Universitat Pompeu Fabra Barcelona | Master in Bioinformatics for Health Sciences

Master project 2020-2021

Personal Information

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Project

Structural bioinformatics

Project Title:

Multi-modal neuroimaging biomarker identification for the improvement of diagnosis and disease monitoring in primary progressive aphasia.

Keywords:

primary-progressive-aphasia, neurodegeneration, voxel-based-morphometry, diffusion-tensor-imaging, resting-state-functional-mri

Summary:

The main objective of this project is to study the clinical utility (to improve diagnosis and track disease progression) of various neuroimaging biomarkers. The secondary but equally fascinating objective is to study the neuroanatomical basis of language using primary progressive aphasia as a “lesion-model.” We hypothesize that specific neuroimaging biomarkers including structural, diffusion tensor imaging, resting-state functional MRI, and fluorodeoxyglucose positron emission tomography provide measures of brain damage that reflect differentiable pathophysiologic mechanisms. More specifically, we hypothesize diffusion tensor imaging and functional MRI will be able to capture brain damage at early disease stages when volumetric atrophy is not apparent. To this end, we will preprocess and analyze the before-mentioned neuroimaging scans and then apply various statistical methodologies to compare across diagnostic groups and study their association with other biologic and language measures. The data for this study originates from a multitude of past and ongoing projects based at the Hospital Sant Pau Memory Unit.

References:

Classification of primary progressive aphasia and its variants. Neurology. 2011 Mar 15;76(11):1006-14. doi: 10.1212/WNL.0b013e31821103e6. Epub 2011 Feb 16. Gorno-Tempini ML1, Hillis AE, Weintraub S, Kertesz A, Mendez M, Cappa SF, Ogar JM, Rohrer JD, Black S, Boeve BF, Manes F, Dronkers NF, Vandenberghe R, Rascovsky K, Patterson K, Miller BL, Knopman DS, Hodges JR, Mesulam MM, Grossman M. Features of Patients With Nonfluent/Agrammatic Primary Progressive Aphasia With Underlying Progressive Supranuclear Palsy Pathology or Corticobasal Degeneration. JAMA Neurol. 2016 Jun 1;73(6):733-42. doi: 10.1001/jamaneurol.2016.0412. Santos-Santos MA1, Mandelli ML1, Binney RJ2, Ogar J1, Wilson SM3, Henry ML4, Hubbard HI1, Meese M1, Attygalle S1, Rosenberg L1, Pakvasa M1, Trojanowski JQ5, Grinberg LT6, Rosen H1, Boxer AL1, Miller BL1, Seeley WW6, Gorno-Tempini ML1. Rates of Amyloid Imaging Positivity in Patients With Primary Progressive Aphasia. JAMA Neurol. 2018 Mar 1;75(3):342-352. doi: 10.1001/jamaneurol.2017.4309. Santos-Santos MA1,2,3,4, Rabinovici GD1,5, Iaccarino L1,6, Ayakta N1,5, Tammewar G1,5, Lobach I7, Henry ML8, Hubbard I1, Mandelli ML1, Spinelli E1,6, Miller ZA1, Pressman PS1,9, O'Neil JP10, Ghosh P1, Lazaris A1, Meyer M1, Watson C1, Yoon SJ1,11, Rosen HJ1, Grinberg L1,12, Seeley

WW1,12, Miller BL1, Jagust WJ5,10, Gorno-Tempini ML1. Functional Connectivity is Reduced in Early-stage Primary Progressive Aphasia When Atrophy is not Prominent. Alzheimer Dis Assoc Disord. 2017 Apr-Jun;31(2):101-106. doi: 10.1097/WAD.0000000000000193. Bonakdarpour B1, Rogalski EJ, Wang A, Sridhar J, Mesulam MM, Hurley RS. The Sant Pau Initiative on Neurodegeneration (SPIN) cohort: A data set for biomarker discovery and validation in neurodegenerative disorders. Alzheimers Dement (N Y). 2019 Oct 14;5:597-609. doi: 10.1016/j.trci.2019.09.005. eCollection 2019. Alcolea D1,2, Clarimón J1,2, Carmona-Iragui M1,2,3, Illán-Gala I1,2, Morenas-Rodríguez E1,2, Barroeta I1,2, Ribosa-Nogué R1,2, Sala I1,2, Sánchez-Saudinós MB1,2, Videla L1,2,3, Subirana A1,2, Benejam B1,2,3, Valldeneu S1,2, Fernández S1,2,3, Estellés T1,2, Altuna M1,2, Santos-Santos M1,2, García-Losada L1,2, Bejanin A1,2, Pegueroles J1,2, Montal V1,2, Vilaplana E1,2, Belbin O1,2, Dols-Icardo O1,2, Sirisi S1,2, Querol-Vilaseca M1,2, Cervera-Carles L1,2, Muñoz L1,2, Núñez R1,2, Torres S1,2, Camacho MV4, Carrió I4, Giménez S5, Delaby C1,6, Rojas-Garcia R7,8, Turon-Sans J7,8, Pagonabarraga J2,9, Jiménez A10, Blesa R1,2, Fortea J1,2,3, Lleó A1,2.

Expected skills::

Basic knowledge in statistics, basic hands on experience with programming and imaging analysis software

Possibility of funding::

To be discussed

Possible continuity with PhD: :

To be discussed