Learning Vector Quantization with Applications in Neuroimaging and Biomedicine

van Veen, Rick

DOI:
10.33612/diss.211419033

Publication date:
2022

Propositions belonging to the thesis

Learning Vector Quantization with Applications in Neuroimaging and Biomedicine

Rick van Veen

1. Generalized Matrix Learning Vector Quantization (GMLVQ) in the Scaled Sub-Profile Model / Principal Component Analysis (SSM/PCA) space can discriminate between Alzheimer's disease (AD), dementia with Lewy bodies (DLB), healthy controls (HC), and Parkinson's disease (PD) using a single system with fair accuracy.
2. Using Learning Vector Quantization (LVQ) and, in particular, the discriminative visualization produced by GMLVQ, we can identify outliers and other patients of interest.
3. Promising results have been achieved using these same discriminative visualizations and the projected trajectories of patients with idiopathic REM sleep behavior disorder.
4. Machine learning methods trained on the data of several neuroimaging centers can diagnose AD and PD reasonably well. However, a model's performance on one center does not transfer to other centers.
5. Experiments varying the SSM/PCA reference space have suggested that the space-defining reference group matters less than expected.
6. The voxel representation of the PD prototypes and relevance matrices created by GMLVQ have shown significant agreement with the current medical beliefs about PD.
7. Our subspace corrected relevance learning has resulted in the construction of GMLVQ diagnostic systems that eliminate at least part of the unwanted center variation.
8. The classification of adrenocortical cancer can be achieved with great accuracy using GMLVQ trained on steroid panels extracted using GC-MS. A similar performance on reduced steroid panels extracted using LC-MS can be achieved.
9. "If we knew what it was we were doing, it would not be called research, would it?"

   — *Albert Einstein*
10. "Work expands so as to fill the time available for its completion."

   — *Parkinson's law by Cyril Northcote Parkinson*