

## Accepted Manuscript

A physical model for dementia

O. Sotolongo-Costa, L.M. Gaggero-Sager, J.T. Becker, F. Maestu,  
O. Sotolongo-Grau, for the Alzheimer's Disease Neuroimaging  
Initiative

PII: S0378-4371(16)31073-1

DOI: <http://dx.doi.org/10.1016/j.physa.2016.12.086>

Reference: PHYSA 17888

To appear in: *Physica A*

Received date: 28 July 2016

Revised date: 11 November 2016

Please cite this article as: O. Sotolongo-Costa, L.M. Gaggero-Sager, J.T. Becker, F. Maestu, O. Sotolongo-Grau, A physical model for dementia, *Physica A* (2017), <http://dx.doi.org/10.1016/j.physa.2016.12.086>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



# A physical model for dementia

O. Sotolongo-Costa<sup>a</sup>, L. M. Gaggero-Sager<sup>b</sup>, J. T. Becker<sup>c</sup>, F. Maestu<sup>d</sup>, O. Sotolongo-Grau<sup>e,\*</sup>, for the Alzheimer's Disease Neuroimaging Initiative<sup>1</sup>

<sup>a</sup> *CInC-(IICBA), Universidad Autónoma del Estado de Morelos, 62209 Cuernavaca, Morelos, México*

<sup>b</sup> *CIICAP-(IICBA), Universidad Autónoma del Estado de Morelos, 62209 Cuernavaca, Morelos, México*

<sup>c</sup> *Department of Psychiatry, Department of Neurology and Department of Psychology, School of Medicine, University of Pittsburgh, Pittsburgh PA 15213, USA*

<sup>d</sup> *Laboratory of Cognitive and Computational Neuroscience (UCM-UPM), Centre for Biomedical Technology (CTB), Campus de Montegancedo s/n, Pozuelo de Alarcón, 28223, Madrid, Spain*

<sup>e</sup> *Alzheimer Research Center and Memory Clinic, Fundació ACE, Institut Català de Neurociències Aplicades, 08029 Barcelona, Spain*

## Abstract

Aging associated brain decline often result in some kind of dementia. Even when this is a complex brain disorder a physical model can be used in order to describe its general behavior. A probabilistic model for the development of dementia is obtained and fitted to some experimental data obtained from the Alzheimer's Disease Neuroimaging Initiative. It is explained how dementia appears as a consequence of aging and why it is irreversible.

**Keywords:** Dementia, Cusp, Catastrophe Theory, Stochastic Process  
**PACS:** 87.19.L, 87.19.xr, 87.85.dm, 87.10.Mn

## 1. Introduction

Dementia is a decline in mental ability, caused by damage to brain cells, that interferes with daily life. Activities of daily living are usually divided into basic and instrumental activities of daily living (IADL) [1, 2].

\*Corresponding author, Tlf: +34 652575178, Fax: +34 934101701

Email addresses: [osotolongo@uaem.mx](mailto:osotolongo@uaem.mx) (O. Sotolongo-Costa), [lgaggero@uaem.mx](mailto:lgaggero@uaem.mx) (L. M. Gaggero-Sager), [BeckerJT@upmc.edu](mailto:BeckerJT@upmc.edu) (J. T. Becker), [fernando.maestu@ctb.upm.es](mailto:fernando.maestu@ctb.upm.es) (F. Maestu), [osotolongo@fundacioace.com](mailto:osotolongo@fundacioace.com) (O. Sotolongo-Grau)

<sup>1</sup>Data used in preparation of this article were obtained from the Alzheimer's Disease Neuroimaging Initiative (ADNI) database ([adni.loni.usc.edu](http://adni.loni.usc.edu)). As such, the investigators within the ADNI contributed to the design and implementation of ADNI and/or provided data but did not participate in analysis or writing of this report. A complete listing of ADNI investigators can be found at: [http://adni.loni.usc.edu/wp-content/uploads/how\\_to\\_apply/ADNI\\_Acknowledgement\\_List.pdf](http://adni.loni.usc.edu/wp-content/uploads/how_to_apply/ADNI_Acknowledgement_List.pdf)

Download English Version:

<https://daneshyari.com/en/article/5103157>

Download Persian Version:

<https://daneshyari.com/article/5103157>

[Daneshyari.com](https://daneshyari.com)