Exploring Genetic Complexity: A Novel Fractal Fourier Analysis in Genome-Wide Association Studies (GWAS)

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Amyotrophic Lateral Sclerosis (ALS), Parkinson's disease, and Alzheimer's disease are all Neuro degenerative disorders, affecting millions worldwide, with no known cure despite ongoing research. Since the literature has only vague symptomatic proof that these three diseases frequently co-occur, but not mathematical of genetic similarity between ALS, Parkinson's disease, and Alzheimer's disease, this project aimed to uncover similarities by comparing the genetic profiles of these three disorders through a novel Fractal Fourier analysis. A SNP was picked from each of the highest p-level chromosomes. There were eleven chromosomes found to have all three disease variants. Seven of the highest r2 LD's for ALS, Parkinson's, and Alzheimer's from the GWAS were recorded into an EXCEL spread sheet. With the fourth SNP in the sequence being the one examined. The novel fractal patterns for each chromosome were made by subtracting one variant location from the prior variant location for the three diseases on each chromosome. These fractal patterns were entered into the NCSS statistical software to determine the wavelengths from a Fourier analysis. The Fourier analysis then revealed the extent of statistical significance for the similarities between between the three diseases. Out of the eleven chromosomes examined, three shared the same exact Fourier period; chromosome 3, 14 and 17. By comparing the genetic profiles of ALS, Parkinson's, and Alzheimer's through a fractal Fourier analysis, I gained insight into their distinct etiological factors and showed a significant mathematical similarity between the genetic inheritability of these three disorders.

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