

# FREE SPACES AND $\ell_1$

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ABSTRACT. Let  $M$  be a pointed metric space and  $Lip_0(M)$  the space of Lipschitz functions vanishing at 0. Endowed with the Lipschitz norm this space is a Banach space. Denote  $\mathcal{F}(M)$  the closed subspace of  $Lip_0(M)^*$  spanned by the evaluation points and call it the Lipschitz-free space over  $M$ .

We will first study Lipschitz-free spaces over compact ultrametric spaces and prove that they are dual spaces isomorphic to  $\ell_1$ , with a predual isomorphic to  $c_0$ . However, we will then prove that Lipschitz-free spaces over ultrametric spaces are never isometric to  $\ell_1$ .