

## Applicability of Amyloid Intensity Histograms and Amyloid Beta Status on Segmented Positron Emission Tomography Scans for Alzheimer's Diagnosis

**Authors :** Micheal Adeyosoye, Luana O. Sawada, Robin Mayrand, Bipul Simkhada, Mercedes Cabrerizo, Armando Barreto, Naphtali Rishe, Rosie R. C. Cid, David Loewenstein, Ranjan Duara, Malek Adjouadi

**Abstract :** The Neuroimaging Web Services Interface (NWSI), developed by FIU's research team with the Center for Advanced Technology and Education (CATE), enables researchers to analyze neural scans using the Papaya medical image viewer. It visualizes PET scans for diagnosing amyloid positivity/negativity ( $A\beta+$ / $A\beta-$ ) related to Alzheimer's disease (AD). Diagnosis relies on experienced doctors interpreting standardized uptake value ratios (SUVR) against a threshold. This study introduces a histogram-based method for visualizing PET scans, using Python libraries to highlight cortical and disease-prone areas such as the Hippocampus. The histogram's statistical measures, such as kurtosis and skewness, provide insights into amyloid load and disease progression, potentially enhancing diagnosis when SUVR values fall within uncertain ranges. The main aim of this study is to investigate the relationship between the skewness of amyloid PET data histograms and the progression of Alzheimer's Disease (AD), focusing on how skewness changes as the disease advances. Specifically, we hypothesize that as Alzheimer's progresses, the skewness of the histogram will become more negative, reflecting an increased concentration of amyloid-beta ( $A\beta$ ) uptake in the cortical area, in brain regions such as the posterior cingulate, precuneus, and frontal cortex, and the specific disease-prone region of the Hippocampus. This shift in skewness is more pronounced in  $A\beta$ -positive individuals, providing further support for the use of  $A\beta$  positivity as a biomarker for Alzheimer's disease. Additionally, the study aims to explore how histograms of amyloid PET data can differentiate between cognitively normal (CN), mild cognitive impairment (MCI), late mild cognitive impairment (LMCI), and AD groups based on their skewness profiles and their  $A\beta$  status.

**Keywords :** neuroimaging, image processing positron emission tomography, histograms, standardized uptake value ratio, amyloid beta status

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