

BIOGRAPHICAL SKETCH

NAME: Fernandez-Miranda, Juan Carlos

eRA COMMONS USER NAME (credential, e.g., agency login): fernandezmirandajc

POSITION TITLE: Professor of Neurosurgery

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Complutense University of Madrid (Spain), School of Medicine	M.D.	07/2000	Medicine
University Hospital "La Paz", Autonomous University of Madrid (Spain)	Neurosurgery Residency	07/2006	Neurological Surgery
University of Florida, Gainesville, Florida	Postdoctoral	07/2007	Microsurgical Neuroanatomy
University of Virginia, Charlottesville, Virginia	Clinical Fellowship	07/2008	Cerebrovascular Surgery
University of Pittsburgh, Pittsburgh, Pennsylvania	Clinical Fellowship	07/2010	Minimally Invasive Skull Base and Brain Surgery

A. Personal Statement

I have the expertise, leadership, training, and motivation necessary to successfully collaborate in the proposed research project. I have a broad background in neurosurgery and neuroanatomy, with specific training and expertise in white matter fiber dissection, advanced fiber tractography techniques, and their synergistic combination. As PI on several university/foundation and NIH-funded grants, I have successfully completed multiple research projects that are highly related with the one proposed here. My previous and current efforts, as director of the Fiber Tractography Lab at the University of Pittsburgh and now at Stanford University, have laid the groundwork for the proposed research in the application and combination of advanced white matter mapping techniques for the in-depth investigation of the complex three-dimensional structure of the human fiber tracts.

B. POSITIONS AND HONORS

Positions and Employment

- 2001-2006 **Neurosurgery Resident**, Department of Neurosurgery, University Hospital La Paz, Autonomous University of Madrid (Spain).
- 2005-2007 **Post-Doctoral Associate**, Department of Neurosurgery, University of Florida, Gainesville, FL

2007-2008 **Clinical Fellow**, Department of Neurosurgery, University of Virginia, Charlottesville, VA
 2008-2010 **Clinical Instructor**, Department of Neurosurgery, University of Pittsburgh, PA
 2010-2014 **Assistant Professor**, Department of Neurosurgery, University of Pittsburgh, PA
 2010-2018 **Director**, Surgical Neuroanatomy Lab, University of Pittsburgh
 2012-2018 **Director**, Fiber Tractography Lab, University of Pittsburgh
 2014-2018 **Associate Professor**, Department of Neurosurgery, University of Pittsburgh, PA
 2014-2018 **Associate Director**, Center for Cranial Base Surgery, University of Pittsburgh, PA
 2018-present **Professor**, Department of Neurosurgery, Stanford University, Palo Alto, CA
 2018-present **Surgical Director**, Brain Tumor, Skull Base and Pituitary Centers, Stanford University, Palo Alto, CA
 2018-present **Director**, Surgical Neuroanatomy, Fiber Tractography, and Virtual Simulation Research Center, Stanford University, Palo Alto, CA

Other Experience and Professional Memberships

2001-2007 Member, Royal College of Physicians of Madrid, Spain
 2004- Member, Spanish Society of Neurological Surgeons
 2006- Member, American Association of Neurological Surgeons
 2008- Member, European Association of Neurosurgical Societies
 2008- Tumor Section – American Association of Neurological Surgeons & Congress of Neurological Surgeons
 2009- Board of Advisors, Pittsburgh Brain Connectivity Competition
 2010- German Skull Base Society (Correspondent Member)
 2010- The Cajal Club
 2011- Member, Congress of Neurological Surgeons
 2011- North American Skull Base Society
 2012- Pituitary Network Association
 2013- Pituitary Society
 2017- Fellow, American College of Surgeons

Honors and Awards

2006 Synthes CMF (Cranio-Maxillofacial) Anatomical Fellowship
 2006 Pedro Mata Award of the Neurosurgical Society of Madrid – Best Neurosurgical Research
 2006 Sanitas Award – Best Medical Post-graduate Trainee in Spain
 2008 Aesculap EANS Research Award
 2009 National Investigation Award (Barclays Foundation) to the best medical paper published by a Spanish doctor
 2013-2018 Best Doctors In America
 2016 Annual Faculty Teaching Award, University of Pittsburgh School of Medicine

C. Contribution to Science

1. I started investigating the complex three-dimensional anatomy of the white matter of the human brain in 2002. Since then, I have been combining fiber microdissection techniques and fiber tractography techniques to better understand the trajectory, segmentation, asymmetry, and spatial relationships of white matter fiber tracts. In 2009, I introduced advanced fiber tracking into our research projects. Furthermore, we have routinely employed datasets from the Human Connectome Project to complement our research studies. Our collaborative work has been well received and widely published because the combination of both techniques overcomes several limitations of each individual technique.

In fact, our studies have described the anatomy of several major fiber tracts with greater detail, correcting previous imprecisions and providing further details that help to understand better their complex architecture. In particular, we have extensively investigated the following fiber tracts: arcuate fascicle, superior longitudinal fascicle, middle longitudinal fascicle, superior fronto-occipital fascicle, optic radiations, claustrum-cortical radiations, dentatorubrothalamic tract, brainstem tracts, and cranial nerves.

- a. Choi C, Rubino P, **Fernandez-Miranda JC**, Rhoton AL Jr: Meyer's Loop and the Optic Radiations in the Transsylvian Approach to the Mediobasal Temporal Lobe. *Neurosurgery* 59:228-36, 2006.
 - b. **Fernandez-Miranda JC**, Rhoton AL Jr, Alvarez-Linera J, Kakizawa Y, Choi C, de Oliveira E: Three-dimensional microsurgical and tractographic anatomy of the white matter of the human brain. *Neurosurgery* 62(6 Suppl 3):989-1028, 2008
 - c. **Fernandez-Miranda JC**, Rhoton AL Jr, Kakizawa Y, Choi C, Alvarez-Linera J: The claustrum and its projection system in the human brain: a microsurgical and tractographic anatomic study. *Journal of Neurosurgery* 108:764-774, 2008
 - d. Wang Y, **Fernandez-Miranda JC**, Verstynen T, Pathak S, Schneider W, Yeh FC. Rethinking the Role of the middle longitudinal fascicle in language and auditory pathways. *Cereb Cortex*. 2013 Oct 23(10):2347-56
 - e. **Fernández-Miranda JC**, Wang Y, Pathak S, Stefaneau L, Verstynen T, Yeh FC. Asymmetry, connectivity, and segmentation of the arcuate fascicle in the human brain. *Brain Struct Funct*. 2015 May;220(3):1665-80.
 - f. Meola A, Comert A, Yeh FC, Stefaneanu L, **Fernandez-Miranda JC**, The controversial existence of the human superior fronto-occipital fasciculus: Connectome-based tractographic study with microdissection validation. *Hum Brain Mapp*.2015 Dec; 36(12): 4964-71.
 - g. Wang X, Pathak S, Stefaneanu L, Yeh FC, Li S, **Fernandez-Miranda JC**. Subcomponents and connectivity of the superior longitudinal fasciculus in the human brain. *Brain Struct Funct*. 2016 May;221(4):2075-92
 - h. Meola A, Comert A, Yeh FC, Sivakanthan S, **Fernandez-Miranda, JC**. The nondecussating pathway of the dentatorubrothalamic tract in humans: human connectome based tractographic study and microdissection validation. *J Neurosurg*. 2016 May;124(5):1406-12
 - i. Yoshino M, Abhinav K, Yeh FC, Panesar S, Fernandes D, Pathak S, Gardner PA, **Fernandez-Miranda JC**. Visualization of Cranial Nerves Using High-Definition Fiber Tractography. *Neurosurgery*. 2016 Jul;79(1):146-65.
 - j. Meola A, Yeh FC, Fellows-Mayle W, Weed J, **Fernandez-Miranda JC**. Human Connectome-Based Tractographic Atlas of the Brainstem Connections and Surgical Approaches. *Neurosurgery*. 2016 Sep;79(3):437-55.
2. In addition to the contributions described above, with a team of collaborators, I directly documented the clinical and surgical applications of advanced fiber tractography techniques for a variety of pathological conditions, including: intra-axial tumor resection, brain tumor evaluation, supratentorial and brainstem cavernomas, high-grade gliomas, neurodegenerative disorders including ALS, cerebellar agenesis, and Lhermitte-Duclos disease. These studies emphasized the importance of advanced fiber tractography for investigating the structural impact of neurological diseases, and for preoperative evaluation and surgical planning in neurosurgical cases.
- a. **Fernandez-Miranda JC**, Engh JA, Pathak S, Madhok R, Boada F, Schneider F, Kassam AB. High-definition fiber tracking guidance for fully endoscopic intra-axial tumor resection. Technical note. *Journal of Neurosurgery* 2010;113:990-9

- b. **Fernandez-Miranda JC**, Pathak S, Engh J, Jarbo K, Verstynen T, Yeh F, Mintz A, Boada F, Schneider W, Friedlander R. High-Definition Fiber Tractography of the Human Brain: Neuroanatomical Validation and Neurosurgical Applications. *Neurosurgery*. 2012 Aug; 71(2): 430-53.
- c. Abhinav K, Yeh FC, El-Dokla A, Ferrando LM, Chang YF, Lacomis D, Friedlander RM, **Fernandez-Miranda JC**. Use of diffusion spectrum imaging in preliminary longitudinal evaluation of amyotrophic lateral sclerosis: development of an imaging biomarker. *Front Hum Neurosci*. 2014 Apr 29;8:270.
- d. Abhinav K, Pathak S, Richardson RM, Engh J, Gardner P, Yeh FC, Friedlander RM, **Fernandez-Miranda JC**. Application of high definition fiber tractography in the management of supratentorial cavernous malformations: a combined qualitative and quantitative approach. *Neurosurgery*. 2014 Jun;74(6):668-80.
- e. Abhinav K, Yeh FC, Pathak S, Suski V, Lacomis D, Friedlander RM, **Fernandez-Miranda JC**. Advanced diffusion MRI fiber tracking in neurosurgical and neurodegenerative disorders and neuroanatomical studies: A review. *Biochim Biophys Acta*. 2014 Nov;1842(11):2286-2297.
- f. Abhinav K, Yeh FC, Mansouri A, Zadeh G, **Fernandez-Miranda JC**. High-definition fiber tractography for the evaluation of perilesional white matter tracts in high-grade glioma surgery. *Neuro Oncol*. 2015 Sep;17(9):1199-209.
- g. Faraji AH, Abhinav K, Jarbo K, Yeh FC, Shin SS, Pathak S, Hirsch BE, Schneider W, Fernandez-Miranda JC, Friedlander RM. Longitudinal evaluation of corticospinal tract in patients with resected brainstem cavernous malformations using high-definition fiber tractography and diffusion connectometry analysis: preliminary experience. *J Neurosurg*. 2015 Nov;123(5):1133-44
- h. Meola A, **Fernandez-Miranda JC**. Peduncles Without Cerebellum: The Cerebellar Agenesis. *Eur Neurol*. 2015;74(3-4):162.
- i. Fernandes-Cabral DT, Zenonos GA, Hamilton RL, Panesar SS, **Fernandez-Miranda JC**. High-Definition Fiber Tractography in the Evaluation and Surgical Planning of Lhermitte-Duclos Disease: A Case Report. *World Neurosurg*. 2016 Aug;92:587.e9-587.e13

Complete List of Published Work in MyBibliography:

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

R01 DC013803-01A1 Fernandez-Miranda (PI) 4/1/2015-3/31/2020

Language connectivity pathways and neuroplasticity in aphasic stroke patients

In this proposal our strategy is to combine innovative diffusion imaging techniques, behavioral assessment, and intensive speech therapy in patients with chronic stroke-related aphasia in order to establish the role of fiber tracts in language function, identify the consequences of their disruption, investigate the potential neuroplastic changes after treatment, and characterize the white matter structural factors that may influence recovery.

Role: PI

Brain Institute, University of Pittsburgh Fernandez-Miranda (PI) 3/1/2014-7/1/2018
Structural Brain Mapping using High Definition Fiber Tracking

This project uses High-Definition Fiber Tractography, an advanced MRI-based non-invasive imaging technique, to study the intrinsic structure and connectivity of the living human brain, both in normal subjects and neurosurgery/neurology patients.

Role: PI

Completed Research Support

The Copeland Fund of the Pittsburgh Foundation Fernandez-Miranda (PI) 7/1/09-7/1/10
Advanced Magnetic resonance imaging techniques in minimally invasive brain surgery
The goal of this study was to investigate the application of high-definition fiber tracking techniques for the presurgical planning of minimally invasive brain surgery procedures.
Role: PI

The Copeland Fund of the Pittsburgh Foundation Fernandez-Miranda (PI) 7/1/10-7/1/11
High-Definition Fiber Tractography in Neurosurgery
The goal of this study was to investigate the application of high-definition fiber tracking techniques for the presurgical planning, preoperative estimation of structural impact caused by brain lesions, and postoperative study of structural changes caused by a surgical procedure.
Role: PI

The Copeland Fund of the Pittsburgh Foundation Fernandez-Miranda (PI) 8/1/12-7/31/13
Animal Model for Anatomic Validation of High-Definition Fiber Tracking White Matter Structural Damage Assessment
The goal of this project was to develop an animal model for histological validation of patterns of structural damage provided by advanced fiber tractography.
Role: PI

The Fine Foundation Fernandez-Miranda (PI) 6/1/13-5/31/15
White Matter Mapping to Study Neurodegenerative Conditions
The goal of this project was to apply High-Definition Fiber Tracking for the study of neurodegenerative diseases, such as Huntington disease and ALS, looking for longitudinal changes in fiber tracts and their correlation with clinical progression.
Role: PI

The Hellmund Fund Fernandez-Miranda (PI) 1/1/14-12/31/15
High Definition Fiber Tracking in Skull Base Tumors
The aim of this project was to investigate the application of HDFT for prediction of visual pathway outcome after surgery and presurgical localization of displaced cranial nerves.
Role: PI