1995-1997, México.

Graduate (PhD) fellowship of Consejo Nacional de Ciencia y Tecnología, 1998-2002, México.

Travel Award, 1st. International Conference on Quantum Limits to the Second Law, San Diego, California, USA, July 29-August 3, 2002.

Winner of the fellowship "Summer research visit to USA Labs for young Mexican researchers", program supported by U.S.-México Foundation for Science and Mexican Academy of Sciences, July-August 2003.

Award to the best Ph. D. thesis "A non-linear analysis of heartbeat times series". Instituto Politécnico Nacional, México, 2003.

Award to Research Project **SEP-CONACYT, México** 2006, "*Redes Complejas, Fluctuaciones y Sistemas Dinámicos*", amount: \$415,000.00 MXN.

Memberships and professional services

Hirsh's Index ($H=9$, Source: Google Scholar, Dec. 2014)

Member of the National Systems of Researchers (SNI-CONACYT), level II, México.

Member of the Mexican Physical Society

Member of the Mexican Academy of Sciences

Review Editor - Frontiers in Systems Biology

(<http://frontiersin.org/psychiatry/systemsbiology/editorialboard/>)

Reviewer of scientific journals: *Eur. Phys. Lett*, *Physica A*, *J. Appl. Phys.*, *Energy Institute*, *Natural Hazards and Earth System Sciences*, *Acta Geophysica*, *Rev. Mex. Fis.*, *Int. Journal of Modern Physics C*

Programming languages: C/C++, Python

Programming tools: Matlab (Octave), Python-**Networkx**, Numarray-Numpy, Bash, Awk (Linux), Pajek, Grace