

# Move-to-data: A new Continual Learning approach with Deep CNNs, Application for image-class and Object recognition

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## I. APPENDIX A

### A. Mathematical justification of Move-To-Data

In the following let  $d \in \mathbb{N}$  and  $\epsilon \in (0, 1)$ . We fix a vector  $w \in \mathbb{R}^d$  and a sequence  $(v^n)_{n \in \mathbb{N}} \subset \mathbb{R}^d$ . The sequence resulting from the *Move-To-Data* Algorithm  $(w^n)_{n \in \mathbb{N}}$  is defined recursively as

$$w^{n+1} := w^n + \epsilon(v^n - w^n)$$

for all  $n \in \mathbb{N}$  with the notation  $w^0 := w$ .

*Lemma 1:* The *Move-To-Data* Algorithm can be rewritten in

$$w^n = \sum_{i=1}^n \epsilon(1 - \epsilon)^{n-i} v^i.$$

*Proof:* We simply expand

$$\begin{aligned} w^{n+1} &= w^n + \epsilon(v^n - w^n) \\ &= \epsilon v^n + (1 - \epsilon)w^n \\ &= \epsilon v^n + (1 - \epsilon)(\epsilon v^{n-1} + (1 - \epsilon)w^{n-1}) \end{aligned}$$

Then continuing the pattern

$$w^{n+1} = \sum_{i=1}^{n+1} \epsilon(1 - \epsilon)^{n-i} v^i.$$

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In order to proof stochastic results we introduce a measure space  $(\Omega, \mathcal{B}_\Omega, \mu)$

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